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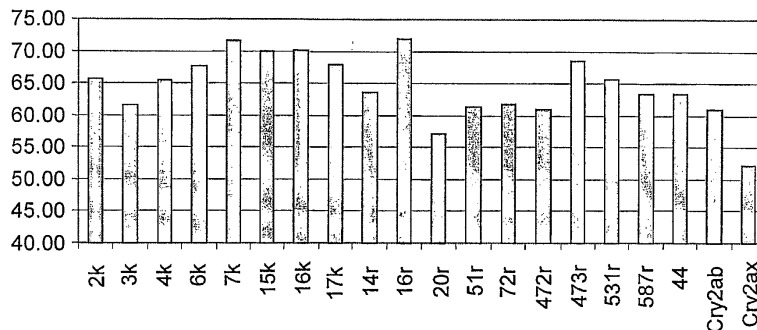
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(54) 발명의 명칭 **신규한 바실루스 투링기엔시스 결정 폴리펩티드, 폴리뉴클레오티드, 및 이의 조성물**

(57) 요약

본 발명은 바실루스 (*Bacillus*) Cry2 폴리펩티드와 관계된 살충성 폴리펩티드를 제공한다. 본 발명의 폴리펩티드를 암호화하는 핵산이 또한 제공된다. 곤충 포식에 대한 식물의 저항성을 증강시키기 위해 본 발명의 폴리펩티드 및 핵산을 사용하는 방법이 포함된다.

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특허청구의 범위

청구항 1

서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259 중의 어느 것, 또는 그의 보체를 포함하는 분리된 핵산 분자의 용도.

명세서

기술분야

[0001] 본 발명은 일반적으로, 병충해 방제 (pest control) 분야에 관한 것이고, 바실루스 (*Bacillus*) Cry2 폴리펩티드와 관계된 살충성 폴리펩티드, 및 이를 암호화하는 폴리뉴클레오티드를 제공한다. 본 발명은 또한, 트랜스제닉 (transgenic) 식물 생성을 포함하지만 이에 제한되지 않는, 곤충 포식에 대한 식물의 저항성을 변경시키기 위한 방법 및 조성물에 관한 것이다.

배경기술

[0002] 통상의 농작물을 포함하여 상업적으로 유용한 수 많은 식물들은 곤충과 선충류 병충해에 의한 공격을 받기 쉽다. 이들 병충해는 작물 수확량과 질에 있어 상당한 감소를 유발시킬 수 있다. 전통적으로, 농부들은 병충해로 인한 손상을 없애기 위해 주로 화학적 살충제에 의존하여 왔다. 그러나, 화학적 살충제를 사용한 결과, 살충제를 살포하는 것과 관련한 불편함과 비용 문제와 같은 자체 문제점이 부각되었다. 더욱이, 화학적 잔기들은 환경상 및 보건상의 우려를 유발시킨다. 이러한 이유들과 기타 이유로 인해, 대체 살충제가 요망된다.

[0003] 병충해를 방제하기 위한 환경 친화적 접근법은 흔히 "Cry 단백질"로서 지칭되는, 토양 세균인 바실루스 투링기엔시스 (*Bacillus thuringiensis*) ("Bt")로부터 유래된 살충성 결정 단백질을 사용하는 것이다. 이들 단백질 중의 상당 수가 특이적 표적 곤충에 대해서는 다소 독성이 있긴 하지만, 식물과 기타 비-표적화 유기체에 대해서는 무해하다. 몇몇 Cry 단백질이 작물에서 재조합적으로 발현되어 병충해-내성 트랜스제닉 식물을 제공해 주었다. 이들 중에서, Bt-트랜스제닉 목화 및 옥수수가 광범위하게 경작되었다.

[0004] 다수의 Cry 단백질이 아미노산 서열 상동성에 기초하여 분리, 정상확인 및 분류되었다 [참고: Crickmore et al., 1998, *Microbiol. Mol. Biol. Rev.*, 62: 807-813]. 이러한 분류 도식은 새로이 밝혀진 Cry 단백질에 명칭을 부여하고 분류하는데 있어 체계적인 메카니즘을 제공한다.

[0005] 일반적으로, 개개의 Cry 단백질은 Cry2A를 제외하고는 비교적 협소한 활성 스펙트럼을 보유하고 있는 것으로 밝혀졌다. Cry2A는 이러한 Cry 단백질의 일부가 레피도프테라 (*Lepidoptera*) 목 곤충과 디프테라 (*Diptera*) 목 곤충 둘 다에 대한 독성을 포함한 보다 넓은 유효 범위를 보유하고 있다는 점에서 보면 별난 것이다. Cry2A 단백질은 트리코플루시아 니 (*Trichoplusia ni*) (양배추 자벌레: cabbage looper)와 에데스 테니오르헨쿠스 (*Aedes taeniorhynchus*) (모기: mosquito)에 대항하여 이중 활성을 나타내는 독소인 것으로 밝혀졌다 [참고: Yamamoto and McLaughlin, 1982, *Biochem. Biophys. Res. Comm.* 130: 414-421]. Cry2A 단백질을 암호화하는 핵산 분자 (Cry2Aa로 명명됨)를 클로닝하고 비. 메가테륨 (*B. megaterium*)에서 발현시켰으며, 이는 레피도프테라 곤충과 디프테라 곤충 둘 다에 대항하여 활성이 있는 것으로 밝혀졌다 [참고: Donovan et al. 1988, *J. Bacteriol.* 170: 4732-4738]. Cry2Aa와 상동성인 부가의 암호화 서열 (Cry2Ab로 명명됨)을 클로닝하였고, 이는 단지 레피도프테라 유충에 대항해서만 활성을 지닌 것으로 밝혀졌다 [참고: Widner and Whiteley, 1989, *J. Bacteriol* 171: 2].

발명의 내용

해결하려는 과제

[0006] 차세대 트랜스제닉 작물은 이들이 다수의 Bt 유전자 및/또는 신규한 Bt 유전자를 발현할 수 있는 경우에는 곤충들에 대해 저항성 (내충성)이 보다 클 수 있다. 따라서, 광범위한 활성 스펙트럼을 갖는 신규한 살충성 단백질이 고도로 요망될 것이다.

과제의 해결 수단

[0007] 본 발명은 바실루스 투링기엔시스로부터 분리한 신규한 Cry2 폴리펩티드, Cry2Ax (서열 2)에 관한 것이다. 또한, Cry2Ax-유래된 폴리펩티드 (서열 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260)가 본 발명에 포괄된다. Cry2Ax 및 Cry2Ax-유래된 폴리펩티드의 폴리펩티드 서열 이외에도, 본 발명의 폴리펩티드는 그의 모든 단편, 유사체, 동족체, 천연 발생적 대립유전자 또는 돌연변이체를 포함하지만 이에 제한되지 않는 변이체를 또한 포괄한다. 본 발명의 폴리펩티드는 또한, 본 발명의 모든 Cry2Ax 또는 Cry2Ax-유래된 핵산에 의해 암호화되는 폴리펩티드를 포괄한다. 한 양태에서는, 한 가지 이상의 Cry2Ax 기능적 활성 (예: 살충 활성)을 지니고 있고 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것의 폴리펩티드 서열과 85%, 90%, 95%, 97%, 98%, 또는 99% 이상 동일한 폴리펩티드, 또는 그의 변이체가 포괄된다. 또 다른 양태에서는, 한 가지 이상의 Cry2Ax 기능적 활성 (예: 살충 활성)을 지니고 있고, 길이가 25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 425, 450, 475, 500, 525, 550, 575, 600, 또는 625개 이상의 연속된 아미노산이며, 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것을 암호화하는 핵산과 엄격한 조건 하에 혼성화하는 폴리뉴클레오티드에 의해 암호화되는 폴리펩티드, 또는 그의 변이체가 포괄된다. 예를 들어, 제조합 수단에 의해 본 발명의 폴리펩티드를 생성시키는 방법 또한 제공된다. 본 발명의 하나 이상의 폴리펩티드를 포함하는 조성물이 또한 고려된다.

[0008] 본 발명은 또한, Cry2Ax의 핵산 분자 (서열 1) 및 Cry2Ax-유래된 핵산 분자 (서열 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259)에 관한 것이다. 또한, 적어도 부분적으로 기능적 활성인, 즉 야생형 Cry2Ax 폴리펩티드와 연관된 한 가지 이상의 공지된 기능적 활성을 표시할 수 있는 폴리펩티드를 암호화하는 단편 및 유사체가 본 발명에 포괄된다. 한 양태에서는, 본 발명이 i) 서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185,

187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259 중의 어느 것의 뉴클레오티드 서열과 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, 또는 99% 이상 동일한 뉴클레오티드 서열; ii) 서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259 중의 어느 것, 또는 그의 보체의 뉴클레오티드 서열로 이루어진 핵산 프로브와 엄격한 조건 하에 혼성화하는 뉴클레오티드 서열; 및/또는 iii) 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것의 아미노산 서열을 포함하는 폴리펩티드를 암호화하는 핵산 분자를 포함하는 뉴클레오티드 서열을 포함하는 분리된 핵산 분자를 포괄한다. 본 발명의 핵산을 포함하는 벡터가 또한 포괄된다. 본 발명의 벡터를 포함하는 세포 또는 식물이 또한 포괄된다.

[0009] 본 발명은 또한, 본 발명의 핵산 및/또는 폴리펩티드를 발현하는 트랜스제닉 식물에 관한 것이다. 이러한 트랜스제닉 식물은 구성성 발현, 발생적으로 조절된 발현, 조직 특이적 발현 등을 포함하지만 이에 제한되지 않는, 당해 분야에 공지된 어떠한 방식이든 트랜스유전자 (transgene)를 발현할 수 있다. 본 발명의 트랜스제닉 식물로부터 수득한 종자 (seed) 또한 포괄된다.

도면의 간단한 설명

[0010] 도 1은 셔플링 (shuffling) 제2 회전으로부터의 cDNA 클론의 살충 활성을 도기한 것이다. 각 클론은 강제 침윤을 이용하여 엔. 벤타미아나 (*N. benthamiana*) 잎에서 발현시켰다. 각각의 잎 원반상 조직을 단일 제3령 에이치. 제아 (*H. zea*) 유충에 공급하였다. 24시간 동안 향은 배양한 후, 공급 활성을 가시적으로 관찰함으로써 결정하고, 이를 잔존하는 근사 잎 면적 분획으로서 표현하였다. y-축은 해당 곤충에 노출시킨 후 잔존하는 잎 원반상 조직의 비율이다. x-축은 잎 원반상 조직에서 발현된 클론이다. 몇 가지 클론, 예를 들어 7K (D_S01000779) (서열 10), 15K (D_S00999080) (서열 12), 16K (D_S01000269) (서열 14), 16R (D_S01037143) (서열 16), 및 473R (D_S01037677) (서열 18)은 증가된 살충 활성을 나타내었다.

도 2는 제1 회전 셔플링된 클론 44 (D_S00503970) 및 제3 회전 셔플링된 클론 D_S01764701의 살충 활성을 도기한 것이다. 각 클론은 강제 침윤을 이용하여 엔. 벤타미아나 잎에서 발현시켰다. 각각의 잎 원반상 조직을 단일 제3령 에이치. 제아 유충에 공급하였다. 24시간 동안 향은 배양한 후, 잎 원반상 조직을 비디오로 포착함으로써 공급 활성을 결정하였다. y-축은 포착된 잎 원반상 조직 영상에 존재하는 픽셀 수이다. x-축은 잎 원반상 조직에서 발현된 클론이다. 그 결과는 3가지 실험에 대한 평균치로 나타내었다. 각 실험의 경우, 8개 이상의 잎 원반상 조직을 각 클론에 대해 시험하였다.

도 3A-3B는 색소체 구획 (좌측 패널) 또는 세포질 (우측 패널)에서 제1 회전 셔플링된 클론 44를 발현하는 트랜스제닉 담배 식물에 대한 효능 결과를 도기한 것이다. (A) 에이치. 제아 또는 (B) 에스. 엑시구아 (*S. exigua*) 억제 효능은, 잎들을 벌레들과 함께 24시간 동안 향은 배양한 후에 결정하였다. 잔존하는 상대적 잎 면적 (픽셀 수)을 실제적으로 계산하기 위해 비디오 포착 장비를 이용하여 잔존하는 잎의 양을 관찰하였다. 각 트랜스제닉 식물은 분석을 위해 채집한 6개의 잎 원반상 조직을 갖는다. 각 트랜스유전자 구조물을 이용하여 25개 트랜스제닉 식물을 만들었기 때문에, 해당 번호들이 특정한 구조물을 이용하여 상이한 식물을 구별시켜 준다.

도 4A-4B는 제1 회전 셔플링된 클론 44-발현성 트랜스제닉 식물에서의 트랜스유전자 발현 수준을 도기한 것이다. 이러한 셔플링된 Cry2-유래된 폴리펩티드는 pMAXY5469 또는 pMAXY5471로 각각 형질전환시킴으로써 (A) 색소체성 또는 (B) 세포질성 세포하 구획 내에서 발현되었다. 제1 회전 셔플링된 클론 44 폴리펩티드의 독소 영역에 대해 지시된 폴리클로날 항체를 사용하여 트랜스제닉 식물 추출물 상에서 웨스턴 블롯 분석을 수행하였다. 음성 대조군은 형질전환시키지 않은 식물로부터 취한 추출물이었다. 양성 대조군은 20 ng 또는 40 ng의

정제된 Cry2Ax 독소였다. 양성 대조군 Cry2Ax의 분자량은 식물 추출물에서 Cry2Ax-유래된 폴리펩티드의 분자량과 상이한데, 이는 전자가 활성화된 트립신이고 후자가 프로-독소이기 때문이다.

발명을 실시하기 위한 구체적인 내용

[0011] 본 발명은 바실루스 Cry2 폴리펩티드와 관계된 살충성 폴리펩티드를 제공한다. 본 발명의 폴리펩티드를 암호화하는 핵산 분자가 또한 제공된다. 곤충 포획에 대한 식물의 저항성을 증강시키기 위해 본 발명의 폴리펩티드 및 핵산을 사용하는 방법이 포괄된다.

[0012] 5.1 본 발명의 폴리펩티드

[0013] 본 발명은 바실루스 투링기엔시스로부터 분리한 신규한 Cry2 폴리펩티드, Cry2Ax (서열 2)에 관한 것이다. 또한, Cry2Ax-유래된 폴리펩티드 (서열 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260)가 본 발명에 포괄된다. 본 발명의 폴리펩티드에는 또한, 본 발명의 모든 Cry2Ax 또는 Cry2Ax-유래된 핵산에 의해 암호화되는 폴리펩티드가 포괄된다 (섹션 5.2 참고).

[0014] Cry2Ax 및 Cry2Ax-유래된 폴리펩티드의 폴리펩티드 서열 이외에도, 본 발명의 폴리펩티드는 또한, 그의 실질적으로 유사한 모든 서열, 모든 단편, 유사체, 동족체, 천연 발생적 대립유전자 또는 돌연변이체를 포함하지만 이에 제한되지 않는 그의 변이체를 포괄한다는 것을 인지해야 할 것이다. 본 발명에 포괄된 변이체는 적어도 부분적으로 기능적 활성인, 즉 야생형 Cry2Ax 폴리펩티드와 연관된 한 가지 이상의 공지된 기능적 활성을 표시할 수 있는 폴리펩티드이다. 이러한 기능적 활성에는 생물학적 활성, 예를 들어 살충 활성; 항원성, 즉 항-Cry2Ax 항체와 결합하기 위해 Cry2Ax와 경쟁하거나 이와 결합할 수 있는 능력; 면역원성, 즉 Cry2Ax 폴리펩티드와 결합하는 항체를 생성할 수 있는 능력이 포함되지만, 이에 제한되지 않는다. 몇몇 양태에서는, 변이체가 그의 모 폴리펩티드와 실질적으로 유사한 한 가지 이상의 기능적 활성을 지닌다 (예를 들어, Cry2Ax의 변이체는 Cry2Ax와 실질적으로 유사한 한 가지 이상의 기능적 활성을 지닐 것이다). 본원에 사용된 바와 같은, 변이체의 기능적 활성은 변이체가 모 폴리펩티드의 하나의 표준 편차 내에 있다면, 이러한 모 폴리펩티드와 "실질적으로 유사한" 것으로 간주될 것이다.

[0015] 한 양태에서는, 한 가지 이상의 Cry2Ax 기능적 활성 (예: 살충 활성)을 지니고 있고 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것의 폴리펩티드 서열과 85%, 90%, 95%, 97%, 98%, 또는 99% 이상 동일한 폴리펩티드가 본 발명에 포괄된다. 이러한 본 발명의 폴리펩티드는 H₂, S₇, Q₂₇, Q₃₅, E₃₆, K₄₃, D₄₄, N₄₅, D₅₁, A₅₈, V₆₉, R₇₈, N₇₉, K₉₉, T₁₁₈, V₁₂₄, E₁₂₅, R₁₂₉, N₁₃₈, R₁₃₉, A₁₄₁, T₁₆₂, Q₁₆₅, M₁₆₆, L₁₈₃, I₁₉₂, H₂₁₁, R₂₁₃, R₂₁₇, D₂₁₈, V₃₂₄, I₃₈₆, T₃₉₉, S₄₀₅, Q₄₄₅, I₅₅₁, S₅₈₇, I₅₉₁, L₆₁₀, 및 L₆₃₁로 이루어진 군으로부터의 1개 이상, 5개 이상, 10개 이상, 20개 이상, 30개 이상, 또는 40개 모든 아미노산 잔기를 함유한다. 아래첨자는 폴리펩티드 서열을 서열 2와 최적으로 정렬시킨 경우에 서열 2 내의 위치에 상응하는 아미노산 잔기 위치를 지시한다. 기준 서열과 최적으로 정렬되는 아미노산 서열과 관련하여, 특정 아미노산은 잔기가 해당 정렬에서 쌍을 이루는 기준 서열 내의 위치에 "상응한다".

[0016] 본원에 사용된 바와 같이, 특정 서열이 기준 서열과 "% 이상 동일한" 것으로서 규정되는 경우, 예를 들어 "서열 2와 95% 이상 동일한 폴리펩티드"로서 규정되는 경우, "% 동일하다"는 것은 달리 지시되지 않는 한, 절대 동일률을 지칭하는 것으로 인지해야 한다. 용어 "절대 동일률"은 미스매치된 아미노산이나 핵산의 유사성 여부와는 상관없이, 동일한 아미노산이나 핵산을 1로서 점수 매기고 어떠한 치환물도 제로 (0)로서 점수 매김으로써 측정된 서열 동일률을 지칭한다. 전형적인 서열 정렬에서는, 두 서열의 "절대 동일률"이 아미노산 또는 핵산 "동일률"로서 표시된다. 두 서열을 최적으로 정렬시키기 위해 이들 서열 중의 어느 하나 또는 둘 다에 갭을

삽입시켜야 하는 경우에는, 다른 서열 내의 갭과 정렬하는 한 서열 내의 아미노산 잔기가 동일할 결정 목적상 미스매칭물로서 계수된다. 갭은 내부적이거나 외부적, 즉 절단물일 수 있다. 절대 동일물은, 예를 들어, 디폴트 (default: 생략) 파라미터를 사용하여 클러스탈 (Clustal) W 프로그램, 버전 1.8 (1999년 6월)을 이용하여 용이하게 결정할 수 있다 [참고: Thompson et al., 1994, *Nucleic Acids Research* 22: 4673-4680].

[0017] 또 다른 양태에서는, Cry2Ax 및 Cry2Ax-유래된 폴리펩티드의 단편이 본 발명에 포괄된다. 한 가지 이상의 Cry2Ax 기능적 활성 (예: 살충 활성)을 지니고 있고; 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것의 25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 425, 450, 475, 500, 525, 550, 575, 600 또는 625개 이상의 연속된 아미노산 길이를 갖고; 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것을 암호화하는 핵산과 엄격한 조건 하에 혼성화하는 폴리뉴클레오티드에 의해 암호화되는 폴리펩티드가 포괄된다. 본 발명의 단편이 서열 2의 아미노산 잔기 2, 7, 27, 35, 36, 43, 44, 45, 51, 58, 69, 78, 79, 99, 118, 124, 125, 129, 138, 139, 141, 161, 165, 166, 183, 192, 211, 213, 217, 218, 324, 386, 399, 405, 445, 551, 587, 591, 610, 631에 상응하는 아미노산 잔기들 중의 어느 것을 포괄하는 양태에서는, 이러한 본 발명의 폴리펩티드가 H₂, S₇, Q₂₇, Q₃₅, E₃₆, K₄₃, D₄₄, N₄₅, D₅₁, A₅₈, V₆₉, R₇₈, N₇₉, K₉₉, T₁₁₈, V₁₂₄, E₁₂₅, R₁₂₉, N₁₃₈, R₁₃₉, A₁₄₁, T₁₆₂, Q₁₆₅, M₁₆₆, L₁₈₃, I₁₉₂, H₂₁₁, R₂₁₃, R₂₁₇, D₂₁₈, V₃₂₄, I₃₈₆, T₃₉₉, S₄₀₅, Q₄₄₅, I₅₅₁, S₅₈₇, I₅₉₁, L₆₁₀, 및 L₆₃₁로 이루어진 군으로부터의 1개 이상, 5개 이상, 10개 이상, 20개 이상, 30개 이상, 또는 40개 모든 아미노산 잔기를 함유한다.

[0018] 구체적 양태에서는, 본 발명의 단편이, 가공-처리시킨 프로-독소의 길이에 상응한다. 완전한 길이의 프로-독소 Cry2와 가공-처리시킨 Cry2 독소 간의 분자량 차이는 5 내지 6 kDa이다. 이는 대략 40개 아미노산이 프로-독소 Cry2 폴리펩티드로부터 절단된 것에 따른 결과이다 [참고: Rukmini et al., 2000, *Biochimie* 82: 109-116; Aronson et al., 1993, *Mol. Microbiol.* 7: 489-496; Morse et al., 2001, *Structure* 9: 409-17]. 이와 같이 가공-처리시킨 Cry2 단편에 상응하는 폴리펩티드를, 프로-독소 가공 처리에 대한 필요성을 직접적으로 회피하기 위해 본 발명의 방법에 제공할 수 있다.

[0019] 또 다른 구체적 양태에서는, 본 발명의 단편이 Cry2 도메인에 상응한다. Cry2 폴리펩티드는 i) 곤충 선단 중간창자 막 내로의 삽입에 관여하고 이온 채널 기능에 영향을 미치는 도메인 I; ii) 곤충 중간창자 상피 세포막 상에서의 수용체 결합에 관여하는 도메인 II; 및 iii) 이온 채널 기능, 수용체 결합 및 막 내로의 삽입에 관여하는 도메인 III을 포함한 3개의 도메인을 갖는다 [참고: Dean et al., 1996, *Gene* 179: 111-117; Schnepf et al., 1998, *Microbiol. Molec. Biol. Rev.* 62: 775-806].

[0020] 또 다른 양태에서는, 유사체 폴리펩티드가 본 발명에 포괄된다. 유사체 폴리펩티드는 변형시킨, 즉 모든 유형의 분자를 Cry2Ax 또는 Cry2Ax-유래된 폴리펩티드에 공유 부착시킴으로써 변형시킨 잔기를 보유할 수 있다. 예를 들어, 본 발명의 유사체 폴리펩티드는, 예를 들면 당화, 아세틸화, 페길화, 인산화, 아미드화, 공지된 보호기/차단기에 의한 유도체화, 단백질 분해적 절단, 세포성 리간드 또는 기타 단백질에 대한 연결 등에 의해 변형시킬 수 있지만, 이에 제한되지는 않는다. 본 발명의 유사체 폴리펩티드는 당업자에게 공지된 기술 [이에는 특이적 화학적 절단, 아세틸화, 포밀화, 투니카마이신의 대사적 합성 등이 포함되지만, 이에 제한되지 않는다]을 이용하여 화학적으로 변형시킴으로써 변형시킬 수 있다. 더욱이, 본 발명의 폴리펩티드의 유사체는 하나 이상의 비-전통적 아미노산을 함유할 수 있다.

[0021] 예를 들어, 제조할 수단에 의해 본 발명의 폴리펩티드를 생성하는 방법이 또한 제공된다 (섹션 5.6 참고).

[0022] 본 발명의 하나 이상의 폴리펩티드를 포함하는 조성물이 또한 포괄된다. 본 발명의 조성물은 확산제-점착제 아주반트, 안정화제, 기타 살충성 부가제, 희석제, 조성물의 형태학적 특성 또는 안정성을 최적화시키는 작용제, 예를 들어 계면활성제, 유화제, 분산제 및/또는 중합체를 포함하지만, 이에 제한되지 않는 부가 작용제를 추가로 포함할 수 있다.

[0023] 5.2 본 발명의 핵산

[0024] 본 발명은 또한, Cry2Ax의 핵산 분자 (서열 1) 및 Cry2Ax-유래된 핵산 분자 (서열 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259)에 관한 것이다. 본 발명의 핵산 분자는 또한, 본 발명의 어떠한 Cry2Ax이나 Cry2Ax-유래된 폴리펩티드도 암호화하는 핵산 분자를 포괄한다 (섹션 5.1 참고).

[0025] Cry2Ax 및 Cry2Ax-유래된 핵산 분자의 핵산 분자 이외에도, 본 발명의 핵산은 또한, 그의 실질적으로 유사한 모든 서열, 모든 단편, 동족체, 천연 발생적 대립유전자 또는 돌연변이체를 포함하지만 이에 제한되지 않는 그의 변이체를 포괄한다는 것을 인지해야 할 것이다. 본 발명에 포괄된 변이체 핵산 분자는 적어도 부분적으로 기능적 활성인, 즉 야생형 Cry2Ax 폴리펩티드와 연관된 한 가지 이상의 공지된 기능적 활성을 표시할 수 있는 폴리펩티드를 암호화한다. 이러한 기능적 활성에는 생물학적 활성, 예를 들어 살충 활성; 항원성, 즉 항-Cry2Ax 항체와 결합하기 위해 Cry2Ax와 경쟁하거나 이와 결합할 수 있는 능력; 면역원성, 즉 Cry2Ax 폴리펩티드와 결합하는 항체를 생성할 수 있는 능력이 포함되지만, 이에 제한되지 않는다. 몇몇 양태에서는, 변이체가 그의 모 핵산 분자와 실질적으로 유사한 한 가지 이상의 기능적 활성을 지닌다 (예를 들어, Cry2Ax 핵산 분자의 변이체는 Cry2Ax 핵산 분자에 의해 암호화된 폴리펩티드와 실질적으로 유사한 한 가지 이상의 기능적 활성을 지닌 폴리펩티드를 암호화할 것이다). 본원에 사용된 바와 같은, 변이체의 기능적 활성은 변이체가 모 폴리펩티드의 하나의 표준 편차 내에 있다면, 이러한 모 폴리펩티드와 "실질적으로 유사한" 것으로 간주될 것이다.

[0026] 한 양태에서는, 서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259의 핵산 분자 중의 어느 것보다도 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, 또는 99% 이상 동일한 핵산 분자가 본 발명에 포괄된다. 이러한 본 발명의 핵산 분자는 H₂, S₇, Q₂₇, Q₃₅, E₃₆, K₄₃, D₄₄, N₄₅, D₅₁, A₅₈, V₆₉, R₇₈, N₇₉, K₉₉, T₁₁₈, V₁₂₄, E₁₂₅, R₁₂₉, N₁₃₈, R₁₃₉, A₁₄₁, T₁₆₂, Q₁₆₅, M₁₆₆, L₁₈₃, I₁₉₂, H₂₁₁, R₂₁₃, R₂₁₇, D₂₁₈, V₃₂₄, I₃₈₆, T₃₉₉, S₄₀₅, Q₄₄₅, I₅₅₁, S₅₈₇, I₅₉₁, L₆₁₀, 및 L₆₃₁로 이루어진 군으로부터의 1개 이상, 5개 이상, 10개 이상, 20개 이상, 30개 이상, 또는 40개 모든 아미노산 잔기를 함유하는 폴리펩티드를 암호화한다.

[0027] 두 핵산 분자의 동일률을 결정하기 위해, 이들 서열을 최적의 비교 목적으로 정렬시킨다 (예를 들어, 제1 핵산 분자를 제2 핵산 분자와 최적으로 정렬시키기 위해 제1 핵산 분자에 갭을 도입할 수도 있다). 그 다음, 상응하는 뉴클레오티드 위치에서의 뉴클레오티드들을 비교한다. 제1 서열 내의 특정 위치가 제2 서열 내에서의 상응하는 위치와 동일한 뉴클레오티드에 의해 점유된 경우에는, 해당 분자가 상기 위치에서 동일하다. 두 서열 간의 동일률은 서열들에 의해 공유된 동일한 위치 수의 함수이다 (즉, 동일률 % = 동일한 중복 위치 수 / 총 위치 수 X 100%). 한 양태에서는, 두 서열이 동일한 길이이다.

[0028] 두 서열 간의 동일률을 결정하는 것은 수학적 알고리즘을 이용하여 달성할 수도 있다. 두 서열을 비교하기 위해 활용되고 있는 수학적 알고리즘의 비-제한적 예는 문헌 [참고: Karlin and Altschul, 1993, *Proc. Natl. Acad. Sci.* 90: 5873-5877]에서와 같이 변형시킨, 문헌 [참고: Karlin and Altschul, 1990, *Proc. Natl. Acad. Sci.* 87: 2264-2268]의 알고리즘이다. 이러한 알고리즘은 NBLAST 및 XBLAST 프로그램 [참고: Altschul et al., 1990, *J. Mol. Biol.* 215: 403 and Altschul et al., 1997, *Nucleic Acids Res.* 25: 3389-3402] 내로 혼

입된다. BLAST 분석을 수행하기 위한 소프트웨어는 예를 들어, 다음 공급처 [the National Center for Biotechnology Information]를 통해 공개적으로 입수 가능하다. 이러한 알고리즘은 먼저, 데이터베이스 서열 내의 동일한 길이의 특정 문자와 정렬되는 경우에 몇몇 양성치 한계 스코어 T와 부합되거나 이를 만족시키는, 의문 서열 내의 길이 W의 단문자를 확인함으로써 고 스코어링 서열 쌍 (HSPs)을 확인하는 것을 포함한다. T는 이웃하는 문자 스코어 한계치로서 지칭된다 [Altschul et al., 상기 참고]. 이들 초기의 이웃하는 문자 표적물은 이를 함유하는 보다 긴 HSPs를 발견하기 위한 연구를 개시하기 위한 시드로서 작용한다. 그 다음, 문자 표적물은 누적 정렬 스코어가 증가될 수 있는 한에서는 각 서열을 따라 양 방향으로 연장된다. 뉴클레오티드 서열에 대해 파라미터 M (매칭 잔기 쌍에 대한 보상 스코어; 항상 >0이다) 및 N (미스매칭 잔기에 대한 페널티 스코어; 항상 <0이다)을 사용하여 누적 스코어를 계산한다. 아미노산 서열에 대해서는, 스코어링 매트릭스를 사용하여 누적 스코어를 계산한다. 누적 정렬 스코어가 그의 최대 달성치로부터 X 양만큼 감소되는 경우; 하나 이상의 음성-스코어링 잔기 정렬이 축적됨으로 인해, 누적 스코어가 0 이하로 되는 경우; 또는 어느 한 서열의 말단에 도달하는 경우에는, 문자 표적물이 각 방향으로 연장되는 것을 중지시킨다. BLAST 알고리즘 파라미터 W, T, 및 X는 정렬 민감도와 속도를 결정한다. BLASTN 프로그램 (뉴클레오티드 서열의 경우)은 디폴트로서 문자 길이 (W) 11, 기대치 (E) 10, 컷오프 (cutoff) 100, M = 5, N = 4, 및 양 가닥의 비교치를 이용한다. 아미노산 서열의 경우에는, BLASTP 프로그램이 디폴트로서 문자 길이 (W) 3, 기대치 (E) 10, 및 BLOSUM62 스코어링 매트릭스를 이용한다 [참고: Henikoff & Henikoff, 1989, PNAS, 89: 10915].

[0029] 클러스탈 V 정렬 방법을 또한 사용하여 동일률을 결정할 수 있고 [참고: Higgins and Sharp, 1989, *CABIOS*. 5 : 151-153], 이는 LASERGENE 생물 정보학 컴퓨팅 슈트의 메갈라인 (Megalign) 프로그램 (공급처: DNASTAR Inc., Madison, WI)에서 발견되었다. "디폴트 파라미터"는 프로그램 제작업자에 의해 미리 설정된 파라미터이고, 다중 정렬시키는 경우에는 이들이 갭 페널티 (GAP PENALTY)=10 및 갭 길이 페널티 (GAP LENGTH PENALTY)=10에 상응하는 반면, 쌍을 이룬 정렬의 경우에는 이들이 KTUPLE 1, GAP PENALTY=3, WINDOW=5 및 DIAGONALS SAVED=5이다. 서열을 정렬시킨 후, 클러스탈 V 프로그램을 이용하여, 동일한 프로그램 상의 "서열 거리" 표를 관찰함으로써 "동일률"을 수득하는 것이 가능하다.

[0030] 두 서열 간의 동일률은 갭을 허용하거나 허용하지 않으면서 상기 언급된 바와 유사한 기술을 사용하여 결정할 수 있다. 동일률을 계산하는데 있어서, 전형적으로 정확한 매치 만을 계수한다.

[0031] 또 다른 양태에서는, Cry2Ax 및 Cry2Ax-유래된 핵산 분자의 단편이 본 발명에 포괄된다. 한 가지 이상의 Cry2Ax 기능적 활성 (예: 살충 활성)을 지니고 있고/있거나 서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259 중의 어느 것의 100, 250, 500, 750, 1000, 1500 또는 1800개 이상의 연속된 뉴클레오티드 길이를 갖고/갖거나 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것을 암호화하는 핵산 분자와 엄격한 조건 하에 혼성화하는 핵산 분자가 포괄된다. 본 발명의 핵산 단편이 서열 2의 아미노산 잔기 2, 7, 27, 35, 36, 43, 44, 45, 51, 58, 69, 78, 79, 99, 118, 124, 125, 129, 138, 139, 141, 161, 165, 166, 183, 192, 211, 213, 217, 218, 324, 386, 399, 405, 445, 551, 587, 591, 610, 631에 상응하는 아미노산 잔기들 중의 어느 것을 포괄하는 폴리펩티드를 암호화하는 경우에는, 이러한 본 발명의 핵산 분자가 H₂, S₇, Q₂₇, Q₃₅, E₃₆, K₄₃, D₄₄, N₄₅, D₅₁, A₅₈, V₆₉, R₇₈, N₇₉, K₉₉, T₁₁₈, V₁₂₄, E₁₂₅, R₁₂₉, N₁₃₈, R₁₃₉, A₁₄₁, T₁₆₂, Q₁₆₅, M₁₆₆, L₁₈₃, I₁₉₂, H₂₁₁, R₂₁₃, R₂₁₇, D₂₁₈, V₃₂₄, I₃₈₆, T₃₉₉, S₄₀₅, Q₄₄₅, I₅₅₁, S₅₈₇, I₅₉₁, L₆₁₀, 및 L₆₃₁로 이루어진 군으로부터의 1개 이상, 5개 이상, 10개 이상, 20개 이상, 30개 이상, 또는 40개 모든 아미노산 잔기에 대한 암호화 서열을 함유한다.

[0032] 구체적 양태에서는, 본 발명의 단편이, 가공-처리시킨 프로-독소를 암호화하는 핵산의 길이에 상응한다. 완전

한 길이의 프로-독소 Cry2와 가공-처리시킨 Cry2 독소 간의 분자량 차이는 5 내지 6 kDa이다. 이는 대략 40개 아미노산이 프로-독소 Cry2 폴리펩티드로부터 절단된 것에 따른 결과이다 [참고: Rukmini et al., 2000, *Biochimie* 82: 109-116; Aronson et al., 1993, *Mol. Microbiol.* 7: 489-496; Morse et al., 2001, *Structure* 9: 409-17].

[0033] 또 다른 구체적 양태에서는, 본 발명의 단편이 Cry2 도메인에 상응하는 폴리펩티드를 암호화한다.

[0034] 또 다른 양태에서는, 서열 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259 중의 어느 하나와 엄격한 조건 하에 혼성화하는 핵산 분자가 본 발명에 포괄된다. 이러한 본 발명의 핵산 분자는 H₂, S₇, Q₂₇, Q₃₅, E₃₆, K₄₃, D₄₄, N₄₅, D₅₁, A₅₈, V₆₉, R₇₈, N₇₉, K₉₉, T₁₁₈, V₁₂₄, E₁₂₅, R₁₂₉, N₁₃₈, R₁₃₉, A₁₄₁, T₁₆₂, Q₁₆₅, M₁₆₆, L₁₈₃, I₁₉₂, H₂₁₁, R₂₁₃, R₂₁₇, D₂₁₈, V₃₂₄, I₃₈₆, T₃₉₉, S₄₀₅, Q₄₄₅, I₅₅₁, S₅₈₇, I₅₉₁, L₆₁₀, 및 L₆₃₁로 이루어진 군으로부터의 1개 이상, 5개 이상, 10개 이상, 20개 이상, 30개 이상, 또는 40개 모든 아미노산 잔기를 함유하는 폴리펩티드를 암호화한다.

[0035] "엄격한 조건"이란, 특정 핵산이 전형적으로는 핵산의 복합 혼합물 중의 그의 표적 핵산과는 혼성화하지만, 본질적으로 기타 핵산과는 혼성화하지 않는 혼성화 조건을 지칭한다. 엄격한 조건은 서열-의존적이고 상이한 상황 하에서 상이할 것이다. 보다 긴 핵산은 특이적으로 보다 고온에서 혼성화한다. 핵산의 혼성화에 관한 광범위한 안내서는 다음 문헌을 참고할 수 있다 [참고: Tijssen, Techniques in Biochemistry and Molecular Biology--Hybridization with Nucleic Probes, "Overview of principles of hybridization and the strategy of nucleic acid assays" (1993)]. 일반적으로, 고도로 엄격한 조건은 규정된 이온 강도 pH에서 특이적 핵산에 대한 열 용점 (T_m) 보다 약 5 내지 10°C 정도 더 낮도록 선택된다. 낮은 엄격성 조건은 일반적으로, T_m 보다 약 15 내지 30°C 낮도록 선택된다. T_m은 표적에 대해 상보적인 프로브의 50%가 평형 상태의 표적 핵산과 혼성화하는 (표적 핵산이 T_m에서 과량으로 존재함에 따라, 프로브의 50%가 평형 상태를 차지한다) 온도이다 (규정된 이온 강도, pH 및 핵산 농도 하). 혼성화 조건은 전형적으로, 염 농도가 pH 7.0 내지 8.3에서 약 1.0 M 미만 나트륨 이온, 전형적으로는 약 0.01 내지 1.0 M 나트륨 이온 농도 (또는 기타 염)이고, 온도가 짧은 프로브 (예를 들어, 10 내지 50개 뉴클레오티드)의 경우에는 약 30°C 이상이고, 긴 프로브 (예를 들어 50개 초과 뉴클레오티드)의 경우에는 약 60°C 이상인 조건이다. 엄격한 조건은 또한, 탈안정화제 (예: 포름아미드)를 부가하여 달성할 수도 있다. 선택적 또는 특이적 혼성화의 경우에는, 양성 신호가 배경의 2배 이상, 바람직하게는 배경 혼성화의 10배이다. 한 양태에서, 엄격한 조건에는 약 50°C 이상, 통상적으로 약 55°C, 또는 종종 60°C 또는 65°C 하에 0.2X SSC에서 20분 동안 1회 이상 (통상적으로 2회)세척하는 조건, 또는 실질적으로 등가의 조건이 포함된다. 구체적 양태에서는, 본 발명의 핵산 분자가 서열 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260 중의 어느 것의 폴리펩티드를 암호화하는 폴리뉴클레오티드와 특이적으로 혼성화한 다음, 55°C 하에 0.2X SSC에서 20분 동안 1회 이상 세척한다. 또 다른 양태에서는, 엄격한 조건에 약 45°C 하에 6X 염화나트륨/나트륨 시트레이트 (SSC)에서 혼성화한 다음, 50 내지 65°C 하에 0.2X SSC, 0.1% SDS에서 1회 이상 세척하는 것이 포함된다.

[0036] "특이적으로 혼성화하는"이란, 특정한 뉴클레오티드 서열이 복합 혼합물 (예: 총 세포성 또는 라이브러리 DNA 또는 RNA)에 존재하는 경우, 특정 분자가 엄격한 혼성화 조건 하에 상기 특정한 뉴클레오티드 서열하고만 결합하거나, 이중체 형성하거나 또는 혼성화하는 것을 지칭한다.

[0037] 본 발명의 핵산을 포함하는 벡터가 또한 포괄된다. 본 발명의 벡터를 포함하는 세포 또는 식물 또한 포괄된다.

[0038] 본원에서의 용어 "핵산" 또는 "핵산 분자"는 5' 말단에서부터 3' 말단까지 관독한 테옥시리보뉴클레오티드 또는

리보뉴클레오티드 염기의 단일 가닥 또는 이중 가닥 중합체를 지칭한다. 이에는 염색체성 DNA, 자가-복제성 플라스미드, 및 주로 구조적 역할을 수행하는 DNA 또는 RNA가 포함된다. 용어 "암호화하는"이란, 1개 이상의 아미노산을 암호화하는 폴리뉴클레오티드 서열을 지칭한다. 상기 용어는 출발 또는 정지 코돈을 요구하지 않는다. 아미노산 서열은 폴리뉴클레오티드 서열 및 그의 보체에 의해 제공된 6개의 상이한 판독 프레임 중의 어느 하나에서 암호화될 수 있다.

[0039] 표 1에는 Cry2Ax 및 Cry2Ax-유래된 서열 및 상응하는 서열 실체 번호가 기재되어 있다.

[0040] 5.3 Cry2Ax-유래된 서열

[0041] 본 발명의 Cry2Ax-유래된 폴리펩티드 및 핵산은, 하나 이상의 뉴클레오티드 치환물, 부가물 및/또는 결실물을 Cry2Ax 또는 관련 핵산의 뉴클레오티드 서열 내로 도입하여, 하나 이상의 아미노산 치환물, 부가물 및/또는 결실물이 암호화된 단백질 내로 도입되도록 함으로써 창출시킬 수 있다. 일반적으로, Cry2Ax-유래된 서열은 Cry2Ax 폴리펩티드의 바람직한 특징을 강조하기 위해 또는 이의 바람직하지 못한 특징을 저하시키기 위해 창출시킨다. 한 양태에서는, Cry2Ax-유래된 폴리펩티드가 Cry2Ax에 비해 개선된 살충 활성을 지니고 있는데, 이에 는 보다 강력한 효능 및/또는 해충 범위 증가가 포함되지만 이에 제한되지 않는다. 또 다른 양태에서는, Cry2Ax-유래된 폴리펩티드가 Cry2Ax 보다 더 우수하게 발현되는데, 이에 는 반감기 증가, 분해에 대한 보다 낮은 감수성, 및/또는 보다 효율적인 전사 또는 해독이 포함되지만 이에 제한되지 않는다.

[0042] 한 양태에서는, Cry2Ax (서열 1) 핵산 분자가 Cry2Ax-유래된 뉴클레오티드를 창출하기 위한 주형으로서 사용된다. 또 다른 양태에서는, Cry2Ax 관련 핵산이 Cry2Ax-유래된 뉴클레오티드를 창출하기 위한 주형으로서 사용된다. 구체적 양태에서는, Cry2Ab*가 주형으로서 사용된다. Cry2Ab*는 야생형 Cry2Ab과 비교해서 2개의 아미노산이 변경된 것이다 (유전자은행 승인 번호 M23724의 위치 36에서 K가 R로 변경되었고, 위치 241에서 M이 T로 변경되었다). 또 다른 구체적 양태에서는, 변경 1 회전으로부터 분리한 클론을 추가 변경 회전에 대한 주형으로서 사용할 수 있다 (예를 들어, 클론 38, 44, 및 473R; 섹션 6.2 및 6.4 참고).

[0043] 서열 변경물은 표준 기술, 예를 들어 지시된 분자 진화 기술, 예를 들면, DMA 서플링 방법 [참고: 예를 들어, Christians et al., 1999, *Nature Biotechnology* 17: 259-264; Cramer et al., 1998, *Nature*, 391: 288-291; Cramer, et al., 1997, *Nature Biotechnology* 15: 436-438; Cramer et al., 1996, *Nature Biotechnology* 14: 315-319; Stemmer, 1994, *Nature* 370: 389-391; Stemmer et al., 1994, *Proc. Natl. Acad. Sci.*, 91: 10747-10751; United States Patent Nos. 5,605,793; 6,117,679; 6,132,970; 5,939,250; 5,965,408; 6,171,820; International Publication Nos. WO 95/22625; WO 97/0078; WO 97/35966; WO 98/27230; WO 00/42651; and WO 01/75767]; 부위 지시된 돌연변이 유발 [참고: 예를 들어, Kunkel, 1985, *Proc. Natl. Acad. Sci.*, 82: 488-492; Oliphant et al., 1986, *Gene* 44: 177-183]; 올리고뉴클레오티드-지시된 돌연변이 유발 [참고: 예를 들어, Reidhaar-Olson et al., 1988, *Science* 241: 53-57]; 화학적 돌연변이 유발 [참고: 예를 들어, Eckert et al., 1987, *Mutat. Res.* 178: 1-10]; 변이성 (error prone) PCR [참고: 예를 들어, Caldwell & Joyce, 1992, *PCR Methods Applic.* 2: 28-33]; 및 카세트 돌연변이 유발 [참고: 예를 들어, Arkin et al., *Proc. Natl. Acad. Sci.*, 1992, 89: 7871-7815]에 의해 도입할 수 있다 [참고: 일반적으로, Arnold, 1993, *Curr. Opinion Biotechnol.* 4: 450-455; Ling et al., 1997, *Anal. Biochem.*, 254 (2): 157-78; Dale et al., 1996, *Methods Mol. Biol.* 57: 369-74; Smith, 1985, *Ann. Rev. Genet.* 19: 423-462; Botstein et al., 1985, *Science*, 229: 1193-1201; Carter, 1986, *Biochem. J.* 237: 1-7; Kramer et al., 1984, *Cell* 38: 879-887; Wells et al., 1985, *Gene* 34: 315-323; Minshull et al., 1999, *Current Opinion in Chemical Biology* 3: 284-290].

[0044] 한 양태에서는, DNA 서플링을 사용하여 Cry2Ax-유래된 뉴클레오티드를 창출시킨다. DNA 서플링은 시험관내, 생체내, 컴퓨터 내에서 (in silico), 또는 이들을 병용하여 수행할 수 있다. 유전자 알고리즘을 컴퓨터에 사용하여 상동성 (또는 심지어 비-상동성) 핵산에 상응하는 서열 스트링을 재조합하는 컴퓨터 내에서의 재조합 방법을 수행할 수 있다. 이로써 생성된 재조합된 서열 스트링은 임의로, 예를 들어 올리고뉴클레오티드 합성 유전자 리어셈블리 기술과 협력하여, 재조합된 서열에 상응하는 핵산을 합성함으로써, 핵산으로 전환시킨다. 이러한 접근법은 무작위, 부분적 무작위 또는 계획된 변경물을 생성시킬 수 있다. 상응하는 핵산 뿐만 아니라 계획된 핵산 조합물 (예를 들어, 교차 부위 선별에 기초함)의 발생과 병용해서, 컴퓨터 시스템에서 유전자 알고리즘, 유전자 오퍼레이터 등을 사용하는 방법 뿐만 아니라 계획된, 가성-무작위 또는 무작위 재조합 방법을 포함한, 컴퓨터 내에서의 재조합에 관한 수 많은 상세 내역이 당해 분야에 보고되었다 [예를 들어, 국제 공개공보 WO 00/42560 및 WO 00/42559 참고].

- [0045] 또 다른 양태에서는, 표적화 돌연변이 유발을 이용하여, 변경시키기 위한 Cry2Ax 또는 관련 핵산의 특정한 뉴클레오티드 서열 또는 위치를 선택함으로써 Cry2Ax-유래된 뉴클레오티드를 창출시킨다. 이러한 표적화 돌연변이물은 상기 핵산 내의 어떠한 위치에도 도입할 수 있다. 예를 들어, "비-필수" 또는 "필수" 아미노산 잔기에서의 아미노산 치환물을 가져다 주는 뉴클레오티드 치환을 수행할 수 있다. "비-필수" 아미노산 잔기는 생물학적 활성을 변경시키지 않고서 야생형 서열로부터 변경시킬 수 있는 잔기인 반면, "필수" 아미노산 잔기는 해당 폴리펩티드의 한 가지 이상 생물학적 활성에 요구된다. 예를 들어, 각종 종의 동족체들 중에서 보존되지 않거나 단지 절반 정도만 보존되는 아미노산 잔기는 활성에 대해 비-필수적일 수 있다. 또 다른 한편, 각종 종의 동족체들 중에서 보존되는 아미노산 잔기는 활성에 대해 필수적일 수 있다.
- [0046] 이러한 표적화 돌연변이물은 보존적이거나 비-보존적일 수 있다. "비-보존적 아미노산 치환"은 특정 아미노산 잔기를 상이한 측쇄를 갖는 다른 아미노산 잔기로 대체시키는 것이다. 유사한 측쇄를 갖는 아미노산 잔기 계열이 당해 분야에 규정되었다. 이들 계열에는 염기성 측쇄를 갖는 아미노산 (예: 리신, 아르기닌, 히스티딘), 산성 측쇄를 갖는 아미노산 (예: 아스파르트산, 글루탐산, 아스파라긴, 글루타민), 전하를 띠지 않는 극성 측쇄를 갖는 아미노산 (예: 글리신, 세린, 트레오닌, 티로신, 시스테인), 비극성 측쇄를 갖는 아미노산 (예: 알라닌, 발린, 루이신, 이소루이신, 프롤린, 페닐알라닌, 메티오닌, 트립토판), β -분지된 측쇄를 갖는 아미노산 (예: 트레오닌, 발린, 이소루이신) 및 방향족 측쇄를 갖는 아미노산 (예: 티로신, 페닐알라닌, 트립토판, 히스티딘)이 포함된다.
- [0047] 또 다른 한편, 또는 비-보존적 아미노산 잔기 치환물 이외에도, 상기 표적화 돌연변이물은 보존적일 수 있다. "보존적 아미노산 치환"은 특정 아미노산 잔기를 유사한 측쇄를 갖는 다른 아미노산 잔기로 대체시키는 것이다. 돌연변이 유발시킨 후, 암호화된 단백질을 재조합적으로 발현시킬 수 있고, 단백질의 활성을 결정할 수 있다.
- [0048] 또 다른 양태에서는, 무작위 돌연변이 유발을 이용하여 Cry2Ax-유래된 뉴클레오티드를 창출시킨다. 암호화 서열의 전부 또는 일부를 따라 돌연변이물을 무작위로 도입할 수 있다 (예를 들어, 포화 돌연변이 유발에 의해 수행함). 특정 양태에서는, 유사한 도메인, 구조적 모티프, 활성 부위를 갖거나, 또는 미스매칭물 또는 불완전한 매칭물을 수반한 본 발명의 Cry2Ax의 일부와 함께 정렬되는 기타 관련 폴리펩티드를 암호화하는 뉴클레오티드 서열을 상기 돌연변이 유발 공정에 사용하여 서열 다양성을 생성시킬 수 있다.
- [0049] 상기 언급된 기술들 중의 몇몇에서의 각 돌연변이 유발 단계에 대해, 이들 단계 모두 또는 어느 한 단계를 수없이 반복해서 수행하여 서열 다양성을 최적화시킬 수 있다는 것을 인지해야 한다. 상기 언급된 방법을 목적하는 어떠한 순서로든 병용해서 사용할 수 있다. 많은 경우에 있어, 이들 방법으로 인해, 변경된 핵산 서열 풀, 또는 변경된 핵산 서열을 포함하는 재조합 숙주 세포 풀이 발생한다. 변경된 핵산 서열, 또는 목적하는 특징을 수반한 변경된 핵산 서열을 발현하는 숙주 세포는, 당해 분야에 공지된 한 가지 이상 검정을 이용하여 스크리닝함으로써 확인할 수 있다. 이러한 검정은 목적하는 물리적 또는 화학적 특징을 보유하고 있는 폴리펩티드를 선별해 주는 조건 하에 수행할 수 있다. 핵산 서열 상의 변경은, 클론에서 변경된 폴리펩티드를 암호화하는 핵산 분자를 서열 분석함으로써 결정할 수 있다.
- [0050] 부가적으로, Cry2Ax 및 Cry2Ax-유래된 핵산 분자는 완전히 또는 부분적으로 코돈 최적화시킬 수 있다. 어느 하나의 아미노산 (메티오닌 제외)은 수 많은 코돈에 의해 암호화되기 때문에 (표 2), 이러한 핵산 분자의 서열은 암호화된 아미노산을 변화시키지 않고서도 변화시킬 수 있다. 아미노산이 변화되지는 않지만 특정한 숙주 유기체에서의 발현이 증가되도록 1개 이상의 코돈을 핵산 수준에서 변경시킨 경우가 코돈 최적화이다. 당업자는 광범위한 유기체에 대해 선호되는 정보를 제공해주는 표 및 기타 참고 문헌이 당해 분야에서 입수 가능하다는 사실을 인식할 것이다.
- [0051] 5.4 살충 활성의 검정 방법
- [0052] 본원에 사용된 바와 같은 용어 "살충 활성"은 특정 폴리펩티드의 섭취시 곤충 (해충) 공급을 저하 또는 억제시키고/시키거나 곤충 사망률을 증가시킬 수 있는 상기 폴리펩티드의 능력을 지칭한다. 어떠한 곤충도 영향을 받을 수 있긴 하지만, 바람직하게는 레피도프테라 목 곤충과 디프테라 목 곤충이 영향을 받는다.
- [0053] 각종 검정을 사용하여, 본 발명의 특정한 폴리펩티드가 살충 활성을 지니고 있는지, 만약 그렇다면 어느 정도의 살충 활성을 지니고 있는지를 결정할 수 있다. 일반적으로, 본 발명의 폴리펩티드는 섭취될 수 있는 어떠한 형태로든 해충에게 제공된다. 본 발명의 폴리펩티드를 섭취하는 것에 대한 해충의 반응을 관찰한다 (예를 들어, 약 1 내지 3일 동안 관찰함). 본 발명의 폴리펩티드를 섭취한 후 해충 공급이 저하 또는 억제되고/되거나 해충 사망률이 증가되었다는 것이 살충 활성의 지표이다. 공지되지 않은 살충 활성을 지닌 본 발명의 폴리펩티드를

양성 및/또는 음성 대조군과 비교하여 검정 결과를 보다 정확하게 평가해야 한다.

- [0054] 한 양태에서는, 본 발명의 폴리펩티드를 정제하고 (가용성 형태 또는 결정 형태), 이를 해충 식이에 추가한다.
- [0055] 또 다른 양태에서는, 본 발명의 폴리펩티드를 재조합 미생물 [예: 이. 콜라이 (*E. coli*)]에서 발현시킨다. 이러한 재조합 미생물을 해충에 직접 공급한다 [참고: Moellenbeck et al., 2001, *Nat. Biotechnol.* 19: 668].
- [0056] 또 다른 양태에서는, 본 발명의 폴리펩티드를 식물에서 발현시키고, 이 식물을 해충에 공급한다. 항온 배양 기간 후, 해충이 통상적으로 먹었을 것으로 추정되는 식물 부분을 가시적으로 관찰하거나 (예를 들어, 잔존하는 근사 잎 면적 분석을 관찰함) 또는 비디오로 포착함으로써 (예를 들어, 잔존하는 잎 면적 내의 픽셀 수) 해충의 공급 활성을 결정할 수 있다. 구체적 양태에서는, 식물에서의 본 발명의 폴리펩티드의 발현이 일시적이다. 이러한 양태에서는, 본 발명의 폴리펩티드를 암호화하는 핵산을 식물 발현 벡터 내로 클로닝하고, 이를 아그로박테륨 투메파시엔스 (*Agrobacterium tumefaciens*) 내로 형질감염시킨다. 이와 같이 형질전환시킨 세균을 엔. 벤타미아나로부터의 잎과 함께 공동-배양하고, 강제 침윤을 이용하여 상기 잎이 본 발명의 폴리펩티드를 발현하도록 한다. 그러나, 본 발명의 폴리펩티드의 발현은 잎 공동-배양물 간에 가변적이다. 또 다른 구체적 양태에서는, 식물에서의 본 발명의 폴리펩티드의 발현이 안정적이다. 이러한 양태에서는, 본 발명의 폴리펩티드를 발현하는 트랜스제닉 식물을 만든다.
- [0057] 또 다른 양태에서는, 배양된 세포를 사용하여 세포 사멸 및/또는 세포 성장을 측정함으로써 본 발명의 폴리펩티드의 살충 활성을 검정할 수 있다. 이러한 검정은 전형적으로, 천연적으로 또는 이중 유전자의 발현 결과로서, 특정한 독소에 대한 수용체를 발현하는 세포를 사용하거나 또는 스크리닝되는 특정한 독소에 대해 감수성인 배양된 곤충 세포를 사용하는 것을 포함한다. 따라서, 곤충 세포 이외에도, 포유류, 세균성 및 효모 세포가 시험관내 검정에 유용한 세포이다. 배양된 세포에 대한 독성을 측정하는 시험관내 생물학적 검정이 당해 분야에 보고되었다 [참고: Johnson, 1994, *J. Invertebr. Pathol.* 63: 123-129].
- [0058] 또 다른 양태에서는, 표적 곤충-유래된 중간착자 상피 막 소포체에서의 기공 형성을 측정함으로써, 본 발명의 폴리펩티드의 살충 활성을 검정할 수 있다 [참고: Juttner and Ebel, 1998, *Biochim. Biophys. Acta* 1370: 51-63; English et al., 1991, *Insect Biochem.* 21: 177-184]. 이러한 검정은 상기 막 소포체의 관강 (lumen)으로부터의 리간드 활성화 기질의 독소 조건 방출을 구성할 수 있다. 이를 위해서는, 리간드가 소포체 외부에 존재해야 한다. 또 다른 한편으로, 이와는 반대 시나리오를 활용함으로써, 리간드가 소포체 관강 내에 존재하고 기질을 활성화시키고자 하는 리간드를 소포체의 외부에 위치시킬 수 있다. 독소 활성이 보다 높을 수록, 형성되는 기공의 수 또는 크기가 보다 커진다.
- [0059] 5.5 식물에서 해충 저항성을 증강시키는 방법
- [0060] 본 발명은 Cry2 관련 살충성 폴리펩티드의 사용을 통하여, 헬리코베르파 아종 [*Helicoverpa ssp.* (예: 헬리코베르파 제아: *Helicoverpa Zea*)] 및/또는 스포도프테라 아종 [*Spodoptera ssp.* (예: 스포도프테라 엑시구아: *Spodoptera exigua*)]의 구성원을 포함하지만 이에 제한되지 않는 해충에 대한 식물 저항성을 증강시키는 방법을 제공한다. 당해 분야에 공지된 모든 방법을 사용하여, 식물 상으로의 공급 과정 동안 해충이 본 발명의 하나 이상의 폴리펩티드를 섭취할 수 있도록 할 수 있다. 따라서, 해충은 살충량의 본 발명의 하나 이상의 폴리펩티드를 섭취할 것이며, 식물 상으로의 공급을 중단할 수 있다. 몇몇 양태에서는, 해충이 본 발명의 하나 이상의 폴리펩티드를 섭취함으로써 사멸된다. 기타 양태에서는, 해충을 사멸시키지 않고 식물 상으로 공급되는 것을 억제시키거나 방해한다.
- [0061] 한 양태에서는, 본 발명의 하나 이상의 폴리펩티드를 발현하는 트랜스제닉 식물을 만들 수 있다 (일반적으로, 트랜스제닉 식물 생산 방법에 관한 섹션 5.7 참고). 이러한 트랜스제닉 식물은 모든 조직에서 본 발명의 하나 이상의 폴리펩티드를 발현할 수 있다 (예: 포괄적 발현). 또 다른 한편, 본 발명의 하나 이상의 폴리펩티드는 단지 조직의 일부에서만 발현될 수 있는데 (예: 조직 특이적 발현), 바람직하게는 해충에 의해 소모되는 조직에서만 발현될 수 있다. 본 발명의 폴리펩티드는 식물에서 구성적으로 발현될 수 있거나 또는 유도성 프로모터의 제어 하에 있을 수 있다.
- [0062] 또 다른 양태에서는, 본 발명의 하나 이상의 폴리펩티드를 포함하는 조성물을, 해충에 대해 감수성인 식물에 외부적으로 적용할 수 있다. 이러한 조성물의 외부적 적용에는 식물 전체에 또는 일부에 직접적으로 적용하는 방식 및/또는, 예를 들어 식물 주위 환경 (예: 토양)에 간접적으로 적용하는 방식이 포함된다. 상기 조성물은 당해 분야에 공지된 어떠한 방법에 의해서도 적용할 수 있는데, 이에겐 분무, 분진, 스프링클링 등이 포함되지만, 이에 제한되지 않는다. 일반적으로, 상기 조성물은 식물이 성장하는 어떠한 시기에도 적용할 수 있다. 당업자

는 최적의 조성물 투여 시기를 실험적으로 결정하기 위해 당해 분야에 공지된 방법을 이용할 수 있다. 최적의 투여 시기에 영향을 미치는 요인에는 해당 조성물 내의 본 발명의 하나 이상의 폴리펩티드가 투여되는, 감수성 식물의 유형, 해충의 유형 등이 포함되지만, 이에 제한되지 않는다.

[0063] 본 발명의 하나 이상의 폴리펩티드를 포함하는 조성물은 실질적으로 정제된 폴리펩티드, 세포 현탁물, 세포 펠릿, 세포 상등액, 세포 추출물, 또는 바실루스 투링기엔시스 세포의 포자-결정 복합체일 수 있다 (일반적으로, 재조합 폴리펩티드 합성 기술에 관한 섹션 5.6 참고). 본 발명의 하나 이상의 폴리펩티드를 포함하는 조성물은 용액, 에멀션, 현탁액 또는 분말 형태일 수 있다. 액상 제형은 수성 또는 비-수성에 기초할 수 있고, 발포제, 젤, 현탁제, 유화성 농축제 등으로서 제공될 수 있다. 이러한 제형은 본 발명의 하나 이상의 폴리펩티드 이외의 작용제를 포함할 수 있다. 예를 들어, 조성물은 확산제-점착제 아쿠반트, 안정화제, 기타 살충성 부가제, 희석제, 조성물의 형태학적 특성 또는 안정성을 최적화시키는 작용제, 예를 들어 계면활성제, 유화제, 분산제 또는 중합체를 추가로 포함할 수 있다.

[0064] 또 다른 양태에서는, 본 발명의 하나 이상의 폴리펩티드를 발현하는 재조합 숙주를, 해충에 의해 공격받기 쉬운 식물 상에 또는 근처에 적용한다. 이러한 재조합 숙주에는 본 발명의 하나 이상의 핵산 분자 (및 이에 따른 폴리펩티드)를 이용하여 형질전환시켰고, 이를 발현하는 미생물성 숙주 및 곤충 바이러스가 포함되지만, 이에 제한되지 않는다. 몇몇 양태에서는, 재조합 숙주가 본 발명의 폴리펩티드를 그의 주변 환경 내로 분비하여 해충과 접촉하도록 한다. 기타 양태에서는, 해충에 침습받기 쉬운 하나 이상의 식물 조직이 상기 재조합 숙주에 집락 형성한다.

[0065] 5.6 재조합 발현

[0066] 본 발명의 핵산 분자 및 폴리펩티드는 당해 분야에 널리 공지되어 있는 표준 재조합 DNA 및 분자 클로닝 기술을 사용하여 재조합적으로 발현할 수 있다 [참고: Sambrook, Fritsch, and Maniatis, Molecular Cloning: A Laboratory Manual; Cold Spring Harbor Laboratory Press: Cold Spring Harbor, 1989]. 부가적으로, 재조합 DNA 기술을 사용하여 트랜스제닉 식물을 제조하는데 사용하기 적합한 핵산 구조물을 창출시킬 수 있다 (섹션 5.7 참고).

[0067] 따라서, 본 발명의 한 국면은 본 발명의 핵산 분자 또는 그의 변이체를 포함하는 벡터, 바람직하게는 발현 벡터에 관한 것이다. 본원에 사용된 바와 같은 용어 "벡터"는 이와 연결된 또 다른 핵산을 수송할 수 있는 폴리뉴클레오티드를 지칭한다. 한 가지 유형의 벡터가 "플라스미드"인데, 이는 부가의 DNA 절편이 도입될 수 있는 환상의 이중 가닥 DNA 루프를 지칭한다. 또 다른 유형의 벡터는 바이러스성 벡터인데, 이는 부가의 DNA 절편을 바이러스성 계놈 내로 도입할 수 있다.

[0068] 특정 벡터는 이러한 벡터가 도입되는 숙주 세포에서 자기 복제할 수 있다 (예를 들어, 세균성 복제 기점을 갖는 세균성 벡터 및 에피솜성 벡터). 기타 벡터 (예: 비-에피솜성 벡터)는 숙주 세포 내로의 도입시 숙주 세포의 계놈 내로 통합됨으로써, 숙주 계놈을 따라 복제된다. 일반적으로, 재조합 DNA 기술에서 활용되는 발현 벡터는 종종, 플라스미드 (벡터) 형태이다. 그러나, 본 발명에는 이러한 기타 형태의 발현 벡터, 예를 들어 바이러스성 벡터 (예: 복제 결함성 레트로바이러스)가 포함된다.

[0069] 본 발명의 재조합 발현 벡터는 숙주 세포에서 핵산 분자를 발현시키기에 적합한 형태로 본 발명의 핵산 분자를 포함한다. 이는 재조합 발현 벡터가, 발현시키고자 하는 폴리뉴클레오티드와 작동적으로 연합되는, 발현을 위해 사용될 숙주 세포를 기초로 하여 선별된 하나 이상의 조절성 서열을 포함한다는 것을 의미한다. 재조합 발현 벡터 내에서 "작동적으로 연합된다"는 것은 관심있는 뉴클레오티드 서열이 이러한 뉴클레오티드 서열의 발현을 허용해주는 방식으로 (예를 들어, 시험관내 전사/해독 시스템에서, 또는 벡터가 숙주 세포 내로 도입되는 경우에는 숙주 세포에서) 조절성 서열(들)과 연결된다는 것을 의미한다. 용어 "조절성 서열"에는 프로모터, 증강 인자 및 기타 발현 제어 요소 (예: 폴리아데닐화 신호)가 포함된다. 이러한 조절성 서열은 당해 분야의 문헌에 기재되어 있다 [참고: 예를 들어, Goeddel, Gene Expression Technology: Methods in Enzymology, 1990, Academic Press, San Diego, CA]. 조절성 서열에는 많은 유형의 숙주 세포에서 뉴클레오티드 서열의 구성성 발현을 지시하는 서열, 및 단지 특정한 숙주 세포에서 뉴클레오티드 서열의 발현을 지시하는 서열 (예: 조직-특이적 조절성 서열)이 포함된다. 발현 벡터의 고안은 형질전환시키고자 하는 숙주 세포의 선택, 목적하는 단백질의 발현 수준, 발현이 요망되는 유기체의 면적 등과 같은 요인들에 의해 좌우될 수 있다는 것을 당업자는 인지할 것이다. 본 발명의 발현 벡터를 숙주 세포 내로 도입함으로써, 본원에 기재된 바와 같은 핵산 분자에 의해 암호화된 단백질 또는 펩티드 (융합 단백질 또는 펩티드 포함)를 생성시킬 수 있다.

- [0070] 몇몇 양태에서는, 프로모터 또는 증강인자 요소로서 제공되는 분리된 핵산을 비-이종 형태의 본 발명의 폴리뉴클레오티드의 적당한 위치 (일반적으로 상단)에 도입하여, 본 발명의 폴리뉴클레오티드의 발현을 상향 조절하거나 하향 조절할 수 있다. 예를 들어, 내인성 프로모터를 돌연변이, 결실, 및/또는 치환시킴으로써 생체 내에서 변경시킬 수 있거나 [참고: 미국 특허 제5,565,350호; 국제 특허출원 PCT/US93/03868], 또는 분리된 프로모터를 본 발명의 폴리뉴클레오티드의 동족 유전자로부터 일정한 배향과 거리에서 식물 세포 내로 도입하여 이러한 유전자의 발현을 제어할 수 있다. 유전자 발현은 식물 성장에 적합한 조건 하에 조정함으로써 총 농도를 변경시키고/시키거나 식물 세포에서의 본 발명의 폴리펩티드의 조성을 변경시킬 수 있다. 따라서, 본 발명은 본 발명의 본래의 내인성 (즉, 비-이종) 형태의 폴리뉴클레오티드와 작동적으로 연결된 이종 프로모터 및/또는 증강인자를 제조하기 위한 조성물 및 방법을 제공한다.
- [0071] 폴리펩티드 발현이 요망되는 경우에는, 일반적으로 폴리뉴클레오티드 암호화 영역의 3' 말단에 폴리아데닐화 영역을 포함시키는 것이 바람직하다. 폴리아데닐화 영역은 천연 유전자로부터, 각종의 기타 식물 유전자로부터, 또는 T-DNA로부터 유래될 수 있다. 부가될 3' 말단 서열은, 예를 들어 노팔린 신타제 또는 옥토파인 신타제 유전자로부터, 또는 또 다른 식물 유전자로부터 유래될 수 있거나, 덜 바람직하게는 기타 모든 진핵성 유전자로부터 유래될 수 있다.
- [0072] 본 발명의 재조합 발현 벡터는 원핵성 세포 [예: 엔테로박테리아세에 (*Enterobacteriaceae*), 예를 들어 에스케리차 (*Escherichia*); 바실라세에 (*Bacillaceae*); 리조보세에 (*Rhizoboceae*), 예를 들어 리조븀 (*Rhizobium*) 및 리조박터 (*Rhizobacter*); 스피릴라세에 (*Spirillaceae*), 예를 들어 포토박테륨 (*photobacterium*); 지모모나스 (*Zymomonas*); 세라티아 (*Serratia*); 에로모나스 (*Aeromonas*); 비브리오 (*Vibrio*); 데술포비브리오 (*Desulfovibrio*); 스피릴럼 (*Spirillum*); 락토바실라세에 (*Lactobacillaceae*); 슈도모나다세에 (*Pseudomonadaceae*), 예를 들어 슈도모나스 (*Pseudomonas*) 및 아세트박터 (*Acetobacter*); 아조토박테라세에 (*Azotobacteraceae*) 및 니트로박테라세에 (*Nitrobacteraceae*)] 또는 진핵성 세포 [예: 바쿨로바이러스 (*baculovirus*) 발현 벡터를 이용한 곤충 세포, 효모 세포, 식물 세포, 또는 포유류 세포]에서 본 발명의 폴리펩티드를 발현하도록 고안할 수 있다 [적합한 숙주 세포에 관한 논의는 Goeddel의 상기 문헌을 참고할 수 있다]. 또 다른 한편, 재조합 발현 벡터는, 예를 들어 T7 프로모터 조절성 서열 및 T7 폴리머라제를 사용하여 시험관 내에서 전사 및 해독할 수 있다.
- [0073] 단백질을 원핵생물에서 발현하는 것은, 융합 또는 비-융합 단백질의 발현을 지시하는 구성성 또는 유도성 프로모터를 포함하는 벡터를 이용하여 이. 콜라이에서 가장 흔히 수행된다. 융합 벡터는 수 많은 아미노산을 본원에서 암호화된 단백질, 통상적으로는 재조합 단백질의 아미노 말단에 부가시켜 준다. 이러한 융합 벡터는 전형적으로, 적어도 다음 3가지 목적을 제공해 준다: 1) 재조합 단백질의 발현을 증가시키고/시키거나; 2) 재조합 단백질의 용해도를 증가시키고/시키거나; 3) 친화성 정제에서 리간드로서 작용함으로써 재조합 단백질의 정제에 도움을 준다. 종종, 융합 발현 벡터에서는 융합 잔기와 재조합 단백질의 연결부에 단백질 분해적 절단 부위를 도입하여, 융합 단백질을 정제한 후에 재조합 단백질이 융합 잔기로부터 격리될 수 있도록 한다. 이러한 효소, 및 이의 동족 인식 서열에는 인자 Xa, 트롬빈 및 엔테로키나제가 포함된다. 전형적인 융합 발현 벡터에는 글루타치온 S-트랜스퍼라제 (GST), 말토스 E 결합성 단백질 또는 단백질 A를 각각 표적 재조합 단백질에 융합시키는, pGEX [공급처: Pharmacia Biotech Inc.; 참고: Smith and Johnson, 1988, *Gene* 67: 31-40], pMAL [공급처: New England Biolabs, Beverly, MA] 및 pRIT5 [공급처: Phannacia, Piscataway, NJ]가 포함된다.
- [0074] 또 다른 양태에서는, 발현 벡터가 효모 발현 벡터이다. 효모 에스. 세레비지에 (*S. cerevisiae*)에서 발현하기 위한 벡터의 예에는 pYepSec1 [참고: Baldari et al., 1987, *EMBO J.* 6: 229-234], pMfa [참고: Kurjan and Herskowitz, 1982, *Cell* 30: 933-943], pJRY88 [참고: Schultz et al., 1987, *Gene* 54: 113-123], pYES2 [공급처: Invitrogen Corp., San Diego, CA], 및 pPicZ [공급처: Invitrogen Corp., San Diego, CA]가 포함된다.
- [0075] 또 다른 한편, 발현 벡터는 바쿨로바이러스 발현 벡터이다. 배양된 곤충 세포 (예: Sf9 세포)에서 단백질을 발현하는데 이용 가능한 바쿨로바이러스 벡터에는 pAc 시리즈 [참고: Smith et al., 1983, *Mol. Cell Biol.* 3: 2156-2165] 및 pVL 시리즈 [참고: Lucklow and Summers, 1989, *Virology* 170: 31-39]가 포함된다.
- [0076] 또 다른 양태에서는, 본 발명의 핵산을, 담배 모자이크 바이러스 및 감자 바이러스 발현 벡터를 포함하지만 이에 제한되지 않는 식물 발현 벡터를 사용하여 식물 세포에서 발현시킨다.
- [0077] 원핵성 세포와 진핵성 세포 둘 다에 대해 적합한 기타 발현 시스템은 당해 분야에 공지되어 있다 [참고: 예를 들어, chapters 16 and 17 of Sambrook et al. 1990, *Molecular Cloning, A Laboratory Manual*, 2d Ed., Cold

Spring Harbor Laboratory, Cold Spring Harbor, NY].

- [0078] 본 발명을 실시하는데 있어 수 많은 프로모터를 사용할 수 있다. 프로모터는 목적하는 결과에 의거하여 선택할 수 있다. 핵산을 숙주 유기체에서 발현하기 위한 구성성, 조직-특이적, 유도성 또는 기타 프로모터와 합할 수 있다.
- [0079] "조직-특이적 프로모터"는 특이적 조직, 기관 또는 세포 유형에서의 본 발명의 핵산의 발현을 지시할 수 있다. 조직-특이적 프로모터는 유도성일 수 있다. 유사하게, 조직-특이적 프로모터는 특정한 시간틀 내에서의 전사만을 증진시킬 수 있거나 해당 조직 내에서의 발생기만을 증진시킬 수 있다. 기타 조직-특이적 프로모터는 특정한 조직의 생활 주기 전반에 걸쳐 활성일 수 있다. 당업자는 조직-특이적 프로모터가 표적 조직 이외의 조직에서 작동적으로 연결된 서열의 발현을 구동할 수 있다는 것을 인식할 것이다. 따라서, 본원에 사용된 바와 같은 조직-특이적 프로모터는 표적 조직이나 세포 유형에서 우선적으로 발현을 구동시키는 것이지만, 또한 기타 조직에서도 몇몇 발현을 유발시킬 수 있다. 수 많은 조직-특이적 프로모터를 본 발명에 사용할 수 있다. 적당한 프로모터를 사용하여, 어린가지 영양 기관/구조물 (예: 잎, 줄기 및 괴경), 뿌리, 꽃 및 꽃 기관/구조물 [예: 포엽 (bract), 꽃받침 조각 (sepal), 꽃잎 (petal), 수술 (stamen), 암술잎 (carpel), 꽃밥 (anther) 및 배주 (ovule)], 종자(씨앗) (배아, 내배유, 및 종피 포함) 및 과일과 같은 모든 기관을 표적화할 수 있다. 예를 들어, 잎, 뿌리 또는 꽃에서의 핵산 발현을 지시하는 프로모터가, 이러한 기관을 감염시키는 병충해에 대한 저항성을 증강시키는데 유용하다. 본 발명의 폴리뉴클레오티드를 특정 식물의 공중 영양 기관에서 발현시키는 경우에는, 광합성 기관-특이적 프로모터, 예를 들어 *RBCS* 프로모터 [참고: Khoudi et al., *Gene* 197: 343, 1997]를 사용할 수 있다. 본 발명의 폴리뉴클레오티드의 뿌리-특이적 발현은 뿌리-특이적 프로모터, 예를 들어 *ANRI* 유전자로부터의 프로모터 [참고: Zhang and Forde, *Science*, 279: 407, 1998]의 제어 하에 달성할 수 있다. 기타 예시되는 프로모터에는 대두로부터의 뿌리-특이적 글루타민 신테타제 유전자 [참고: Hirel et al., 1992, *Plant Molecular Biology* 20: 207-218] 및 강낭콩 (French bean)의 GRP 1.8 유전자에서의 뿌리-특이적 제어 요소 [참고: Keller et al., 1991, *The Plant Cell* 3: 1051-1061]가 포함된다.
- [0080] "구성성 프로모터"는 모든 조직에서 특정 유전자의 발현을 지시하고 대부분의 환경적 발생 또는 세포 분화 조건 및 상태 하에서 활성인 프로모터로서 정의된다. 구성성 프로모터의 예에는 콜리플라워 모자이크 (cauliflower mosaic) 바이러스 (CaMV) 35S 전사 개시 영역, 아그로박테륨 투마파시엔스의 T-DNA로부터 유래된 1'- 또는 2'-프로모터, 및 당업자에게 공지된 각종 식물 유전자로부터의 기타 전사 개시 영역이 포함된다. 이러한 유전자에는, 예를 들어 아라비도프시스 (*Arabidopsis*)로부터의 *ACT11* [참고: Huang et al. 1996, *Plant Mol. Biol.* 33: 125-139], 아라비도프시스로부터의 *Cat3* [유전자은행 승인 번호 U43147; 참고: Zhong et al., 1996, *Mol. Gen. Genet.* 251: 196-203], 브라시카 나푸스 (*Brassica napus*)로부터의 스테아로일-아실 캐리어 단백질 불포화화 효소를 암호화하는 유전자 (유전자은행 승인 번호 X74782; 참고: Solocombe et al. 1994, *Plant Physio.* 104: 1167-1176), 옥수수로부터의 *Gpc1* (유전자은행 승인 번호 X15596; 참고: Martinez et al., 1989, *J.Mol. Biol.* 208: 551-565), 및 옥수수로부터의 *Gpc2* (유전자은행 승인 번호 U45855; 참고: Manjunath et al., 1997, *Plant Mol. Biol.* 33: 97-112)가 포함된다. 식물 전반에 걸쳐 본 발명의 폴리뉴클레오티드를 발현하기 위해 어떠한 강력한 구성성 프로모터 (예를 들어, CaMV 35S 프로모터)도 사용할 수 있다.
- [0081] 용어 "유도성 프로모터"는 정확한 환경적 또는 발생적 제어 하에 있는 프로모터를 지칭한다. 유도성 프로모터에 의해 전사를 초래할 수 있는 환경적 조건의 예에는 혐기성 조건, 상승 온도, 빛의 존재, 또는 화학물질/호르몬을 이용한 분무가 포함된다.
- [0082] 식물 숙주 세포에 사용하기 적합한 구성성 프로모터에는, 예를 들어 *Rsyn7* 프로모터의 코어 프로모터 및 기타 관련 구성성 프로모터 [참고: 국제공개공보 WO 99/43838 및 미국 특허 제6,072,050호]; 코어 CaMV 35S 프로모터 [참고: Odell et al., 1985, *Nature* 313: 810-812]; 벼 액틴 (rice actin) [참고: McElroy et al., 1990, *Plant Cell* 2: 163-171]; 유비퀴틴 (ubiquitin) [참고: Christensen et al., 1989, *Plant Mol. Biol.* 12: 619-632 and Christensen et al., 1992, *Plant Mol. Biol.* 18: 675-689]; pEMU [참고: Last et al., 1991, *Theor. Appl. Genet.* 81: 581-588]; MAS [참고: Velten et al., 1984, *EMBO J.* 3: 2723-2730]; ALS 프로모터 [참고: 미국 특허 제5,659,026호] 등이 포함된다 [예를 들어, 미국 특허 제5,608,149호; 제5,608,144호; 제5,604,121호; 제5,569,597호; 제5,466,785호; 제5,399,680호; 제5,268,463호; 제5,608,142호; 및 제6,177,611호 참고].
- [0083] 본 발명의 또 다른 국면은 본 발명의 재조합 발현 벡터를 도입시킨 숙주 세포에 관한 것이다. 용어 "숙주 세포" 및 "재조합 숙주 세포"는 본원에서 상호 교환적으로 사용된다. 이러한 용어들은 특정한 대상 세포 뿐만

아니라 이러한 세포의 자손 또는 잠재적 자손을 지칭한다는 것을 인지해야 한다. 돌연변이 또는 환경적 영향으로 인해 후대에서는 특징의 변형이 발생할 수도 있기 때문에, 자손이 사실상 모 세포와 동일하지 않을 수도 있지만, 이 역시 본원에 사용된 바와 같은 상기 용어의 범위 내에 포함된다.

[0084] 따라서, 본 발명은 본 발명의 핵산 또는 그의 변이체를 포함하는 발현 벡터를 갖는 숙주 세포를 제공한다. 숙주 세포는 어떠한 원핵성 세포 [예: 이. 콜라이, 바실루스 투링기엔시스] 또는 진핵성 세포 [예: 곤충 세포, 효모 또는 식물 세포]일 수도 있다. 본 발명은 또한, i) 본 발명의 핵산 분자를 포함하는 세포를, 암호화된 폴리펩티드의 생성을 허용하는 조건 하에 배양하는 단계; 및 ii) 발현된 폴리펩티드를 분리하는 단계를 포함하여, 본 발명의 핵산을 발현함으로써 암호화된 폴리펩티드를 제조하는 방법을 제공한다.

[0085] 벡터 DNA를 통상적인 형질전환 또는 형질감염 기술을 통하여 원핵성 또는 진핵성 세포 내로 도입할 수 있다. 본원에 사용된 바와 같은 용어 "형질전환" 및 "형질감염"은 외래 핵산 분자를 숙주 세포 내로 도입하기 위해 당해 분야에 인식된 각종 기술을 지칭하는데, 이러한 기술에는 인산칼슘 또는 염화칼슘 공-침전, DEAE-텍스트란-매개된 형질감염, 리포펙션 (lipofection), 또는 전기천공이 포함된다. 숙주 세포를 형질전환 또는 형질감염시키는데 적합한 방법은 당해 분야에 공지되어 있다 [예를 들어, Sambrook, et al. 상기 문헌 참고].

[0086] 5.7 트랜스제닉 식물의 생성

[0087] 본 발명의 핵산 분자를 이용하여 식물 또는 식물 세포를 형질전환시키기 위해 당해 분야에 공지된 모든 방법을 사용할 수 있다. 핵산 분자를 식물 DNA (예: 게놈 DNA 또는 엽록체 DNA) 내로 도입할 수 있거나, 또는 식물 DNA 내로 삽입하지 않고서도 유지시킬 수 있다 (예를 들어, 인공 염색체를 사용함). 핵산 분자를 식물 세포 내로 도입하는데 적합한 방법에는 미세주사 [참고: Crossway et al., 1986, *Biotechniques* 4: 320-334]; 전기천공 [참고: Riggs et al., 1986, *Proc. Natl. Acad. Sci.* 83: 5602-5606; D'Halluin et al., 1992, *Plant Cell* 4: 1495-1505]; 아그로박테륨 (*Agrobacterium*)-매개된 형질전환 [참고: 미국 특허 제5,563,055호 및 제5,981,840호, Osjoda et al., 1996, *Nature Biotechnology* 14: 745-750; Horsch et al., 1984, *Science* 233: 496-498, Fraley et al., 1983, *Proc. Natl. Acad. Sci.* 80: 4803, and *Gene Transfer to Plants*, Potrykus, ed., Springer-Verlag, Berlin 1995]; 직접적인 유전자 전이 [참고: Paszkowski et al., 1984, *EMBO J.* 3: 2717-2722]; 탄도 (ballistic) 입자 가속화 [참고: 미국 특허 제4,945,050호; 제5,879,918호; 제5,886,244호; 제5,932,782호; Tomes et al., 1995, "Direct DNA Transfer into Intact Plant Cells via Microprojectile Bombardment, in Plant Cell, Tissue, and Organ Culture: Fundamental Methods, ed. Gamborg and Phillips, Springer-Verlag, Berlin; and McCabe et al., 1988, *Biotechnology* 6: 923-926]; 바이러스-매개된 형질전환 [참고: 미국 특허 제5,889,191호, 제5,889,190호, 제5,866,785호, 제5,589,367호 및 제5,316,931호]; 화분 (pollen) 형질전환 [참고: De Wet et al., 1985, in The Experimental Manipulation of Ovule Tissues, ed. Chapman et al., Longman, New York, pp. 197-209]; Lec 1 형질전환 [참고: 미국 특허원 제09/435,054호; 국제 공개공보 WO 00/28058]; 위스커 (whisker)-매개된 형질전환 [참고: Kaeppler et al., 1990, *Plant Cell Reports* 9: 415-418; Kaeppler et al., 1992, *Theor. Appl. Genet.* 84: 560-566]; 및 엽록체 형질전환 기술 [참고: Bogorad, 2000, *Trends in Biotechnology* 18: 257-263; Ramesh et al., 2004, *Methods Mol Biol.* 274: 301-7; Hou et al., 2003, *Transgenic Res.* 12: 111-4; Kindle et al., 1991, *Proc. Natl. Acad. Sci.* 88: 1721-5; Bateman and Purton, 2000, *Mol Gen Genet.* 263: 404-10; Sidorov et al., 1999, *Plant J.* 19: 209-216]이 포함된다.

[0088] 트랜스제닉 식물 및 식물 세포를 생성시키기 위해 사용된 형질전환 프로토콜의 선택은 형질전환을 위해 표적화시킨 식물 또는 식물 세포의 유형, 즉 단자엽 식물 또는 쌍자엽 식물에 따라서 다양할 수 있다. 특정한 식물 유형에 특히 적합한 형질전환 프로토콜의 예에는 감자에 대한 것 [참고: Tu et al., 1998, *Plant Molecular Biology* 37: 829-838; Chong et al., 2000, *Transgenic Research* 9: 71-78]; 대두에 대한 것 [참고: Christou et al., 1988, *Plant Physiol.* 87: 671-674; McCabe et al., 1988, *BioTechnology* 6: 923-926; Finer and McMullen, 1991, *In Vitro Cell Dev. Biol.* 27P: 175-182; Singh et al., 1998, *Theor. Appl. Genet.* 96: 319-324]; 옥수수에 대한 것 [참고: Klein et al., 1988, *Proc. Natl. Acad. Sci.* 85: 4305-4309; Klein et al., 1988, *Biotechnology* 6: 559-563; Klein et al., 1988, *Plant Physiol.* 91: 440-444; Fromm et al., 1990, *Biotechnology* 8: 833-839; Tomes et al., 1995, "Direct DNA Transfer into Intact Plant Cells via Microprojectile Bombardment", in Plant Cell, Tissue, and Organ Culture: Fundamental Methods, ed. Gamborg (Springer-Verlag, Berlin)]; 곡류에 대한 것 [참고: Hooykaas-Van Slogteren et al., 1984, *Nature* 311: 763-764; 미국 특허 제5,736,369호]이 포함된다.

- [0089] 몇몇 양태에서는, 트랜스제닉 식물 및 식물 세포의 발생에 있어 형질전환시키기 위해 한 가지 이상의 구조물을 사용한다. 다중 구조물이 시스 또는 트랜스 위치에 포함될 수 있다. 바람직한 양태에서는, 각 구조물이 프로모터 및 기타 조절성 서열을 갖는다.
- [0090] 상기 형질전환 기술 중의 어느 것에 의해 유도되는 형질전환된 식물 세포를 배양하여, 형질전환된 유전자형을 보유하고 있으므로 목적하는 표현형을 보유하고 있는 완전한 식물을 재생시킬 수 있다. 이러한 재생 기술은 특정의 피토히르몬을 조직 배양 성장 배지에서 조작하는 것에 의존하는데, 이는 전형적으로 목적하는 뉴클레오티드 서열과 함께 도입시킨 살생제 및/또는 제초제 마커에 의존한다. 배양된 원형질체로부터의 식물 재생은 당해 분야에 보고되었다 [참고: 예를 들어, Evans et al., Protoplasts Isolation and Culture, Handbook of Plant Cell Culture, pp. 124-176, MacMillan Publishing Company, New York, 1983; and Binding, Regeneration of Plants, Plant Protoplasts, pp. 21-73, CRC Press, Boca Raton, 1985]. 재생은 또한, 식물 캘러스, 외식편, 기관, 또는 그의 일부로부터 수득할 수 있다. 이러한 재생 기술 또한 당해 분야에 보고되었다 [참고: 예를 들어, Klee et al. 1987, Ann. Rev. of Plant Phys. 38: 467-486].
- [0091] 용어 "식물"에는 완전 식물, 어린가지 영양 기관/구조물 (예: 잎, 줄기 및 괴경), 뿌리, 꽃 및 꽃 기관/구조물 [예: 포엽, 꽃받침 조각, 꽃잎, 수술, 암술잎, 꽃밥 및 배주], 종자 (배아, 내배유, 및 종피 포함) 및 과실 (성숙한 씨방), 식물 조직 (예: 도관 조직, 그라운드 조직 등) 및 세포 [예: 공변 세포, 난 세포, 트리콤 (trichome) 등], 및 이들의 자손이 포함된다. 본 발명의 방법에 사용될 수 있는 식물 부류에는 형질전환 기술을 받을 수 있는 고등 및 하등 식물 부류가 포함되는데, 이에 속는 식물 (단자엽 및 쌍자엽 식물), 겉씨 식물, 양치류 (fern), 및 다세포 해조류가 포함된다. 이수체, 배수체, 배수 염색체, 반수체 및 반접합체 식물을 포함한, 각종 배수성 수준의 식물이 또한 포함된다.
- [0092] 본 발명의 핵산 분자를 사용하여 본질적으로 모든 식물에 대해 목적하는 형질을 부여할 수 있다. 따라서, 본 발명은 속 아그로티스 (*Agrotis*), 알룸 (*Allium*), 아나나스 (*Ananas*), 아나카르дум (*Anacardium*), 아픍 (*Apium*), 아라키스 (*Arachis*), 아스파라구스 (*Asparagus*), 아타만타 (*Athamanta*), 아트롭 (*Atropa*), 아베나 (*Avena*), 밤부사 (*Bambusa*), 베타 (*Beta*), 브라시카 (*Brassica*), 브로무스 (*Bromus*), 브로왈리아 (*Browalia*), 카멜리아 (*Camellia*), 칸나비스 (*Cannabis*), 카리카 (*Carica*), 세라토니아 (*Ceratonia*), 시세르 (*Cicer*), 케노포듐 (*Chenopodium*), 키코룸 (*Chicorium*), 시트루스 (*Citrus*), 시트룰루스 (*Citrullus*), 캡시쿰 (*Capsicum*), 카르타무스 (*Carthamus*), 코코스 (*Cocos*), 코페아 (*Coffea*), 코익스 (*Coix*), 쿠쿠미스 (*Cucumis*), 쿠쿠르비타 (*Cucurbita*), 시노돈 (*Cynodon*), 닥틸리스 (*Dactylis*), 다투라 (*Datura*), 다우쿠스 (*Daucus*), 디안투스 (*Dianthus*), 디지털리스 (*Digitalis*), 디오스코레아 (*Dioscorea*), 엘레이스 (*Elaeis*), 엘리우신 (*Eliusine*), 에우포르비아 (*Euphorbia*), 페스투카 (*Festuca*), 피쿠스 (*Ficus*), 프라가리아 (*Fragaria*), 제라늄 (*Geranium*), 글리신 (*Glycine*), 그라미네 (*Graminae*), 고시뮴 (*Gossypium*), 헬리안투스 (*Helianthus*), 헤테로칼리스 (*Heterocallis*), 헤베아 (*Hevea*), 히비스쿠스 (*Hibiscus*), 호르데움 (*Hordeum*), 효스시아무스 (*Hyoscyamus*), 이포모에아 (*Ipomoea*), 락투카 (*Lactuca*), 라티루스 (*Lathyrus*), 렌스 (*Lens*), 릴륨 (*Lilium*), 리눔 (*Linum*), 롤륨 (*Lolium*), 로투스 (*Lotus*), 루피누스 (*Lupinus*), 리코페르시콘 (*Lycopersicon*), 마카다미아 (*Macadamia*), 마크로필라 (*Macrophylla*), 말루스 (*Malus*), 만기페라 (*Mangifera*), 마니호트 (*Manihot*), 마조라나 (*Majorana*), 메디카고 (*Medicago*), 무사 (*Musa*), 나르시수스 (*Narcissus*), 네메시아 (*Nemesia*), 니코티아나 (*Nicotiana*), 오노브리키스 (*Onobrychis*), 올레아 (*Olea*), 올리레아 (*Olyreae*), 오리자 (*Oryza*), 파니쿰 (*Panicum*), 파니쿰 (*Panicum*), 파니에움 (*Paniseum*), 파니세툼 (*Pannisetum*), 페니세툼 (*Pennisetum*), 페투니아 (*Petunia*), 펠라르고늄 (*Pelargonium*), 페르세아 (*Persea*), 파로이데아 (*Pharoidae*), 파세올루스 (*Phaseolus*), 프레움 (*Phleum*), 피세아 (*Picea*), 포아 (*Poa*), 피누스 (*Pinus*), 피스타키아 (*Pistachia*), 피숨 (*Pisum*), 포플루스 (*Populus*), 슈도트수가 (*Pseudotsuga*), 피루스 (*Pyrus*), 프루누스 (*Prunus*), 슈도트수가 (*Pseutotsuga*), 프시뮴 (*Psidium*), 퀘르쿠스 (*Quercus*), 라눈쿨루스 (*Ranunculus*), 라파누스 (*Raphanus*), 리베스 (*Ribes*), 리시누스 (*Ricinus*), 로도덴드론 (*Rhododendron*), 로사 (*Rosa*), 삭카룸 (*Saccharum*), 살피글로시스 (*Salpiglossis*), 세칼레 (*Secale*), 세네시오 (*Senecio*), 세타리아 (*Setaria*), 세쿠오이아 (*Sequoia*), 시나피스 (*Sinapis*), 솔라눔 (*Solanum*), 소르굼 (*Sorghum*), 스테노타프룸 (*Stenotaphrum*), 테오브로무스 (*Theobromus*), 트리코넬라 (*Trigonella*), 트리폴륨 (*Trifolium*), 트리코넬라 (*Trigonella*), 트리티쿰 (*Triticum*), 트수가 (*Tsuga*), 툴리파 (*Tulipa*), 비시아 (*Vicia*), 비티스 (*Vitis*), 비그나 (*Vigna*), 및 제아 (*Zea*)로부터의 종을 포함한, 광범위한 식물에 대해 사용된다.
- [0093] 구체적 양태에서는, 트랜스제닉 식물이 옥수수, 감자, 벼, 대두 또는 목화 식물이다.
- [0094] 동일한 형질전환된 균주 또는 상이한 균주를 사용하여 트랜스제닉 식물을 성장 및 수분시킬 수 있다. 2 세대

이상의 식물을 성장시켜, 목적하는 핵산 분자, 폴리펩티드 및/또는 표현형별 특성의 발현이 안정적으로 유지되어 유전되도록 할 수 있다. 당업자는 본 발명의 핵산 분자를 트랜스제닉 식물에 안정적으로 혼입시키고 이것이 작동 가능하다는 것을 확인한 후, 이를 유성 교배시킴으로써 다른 식물에 도입할 수 있다. 교배시키고자 하는 종에 따라서, 수 많은 표준 육종 기술을 사용할 수 있다.

[0095] 5.8 트랜스제닉 식물에서의 발현 결정

[0096] 본 발명의 핵산 분자 또는 이로부터 암호화된 폴리펩티드가 특정 식물에서 발현되는 수준을 결정하기 위해, 당해 분야에 공지된 어떠한 방법도 사용할 수 있다. 예를 들어, 본 발명의 핵산 분자에 의해 암호화된 폴리펩티드의 식물에서의 발현 수준은 면역검정, 정량적 겔 전기영동 등에 의해 결정할 수 있다. 부가적으로, 본 발명의 핵산 분자에 의해 암호화된 폴리펩티드의 식물에서의 발현 수준은 식물 표현형이 변경되는 정도에 의해 결정할 수 있다. 구체적 양태에서는, 증강된 해충 저항성이 검정하고자 하는 표현형이다.

[0097] 본원에 사용된 바와 같은 "증강된 해충 저항성"은 해충에 의한 소모 및/또는 침습에 대한, 본 발명의 폴리펩티드를 발현하는 트랜스제닉 식물의 저항성이 본 발명의 폴리펩티드를 발현하지 않는 식물과 비교해서 증가된 것을 지칭한다. 저항성 증가는 수 많은 방식으로 측정할 수 있다. 한 양태에서는, 저항성 증강이, 동일한 기간 동안 해충을 향한 배양한 후 본 발명의 폴리펩티드를 발현하지 않는 식물과 비교해서 본 발명의 폴리펩티드를 발현하는 식물에 대한 손상이 감소된 것으로서 측정된다. 해충 손상은 가시적으로 평가할 수 있다. 예를 들어, 목화 식물에서는, 해충에 의한 소모 징후를 알아보기 위해 목화 식물 등근 꼬투리에서 직접 관찰함으로써, 침습 후의 손상을 측정할 수 있다. 또 다른 양태에서는, 저항성 증강이, 동일한 기간 동안 해충을 향한 배양한 후 본 발명의 폴리펩티드를 발현하지 않는 식물과 비교해서 본 발명의 폴리펩티드를 발현하는 식물로부터의 작물 수율이 증가된 것으로서 측정된다. 특정한 양태에서는, 해충이 레피도프테라 목 및/또는 디프테라 목으로부터의 것이다.

[0098] 완전 식물, 그의 조직, 또는 식물 세포 배양물을 이용하여 결정할 수 있다.

[0099] 0.97 MB이고 현재 제출된 콤팩트 디스크 상에서 2005년 2월 24일자로 창출시킨 서열 목록 (21194286PC.TXT로 명명됨)은 그의 전문이 참고로 도입된다.

[0100] 본원에 인용된 모든 공개 문헌, 책, 참고 매뉴얼 및 초록 내용은 본 발명이 속하는 기술 수준을 보다 상세히 기재하기 위해 그의 전문이 본원에 참고로 도입된다.

[0101] 본 발명의 범위와 요지를 벗어나지 않고서도 상기 언급된 주제에서 각종 변화가 이루어질 수 있기 때문에, 상기 명세서에 함유되고/되거나 첨부된 청구의 범위에서 규정된 모든 주제는 본 발명을 설명하고 예시하는 것으로서 해석해야 한다. 상기 언급된 교시에 비추어볼 때 본 발명에 관한 변형과 변화가 가능하다.

[0102] 실시예

[0103] 6.1 실시예 1: 일차 곤충 스크리닝

[0104] 일차 곤충 스크리닝은 헬리코베르프 아종에 대한 활성을 지닌 생물학적 다양상 콜렉션으로부터 Bt 배양물을 확인하였다. 스크리닝은 헬리코베르프 제아 신생 유충에 대한 1회분 고용량의 포자-결정 복합체 샘플을 사용하여 수행하였다.

[0105] 1 ml CYS 포자형성 배지를 함유하는 심부-웰 생산 판에서 포자-결정 복합체 샘플을 제조하였다 [참고: Yamamoto, 1990, Analytical Chemistry of *Bacillus thuringiensis* 432: 46-60]. 이러한 생산 판에 -80°C 하에 냉동 유지시킨 10 µl 시드 배양물을 접종하고; 대부분의 배양물이 포자형성하고 자유 포자와 결정을 방출할 때까지 3일 동안 30°C, 350 rpm 하에 향한 배양하였다. 상기 판을 4000 rpm으로 40분 동안 원심분리시켜 포자, 결정 및 용해되지 않은 세포를 침전시켰다. 이와 같이 침전된 포자-결정 복합체를, 100 µg 리소자임을 함유하는 1.2 ml 15 mM 칼륨 아세테이트에 현탁시키고 30°C, 250 rpm 하에 16시간 동안 향한 배양하여 완전한 포자형성과 세포 용해를 보장하였다. 16시간 동안 향한 배양한 후, 원심분리시켜 포자-결정 복합체를 수집하고, 이를 15 mM 칼륨 아세테이트에 현탁시켰다. 이러한 칼륨 아세테이트 단계를 1회 반복하였다. 최종 포자-결정 현탁물을 1 ml 15 mM 칼륨 아세테이트에서 만들고, 이를 사용하여 에이치. 제아 (*H. zea*) 활성에 대해 스크리닝하였다.

[0106] 각 웰에 150 µl 인공 곤충 식이를 함유하는 얇은 96-웰 판에서 곤충 스크리닝을 수행하였다. 20 µl의 포자-결정 현탁물을 곤충 식이 상에 놓아 두었다. 약 5마리의 신생 유충을 각 웰에 놓아 두었다. 곤충 검정용 판을 29°C 하에 3일 동안 향한 배양하였다. Bt 결정에 대한 곤충 반응은 공급 억제와 사망률을 내포하였다. 약 400

개 배양물은 상당한 사망율을 나타내었으므로, 양성인 것으로 확인되었다. 특히, Cry2Ax가 양성이었다.

[0107] 6.2 실시예 2: Cry2Ax-유래된 폴리펩티드를 분리하기 위한 DNA 서플링

[0108] Cry2Ax 폴리펩티드 (서열 2) 및 Cry2Ab* 폴리펩티드 (Cry2Ab*는 야생형 Cry2Ab과 비교해서 2개의 아미노산이 변경된 것인데; 유전자은행 승인 번호 M23724의 위치 36에서 K가 R로 변경되었고, 위치 241에서 M이 T로 변경되었다)로 시작하여, DNA 서플링하기 위해 합성 DNA 주형을 창출시켰다. Cry2Ab (유전자은행 승인 번호 M23724)와 Cry2Ax (서열 2)를 계통발생학적으로 비교하여, 이들 2개의 폴리펩티드 서열 간에 상이한 40개 아미노산 위치 (섹션 5.1 참고)가 다양한 라이브러리를 창출시켰다. 모 DNA 주형으로서 작용하는 Cry2Ax를 암호화하는 합성 유전자를 수반한 올리고뉴클레오티드 지시된 서플링을 이용하여, 서플링된 DNA 라이브러리를 창출시켰다. Cry2Ab* 유전자를 대체시킴으로써, PCR DNA 라이브러리를 pMAXY3219 내로 클로닝하였다. 독소 클론이 이. 콜라이 말토스 결합성 단백질 (MBP)과의 융합물로서 발현되도록 이를 확립하였다. 일차 곤충 스크리닝 결과, 헬리코베르과 아충에 대항하여 활성인 배양물을 확인하였다. 이러한 스크리닝은 1회분 저용량에서 MBP::Cry2Ax-유래된 폴리펩티드 융합물을 발현하는 소량의 이. 콜라이 배양물을 인공 식이 내에 혼입한 다음, 에이치. 제아 유충으로 침습시킴으로써 수행하였다. 스크리닝은 각 웰에 150 μ l 인공 곤충 식이를 함유하는 얇은 96-웰 판에서 수행하였다. 약 0.5 μ l의 MBP::Cry2Ax-유래된 폴리펩티드 융합물 발현성 배양물을 상기 곤충 식이 내에 혼입하였다. 대략 5마리의 에이치. 제아 신생 유충을 각 웰에 놓아 두었다. 곤충 검정용 판을 29°C 하에 4일 동안 항온 배양하였다. 이. 콜라이 샘플에 대한 곤충 반응은 공급 억제와 사망율을 내포하였다. 유충에 대한 심각한 발육방해 또는 사망을 유발시키는 샘플을 추가 분석하기 위해 재검정하였다.

[0109] 이와 같이 라이브러리를 제1 회전 스크리닝한 결과, Cry2Ax 및 Cry2Ab*에 비해 살충 활성이 개선된 몇 가지 클론을 발견하게 되었다. 특히, 클론 38 (D_S00503480) (서열 4) 및 44 (D_S00503970) (서열 6)가 발견되었을 때 고도로 활성인 것으로 밝혀졌다 (데이터는 제시되지 않음). 따라서, 이들 클론이 DNA 서플링의 그 다음 (후속) 회전을 위해 선택되었다.

[0110] 서플링의 제2 회전에 대해서는, 클론 38 (D_S00503480) (서열 4) 및 44 (D_S00503970) (서열 6)로부터의 모 DNA 주형을 우라실의 존재 하에 PCR 증폭시킨 다음, 우라실 N-글리코실라제를 이용하여 단편화하였다. 이어서, 이와 같이 단편화된 주형을 혼합하고, 리어셈블리한 다음, 재조합 주형을 PCR에 의해 증폭시켰다. 이들 서플링된 주형 라이브러리를 상기 언급된 바와 같이 pMAXY3219에서 창출시켰다. 서플링 제1 회전과 제2 회전으로부터 분리한 몇몇 클론의 서열이 표 3에 제시되었는데, 이는 변화된 아미노산 잔기를 지시하고 있다.

[0111] 상단의 실행 가능한 제2 회전 표적물 중의 하나인 클론 473R (D_S01037677) (서열 18)을 추가로 다양화하기 위해, 폴리펩티드의 아미노 말단 영역에서의 처음 46개 아미노산 잔기가 8개의 상이한 Cry2 폴리펩티드 서열 (즉, Cry2Aa, Cry2Ab, Cry2Ac, Cry2Ad, Cry2Ae, Cry2Af, Cry2Ag, 및 Cry2Ax)에서 발견된 잔기를 함유하도록 변형시켰다. 또한, 2개의 잔기 I13 및 D15를 보존적 잔기 발린 및 글루타메이트로 각각 치환시켰다 (표 4 참고). 이와 같이 변형시킨 클론은 클론 473N (서열 8)으로 명명하였다.

[0112] 6.3 실시예 3: Cry2Ax-유래된 폴리펩티드의 활성

[0113] 서플링된 클론의 활성을 스크리닝하는 것은 몇 가지 단계에서 수행하였다. 초기에는, 클론 융합 단백질을 발현하는 소량의 이. 콜라이를 제1령 에이치. 제아 유충에 대한 인공 식이 내에 제공함으로써, 클론을 고 살충 활성에 대해 스크리닝하였다. 상기 유충을 완전하게 사멸시키거나 완전히 발육방해시키는 클론을 추가 연구용으로 선택하였다. 그 다음, 높은 살충 활성을 나타내는 것으로 입증된 클론을 사용하여, 아그로박테륨 투메파시엔스에서 식물 발현 벡터 내의 신규한 라이브러리를 창출시켰다. 이러한 라이브러리를 대상으로 하여, 4개 복제물 중의 각 클론을 엔. 벤타미아나 잎과 함께 공동 배양한 다음 (각각의 배양물을 강제 침윤시켜 수행함), 상응하는 각 원반상 조직을 단일 제3령 에이치. 제아 유충에 공급하였다. 24시간 동안 항온 배양한 후, 공급 활성을 가시적으로 관찰함으로써 결정하고, 이를 잔존하는 근사 잎 면적 분획으로서 표현하였다.

[0114] 이. 콜라이 발현/식이 혼입 검정의 추가 반복을 통과한 클론을 식물 발현 벡터 pMAXY4384 내로 개별적으로 재클로닝하고, 이를 대상으로 하여 상기 언급된 바와 같은 식물체 내 (in planta) 효능에 대해 시험하였다. 이. 콜라이 발현 다중적 검정 및 식물 라이브러리 접근법으로부터의 최적의 표적물에 관한 최종 식물체 내 활성 평가가 도 1에 도시되어 있다. 이러한 분석으로부터, 7K (D_S01000779) (서열 10), 15K (D_S00999080) (서열 12), 16K (D_S01000269) (서열 14), 16R (D_S01037143) (서열 16), 및 473R (D_S01037677) (서열 18)을 포함한 몇 가지 클론이 증가된 살충 활성을 지닌 것으로 나타났다.

[0115] 6.4 실시예 4: 부가의 Cry2Ax-유래된 폴리펩티드를 분리하기 위한 DNA 서플링

[0116] 섹션 6.2에 기재된 바와 같이 제1 회전 및 제2 회전 서플링 표적물인 클론 44 (D_S00503970) (서열 6), 473R (D_S01037677) (서열 18), 및 Cry2Ab*를 추가 서플링을 위한 주형으로서 사용하였다. 이들 주형과 올리고뉴클레오티드 지시된 서플링을 사용하여, 야생형 Cry2 폴리펩티드 (즉, Cry2Ae 및 Cry2Ag) 뿐만 아니라 컴퓨터 발생한 무작위 보존적 아미노산 치환물 및 특정의 구조적 루프 영역의 절편 내에서의 무작위 치환물로부터의 아미노산 다양성을 지닌 유래된 폴리펩티드를 창출시켰다. Cry2Ab* 유전자를 대체시킴으로써, 서플링된 DNA 라이브러리를 pMAXY3219 내로 클로닝하였다. 독소 클론이 이. 콜라이 말토스 결합성 단백질 (MBP)과의 융합물로서 발현되도록 이를 확립하였다. 분리된 서열에 관한 요약이 표 5 내지 7에 제시되었다.

[0117] 6.5 실시예 5: 부가의 Cry2Ax-유래된 폴리펩티드의 활성

[0118] 목화 해충인 헬리코베르파 제아에 대항한 상기 서플링된 유래된 폴리펩티드의 활성을 평가하기 위해, 클론 융합 단백질을 발현하는 완전한 이. 콜라이 세포를 함유하는 인공 식이를 사용하여 고 처리능력 스크리닝을 상기 언급된 바와 같이 수행하였다. 높은 활성 수준을 지닌 클론을 대상으로 하여, 식물체 내 활성에 대해 추가로 시험하여, 각각의 유래된 폴리펩티드에 대해 이루어진 변화가 식물 세포에서의 유전자 발현이나 단백질 축적에 불리한 영향을 미치지 않았는지를 확인하였다. 이러한 공정을 개시하기 위해, 각 Cry2Ax-유래된 폴리펩티드를 아그로박테륨 투메파시엔스에 의거한 식물 발현 벡터 내로 클로닝하고, 숙주 아그로박테륨 균주 내로 형질전환시킨 다음, 미세역가 디쉬 내로 어레이하였다. 이어서, 이러한 표적물을 대상으로 하여, 4개 복제물 중의 각각을 엔. 벤타미아나 잎과 함께 공동 배양한 다음 (각각의 배양물을 강제 침윤시켜 수행함), 상응하는 각 원반상 조직을 단일 제3령 에이치. 제아 유충에 공급하였다. 24시간 동안 항온 배양한 후, 상기 언급된 바와 같이 가지적 포착 및 분석 방법에 의해 각 원반상 조직 상에서의 공급 활성을 결정하였다. 이러한 공정으로부터의 몇몇 유래된 폴리펩티드는 모 클론에 비해 개선되었다. 이러한 클론 중의 하나가 D_S01764701 (서열 134)인데, 이는 클론 44에 비해 개선된 활성을 나타내었다. 공급 검정 결과가 도 2에서 3가지 실험에 대해 나타내었다.

[0119] 6.6 실시예 6: 클론 44를 발현하는 트랜스제닉 식물

[0120] 이원 벡터 pMAXY5469와 pMAXY5471을 사용하여 글리포세이트 선별을 수반하여 아그로박테륨-매개된 형질전환시킴으로써, 클론 44 (D_S00503970)를 발현하는 트랜스제닉 담배 식물을 생성시켰다. 이들 벡터는 dSVBV 구동된 GAT 유전자와 dMMV 구동된 클론 44 핵산 분자 클론 44 (서열 5)을 함유하였다. pMAXY5469는 이것이 클론 44의 암호화 영역과 융합된 색소체 표적화 신호를 함유하여 이러한 독소 변이체가 색소체 구획에 축적되도록 한다는 점에서 pMAXY5471과 상이하다. 각 구조물에 대해 대략 25개 형질전환체가 생성되었다. 클론 44를 발현하는 잎 원반상 조직을 48-웰 역가 트레이 중의 한천 층 위에 놓아둔 다음, 제3령 헬리코베르파 제아 유충 또는 제4령 스포도프테라 엑시구아 유충을 침습시켰다. 잎을 상기 벌레들과 함께 24시간 동안 항온 배양한 다음, 유충을 꺼내고; 비디오 포착 장비를 이용하여 잔존하는 잎을 관찰함으로써, 잔존하는 상대적 잎 면적 (픽셀 수)을 실제적으로 계산하였다. 각 벡터에 대한 상부 형질전환체를 이용한 결과가, 에이치. 제아의 경우에는 도 3A에 도시되었고, 에스. 엑시구아 (*S. exigua*)의 경우에는 도 3B에 도시되었다. 각 트랜스제닉 식물은, 도시된 바와 같이 분석용으로 취한 6개 잎 원반상 조직을 갖는다.

[0121] 이어서, 색소체 (도 4A) 또는 세포질성 구획 (도 4B)에서 트랜스제닉 담배 식물에서의 클론 44 폴리펩티드의 발현을, 이러한 클론 44 폴리펩티드에 대해 지시된 폴리클로날 항체를 사용하여 웨스턴 블롯 (western blot)함으로써 검정하였다. 도 4에서의 레인 번호는 도 3에서의 식물 번호에 상응한다.

[0122] 치킨을 정제된 트립신 절단된 클론 44 폴리펩티드로 면역시킨 다음, 기질로서 트립신 절단된 클론 44 폴리펩티드를 이용하여 만든 친화성 칼럼을 사용하여 Cry2 특이적 항체를 정제함으로써, 상기 웨스턴 블롯에서 사용된 폴리클로날 항체를 제조하였다.

[0123] 이러한 2가지 유형의 트랜스제닉 식물 간의 가장 명백한 차이는, 에스. 엑시구아의 억제 색소체-축적된 독소의 경우에 훨씬 더 크다는 것이다 (도 3B의 우측 패널과 좌측 패널 비교). 이들 데이터를 발현 데이터 (도 4)와 연계해서 분석한 결과, 5469 (도 4A)로부터 유래된 T-DNA가 정착된 식물이 5471 (도 4B)로부터 유래된 T-DNA가 정착된 식물 보다 훨씬 더 많은 독소를 생산할 수 있는 것으로 밝혀졌

표 1

[0124]

Cry2Ax 및 Cry2Ax-유래된 서열						
클론명	유형	SEQ ID NO		클론명	유형	SEQ ID NO
Cry2Ax	핵산	1		D_S01611723	폴리펩티드	52
Cry2Ax	폴리펩티드	2		D_S01561293	핵산	53
38 (D_S00503480)	핵산	3		D_S01561293	폴리펩티드	54
38 (D_S00503480)	폴리펩티드	4		D_S01561489	핵산	55
44 (D_S00503970)	핵산	5		D_S01561489	폴리펩티드	56
44 (D_S00503970)	폴리펩티드	6		D_S01561330	핵산	57
473N	핵산	7		D_S01561330	폴리펩티드	58
473N	폴리펩티드	8		D_S01570511	핵산	59
7K (D_S01000779)	핵산	9		D_S01570511	폴리펩티드	60
7K (D_S01000779)	폴리펩티드	10		D_S01570809	핵산	61
15K (D_S00999080)	핵산	11		D_S01570809	폴리펩티드	62
15K (D_S00999080)	폴리펩티드	12		D_S01570568	핵산	63
16K (D_S01000269)	핵산	13		D_S01570568	폴리펩티드	64
16K (D_S01000269)	폴리펩티드	14		D_S01572168	핵산	65
16R (D_S01037143)	핵산	15		D_S01572168	폴리펩티드	66
16R (D_S01037143)	폴리펩티드	16		D_S01571315	핵산	67
473R (D_S01037677)	핵산	17		D_S01571315	폴리펩티드	68
473R (D_S01037677)	폴리펩티드	18		D_S01571875	핵산	69
D_S01466681	핵산	19		D_S01571875	폴리펩티드	70
D_S01466681	폴리펩티드	20		D_S01572374	핵산	71
D_S01466770	핵산	21		D_S01572374	폴리펩티드	72
D_S01466770	폴리펩티드	22		D_S01572905	핵산	73
D_S01467219	핵산	23		D_S01572905	폴리펩티드	74
D_S01467219	폴리펩티드	24		D_S01572908	핵산	75
D_S01466712	핵산	25		D_S01572908	폴리펩티드	76
D_S01466712	폴리펩티드	26		D_S01561856	핵산	77
D_S01467003	핵산	27		D_S01561856	폴리펩티드	78
D_S01467003	폴리펩티드	28		D_S01573294	핵산	79
D_S01460229	핵산	29		D_S01573294	폴리펩티드	80
D_S01460229	폴리펩티드	30		D_S01571529	핵산	81
D_S01459398	핵산	31		D_S01571529	폴리펩티드	82
D_S01459398	폴리펩티드	32		D_S01599948	핵산	83
D_S01464856	핵산	33		D_S01599948	폴리펩티드	84
D_S01464856	폴리펩티드	34		D_S01601459	핵산	85
D_S014657862	핵산	35		D_S01601459	폴리펩티드	86
D_S014657862	폴리펩티드	36		D_S01602925	핵산	87
D_S01458733	핵산	37		D_S01602925	폴리펩티드	88
D_S01458733	폴리펩티드	38		D_S01613034	핵산	89
D_S01457892	핵산	39		D_S01613034	폴리펩티드	90
D_S01457892	폴리펩티드	40		D_S01614407	핵산	91
D_S01442158	핵산	41		D_S01614407	폴리펩티드	92
D_S01442158	폴리펩티드	42		D_S01631557	핵산	93
D_S01443366	핵산	43		D_S01631557	폴리펩티드	94
D_S01443366	폴리펩티드	44		D_S01633080	핵산	95
D_S01442132	핵산	45		D_S01633080	폴리펩티드	96
D_S01442132	폴리펩티드	46		D_S01632237	핵산	97
D_S01532970	핵산	47		D_S01632237	폴리펩티드	98
D_S01532970	폴리펩티드	48		D_S01633031	핵산	99
D_S01532041	핵산	49		D_S01633031	폴리펩티드	100
D_S01532041	폴리펩티드	50		D_S01632121	핵산	101
D_S01611723	핵산	51		D_S01632121	폴리펩티드	102

클론명	유형	SEQ ID NO		클론명	유형	SEQ ID NO
D_S01764500	핵산	103		D_S01765112	핵산	153
D_S01764500	폴리펩티드	104		D_S01765112	폴리펩티드	154
D_S01764502	핵산	105		D_S01765174	핵산	155
D_S01764502	폴리펩티드	106		D_S01765174	폴리펩티드	156
D_S01764505	핵산	107		D_S01765242	핵산	157
D_S01764505	폴리펩티드	108		D_S01765242	폴리펩티드	158
D_S01764533	핵산	109		D_S01765308	핵산	159
D_S01764533	폴리펩티드	110		D_S01765308	폴리펩티드	160
D_S01764543	핵산	111		D_S01765221	핵산	161
D_S01764543	폴리펩티드	112		D_S01765221	폴리펩티드	162
D_S01764546	핵산	113		D_S01765254	핵산	163
D_S01764546	폴리펩티드	114		D_S01765254	폴리펩티드	164
D_S01764554	핵산	115		D_S01765231	핵산	165
D_S01764554	폴리펩티드	116		D_S01765231	폴리펩티드	166
D_S01764568	핵산	117		D_S01765255	핵산	167
D_S01764568	폴리펩티드	118		D_S01765255	폴리펩티드	168
D_S01764569	핵산	119		D_S01765377	핵산	169
D_S01764569	폴리펩티드	120		D_S01765377	폴리펩티드	170
D_S01764577	핵산	121		D_S01765430	핵산	171
D_S01764577	폴리펩티드	122		D_S01765430	폴리펩티드	172
D_S01764642	핵산	123		D_S01765446	핵산	173
D_S01764642	폴리펩티드	124		D_S01765446	폴리펩티드	174
D_S01764643	핵산	125		D_S01765496	핵산	175
D_S01764643	폴리펩티드	126		D_S01765496	폴리펩티드	176
D_S01764680	핵산	127		D_S01764642	핵산	177
D_S01764680	폴리펩티드	128		D_S01764642	폴리펩티드	178
D_S01764685	핵산	129		D_S01766041	핵산	179
D_S01764685	폴리펩티드	130		D_S01766041	폴리펩티드	180
D_S01764691	핵산	131		D_S01764706	핵산	181
D_S01764691	폴리펩티드	132		D_S01764706	폴리펩티드	182
D_S01764701	핵산	133		D_S01766073	핵산	183
D_S01764701	폴리펩티드	134		D_S01766073	폴리펩티드	184
D_S01764706	핵산	135		D_S01764643	핵산	185
D_S01764706	폴리펩티드	136		D_S01764643	폴리펩티드	186
D_S01764723	핵산	137		D_S01763985	핵산	187
D_S01764723	폴리펩티드	138		D_S01763985	폴리펩티드	188
D_S02847715	핵산	139		D_S01764668	핵산	189
D_S02847715	폴리펩티드	140		D_S01764668	폴리펩티드	190
D_S01765051	핵산	141		D_S01764196	핵산	191
D_S01765051	폴리펩티드	142		D_S01764196	폴리펩티드	192
D_S01765068	핵산	143		D_S01764728	핵산	193
D_S01765068	폴리펩티드	144		D_S01764728	폴리펩티드	194
D_S01765100	핵산	145		D_S01764787	핵산	195
D_S01765100	폴리펩티드	146		D_S01764787	폴리펩티드	196
D_S01765063	핵산	147		D_S01764758	핵산	197
D_S01765063	폴리펩티드	148		D_S01764758	폴리펩티드	198
D_S01765119	핵산	149		D_S01764768	핵산	199
D_S01765119	폴리펩티드	150		D_S01764768	폴리펩티드	200
D_S01765104	핵산	151		D_S01764860	핵산	201
D_S01765104	폴리펩티드	152		D_S01764860	폴리펩티드	202
클론명	유형	SEQ ID NO		클론명	유형	SEQ ID NO
D_S01765018	핵산	203		D_S01766026	핵산	233
D_S01765018	폴리펩티드	204		D_S01766026	폴리펩티드	234
D_S01764947	핵산	205		D_S02838294	핵산	235

D_S01764947	폴리펩티드	206		D_S02838294	폴리펩티드	236
D_S01764934	핵산	207		D_S02838310	핵산	237
D_S01764934	폴리펩티드	208		D_S02838310	폴리펩티드	238
D_S01764968	핵산	209		D_S02838327	핵산	239
D_S01764968	폴리펩티드	210		D_S02838327	폴리펩티드	240
D_S01765008	핵산	211		D_S02838328	핵산	241
D_S01765008	폴리펩티드	212		D_S02838328	폴리펩티드	242
D_S01764953	핵산	213		D_S02838330	핵산	243
D_S01764953	폴리펩티드	214		D_S02838330	폴리펩티드	244
D_S01764977	핵산	215		D_S02838454	핵산	245
D_S01764977	폴리펩티드	216		D_S02838454	폴리펩티드	246
D_S01765509	핵산	217		D_S02838470	핵산	247
D_S01765509	폴리펩티드	218		D_S02838470	폴리펩티드	248
D_S01765668	핵산	219		D_S02838478	핵산	249
D_S01765668	폴리펩티드	220		D_S02838478	폴리펩티드	250
D_S01765621	핵산	221		D_S02838434	핵산	251
D_S01765621	폴리펩티드	222		D_S02838434	폴리펩티드	252
D_S01765693	핵산	223		D_S02838549	핵산	253
D_S01765693	폴리펩티드	224		D_S02838549	폴리펩티드	254
D_S01765687	핵산	225		D_S02838632	핵산	255
D_S01765687	폴리펩티드	226		D_S02838632	폴리펩티드	256
D_S01765765	핵산	227		D_S02838640	핵산	257
D_S01765765	폴리펩티드	228		D_S02838640	폴리펩티드	258
D_S01765932	핵산	229		D_S02838648	핵산	259
D_S01765932	폴리펩티드	230		D_S02838648	폴리펩티드	260
D_S01766010	핵산	231		Cry2Ab	폴리펩티드	261
D_S01766010	폴리펩티드	232				

표 2

[0125]

코돈 표								
아미노산:			코돈					
알라닌	Ala	A	GCA	GCC	GCG	GCU		
시스테인	Cys	C	UGC	UGU				
아스파르트산	Asp	D	GAC	GAU				
글루탐산	Glu	E	GAA	GAG				
페닐알라닌	Phe	F	UUC	UUU				
글리신	Gly	G	GGA	GGC	GGG	GGU		
히스티딘	His	H	CAC	CAU				
이소류이신	Ile	I	AUA	AUC	AUU			
리신	Lys	K	AAA	AAG				
류이신	Leu	L	UUA	UUG	CUA	CUC	CUG	CUU
메티오닌	Met	M	AUG					
아스파라긴	Asn	N	AAC	AAU				
프롤린	Pro	P	CCA	CCC	CCG	CCU		
글루타민	Gln	Q	CAA	CAG				
아르기닌	Arg	R	AGA	AGG	CGA	CGC	CGG	CGU
세린	Ser	S	AGC	AGU	UCA	UCC	UCG	UCU
트레오닌	Thr	T	ACA	ACC	ACG	ACU		
발린	Val	V	GUA	GUC	GUG	GUU		
트립토판	Trp	W	UGG					
티로신	Tyr	Y	UAC	UAU				

표 3

DNA 서플링으로부터 분리한 관심있는 클론의 서열

아미노산 위치	모체		제1 회전							제2 회전								
	2Ab	2Ax	38	44	7K	15K	16K	16R	473R	2Ab	2Ax	38	44	7K	15K	16K	16R	473R
3	N	H	H	H	H	H	H	H	H	S	-	S	S	S	S	S	S	S
4	S	N	N	N	N	N	N	N	N	P	V	P	P	P	P	P	P	P
20	A	V	A	A	A	A	A	A	A	N	N	T	N	T	T	T	N	N
35	V	I	V	V	V	V	V	V	V	N	S	S	S	S	S	S	S	S
37	K	E	E	E	E	E	E	E	E	E	G	G	G	G	G	G	G	G
40	T	M	M	M	M	M	M	M	M	V	I	V	V	V	V	V	V	V
42	W	W	W	W	W	W	W	R	W	A	N	A	N	A	N	N	A	N
45	N	D	D	D	D	D	D	D	D	E	Q	Q	Q	Q	Q	Q	Q	Q
51	L	V	V	V	V	L	L	V	V	A	E	E	A	E	A	A	A	E
80	N	N	S	N	S	S	S	S	S	A	L	A	L	A	L	L	A	A
163	P	T	T	P	P	P	P	P	P	H	Y	Y	Y	Y	Y	Y	Y	Y
210	R	Q	R	Q	R	R	Q	R	R	S	T	T	S	T	S	T	T	T
211	D	N	N	N	N	N	N	N	N	N	E	E	E	E	E	E	E	E
212	Y	H	H	H	H	H	H	H	H	N	S	S	S	S	S	S	S	S
214	K	R	R	R	R	R	R	R	R	T	S	S	T	T	S	S	S	T
230	S	T	S	T	S	S	S	S	T	S	D	D	S	S	S	S	S	D
233	K	R	R	R	R	R	R	R	R	S	T	S	S	S	S	S	S	S
242	M	M	M	M	V	M	M	M	M	D	N	N	D	D	D	D	D	N
318	S	T	S	S	S	S	S	S	S	D	E	E	D	D	E	E	D	D
319	N	Q	Q	Q	Q	Q	Q	Q	Q	L	F	F	F	F	F	F	F	F
330	S	T	T	T	T	T	T	T	T	I	L	L	L	L	L	L	L	L
347	I	V	V	V	V	V	V	V	V	S	P	S	P	P	S	S	P	P

[0126]

표 4

야생형 Cry2 폴리펩티드와 클론 473N과의 서열 비교

아미노산 위치	모체									변형된 클론
	Cry2Aa	Cry2Ab	Cry2Ac	Cry2Ad	Cry2Ae	Cry2Af	Cry2Ag	Cry2Ax	473R	
8	S	S	N	S	N	S	S	S	S	N
9	S	G	G	G	G	G	E	G	G	E
11	S	T	N	N	T	T	T	T	T	N
13	S	I	T	I	I	I	K	I	I	V
15	S	D	H	D	D	D	G	D	D	E
17	S	Y	H	Y	Y	Y	Y	Y	Y	H
21	S	A	A	V	A	A	A	A	A	V
22	S	H	H	H	H	H	H	H	H	R
28	S	Q	E	Q	E	Q	E	Q	Q	E
36	S	Q	E	D	R	Q	Q	Q	Q	E
37	S	K	K	N	K	E	K	E	E	K
40	S	T	K	M	M	M	M	M	M	T
44	S	K	R	K	R	K	R	K	K	R
45	S	N	T	D	T	D	T	D	D	N
46	S	N	D	N	D	N	D	N	N	D

[0127]

표 5

모체로서 Cry2Ab'를 사용하여 DNA 서플링으로부터 분리한 관심있는 클론의 서열

클론	1	3	4	7	9	10	11	12	13	14	20	25	26	27	28	29	31	34	36	37	42	46	48	49
Cry2Ab'	M	N	S	N	G	R	T	T	L	C	A	F	S	F	Q	H	S	T	Q	R	W	N	S	L
Cry2Ab wt seq																				K				
D_S02838648			D																P		R			
D_S02838640																				R	R			
D_S02838632																				R	R			P
D_S02838470																				R	R			
D_S02838434																				R	R			
D_S02838328																				R	R			
D_S02838327																				R	R			
D_S02838310																				R	R			
D_S01766073																				R	R			
D_S01766026																				R	R		D	
D_S01765621																				R	R			
D_S01765509																				R	R			
D_S01765496																				R	R			
D_s01765255																				R	R			
D_S01765119																				R	R			
D_S01765112																				R	R			
D_S01765104																				R	R			
D_S01765063																				R	R			
D_S01765008																				R	R			
D_S01764977																				R	R			
D_S01764947																				R	R			
D_S01764787																				R	R			
D_S01764723																				R	R			
D_S01764701																				R	R			
D_S01764691																				R	R			
D_S01764680																				R	R			
D_S01764668																				R	R			
D_S01764668																				R	R			
D_S01764642																				R	R			
D_S01764568																				R	R			
D_S01764554																				R	R			
D_S01764546																				R	R			
D_S01764543																				R	R			
D_S01764533																				R	R			
D_S01764505																				R	R			
D_S01764502																				R	R			
D_S01764500																				R	R			
D_S01764196																				R	R			
D_S01763985																				R	R			
D_S01632237																				R	R			
D_S01632121																				R	R			
D_S01631557																				R	R			
D_S01614407																				R	R			
D_S01613034																				R	R			
D_S01602925																				R	R			
D_S01601459																				R	R			
D_S01599948																				R	R			
D_S01532970																				R	R			
D_S0153204																				R	R			
D_S01467003																				R	R			
D_S01466770																				R	R			
D_S01466712																				R	R			
D_S01466681																				R	R			
D_S014657862																				R	R			
D_S01457892																				R	R			
D_S01443366																				R	R			
D_S01442158																				R	R			
D_S01442132																				R	R			L
D_S-1764685																				R	R			
BY2_Cry2Ab																				R	R			

[0128]

샘플	51	54	56	64	70	76	79	80	89	93	96	97	100	101	107	111	118	119	122	123	124	125	
Cry2Ab ^{wt}	L	I	G	K	V	S	R	N	N	D	R	E	K	F	N	L	L	T	Q	A	N	V	
D_S02838648							S							L					E				
D_S02838640							S												E				
D_S02838632																							
D_S02838470													Q										
D_S02838434							S																
D_S02838328																							
D_S02838327							S						E										
D_S02838310																							
D_S01766073																							
D_S01766026						W						E											
D_S01765621						G								D									
D_S01765509																							
D_S01765496				I																			
D_S01765255																							
D_S01765119													Q										
D_S01765112	V	V						D															
D_S01765104									H							W							
D_S01765063													Q		D								
D_S01765008						W	G																
D_S01764977						W							Q										
D_S01764947						K	S						Q										
D_S01764787						W																	
D_S01764723						W	G										M						
D_S01764701													Q		D								
D_S01764691																							
D_S01764680																							
D_S01764668						L	W	G											R				
D_S01764642														Q									
D_S01764568																					G	I	
D_S01764554							S						R										
D_S01764546													Q										
D_S01764543			E				S																
D_S01764533						W																	
D_S01764505																					S		
D_S01764502						W	G							Q						R			
D_S01764500						G																	
D_S01764196						S		G															
D_S01763985																							
D_S01632237							S																
D_S01632121							S																
D_S01631557							S		V														
D_S01614407													G	R									
D_S01613034		R																					
D_S01602925							S																
D_S01601459							S													E			
D_S01599948							S					G											
D_S01532970																							
D_S0153204																							
D_S01467003																							
D_S01466770																							
D_S01466712																							
D_S01466681																							
D_S014657862															S				R				
D_S01457892																							
D_S01443366																							
D_S01442158																							
D_S01442132																							
D_S-1764685																							
BY2_Cry2Ab							S													E			

[0129]

샘플	126	130	135	137	139	140	141	142	144	153	154	160	162	164	166	167	168	169	172
Cry2Ab*	E	R	F	N	N	R	N	A	P	T	M	N	L	Q	Q	M	Q	G	L
Cry2Ab wt seq																			
D_S02838648																			
D_S02838640						P		D	I										
D_S02838632						P	L	S	I									Q	
D_S02838470									T										
D_S02838434		L																	
D_S02838328																			
D_S02838327						L	D	T											
D_S02838310																			
D_S01766073																			
D_S01766026							Q												
D_S01765621																			
D_S01765509															R	V			
D_S01765496																			
D_S01765255	Q															V			
D_S01765119								L											
D_S01765112								A											
D_S01765104												S							
D_S01765063													S					V	
D_S01765008																			
D_S01764977																			
D_S01764947																			
D_S01764787			Y															V	
D_S01764723					Q				L						R	V			
D_S01764701																			
D_S01764691																			
D_S01764680															R				
D_S01764658																			
D_S01764642																		V	
D_S01764568																			
D_S01764554																			
D_S01764546																			
D_S01764543																			
D_S01764533					T														
D_S01764505																			
D_S01764502								Q											
D_S01764500					T	Q										V			
D_S01764196																	R		S
D_S01763985																			
D_S01632237																	R	Q	
D_S01632121																			
D_S01631557	H																		
D_S01614407																			
D_S01613034																			
D_S01602925																			
D_S01601459																			
D_S01589948																			
D_S01532970																			
D_S0153204	G																		
D_S01467003																			
D_S01466770																			
D_S01466712								T											
D_S01466681																			
D_S014657862	H													M					
D_S01457892																			
D_S01443366																			
D_S01442158																			
D_S01442132																			
D_S-1764685																			
BY2_Cry2Ab																			

[0130]

샘플	178	184	187	191	192	193	197	201	205	210	211	212	214	215	216	218	219	221	226
Cry2Ab*	F	L	S	D	V	I	D	I	T	R	D	Y	K	N	Y	R	D	S	N
Cry2Ab wt seq																			
D_S02838648							G												
D_S02838640																			
D_S02838632																			
D_S02838470																			
D_S02838434	L															R			
D_S02838328	M																		
D_S02838327																			
D_S02838310										Q									
D_S01766073																			
D_S01766026	M																		
D_S01765621					V		V										T		
D_S01765509					V														
D_S01765496																			
D_S01765255	M				V														
D_S01765119																			
D_S01765112										Q	N	H	R						
D_S01765104	M		E																
D_S01765063																			
D_S01765008	M				V														
D_S01764977																			
D_S01764947																			
D_S01764787																			
D_S01764723					V														
D_S01764701																			
D_S01764691																			
D_S01764680	M				V														
D_S01764668	M																	E	
D_S01764642	M				V													E	
D_S01764568																			
D_S01764554				A						Q									S
D_S01764546								A											
D_S01764543																			
D_S01764533					V														
D_S01764505																			
D_S01764502		G			V			A											
D_S01764500																			
D_S01764196										Q			R						
D_S01763985																	H		
D_S01632237											N								
D_S01632121										Q									
D_S01631557																			
D_S01614407																			
D_S01613034											N		R						
D_S01602925													R						
D_S01601459										Q	N								
D_S01599948																			
D_S01532970												F							
D_S0153204										Q	N	H	R						
D_S01467003																			
D_S01466770																			
D_S01466712																			
D_S01466681																			
D_S014657862																E			
D_S01457892																			
D_S01443366																			
D_S01442158																			
D_S01442132																			
D_S-1764685																			W
BY2_Cry2Ab											N		R						

[0131]

샘플	229	230	233	234	237	238	240	241	242	244	273	278	279	283	284	285	286	288	291
Cry2Ab*	Q	S	K	G	T	R	H	D	T	E	G	A	S	P	Q	Q	T	S	S
Cry2Ab wt seq									M										
D_S02838648									T										
D_S02838640		T							T										G
D_S02838632									T										
D_S02838470									T										
D_S02838434									T										
D_S02838328									T										
D_S02838327									T										
D_S02838310		T							T										
D_S01766073																	A		
D_S01766026									T										
D_S01765621									T										
D_S01765509									T										
D_S01765496									T										L
D_S01765255									T										
D_S01765119									T										
D_S01765112		T	R						T										
D_S01765104									T										
D_S01765063								G	T										
D_S01765008									T										
D_S01764977									T	K									
D_S01764947									T										
D_S01764787				A					T										
D_S01764723									T		S								
D_S01764701								G	T										
D_S01764691									T										
D_S01764680						R			T										
D_S01764668									T										
D_S01764642									T										
D_S01764568									T										
D_S01764554									T										
D_S01764546									T										
D_S01764543		T							T				C						
D_S01764533									T										
D_S01764505									T										
D_S01764502								G	T										
D_S01764500			A						T		T							A	
D_S01764196					G				T										
D_S01763985		T							T				V	T	N				
D_S01632237		T							T										
D_S01632121		T							T										
D_S01631557	R								T										
D_S01614407		T							T										
D_S01613034		T							T				V	T	N				
D_S01602925		T							T										
D_S01601459		T							T										R
D_S01599948		T							T										
D_S01532970									T										
D_S0153204		T	R						T										
D_S01467003									T										
D_S01466770									T										
D_S01466712									T			R							
D_S01466681									T										
D_S014657862									T										
D_S01457892									T										
D_S01443366									T										
D_S01442158									T										
D_S01442132									T										
D_S-1764685																		R	
BY2_Cry2Ab		T							T										

[0132]

샘플	298	302	305	307	310	311	317	319	321	323	325	330	331	344	347	358	362	367	383
Cry2Ab*	Y	Q	S	Y	N	G	L	N	F	N	V	S	T	S	I	N	N	L	S
Cry2Ab wt seq																			
D_S02838648																			
D_S02838640																			
D_S02838632																			
D_S02838470	H																		
D_S02838434																			
D_S02838328											G								
D_S02838327																			
D_S02838310																			
D_S01766073																			T
D_S01766026																			
D_S01765621											G								
D_S01765509											G								
D_S01765496																			
D_S01765255											G			V					
D_S01765119																			
D_S01765112							Q	L											
D_S01765104											G								
D_S01765063											G								
D_S01765008											G								
D_S01764977																			
D_S01764947																			
D_S01764787											G								
D_S01764723							S												
D_S01764701											G								
D_S01764691											G								
D_S01764680				H							G								
D_S01764668											G			P					
D_S01764642					S														
D_S01764568																			
D_S01764554														A					
D_S01764546																			
D_S01764543																			
D_S01764533											G								
D_S01764505		Q									G								
D_S01764502					S														
D_S01764500																			
D_S01764196																			
D_S01763985																			
D_S01632237					S														
D_S01632121					H														
D_S01631557																			
D_S01614407											S								
D_S01613034																			
D_S01602925																			
D_S01601459													N						
D_S01599948																			
D_S01532970													T		V		S		
D_S0153204							Q						T						
D_S01467003																			
D_S01466770																			
D_S01466712																			
D_S01466681																			
D_S014657862					D														
D_S01457892																			
D_S01443366																			
D_S01442158																			
D_S01442132																			
D_S-1764685		R														S		T	R
BY2_Cry2Ab																			

[0133]

샘플	386	389	391	399	401	403	405	407	408	413	420	435	436	444	445	447	448	459	461
Cry2Ab*	E	A	V	F	T	L	L	S	G	R	P	R	N	H	Y	E	I	G	A
Cry2Ab wt seq																			
D_S02838648																			
D_S02838640																			
D_S02838632																			
D_S02838470																			
D_S02838434																			
D_S02838328																			
D_S02838327																			
D_S02838310																			
D_S01766073																			
D_S01766026																			
D_S01765621																			
D_S01765509																			
D_S01765496																			
D_S01765255																			
D_S01765119																			
D_S01765112	G	N																	L
D_S01765104					S	I	I		R										
D_S01765063																			
D_S01765008					S	I	I	C											
D_S01764977																			
D_S01764947																			
D_S01764787																			
D_S01764723												K							
D_S01764701																			
D_S01764691																			
D_S01764690																			
D_S01764666					S	I	I												
D_S01764642																			
D_S01764568																			
D_S01764554																			
D_S01764546																			T
D_S01764543																			S
D_S01764533																			
D_S01764505														Y	F				
D_S01764502																			
D_S01764500																			
D_S01764196																			
D_S01763985																			
D_S01632237																			
D_S01632121																			
D_S01631557																			
D_S01614407																			
D_S01613034																			
D_S01602825																			
D_S01601459																			
D_S01599948													K						
D_S01532970																		Q	L
D_S0153204	G	N																	
D_S01467003												S	D						
D_S01466770													D						
D_S01466712																			
D_S01466681																			
D_S014657862					L														
D_S01457892																			
D_S01443366																			
D_S01442158																			
D_S01442132																			
D_S-1764685																			
BY2_Cry2Ab																			

[0134]

샘플	476	490	491	492	497	498	500	508	513	517	529	530	537	538	543	545	553	560	566
Cry2Ab*	H	N	D	Y	I	S	I	Q	I	F	N	N	L	R	S	N	I	V	V
Cry2Ab wt seq															K				
D_S02838648																			
D_S02838640								V											
D_S02838632																			
D_S02838470																			
D_S02838434																			
D_S02838328																			
D_S02838327																			
D_S02838310						G													
D_S01766073																			
D_S01766026																			
D_S01765621						V													
D_S01765509																			
D_S01765496																			
D_S01765255																			
D_S01765119																			
D_S01765112	Y	E								S									
D_S01765104			G																
D_S01765063																			
D_S01765008														G					
D_S01764977															P				
D_S01764947																			
D_S01764787																			A
D_S01764723																			
D_S01764701																			
D_S01764691																			
D_S01764680																			
D_S01764668																			
D_S01764642														W					
D_S01764588																			
D_S01764554																			
D_S01764546																			
D_S01764543																			
D_S01764533																			
D_S01764505																			
D_S01764502																			
D_S01764500																		T	
D_S01764196																			A
D_S01763985																			
D_S01632237																			
D_S01632121																			
D_S01631557																			
D_S01614407								R											
D_S01613034																			
D_S01602925																			
D_S01601459																			
D_S01599948																			D
D_S01532970		E																	
D_S0153204															P	D		A	
D_S01467003																			L
D_S01466770										L	T				F				L
D_S01466712											T								L
D_S01466681																			
D_S014657862																			
D_S01457892			G													F			
D_S01443366					M														L
D_S01442168											T					F			
D_S01442132											A								
D_S-1764685											T								
BY2_Cry2Ab			H									Y							

[0135]

번호	667	668	669	682	683	691	692	693	696	598	600	603	612	619	623	624	625	630	631
Cry2Ab*	Y	T	A	N	D	I	N	I	N	A	S	D	L	D	I	M	L	I	S
Cry2Ab wt seq																			
D_S02838648																			
D_S02838640																			
D_S02838632																			
D_S02838470																			
D_S02838434																			
D_S02838328	H													F					
D_S02838327																			
D_S02838310		A																	
D_S01766073																			
D_S01766026							D								F				
D_S01765621																			
D_S01765509		A													F				
D_S01765496								M											
D_S01765255								M											
D_S01765119																			
D_S01765112																			
D_S01765104								M											
D_S01765063														F		T			
D_S01765008								M						F					
D_S01764977								M						F					
D_S01764947								M		V									
D_S01764787								M						F					
D_S01764723																			
D_S01764701														F		T			
D_S01764691																			
D_S01764680								M											
D_S01764668								M											
D_S01764642						K		M						F					
D_S01764568				V				M								V			
D_S01764554																			
D_S01764546								M											
D_S01764543																			
D_S01764533																			
D_S01764505																			
D_S01764502																			
D_S01764500														F					
D_S01764196																			
D_S01763985																			
D_S01632237																			
D_S01632121																			
D_S01631557																			
D_S01614407																			
D_S01613034																			
D_S01602925																			
D_S01601459																			
D_S01599948														S					
D_S01532970																	F	L	P
D_S0153204			Y														F		
D_S01467003									G										
D_S01465770									N										
D_S01466712								T						F					
D_S01466681															E				
D_S014657882								T											
D_S01457892																			
D_S01443366		V						M						F					G
D_S01442158																			
D_S01442132		V						M						F					
D_S-1764665				N															
BY2_Cry2Ab																			

[0136]

샘플	633
Cry2Ab*	L
Cry2Ab wt seq	
D_S02838648	
D_S02838640	
D_S02838632	
D_S02838470	I
D_S02838434	
D_S02838328	I
D_S02838327	
D_S02838310	
D_S01766073	
D_S01766026	
D_S01765621	I
D_S01765509	I
D_S01765496	I
D_S01765255	I
D_S01765119	
D_S01765112	
D_S01765104	
D_S01765063	
D_S01765008	I
D_S01764977	I
D_S01764947	I
D_S01764787	
D_S01764723	
D_S01764701	
D_S01764691	
D_S01764680	I
D_S01764668	
D_S01764642	I
D_S01764568	I
D_S01764554	
D_S01764546	
D_S01764543	
D_S01764533	I
D_S01764505	
D_S01764502	
D_S01764500	I
D_S01764196	
D_S01763985	
D_S01632237	
D_S01632121	
D_S01631557	
D_S01614407	
D_S01613034	
D_S01602925	
D_S01601459	
D_S01599948	
D_S01532970	
D_S0153204	
D_S01467003	
D_S01466770	I
D_S01466712	
D_S01466681	
D_S014657862	
D_S01457892	I
D_S01443366	
D_S01442158	
D_S01442132	I
D_S-1764685	
BY2_Cry2Ab	

[0137]

표 6

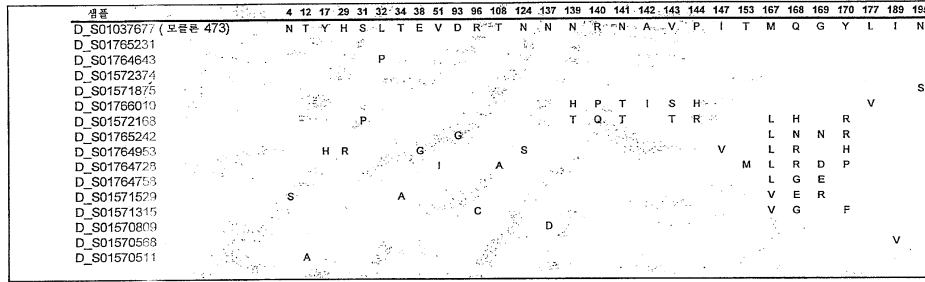
모체로서 클론 44를 사용하여 DNA 서플링으로부터 분리한 관심있는 클론의 아미노산 변화

샘플	84	143	149	189	192	216	217	225	226	290	345	358	393	416	527	553	600	663	616	618	631
D_S09503970 (모류본 44)	K	V	S	F	V	Y	T	I	V	T	G	N	S	Y	E	I	S	D	T	D	P
D_S01765068																		D	N	E	S
D_S01573294						A	H				S										S
D_S01572608																					
D_S01572605																					
D_S01561866		L	P			A				H											A
D_S01561489		A						F													
D_S01561330													R						D		H
D_S01765221																					
D_S01561293		R			V																

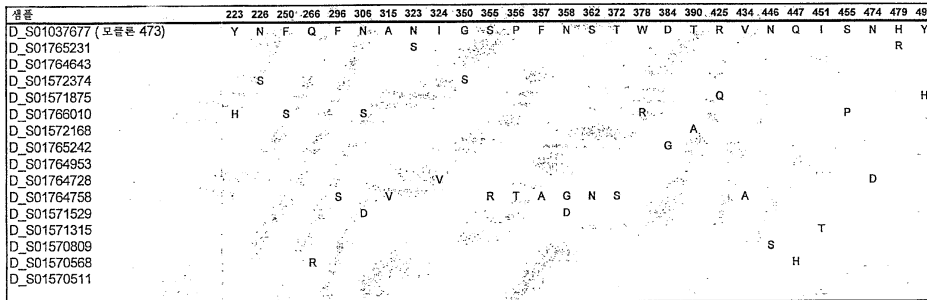
[0138]

표 7

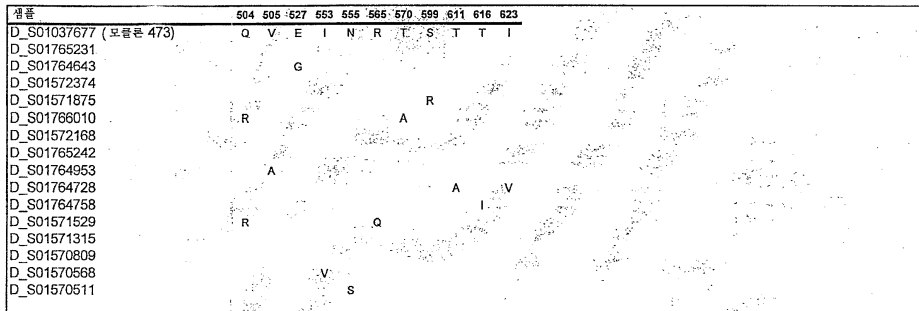
모델로서 클론 473R을 사용하여 DNA 서플링으로부터 분리한 관심있는 클론의 아미노산 서열 변화



[0139]



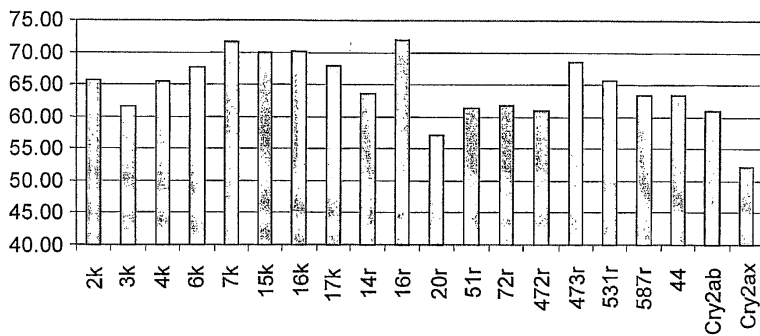
[0140]



[0141]

도면

도면1



<110> PIONEER HI-BRED INTERNATIONAL, INC.

<120> NOVEL BACILLUS THURINGIENSIS CRYSTAL POLYPEPTIDES,
POLYNUCLEOTIDES, AND COMPOSITIONS THEREOF

<130> V0337-PCT

<140>

<141><150> 60/547,664

<151> 2004-02-25

<160> 261

<170> PatentIn Ver. 3.3

<210> 1

<211> 1899

<212> DNA

<213> *Bacillus thuringiensis*

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cttttaaga aagtggggag tcttgttga aaaagaatac tgagtgagtt acggaattta 240

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caagcaaat tagaagagt taatcgaaa gtagataatt ttttgaacc taaccgaaat 420

gctgttcctt taacaatac ttcttcagtt aatacaatgc agcaattatt tctaaataga 480

ttaaccagtc tccagatgca aggatacca ttgttattat tacctttatt tgcacaggca 540

gccaatctac atctttcttt tattagagat gttattctta atgcagacga atggggaatt 600

tcagcagcaa cattacgtac gtatcaaat cacctgagaa attatacaag agattactct 660

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cctaatttg ttggtttacc tgggtactact acaactcag cattgcttgc tgcaagggtc 1020

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<210> 2

<211> 632

<212> PRT

<213> Bacillus thuringiensis

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 Thr Ile Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser Leu
 35 40 45
 Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys Lys
 50 55 60
 Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn Leu
 65 70 75 80
 Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg Glu

85

90

95

Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala Arg

100

105

110

Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe Asn

115

120

125

Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro Leu

130

135

140

Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn Arg

145

150

155

160

Leu Thr Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro Leu

165

170

175

Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val Ile

180

185

190

Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr Tyr

195

200

205

Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys Ile

210

215

220

Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His Asp

225

230

235

240

Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr Val

245

250

255

Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser Gly

260

265

270

Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser Phe

275

280

285

Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn Ser

290

295

300

Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln Thr Phe

305

310

315

320

Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu Leu

325

330

335

Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile Gly
 340 345 350

Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu
 355 360 365

Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg Gly
 370 375 380

Gly Ile Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu Thr Thr
 385 390 395 400

Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser Asn Tyr
 405 410 415

Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val Val
 420 425 430

Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile Arg Asn
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Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr Met Val
 450 455 460

Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn Gly
 465 470 475 480

Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile Ser
 485 490 495

Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser
 500 505 510

Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser Asn
 515 520 525

Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn Leu
 530 535 540

Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val Thr Ile
 545 550 555 560

Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn Asn
 565 570 575

Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile Gly

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atgaacatca tgttcgttcc gacaaaccta tcaccattgt at 1902

<210> 4

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 4

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100	105	110	
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe			
115	120	125	
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro			
130	135	140	
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn			
145	150	155	160
Arg Leu Thr Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro			
165	170	175	
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val			
180	185	190	
Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr			
195	200	205	
Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys			
210	215	220	
Ile Asn Thr Tyr Gln Ser Ala Phe Arg Gly Leu Asn Thr Arg Leu His			
225	230	235	240
Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr			
245	250	255	
Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser			
260	265	270	
Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser			
275	280	285	
Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn			
290	295	300	
Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr			
305	310	315	320
Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu			
325	330	335	
Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile			
340	345	350	

Gly Ala Ser Pro Phe Thr Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

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<210> 6

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 6

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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60

 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

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<210> 8

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 8

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Asn Thr Val Glu Lys Glu Trp Thr Glu Trp Lys Arg Asn Asp His Ser			
	35	40	45
Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys			
	50	55	60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser			
	65	70	75
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg			
	85	90	95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala			
	100	105	110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe			
	115	120	125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Leu Pro			

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Pro Gln Phe Gln Ile Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser

 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu

 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

 580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
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625

630

<210> 9

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400

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 atgaacatca tgttcgttcc gacaaacctt ccaccattgt at 1902

<210> 10

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 10

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Val Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser

 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile

 340 345 350
 Gly Ala Ser Pro Phe Thr Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630

<210> 11

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 11

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<210> 12

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 12

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile

435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Ser Pro Leu Tyr

625 630

<210> 13

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 13

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<210> 14

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 14

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
20 25 30
Asp Thr Val Gln Glu Glu Trp Met Glu Arg Lys Lys Asp Asn His Ser
35 40 45
Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
50 55 60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
65 70 75 80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
85 90 95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
100 105 110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
115 120 125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
130 135 140
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
145 150 155 160
Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
165 170 175
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile

435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Ser Pro Leu Tyr

625 630

<210> 15

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400> 15

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<210> 16

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 16

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45
Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190
Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 17

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400

> 17

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<210> 18

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 18

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

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Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 19

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 19

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ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

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aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgagttg 1860
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<210> 20

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 20

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His

225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn

 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro

 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met

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<210> 21

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 21

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<210> 22

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 22

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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Leu Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Thr Asn Thr Thr Ala Arg Tyr Thr Phe Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asn Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625 630

<210> 23

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 23

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<210> 24

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 24

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val His Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
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 625 630

<210> 25

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400

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<210> 26

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 26

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20

25

30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Thr Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Arg Gly Ser Gly Pro Gln Gln Thr Gln Ser

Thr Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Thr Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 27

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 27

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gagtggaaga agaacaatca ttcgetatat ctgaccga tcgttggaa cgtggcttca 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420

aacgccgtgc ctttgtctat tacgtctcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aaitccagat gcaaggctac caattgtgt tactccggtt attcgeccaa 540

gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atatcgag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtc gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcagggtg ctaacctata cgcaagtgga 840
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<210> 28

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 28

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35

40

45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn

Asn Leu Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Gly Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 29

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 29

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gagtgggaaga agaacaatca ttcgtatata ctcgaccga tcggttgaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagcaa 300

ttcctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gctgctaate ttacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atatcggcag ctgcactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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<210> 30

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 30

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50

55

60

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 31

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 31

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 gagtgaaga aggacaatca ttcgtatata gttgaccga tcgttgaac cgtggcttca 180
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 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
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 atatcggcag ctacactacg tacttatcag aatcacctgc gcaactacac gcgtgactac 660
 tcaaactact gtatcaaac ctatcagact gccttccgtg gctgaatac aaggctccac 720
 gatagtgttg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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 aacatcatgt tcgttccgac aaacctgccg ccattgtatt ag 1902

<210> 32

<211> 633

<212> PRT

<213> Bacillus thuringiensis

<400> 32

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Ile	Gln
Glu	Glu	Trp	Met
Glu	Trp	Lys	Lys
Asp	Asn	His	Ser
35	40	45	
Leu	Tyr	Val	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Asn
65	70	75	80

Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile

580 585 590

Gly Asn Val Val Ala Ser Asp Asn Thr Asn Val Pro Leu Asp Ile Asn

595 600 605

Val Thr Leu Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met Phe

610 615 620

Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 33

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 33

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atatcgagc ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggtccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

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<210> 34

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 34

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser

 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 35

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 35

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<210> 36

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 36

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
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 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Ser Thr Asp Thr Leu Ala
 100 105 110

Arg Val Asn Ala Glu Leu Arg Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn His Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Pro Met Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
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 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
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 Tyr Arg Asp Tyr Leu Lys Glu Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
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 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
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 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
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 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 Ser Asn Tyr Val Leu Asp Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
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 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 37

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 37

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ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

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cggttaaac aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atatcggcag ctacactacg tacttatcag aatcacctgc gcaactacac gcgtgactac 660

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<210> 38

<211> 633

<212> PRT

<213> Bacillus thuringiensis

<400> 38

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 35 40 45
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 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Thr Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Thr Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
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 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro
 355 360 365
 Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg

370 375 380
 Gly Gly Ile Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu Thr
 385 390 395 400
 Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser Asn
 405 410 415
 Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val
 420 425 430
 Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile Arg

 435 440 445
 Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr Met
 450 455 460
 Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn
 465 470 475 480
 Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile
 485 490 495
 Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile

 500 505 510
 Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser
 515 520 525
 Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn
 530 535 540
 Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val Thr
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 Ile Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn

 565 570 575
 Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Ile
 580 585 590
 Gly Asn Val Val Ala Ser Asp Asn Thr Asn Val Pro Leu Asp Ile Asn
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 Val Thr Leu Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met Phe
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Val Pro Thr Asn Leu Pro Pro Leu Tyr

625

630

<210> 39

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 39

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<210> 40

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 40

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Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
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Asp	Thr	Val	Gln
Arg	Glu	Trp	Thr
Glu	Trp	Lys	Lys
Asn	Asn	His	Ser
35	40	45	
Leu	Tyr	Leu	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Asn
65	70	75	80
Leu	Ile	Phe	Pro
Ser	Gly	Ser	Thr
Asn	Leu	Met	Gln
Asp	Ile	Leu	Arg
85	90	95	
Glu	Thr	Glu	Lys
Phe	Leu	Asn	Gln
Arg	Leu	Asn	Thr
Asp	Thr	Leu	Ala
100	105	110	
Arg	Val	Asn	Ala
Glu	Leu	Thr	Gly
Leu	Gln	Ala	Asn
Val	Glu	Glu	Phe
115	120	125	
Asn	Arg	Gln	Val
Asp	Asn	Phe	Leu
Asn	Pro	Asn	Arg
Asn	Ala	Val	Pro
130	135	140	

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
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 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
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 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
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385 390 395 400
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 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
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 450 455 460
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 465 470 475 480
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 515 520 525
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 545 550 555 560
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 580 585 590
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 <210> 41

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400

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<210> 42

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 42

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20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Leu

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

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Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
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 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

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 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
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 530 535 540
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 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

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 <210> 43
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 <212> DNA
 <213> Bacillus thuringiensis

<400> 43

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aacagtgacg tacctctgga cattaacgtt acgttcaact caggcacaca gttcgatttg 1860

atgaacatca tgetgttacc gacaaacatt ggcccattgt attag 1905

<210> 44

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 44

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Met Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Thr Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Val Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Leu Val Pro Thr Asn Ile Gly Pro Leu Tyr
 625 630

<210> 45

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 45

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 gagtgaaga agaacaatca ttcgtatat ctgacccga tcgttgaac cgtggcttca 180
 ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

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 cggttacctc aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
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 aacagtgacg tacctctgga cattaacgtt acgttcaact caggcacaca gttcgatttg 1860

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1905

<210> 46

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 46

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Thr Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Val Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625 630

<210> 47

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 47

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 gagtgaaga agaacaatca ttcgctatat ctgacccga tcgttgaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcggt ggtaagagga ttctctcgga actaaggaac 240
 ttgatcttcc cctccgtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
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ctacaggcaa atgfcgagga gttcaatcgc caagttgaca acttctaaa tcccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccac aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540
 gctgctaate ttacactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcgcgag ctacactacg tactttatagg gatttctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatagtgttg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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 atgaacatca tgttcgttcc gacaaacctc ccaccattgt attag 1905

<210> 48

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 48

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15
Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln Arg Lys Ser Leu

20 25 30
Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45
Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190
Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205
Tyr Arg Asp Phe Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

210 215 220

ctacaggcaa atgtcgggga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttaccac aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gctgctaate ttacactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

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tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggtccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

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accatcaacg gtcgagtgta cacagctaca aacgtcaata ccaccactaa caacgatggt 1740

gtatacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagc 1800

aacagcgagc tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

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<210> 50

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 50

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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Pro Tyr
 530 535 540
 Asp Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Ala
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Tyr Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 51

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 51

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 ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240
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 ttctgaacc agcgactgaa cacggacacc ttggcagag ttaatgctga atgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

ataticggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcg gccttcaaag gccigaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

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acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260

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gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800

aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

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<210> 52

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 52

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1

5

10

15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
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 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 53

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 53

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 gagtgaaga aggacaatca ttcgctatat gttgaccga tcgttgaac cgtggcttca 180
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 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tcccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
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atatcggcag ctacactacg tacttatcag aatcacctgc gcaactacac gcgtgactac 660

 tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
 gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcatcaggtg ctaacctata cgcaagtgga 840
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 acaaacctcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260
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 atgaacatca tgttcgttcc gacaaacctt ccaccattgt attag 1905

<210> 54

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 54

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Arg
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Val Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Met Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 55

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 55

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 gagtggaaga aggacaatca ttcctatat gttgaccoga tcgttggaac cgtggcttca 180
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 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420
 aacgccgcgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccgc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcceaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcgcgag ctacactacg tactttatcag aatcacctgc gcaactacac gcgtgactac 660
 tcaaactact gtttcaacac ctatcagacc gccttccgtg gcctgaatac aaggctccac 720

gatatgttg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggacctc agcaaacca atcgttcacg agtcaagact ggccattcct gtatagcttg 900

ttccaggcca acccaacta cgtgctgaac ggcttctcag gtgctcgatt gtcccagact 960

ttcccaaaca tcgttgact tccaggaaca actacgactc atgccttgct ggctgcacga 1020

gtcaactact ctggtggagt ttcaagtggc gatattggag cttcgccgtt caaccagaac 1080

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acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260

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gtaaagcaca atggtgctcg cttcagcgac atcaacattg gaaacgtagt cgcaagcagc 1800

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<210> 56

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 56

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1	5	10	15
Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Glu	Glu	Trp	Met
Glu	Trp	Lys	Lys
Asp	Asn	His	Ser
35	40	45	

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Ala Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Phe Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 57

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400

> 57

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 ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240
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 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420

 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccac aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540
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 tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
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<210> 58

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 58

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 59

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 59

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 cggttaccac aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

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<210> 60

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 60

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Ala Ile Cys Asp Ala
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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 61

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 61

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gagtgaaga aggacaatca ttctctatat gttgaccga tcgttgaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggagc 240

ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgca gaccgagaag 300

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cggttaccac aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gctgctaate ttacactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atatcggcag ctacactacg tacttatcga aaccatctga ggaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720

gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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<210> 62

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 62

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 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asp Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 63

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 63

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ataticggcag ctacactacg tactttatcga aaccatctga ggaactacac gcgtgactac 660

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<210> 64

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 64

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser			
	35	40	45
Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys			
	50	55	60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser			
65	70	75	80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg			
	85	90	95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala			
	100	105	110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe			
	115	120	125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Val Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Arg Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625

630

<210> 65

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400

> 65

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<210> 66

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 66

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Thr Gln Thr Ala Thr Arg

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

 145 150 155 160
 Arg Leu Pro Gln Phe Gln Leu His Gly Arg Gln Leu Leu Leu Leu Pro

 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

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 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His

 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr

 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser

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 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser

 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn

 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr

 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu

 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile

 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro

 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp

 370 375 380
 Arg Gly Gly Val Asn Ala Val Thr Asn Trp Gln Thr Glu Ser Phe Glu

385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

 595 600 605
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 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630

<210> 67

<211> 1902

<212> DNA

<213> *Bacillus thuringiensis*

<400> 67

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<210> 68

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 68

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 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Cys
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
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 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
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 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160

Arg Leu Pro Gln Phe Gln Val Gly Gly Phe Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
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 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
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 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
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 225 230 235 240
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 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
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 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

405 410 415
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420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Thr Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

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<210> 69

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400> 69

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 atgaacatca tgtttgttcc gacaaacctt ccaccattgt at 1902

<210> 70

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 70

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Ser Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Gln Asn Ile Ser Gly Val Pro Leu

420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile

435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp His Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Arg Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 71

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400> 71

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gagtggaga aggacaatca ttctctatat gttgaccga tcgttggaaac cgtggcttca 180
ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggagc 240
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ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tcccaatcgt 420
aacgccgtgc ctttgtctat tacgtcgtcc gtcaaacga tgcagcagct attcttgaac 480
cggttaccac aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540
gctgctaate ttcaactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
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tcaaactact gtatcagcac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcgagcgac 1800

aacagcaacg tacctctgga cattaacggt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgtttgttcc gacaaacctt ccaccattgt at 1902

<210> 72

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 72

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15
 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Ser Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Ser Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile

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 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagc 1800
 aacagcagc tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgttcgttcc gacaacctta ccaccattgt at 1902

<210> 74

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 74

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
 1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Pro Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Gln Asn His Leu Arg Asn Tyr Ala Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr

450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 75

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400> 75

atgggacaca acgtccttaa ttccggtcgt accacaatat gtgatgcata caacgtggcc 60

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gagtgaaga aggacaatca ttcgtatat gttgaccga tcgttgaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcggtt ggtaagagga ttctctcgga actaaggaac 240
 ttgatcttcc cctccgtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
 ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctctaaa tccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccac aattccagat gcaaggctac caattgttgt tactcccggtt attcgcccaa 540

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 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagc 1800

aacagcgagc tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgttcgttcc gacaaacctc ccaccattgt at 1902

<210> 76

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 76

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Ala
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn

 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro

 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu

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<210> 78

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 78

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Leu Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr His Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605
 Asn Val Thr Leu Asn Ser Gly Ala Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 79

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400> 79

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aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
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 atgaacatca tgttcgttcc gacaaacctc tcaccattgt at 1902

<210> 80

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 80

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

 195 200 205
 Tyr Gln Asn His Leu Arg Asn His Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Ser Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620
 Phe Val Pro Thr Asn Leu Ser Pro Leu Tyr

625 630

<210> 81

<211> 1902

<212> DNA

<213> Bacillus thuringiensis

<400

> 81

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 aacgcctgce ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
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 tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
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<210> 82

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 82

Met Gly His Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asp Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asp Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Arg Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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<210> 84

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 84

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Lys Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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<210> 86

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 86

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr

 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Asn Thr Thr Thr His Ala Leu

 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile

 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro

 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp

 370 375 380
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 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

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 <211> 1902
 <212> DNA
 <213> Bacillus thuringiensis
 <400> 87

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<210> 88

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 88

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Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Arg	Glu	Trp	Thr
Glu	Trp	Lys	Lys
Asn	Asn	His	Ser
35	40	45	
Leu	Tyr	Leu	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Ser

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
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 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
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 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
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 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
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 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
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 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
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 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
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<210> 90

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 90

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35 40 45

Leu Tyr Leu Asp Pro Ile Val Arg Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
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 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
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 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
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 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
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<210> 92

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 92

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Gly Thr Glu Arg Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Arg Thr Arg Thr Phe
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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
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 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
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 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
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 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

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<210> 94

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 94

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Val Ile Leu Arg
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 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
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 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
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 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
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 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
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 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
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610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 95

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 95

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<210> 96

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 96

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Arg	Glu	Trp	Thr
Glu	Trp	Lys	Lys
Asn	Asn	His	Ser
35	40	45	
Leu	Tyr	Leu	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Asn
65	70	75	80
Leu	Ile	Phe	Pro
Ser	Gly	Ser	Thr
Asn	Leu	Met	Gln
Asp	Ile	Leu	Arg
85	90	95	
Glu	Thr	Glu	Lys
Phe	Leu	Asn	Gln
Arg	Leu	Asn	Thr
Asp	Thr	Leu	Ala
100	105	110	
Arg	Val	Asn	Ala
Glu	Leu	Thr	Gly
Leu	Gln	Ala	Asn
Val	Glu	Glu	Phe
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Asp	Asn	Phe	Leu
Asn	Pro	Asn	Arg
Asn	Val	Val	Pro

625

630

<210> 97

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400

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<210> 98

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 98

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Arg Gln Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser

 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Ser Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile

 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 99

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 99

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<210> 100

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 100

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Val Val Pro

130 135 140

Leu Ser Ile Met Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 101

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 101

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<210> 102

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 102

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Ala Thr Ile Cys Asp Ala
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20 25 30
Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
35 40 45
Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
50 55 60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
65 70 75 80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
85 90 95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
100 105 110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
115 120 125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
130 135 140
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
145 150 155 160
Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
165 170 175
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 103

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 103

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<210> 104

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 104

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45
Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Gly

65 70 75 80
Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95
Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110
Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125
Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Thr Gln Asn Ala Val Pro

130 135 140
Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160
Arg Leu Pro Gln Phe Gln Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175
Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190
Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu

465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Thr Gly Asn Ser Thr Ile Arg Val

545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625 630

<210> 105

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

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400> 105

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 gactacttca tccgaaacat ctctggagia cctctagtcg ttaggaacga agacctcgt 1320
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 gcacgagcat acatggtctc agttcacaac cgtagaaca acatccatgc agttcatgag 1440
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 cacgccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
 ggcgattctc tgaggtttga gcagaacaat accacggcaa ggtacactct caggggtaat 1620
 ggaaactctt acaacctata cttgcgtgtc tccagcatag gcaattcaac tatcagggtt 1680

 accatcaacg gtcgagtgtg cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgetggtacc gacaaacatt ageccattgt attag 1905

<210> 106

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 106

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Ala Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Arg Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Gln Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Gly Phe Ile Arg Asp Val

180 185 190

Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Ala Leu Arg Thr

195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 107

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 107

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gagtgggaaga agaacaatca ttctctatat ctgacccga tcgttggaaac cgtggcttca 180

ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttcctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacagtcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa cccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tgcagtatgt ctccatctgg 780
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 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260
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 cacgccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
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gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgctggtacc gacaaacatt ageccattgt attag 1905

<210> 108

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 108

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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Tyr Asn Val Val Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ser Asn Val Glu Glu Phe
 115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 109

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 109

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 gagtggaaga agaacaatca ttcgtatat ctgacccga tcgttgaac cgtggcttca 180

 ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actatggaat 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
 ttctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tcccactaga 420
 aacgcagtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600

 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtcg gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
 agtggacctc agcaaaccac atcgttcacg agtcaagact ggccattcct gtatagcttg 900
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 atgaacatca tgctggtacc gacaaacatt ageccaatct attag 1905

<210> 110

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 110

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1

5

10

15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45

 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn
 65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110

 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Thr Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175

 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

<210> 111

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 111

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 gagtgaaga agaacaatca ttcgctatat ctcgaccga tcgttgaac cgtggcttca 180
 ttcttgctcg agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggtcc 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

 ttctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggt 360
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 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttacctc aattccagat gcaaggttac caattgtgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagaca gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgetggtc tcgtcagggtg ctaacctata cgcattgtga 840

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ggaaactctt acaacctata cttgcgtgic tccagcatag gcaattcaac tatcagggtt 1680

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gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800

aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgctagtacc gacaaacatt agccattgt attag 1905

<210> 112

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 112

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Ser Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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 atgaacatca tgctggtacc gacaaacatt agccattgt attag 1905

<210> 114

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 114

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Arg	Glu	Trp	Thr
Glu	Trp	Lys	Lys
Asn	Asn	His	Ser
35	40	45	
Leu	Tyr	Leu	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	

305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu

 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu

 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Thr
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625 630

<210> 115

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<

400> 115

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 ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggtcc 240
 ttgatcttc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagagg 300
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 atatggcag ccacactacg tacttatcag gactacctga agaactacac gcgtgactac 660
 tcaaactact gtatcagcac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcgggtg ctaacctata cgcaagtgga 840

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 atgaacatca tgctggtacc gacaaacatt agccattgt attag 1905

<210> 116

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 116

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Arg Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Ala
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Gln Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Ser Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Ala Thr Thr His Ala Leu

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 117

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 117

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gagtgggaaga agaacaatca ttctctatat ctcgaccga tcgtcggaac cgtggcttca 180

ttcttctca agaaggtcgg ttctctcgtc ggtaagagga ttctctcgga actaaggaac 240

ttgatcttc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcag gtatcgagga gttcaataga caagttgaca acttctaaa tcccaatcgt 420

aacgcagtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttaccte aattccagat gcaaggctac caattgttgt tactcccggtt attcgcccaa 540

gctgctaate ttacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggtccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggaacctc agcaaaccca atcgttcacg agtcaagact ggccattcct gtatagcttg 900

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<210> 118

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 118

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Gly Ile Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160

 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Val
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

<210> 119

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 119

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 gagtgggaaga agaacaatca ttctgtatat ctgaccga tcgttggaaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
 ttctgaacc agcactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420
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ataticggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgctggtacc gacaaacatt agccattgt attag 1905

<210> 120

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 120

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro

cgtcctctgc actacaatca gatcaggaac attgcgtcac cttcaggtac acctggtgga 1380
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 aacggatcca tgatccactt ggctccagag gactacaccg gatttacaat cagtcctatc 1500
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 atgaacatca tgttcgttcc gacaaaccta ccaccattgt attag 1905

<210> 122

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 122

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625

630

<

210> 123

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 123

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 gaggtggaaga agaacaatca ttcgctatat ctcgaccga tcgttggaac cgtggcttca 180
 ttcttctca agaaggtggg ttctctcgtt ggttaagagga ttctcttgga actaaggaac 240
 ttgatcttc cctccgtag cacaaatctc atgcaggata tactccgtga gaccgagcaa 300
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ctacaggcaa atgtcgagga gttcaataga caagttgaca acttctaaa tccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttacctc aattccaagt gcaaggctac caattgtgt tactcccgtt attcgcccaa 540
 gctgctaata tgcacctgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600
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 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcttgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260
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 cagccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
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<210> 124

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 124

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1	5	10	15
Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Arg	Glu	Trp	Thr
Glu	Trp	Lys	Lys
Asn	Asn	His	Ser
35	40	45	
Leu	Tyr	Leu	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Leu
Glu	Leu	Arg	Asn
65	70	75	80
Leu	Ile	Phe	Pro
Ser	Gly	Ser	Thr
Asn	Leu	Met	Gln
Asp	Ile	Leu	Arg
85	90	95	
Glu	Thr	Glu	Gln
Phe	Leu	Asn	Gln
Arg	Leu	Asn	Thr
Asp	Thr	Leu	Ala
100	105	110	
Arg	Val	Asn	Ala
Glu	Leu	Thr	Gly
Leu	Gln	Ala	Asn
Val	Glu	Glu	Phe
115	120	125	
Asn	Arg	Gln	Val
Asp	Asn	Phe	Leu
Asn	Pro	Asn	Arg
Asn	Ala	Val	Pro
130	135	140	

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Glu Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 Ser Asn Tyr Val Leu Asn Ser Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

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400> 125

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<210> 126

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 126

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Pro

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Gly Gln
 515 520 525

 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
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 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605
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 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630
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 <212> DNA
 <213> Bacillus thuringiensis

<400> 127

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aacgcagtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

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<210> 128

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 128

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Ser Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Ser Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Arg Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu Arg
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn His Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
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 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

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<210> 130

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 130

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Trp Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Arg Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Arg Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
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 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Ser Gln Asn Phe Asn Cys Ser Thr Phe Thr Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Arg Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

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<210> 132

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 132

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

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210> 133

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 133

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 ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaat 240
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ttctgaacc agcgactgga cacggacacc ttggcacgag ttaatgctga attgacaggt 360

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<210> 134

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 134

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asp Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Gly Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Thr Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 135

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

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400> 135

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 ttctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctctaaa tcccaatcgt 420

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 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaaac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtga 840

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<210> 136

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 136

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80

 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 137

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 137

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gagtggaaga agaacaatca ttcgetatat ctcgaccga tcgttggaaac cgtggcttca 180

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ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcaa 420

aacgcagtgc ctttgtctat tacgtcgtcc gtcaacacgt tgcagcagct attcttgaac 480

cggttacctc aattcagagt gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

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<210> 138

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 138

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Leu Phe Gln His Lys Ser Leu

Ser Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Ser Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Lys Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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<210> 140

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 140

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asp Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Met Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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 atgaacatca tgttgttcc gacaaaccta ccaccattgt attag 1905

<210> 142

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 142

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630

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210> 143

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 143

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 gagtgggaaga aggacaatca ttcgctatat gttgaccoga tcgttggaaac cgtggcttca 180
 ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240
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 gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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 atgaacatca tgttcgttcc gacaaacctt tcaccattgt attag 1905

<210> 144

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 144

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1	5	10	15
Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Glu	Glu	Trp	Met
Glu	Trp	Lys	Lys
Asp	Asn	His	Ser
35	40	45	
Leu	Tyr	Val	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Asn

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

gtcaactact ctggtggagt ttcaagtggc gatattggag cttcgccgtt caaccagaac 1080
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 aacagcaacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgtttgttcc gacaaacctt ccaccattgt attag 1905

<210> 146

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 146

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

	85	90	95
Glu Thr	Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala		
	100	105	110
Arg Val	Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe		
	115	120	125
Asn Arg	Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro		
	130	135	140
Leu Ser	Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn		
145	150	155	160
Arg Leu	Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro		
	165	170	175
Leu Phe	Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val		
	180	185	190
Ile Leu	Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr		
	195	200	205
Tyr Arg	Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys		
	210	215	220
Ile Asn	Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His		
225	230	235	240
Asp Met	Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr		
	245	250	255
Val Ser	Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser		
	260	265	270
Gly Ala	Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser		
	275	280	285
Phe Thr	Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn		
	290	295	300
Ser Asn	Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr		
305	310	315	320
Phe Pro	Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu		
	325	330	335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580

585

590

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625

630

<210> 147

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 147

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gagtgaaga agaacaatca ttcgtatat ctgacccga tcgtcggaac cgtggcttca 180

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cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gtgctaaate ttcacctgag cttcatcagg gatgtcatcc tgaatgcaga cgagtggggc 600

atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggetccac 720

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<210> 148

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 148

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asp Thr Asp Thr Leu Ala

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Thr Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 149

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 149

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gagtgggaaga agaacaatca ttcgctatat ctcgaccga tcgttggaaac cgtggcttca 180

ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

ttgatcttcc cctccggtag cacaatctc atgcaggata tactccgtga gaccgagcaa 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420

aacgccgtgc ttttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gtgctaatc ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atateggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaaac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

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<210> 150

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 150

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
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 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
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 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
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 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

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620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 151

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 151

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<210> 152

<211> 633

<212> PRT

<213> Bacillus thuringiensis

<400> 152

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu His

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Trp Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

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 Arg Ser Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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 Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Glu Val
 180 185 190

 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
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 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 305 310 315 320

 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
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 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Ser Thr Ile Gly Ile Arg Ser Arg Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
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 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
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 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
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 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
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 Asn Gly Ser Met Ile His Leu Ala Pro Asn Gly Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Thr Arg Thr Phe Ile
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 Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Asn
 515 520 525
 Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn
 530 535 540
 Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val Thr
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 Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr Asn
 565 570 575

 Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn Met
 580 585 590
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<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 153

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<210> 154

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 154

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Thr Arg Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Val Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asp Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

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Leu Ser Ile Thr Ser Ser Val Asn Ala Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
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Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Leu Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
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Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

<213> Bacillus thuringiensis

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400> 155

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<210> 156

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 156

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
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Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
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<210> 157

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 157

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<210> 158

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 158

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Gly Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Leu Asn Asn Arg Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Gly
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

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<210> 160

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 160

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Leu

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

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<210> 162

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 162

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Arg

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Gln Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Gly Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
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 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
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<210> 163

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 163

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<210> 164

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 164

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

210 215 220

Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His

225 230 235 240

Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 165

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

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400> 165

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<210> 166

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 166

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser
 65 70 75 80

 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Ser Ile Val Gly Leu Pro Gly Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val Arg Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630

<210> 167

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 167

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gagtgaaga agaacaatca ttcgetatat ctgacccga tcgttgaac cgtggcttcg 180

ttcttgctca agaaggtcgg ttctctcgtc ggtaagagga ttctctcgga actaaggaac 240

ttgatcttc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttcctgaacc agegactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcaa caagttgaca acttctaaa tccaatcgc 420

aacgcctgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccaagt gcaaggctac caattgtgt tactcccgtt attcgccaa 540

gctgctaata tgcacctgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gagggactac 660
 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gacacgttgg agtttcggac atacatgttc ctgaacgtgt tcgaatatgt ctccatctgg 780
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gtaaacgaca atggtgctcg cttcagcgac atcaacatgg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgctggtacc gacaacatt agcccaatct attag 1905

<210> 168

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 168

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Arg His Lys Ser Leu

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
 gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
 agtggacctc agcaaaccca atcgttcacg agtcaagact ggccattcct gtatagcttg 900
 ttccaggtca actccaacta cgtgctgaac ggcttctcag gtgctcgatt gtcccagact 960
 ttcccaaaaca tcgttggact tccaggaaca actacgactc atgccttgct ggctgcacga 1020

gtcaactact ctggtggagt ttcaagtggc gatattggag cttcgccgtt caaccagaac 1080
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 aacagcaacg tacctctgga cattaacggt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgttgttcc gacaaaccta ccaccattgt attag 1905

<210> 170

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 170

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Pro

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Gly Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
 agtggacctc agcaaaccba atcgttcacg agtcaagact ggccattcct gtatagcttg 900
 ttccaggtea actccaacta cgtgctgaac ggcttctcag gtgctcgatt gtcccagact 960
 ttcccaaaca tcgttggact tccaggaaca actacgactc atgccttgct ggctgcacga 1020
 gtcaactact ctggtggagt ttcaagtggc gatattggag cttcgccgtt caaccagaac 1080
 ttcagttgca gcacattcct gcctcctttg cttacgccat tcgtagatc ctggctcgac 1140

agtggaagtg atcgaggggg agttaatact gtgaccaact ggacagacaga gaggtttcgag 1200
 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260
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 aacggatcca tgatccactt ggctccagag gactacaccg gatttacaat cagtcctatc 1500
 cagccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaacaa 1560

ggcgatttctc tgaggtttga gcagagtaat accacggcaa ggtacactct caggggtaat 1620
 ggaaactctt acaacctata cttgctgtc tccagcatag gcaattcaac tatcagggtt 1680
 accatcaacg gtcgagtga cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaagcaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagc 1800
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 atgaacatca tgttcgttcc gacaaacctc ccaccattgt attag 1905

<210> 172

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 172

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
 1 5 10 15
 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630

<

210> 173

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 173

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 gagtgggaaga aggacaatca ttcgctatat gttgaccoga tcgttggaa cgtggcttca 180
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 ttgatcttc cctccgtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
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ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaaacaga tgcagcagct attcttgaac 480
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 tcaaactact gtatcaaac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
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tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260
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gggaactctt acaacctata cttgcgtgtc tccagcatag gcaattcaac tatcagggtt 1680
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 atgaacatca tgittgttcc gacaaacctt ccaccattgt attag 1905

<210> 174

<211> 634

<212> PRT

<213> *Bacillus thuringiensis*

<400> 174

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1	5	10	15
Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Glu	Glu	Trp	Met
Glu	Trp	Lys	Lys
Asp	Asn	His	Ser
35	40	45	
Leu	Tyr	Val	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Ser

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

gtcaactact ctggtggaat ctcaagtggc gatattggag cttcaccatt caaccagaac 1080
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 aacggatcaa tgatccactt ggctccaaac gactacaccg gatttacaat cagtctctatc 1500
 cacgccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
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accatcaacg gtcgagtgtg cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaacgaca atggtgctcg cttcagcgac atcaacatgg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgctggtacc gacaacatt agcccaatct attag 1905

<210> 176

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 176

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Arg His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

	85	90	95
Glu Thr	Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala		
	100	105	110
Arg Val	Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe		
	115	120	125
Asn Arg	Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro		
	130	135	140
Leu Ser	Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn		
145	150	155	160
Arg Leu	Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro		
	165	170	175
Leu Phe	Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val		
	180	185	190
Ile Leu	Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr		
	195	200	205
Tyr Arg	Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys		
	210	215	220
Ile Asn	Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His		
225	230	235	240
Asp Thr	Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr		
	245	250	255
Val Ser	Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser		
	260	265	270
Gly Ala	Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Leu		
	275	280	285
Phe Thr	Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn		
	290	295	300
Ser Asn	Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr		
305	310	315	320
Phe Pro	Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu		
	325	330	335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580

585

590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625

630

<210> 177

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 177

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gtcacgacc ctttctcatt ccagcacaaa tcactagaca ctgttcagag ggaatggact 120

gagtgaaga agaacaatca ttcgtatat ctgacccga tcgttgaac cgtggcttca 180

ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctcttga actaaggaac 240

ttgatcttc cciccggtag cacaaatcic atgcaggata tactccgtga gaccgagcaa 300

ttcctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaataga caagttgaca acttcctaaa tcccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccaagt gcaaggctac caattgttgt tactcccgtt attcgcccaa 540

gtgcttaata tgcacctgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600

atatggcag ctacactacg tacttatagg gattacctga agaactacac gaggaatac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggetccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggacctc agcaaaccca atcgttcacg agtcaagact ggccattcct gtatagcttg 900

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ttcaactgca gcacattcct gcctcctttg cttacgcat tcgttagatc ctggctcgac 1140

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 cagccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaacaa 1560
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gtaaacgaca atggtgctcg tttcagcgac atcaaatgg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttcaact caggcacaca gttcgatttg 1860
 atgaacatca tgctggtacc aacaacatt agcccaatct attag 1905

<210> 178

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 178

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Leu Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Trp Gly Asn Gly Asn Ser Tyr
 530 535 540

 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Lys
 580 585 590
 Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625

630

<210> 179

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 179

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gagtggaaga agaacaatca ttcgctatat ctcgaccga tcgttgaac cgtggcttca 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaagagt 240

ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagcaa 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccaaat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gtgctaatc ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atateggcag ctacactacg tacttatagg gattacctga agaactacac gagggactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgtcgttc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggaccte agcaaacca atcgttcacg agtcaagact ggccattcct gtatagcttg 900

ttccaggtca actccaacta cgtgctgaac ggcttctcag gtgctcgatt gtccaacact 960

ttcccaaaca tcgttggact tccaggaagc actacgactc atgccttgct ggctgcacga 1020

gtcaactact ctggtggaat ctcaagtggc gatattggag cttcaccatt caaccagaac 1080

ttcaactgca gcacattcct gcctcctttg cttacgcat tcgttagatc ctggctcgac 1140

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acaacactcg gtctacggtc aggagcattc acagcaagag gaaacagcaa ctacttccca 1260

gactacttca tccgaaacat ctctggagia cctctagtcg ttaggaacga agaccttctg 1320
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aacggatcaa tgatccactt ggctccaac gactacaccg gatttacaat cagtcctatc 1500
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 gtaaacgaca atggtgctcg cttcagcgac atcaacatgg gaaacgtagt cgtaagcagt 1800
 aacagtgcag tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgetggtacc gacaaacatt agcccaatct attag 1905

<210> 180

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 180

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Leu Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Lys Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Met Gly Asn Val Val Val Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625

630

<210> 181

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 181

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 gagggaaga agaacaatca ttctctatat ctgacccga tegtgggaac cgtggcttca 180
 ttcttgctca agaaggtggg ttctctcgtt gtaagagga ttctctcgga actaaggaac 240
 ttgatcttc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

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 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccaatcgt 420
 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccte aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtga 840
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<210> 182

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 182

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<

210> 183

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 183

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gagtgggaaga agaacaatca ttctctatat ctcgaccga tcgttggaaac cgtggcttca 180
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ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420
aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
cggttaccte aattccagat gcaaggctac caattgttgt tactccggtt attcgcccaa 540
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tcaaactact gtatcaaac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcagggtg ctaacctata cgcaagtgga 840
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agtggaagtg atcgagaagg agtcgctact gtgaccaact ggcagacaga gagtttcgag 1200

acaacactcg gtctacgac aggagcattc accgcaagag gaaacagcaa ctacttccca 1260
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cacgccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560

ggcgattctc tgaggtttga gcagaacaat accacggcaa ggtacactct caggggtaat 1620

ggaaactctt acaacctata cttgcgtgtc tccagcatag gcaattcaac taccaggtt 1680

accatcaacg gtcgagtgtg cacagctaca aacgtcaata ccaccactaa caacgatggt 1740

gtaaacgaca atgggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800

aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgetggtacc gacaaacatt agcccattgt attag 1905

<210> 184

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 184

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Ala Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Thr Pro
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Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

<213> Bacillus thuringiensis

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400> 185

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atgaacatca tgtttgttcc gacaaacctt ccaccattgt attag 1905

<210> 186

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 186

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Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Gly Gln
 515 520 525

 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
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 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
 625 630
 <210> 187
 <211> 1905
 <212> DNA
 <213> Bacillus thuringiensis

<400> 187

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aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

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atcctggcag ctacactacg tacttatagg gattacctga agaaccacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagaca gccttcaaag gcctgaatac aaggctccac 720

gatacgttg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgtcgttc tcgtcaggtg ctaacctata tgcaagtgga 840

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acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260

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<210> 188

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 188

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn His Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Thr Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Val Thr Asn Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

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<210> 190

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 190

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Arg Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Glu Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Pro Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Ser Thr Ile Gly Ile Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

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<210> 192

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 192

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Gly Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Arg Gly Tyr Gln Ser Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Gln Asp Tyr Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Ala Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
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 625 630

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210> 193

<211> 1906

<212> DNA

<213> Bacillus thuringiensis

<400> 193

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<210> 194

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 194

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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Ile Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Ala Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Met Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Pro Gln Phe Gln Leu Arg Asp Pro Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605

Asn Val Ala Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Val Met
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Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 195

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

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400> 195

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<210> 196

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 196

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn
 65 70 75 80

 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Tyr Pro Asn Arg Asn Ala Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Ala Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Ala
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
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<210> 197

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 197

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<210> 198

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 198

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Ser Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Val Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Arg Thr Ala Gly Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Ser Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Ala Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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<210> 200

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 200

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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<210> 202

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 202

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 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
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 625 630

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210> 203

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 203

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 ttgatcttcc cctccgtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
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 aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
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 tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
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 tcgcttttca agtaccagtc attgtgggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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<210> 204

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 204

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr	Asn	Val	Ala
Ala	His	Asp	Pro
Phe	Ser	Phe	Gln
His	Lys	Ser	Leu
20	25	30	
Asp	Thr	Val	Gln
Glu	Glu	Trp	Met
Glu	Trp	Lys	Lys
Asp	Asn	His	Ser
35	40	45	
Leu	Tyr	Val	Asp
Pro	Ile	Val	Gly
Thr	Val	Ala	Ser
Phe	Leu	Leu	Lys
50	55	60	
Lys	Val	Gly	Ser
Leu	Val	Gly	Lys
Arg	Ile	Leu	Ser
Glu	Leu	Arg	Ser

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu

 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr

 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

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 agtgggaagtg atcgagaagg agtcgctact gtgaccaact ggacagacaga gagtttcgag 1200
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<210> 206

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 206

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Leu Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Lys Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580

585

590

Met Gly Asn Val Val Val Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr

625

630

<210> 207

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 207

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ttgatcttc cciccggtag cacaaatcic atgcaggata tactccgtga gaccgagaag 300

ttcctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctata tcccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccaagt gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gtgctaaate ttcacctgag cttcatcagg gatgtcatcc tgaatgcaga cgagtggggc 600

atatggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatgc aaggetccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

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 atgaacatca tgctggtacc gacaaacatt agccattgt attag 1905

<210> 208

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 208

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Ala
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 209

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 209

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cggttaccac aattccagat gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gtgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

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tcaaactact gtatcaaac ctatcagact gccttccgtg gcctgaatac aaggctccac 720

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tcgcttttca agtaccagtc attgtcgttc tcgtcaggtg ctaacctata cgcaagtgga 840

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<210> 210

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 210

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625

630

<210> 211

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 211

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 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgtctgtc tcgtcaggtg ctaacctata cgcaagtgga 840
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 accatcaacg gtcgagtgtg cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
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 atgaacatca tgctggtacc gacaaacatt agcccaatct attag 1905

<210> 212

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 212

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Ser
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
 180 185 190

 Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Ser Thr Ile Gly Ile Arg Cys Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Gly Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

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210> 213

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 213

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gagtgggaaga aggacaatca ttcgtatata gttgaccoga tcgttggaaac cgtggcttca 180
ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggagc 240
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ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacgggt 360

ctacaggcaa gtgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420
aacgccgtgc ctttgtctgt tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
cggttaccte aattccagtt gcgtggacac caattgttgt tactccggtt attcgcccaa 540
gctgctaate ttacactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
atatcggcag ctacactacg tacttatcga aaccatctga ggaactacac gcgtgactac 660
tcaaactact gtatcaaac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
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ggcgattctc tgaggtttga gcagagtaat accacggcaa ggtacactct caggggtaat 1620

ggaaactctt acaacctata cttgcgtgic tccagcatag gcaattcaac tadcagggtt 1680

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gtaaacgaca atgggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcgagcgac 1800

aacagcaacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgtttgttcc gacaaacctt ccaccattgt attag 1905

<210> 214

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 214

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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His Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln Arg Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Gly Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Ser Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Val Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Leu Arg Gly His Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

<213> Bacillus thuringiensis

<

400> 215

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gagtggaaga agaacaatca ttcgtatata ctcgaccoga tcgttggaaac cgtggcttca 180
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gctgctaate ttacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
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cacgccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaacaa 1560
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gtaaacgaca atgggtgctcg cttcagcgac atcaacatgg gaaacgtagt cgcaagcagt 1800

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atgaacatca tgctggtacc gacaaacatt agcccaatct attag 1905

<210> 216

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 216

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Pro Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

<210> 217

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 217

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gagtggaaga agaacaatca ttcgctatat ctcgaccga tcgttggaaac cgtggcttca 180

ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

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ttcctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tccaatcgt 420

aacgccgtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattcagagt gcaaggctac caattgtgt tactcccgtt attcgcccaa 540

gtgctaatc ttcaactgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600

atcctggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

gatacgttg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgtcgttc tcgtcaggtg ctaacctata cgcaagtgga 840

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<210> 218

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 218

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Arg Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Val Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu

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 gagtggaaga aggacaatca ttctctatat gttgaccoga tcgttgaac cgtggcttca 180

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 ggaaactctt acaacctata cttgcgtgic tccagcatag gcaattcaac tatcagggtt 1680
 accatcaacg gtcgagtgtg cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcgagcgac 1800

aacagcaacg tacctctgga cattaacggt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgttgttcc gacaaacctt ccaccattgt attag 1905

<210> 220

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 220

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser

35 40 45

Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Gly Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Leu Asn Asn Arg Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240

 Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Gly
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile

gagtggaga agaacaatca ttcgtatat ctcgaccga tcgttggaa cgtggcttca 180
 ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggggt 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

 ttcctgaacc agcgactgga cacggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420
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 tcgcttttca agtaccagtc attgctggtc tcgtcagggt ctaacctata cgcaagtgga 840
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 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgetggtacc gacaaacatt agcccaatct attag 1905

<210> 222

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 222

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Gly

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asp Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Val Leu Asn Ala Asp Glu Trp Gly Val Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Thr Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Val His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

<

210> 223

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 223

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 gagtggaaga aggacaatca ttctctatat gttgaccoga tcgttgaac cgtggcttca 180
 ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggagc 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgccga attgacaggt 360

 ctacaggcaa atgicgagga gttcaatcgc caagttgaca acttcctaaa tcccaatcgt 420
 aacgcctgce ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttaccac aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540
 gctgctaate ttacactgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatega aaccatctga ggaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagact gccttccgtg gcctgaatac aaggctccac 720
 gatatgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

 tcgcttttca agiaccagtc attgctggic tcgtcagggtg ctaacctata cgcaagtgga 840
 agtggacctc agcaaacca atcggtcagc agtcaagact ggccattcct gtatagcttg 900
 ttccaggtea actccaacta cgtgtcgaac ggcttctcag gtgctcgatt gtcccagact 960
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 agtggaaagt atcgaggggg agttaatact gtgaccaact ggcagacaga gagtttcgag 1200

 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260
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 ggaaactctt acaacctata cttgctgtic tccagcatag gcaattcaac tatcagggtt 1680
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 aacagcaacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcacttg 1860
 atgaacatca tgtttgttcc gacaaaccta ccaccattgt attag 1905

<210> 224

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 224

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205
 Tyr Arg Asn His Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Arg Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Asp Met Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320
 Phe Pro Ser Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445
 Arg Asn Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val Arg Glu
 465 470 475 480
 Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr

625 630

<210> 225

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<

400> 225

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 gagtggaaga agaacaatca ttctctatat ctcgaccoga tcgttggaaac cgtggcttca 180
 ttcttgctca agaaggtggg ttctctcggt ggtaagagga ttctctcgga actaaggaac 240
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 ttctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggt 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctctaaa tcccaatcgt 420

aacgccgtgc ctttgtctat tacgicgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttacctc aattccagat gcaaggctac caattgttgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaaac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggacctc agcaaaccca atcgttcacg agtcaagact ggccattcct gtatagcttg 900
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 gtcaactact ctggtggaat ctcaagtggc gatattggag cttcaccatt caaccagaac 1080
 ttcaactgca gcacattcct gcctcctttg cttacgccat tcgtagatc ctggctcgac 1140
 agtggaaagt atcgagaagg agtcgctact gtgaccaact ggacagacaga gaggttcgag 1200
 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260

gactacttca tccgaaacat ctctggagta cctctagtgc ttaggaacga agaccttctg 1320
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 gcacgagcat acatggtctc agttcacaac cgtagaaca acatccatgc agttcatgag 1440
 aacggatcaa tgatccactt ggctccaaac gactacaccg gatttacaat cagtcctatc 1500
 cagccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
 ggcgattctc tgaggtttga gcagaacaat accacggcaa ggtacactct caggggtaat 1620
 ggaaactctt acaacctata cttgcgtgic tccagcatag gcaattcaac tatcagggtt 1680

accatcaacg gtcgagtgta cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgetggtacc gacaaacatt agccattgt attag 1905

<210> 226

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 226

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80

 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 227

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 227

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gagtgaaga agaacaatca ttcgetatat ctgacccga tcgttgaac cgtggetta 180

ttcttgctca agaaggtcgg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240

ttgatcttc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300

ttctgaacc agegactgaa cacggacacc ttggcacgag ttaatgctga attgacagc 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tcccaataga 420

aacgcagtgc ctttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattcagaat gcaaggctac caattgtgt tactcccgtt attcgccaa 540

gctgctaata tgcacctgag cttcatcagg gatgtcgtcc taaatgcaga cgagtggggc 600
 atatcgccag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccgc 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
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<210> 228

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 228

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Ser Ser Phe Gln His Lys Ser Leu

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn His Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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<210> 230

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 230

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr

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<210> 232

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 232

Met Gly His Asn Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Gln Glu Glu Trp Met Glu Trp Lys Lys Asp Asn His Ser
 35 40 45
 Leu Tyr Val Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

Ser Ser Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Gln Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Thr Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Val Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Arg Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Gly Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Gln Ile
 435 440 445

Arg Asn Ile Glu Ser Pro Pro Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu
 465 470 475 480

Asn Gly Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Arg Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Ser Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val

545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Ala Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Asp Asn Ser Asn Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620
 Phe Val Pro Thr Asn Leu Pro Pro Leu Tyr
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210> 233

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 233

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<210> 234

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 234

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu			
	20	25	30
Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asp His Ser			
	35	40	45
Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys			
	50	55	60
Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn			

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr

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<210> 236

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 236

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Ala
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580

585

590

Met Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 237

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 237

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<210> 238

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 238

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Gly Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560
 Thr Ile Asn Gly Arg Val Tyr Ala Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile

595

600

605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 239

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 239

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gagtggaaga agaacaatca ttcgctatat ctcgaccga tcgttgaac cgtggcttca 180

ttcttctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggtec 240

ttgatcttc cctccggtag cacaatctc atgcaggata tactccgtga gaccgaggag 300

ttctgaacc agcgactgaa cacggacacc ttggcacgag ttaatgctga attgacaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tcccaacttg 420

gacaccgtgc cttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caactgtgt tactcccgtt attcgcccaa 540

gtgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

atateggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660

tcaaactact gtatcaacac ctatcagtcc gccttcaaag gcctgaatac aaggctccac 720

gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780

tcgcttttca agtaccagtc attgtctgtc tcgtcaggtg ctaacctata cgcaagtgga 840

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atgaacatca tgetggtacc gacaaacatt agccattgt attag 1905

<210> 240

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 240

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

1 5 10 15

Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Glu Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met

610

615

620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr

625

630

<210> 241

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 241

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cggttacctc aattccagat gcaaggctac caattgtgt tactccggtt attcgcccaa 540

gctgctaata tgcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600

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<210> 242

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 242

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Met His Leu Ser Phe Ile Arg Asp Val
 180 185 190

 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

 Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val His Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Phe Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Ile Tyr
 625 630

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210> 243

<211> 1905

<212> DNA

<213> *Bacillus thuringiensis*

<400> 243

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<210> 244

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 244

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Trp Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Tyr Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Val Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Ala Arg Leu His
 225 230 235 240

Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Gly Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser

<213> *Bacillus thuringiensis*

<

400> 245

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<210> 246

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 246

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

20 25 30

Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Gly

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

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Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asp Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

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Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
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 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
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 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Val His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
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 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
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 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
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 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
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Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
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<210> 247

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 247

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<210> 248

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 248

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Thr Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
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 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220

 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

 Phe Thr Ser Gln Asp Trp Pro Phe Leu His Ser Leu Phe Gln Val Asn
 290 295 300
 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
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 405 410 415

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<210> 250

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 250

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

180 185 190

Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205
 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
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 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
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 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
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 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
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 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile

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<210> 252

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 252

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

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Asp Thr Val Gln Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser

35 40 45

Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys

50 55 60

Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80

Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg

85 90 95

Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala

100 105 110

Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe

115 120 125

Asn Arg Gln Val Asp Asn Leu Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140

Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn

145 150 155 160

Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro

165 170 175

Leu Leu Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val

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Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205

Tyr Arg Asp Tyr Leu Arg Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495
 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
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 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
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210> 253

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 253

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<211> 634

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<213> Bacillus thuringiensis

<400> 254

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 35 40 45
 Leu Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Ser

65 70 75 80
 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Asn Arg Asn Ala Val Pro

130 135 140
 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
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 Arg Leu Pro Gln Phe Gln Met Gln Gly Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr

195 200 205
 Tyr Gln Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Thr Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240

Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255
 Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270
 Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285
 Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
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 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
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 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
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 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365
 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430
 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr

485 490 495
 Ile Gly Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Ala Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn

580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 255

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<

400> 255

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 gagtggaaga agaacaatca ttcccatat ctcgaccga tcgttggaaac cgtggcttca 180
 ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggaac 240
 ttgatcttcc cctccggtag cacaaatctc atgcaggata tactccgtga gaccgagaag 300
 ttctgaacc agcgactgaa caggacacc ttggcacgag ttaatgctga attgacaggc 360
 ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctctaaa tccccctttg 420

agcattgtgc ccttgtctat tacgtcgtcc gtcaacacga tgcagcagct attcttgaac 480
 cggttacctc aattccagat gcaacaatac caactcttgt tactcccgtt attcgcccaa 540
 gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaaac ctaccagtcc gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc actgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840

agtggacctc agcaaaccce atcgttcacg agtcaagact ggccattcct gtatagcttg 900
 ttccaggtea aciccaacta cgtgctgaac ggcttctcag gtgctcgatt gtccaacact 960
 ttcccaaaca tcgttggact tccaggaagc actacgactc atgccttgct ggctgcacga 1020
 gtcaactact ctggtggaat ctcaagtggc gatattggag cttcaccatt caaccagaac 1080
 ttcaactgca gcacattcct gcctcctttg cttacgccat tcgtagatc ctggctcgac 1140
 agtgggaagt atcgagaagg agtcgctact gtgaccaact ggacagacaga gaggttcgag 1200
 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttccca 1260

gactacttca tccgaaacat ctctggagta cctctagtcg ttaggaacga agaccttctg 1320
 cgtcctctgc actacaatga gatcaggaac attgcctcac cttcaggtac acctggtgga 1380
 gcacgagcat acatggtctc agttcacaac cgtagaaca acatccatgc agttcatgag 1440
 aacggatcaa tgatccactt ggctccaaac gactacaccg gatttacaat cagtcctatc 1500
 cagccactc aggtgaacaa ccagactcga acgttcatca gtgagaagtt tggaaaccaa 1560
 ggcgattctc tgaggtttga gcagaacaat accacggcaa ggtacactct caggggtaat 1620
 ggaaactctt acaacctata cttgcgtgtc tccagcatag gcaattcaac tatcagggtt 1680

accatcaacg gtcgagtgta cacagctaca aacgtcaata ccaccactaa caacgatggt 1740
 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgacg tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgetggtacc gacaaacatt agccattgt attag 1905

<210> 256

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 256

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu
 20 25 30
 Asp Thr Val Arg Arg Glu Trp Thr Glu Trp Lys Lys Asn Asn His Ser
 35 40 45
 Pro Tyr Leu Asp Pro Ile Val Gly Thr Val Ala Ser Phe Leu Leu Lys
 50 55 60
 Lys Val Gly Ser Leu Val Gly Lys Arg Ile Leu Ser Glu Leu Arg Asn
 65 70 75 80

 Leu Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg
 85 90 95
 Glu Thr Glu Lys Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala
 100 105 110
 Arg Val Asn Ala Glu Leu Thr Gly Leu Gln Ala Asn Val Glu Glu Phe
 115 120 125
 Asn Arg Gln Val Asp Asn Phe Leu Asn Pro Pro Leu Ser Ile Val Pro
 130 135 140

 Leu Ser Ile Thr Ser Ser Val Asn Thr Met Gln Gln Leu Phe Leu Asn
 145 150 155 160
 Arg Leu Pro Gln Phe Gln Met Gln Gln Tyr Gln Leu Leu Leu Leu Pro
 165 170 175
 Leu Phe Ala Gln Ala Ala Asn Leu His Leu Ser Phe Ile Arg Asp Val
 180 185 190
 Ile Leu Asn Ala Asp Glu Trp Gly Ile Ser Ala Ala Thr Leu Arg Thr
 195 200 205

 Tyr Arg Asp Tyr Leu Lys Asn Tyr Thr Arg Asp Tyr Ser Asn Tyr Cys
 210 215 220
 Ile Asn Thr Tyr Gln Ser Ala Phe Lys Gly Leu Asn Thr Arg Leu His
 225 230 235 240
 Asp Thr Leu Glu Phe Arg Thr Tyr Met Phe Leu Asn Val Phe Glu Tyr
 245 250 255

Val Ser Ile Trp Ser Leu Phe Lys Tyr Gln Ser Leu Leu Val Ser Ser
 260 265 270

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe

500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525

Asn Asn Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr
 530 535 540

Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575

Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590

Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605

Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630

<210> 257

<211> 1905

<212> DNA

<213> Bacillus thuringiensis

<400> 257

atgggaaact ctgtccttaa ttccggctgt accacaatat gtgatgcata caacgtggca 60

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gagtggaaga agaacaatca ttcgetatat ctcgaccga tcgttggaa cgtggettea 180

ttcttgctca agaaggtggg ttctctcgtt ggtaagagga ttctctcgga actaaggtcc 240

ttgatcttcc cctccggtag cacaaatctc atgcaggaca tactccgtga gaccgagaag 300

ttcctgaacc agegactgaa cacggacacc ttggcacgag ttaatgctga attggaaggt 360

ctacaggcaa atgtcgagga gttcaatcgc caagttgaca acttctaaa tccccctaga 420

gacattgtgc cttgtctat tacgtcgtcc gtcaacacga tgcaacagct attcttgaac 480

cggttacctc aattccagat gcaaggctac caattgtgt tactcccgtt attcgccaa 540

gctgctaate ttcacctgag cttcatcagg gatgtcatcc taaatgcaga cgagtggggc 600
 atatcggcag ctacactacg tacttatagg gattacctga agaactacac gcgtgactac 660
 tcaaactact gtatcaacac ctatcagaca gccttcaaag gcctgaatac aaggctccac 720
 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tcgagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcagggtg ccaacctata cgcaagcggg 840
 agtggacctc agcaaaccce atcgttcacg ggtcaagact ggccattcct gtatagcttg 900

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 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgcag tacctctgga cattaacgtt acgttgaact caggcacaca gttcgatttg 1860
 atgaacatca tgctggtacc gacaacatt agccattgt attag 1905

<210> 258

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 258

Met Gly Asn Ser Val Leu Asn Ser Gly Arg Thr Thr Ile Cys Asp Ala

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Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Ser Leu

Gly Ala Asn Leu Tyr Ala Ser Gly Ser Gly Pro Gln Gln Thr Gln Ser
 275 280 285

Phe Thr Gly Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320

Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335

Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350

Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380

Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400

Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415

Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445

Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460

Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480

Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510

Val Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln

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 gatacgttgg agtttcggac atacatgttc ctgaacgtgt tgcagtatgt ctccatctgg 780
 tcgcttttca agtaccagtc attgctggtc tcgtcaggtg ctaacctata cgcaagtgga 840
 agtggacctc agcaaaccca atcgttcacg agtcaagact ggccattcct gtatagcttg 900
 ttccaggtca actccaacta cgtgctgaac ggcttctcag gtgctcgatt gtccaacact 960
 ttcccaaaaca tcgttggact tccgggaagc actacgactc atgccttgct ggctgcacga 1020

gtcaactact ctggtggaat ctcaagtggc gatattggag cttcaccatt caaccagaac 1080
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 acaacactcg gtctacgac aggagcattc acagcaagag gaaacagcaa ctacttcca 1260
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aacggatcaa tgatccactt ggctccaaac gactacaccg gatttacaat cagtcctatc 1500
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 gtaaacgaca atggtgctcg cttcagcgac atcaacatcg gaaacgtagt cgcaagcagt 1800
 aacagtgcag tacctctgga cattaacggt acgttgaact caggcacaca gttcgatttg 1860

atgaacatca tgctggtacc gacaaacatt agccattgt attag 1905

<210> 260

<211> 634

<212> PRT

<213> Bacillus thuringiensis

<400> 260

Met Gly Asn Ser Val Leu Asp Ser Gly Arg Thr Thr Ile Cys Asp Ala
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 Tyr Asn Val Ala Ala His Asp Pro Phe Ser Phe Gln His Lys Pro Leu
 20 25 30
 Asp Thr Val Gln Arg Glu Trp Thr Glu Arg Lys Lys Asn Asn His Ser

Phe Thr Ser Gln Asp Trp Pro Phe Leu Tyr Ser Leu Phe Gln Val Asn
 290 295 300

 Ser Asn Tyr Val Leu Asn Gly Phe Ser Gly Ala Arg Leu Ser Asn Thr
 305 310 315 320
 Phe Pro Asn Ile Val Gly Leu Pro Gly Ser Thr Thr Thr His Ala Leu
 325 330 335
 Leu Ala Ala Arg Val Asn Tyr Ser Gly Gly Ile Ser Ser Gly Asp Ile
 340 345 350
 Gly Ala Ser Pro Phe Asn Gln Asn Phe Asn Cys Ser Thr Phe Leu Pro
 355 360 365

 Pro Leu Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp
 370 375 380
 Arg Glu Gly Val Ala Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu
 385 390 395 400
 Thr Thr Leu Gly Leu Arg Ser Gly Ala Phe Thr Ala Arg Gly Asn Ser
 405 410 415
 Asn Tyr Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu
 420 425 430

 Val Val Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile
 435 440 445
 Arg Asn Ile Ala Ser Pro Ser Gly Thr Pro Gly Gly Ala Arg Ala Tyr
 450 455 460
 Met Val Ser Val His Asn Arg Lys Asn Asn Ile His Ala Val His Glu
 465 470 475 480
 Asn Gly Ser Met Ile His Leu Ala Pro Asn Asp Tyr Thr Gly Phe Thr
 485 490 495

 Ile Ser Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe
 500 505 510
 Ile Ser Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln
 515 520 525
 Asn Asn Thr Thr Ala Arg Tyr Thr Leu Lys Gly Asn Gly Asn Ser Tyr

530 535 540
 Asn Leu Tyr Leu Arg Val Ser Ser Ile Gly Asn Ser Thr Ile Arg Val
 545 550 555 560

 Thr Ile Asn Gly Arg Val Tyr Thr Ala Thr Asn Val Asn Thr Thr Thr
 565 570 575
 Asn Asn Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Ser Asp Ile Asn
 580 585 590
 Ile Gly Asn Val Val Ala Ser Ser Asn Ser Asp Val Pro Leu Asp Ile
 595 600 605
 Asn Val Thr Leu Asn Ser Gly Thr Gln Phe Asp Leu Met Asn Ile Met
 610 615 620

 Leu Val Pro Thr Asn Ile Ser Pro Leu Tyr
 625 630
 <210> 261
 <211> 632
 <212> PRT
 <213> *Bacillus thuringiensis*
 <400> 261
 Met Asn Asn Val Leu Asn Asn Gly Arg Thr Thr Ile Cys Asp Ala Tyr
 1 5 10 15
 Asn Val Val Ala His Asp Pro Phe Ser Phe Glu His Lys Ser Leu Asp
 20 25 30
 Thr Ile Arg Lys Glu Trp Met Glu Trp Lys Arg Thr Asp His Ser Leu

 35 40 45
 Tyr Val Ala Pro Ile Val Gly Thr Val Ser Ser Phe Leu Leu Lys Lys
 50 55 60
 Val Gly Ser Leu Ile Gly Lys Arg Ile Leu Ser Glu Leu Trp Gly Leu
 65 70 75 80
 Ile Phe Pro Ser Gly Ser Thr Asn Leu Met Gln Asp Ile Leu Arg Glu
 85 90 95
 Thr Glu Gln Phe Leu Asn Gln Arg Leu Asn Thr Asp Thr Leu Ala Arg

Ala Val Phe Asn Gln Asn Phe Ser Cys Ser Thr Phe Leu Pro Pro Leu
 355 360 365
 Leu Thr Pro Phe Val Arg Ser Trp Leu Asp Ser Gly Ser Asp Arg Gly
 370 375 380
 Gly Val Asn Thr Val Thr Asn Trp Gln Thr Glu Ser Phe Glu Ser Thr
 385 390 395 400
 Leu Gly Leu Arg Cys Gly Ala Phe Thr Ala Arg Gly Asn Ser Asn Tyr
 405 410 415
 Phe Pro Asp Tyr Phe Ile Arg Asn Ile Ser Gly Val Pro Leu Val Val
 420 425 430
 Arg Asn Glu Asp Leu Arg Arg Pro Leu His Tyr Asn Glu Ile Arg Asn
 435 440 445
 Ile Glu Ser Pro Ser Gly Thr Pro Gly Gly Leu Arg Ala Tyr Met Val
 450 455 460
 Ser Val His Asn Arg Lys Asn Asn Ile Tyr Ala Val His Glu Asn Gly
 465 470 475 480
 Thr Met Ile His Leu Ala Pro Glu Asp Tyr Thr Gly Phe Thr Ile Ser
 485 490 495
 Pro Ile His Ala Thr Gln Val Asn Asn Gln Thr Arg Thr Phe Ile Ser
 500 505 510
 Glu Lys Phe Gly Asn Gln Gly Asp Ser Leu Arg Phe Glu Gln Ser Asn
 515 520 525
 Thr Thr Ala Arg Tyr Thr Leu Arg Gly Asn Gly Asn Ser Tyr Asn Leu
 530 535 540
 Tyr Leu Arg Val Ser Ser Leu Gly Asn Ser Thr Ile Arg Val Thr Ile
 545 550 555 560
 Asn Gly Arg Val Tyr Thr Ala Ser Asn Val Asn Thr Thr Thr Asn Asn
 565 570 575
 Asp Gly Val Asn Asp Asn Gly Ala Arg Phe Leu Asp Ile Asn Met Gly
 580 585 590
 Asn Val Val Ala Ser Asp Asn Thr Asn Val Pro Leu Asp Ile Asn Val

595

600

605

Thr Phe Asn Ser Gly Thr Gln Phe Glu Leu Met Asn Ile Met Phe Val

610

615

620

Pro Thr Asn Leu Pro Pro Ile Tyr

625

630