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(54) **PROCEDE DE LUTTE CONTRE DES CHAMPIGNONS
PARASITES DE PLANTES CULTIVEES**
(54) **METHOD FOR CONTROLLING PARASITIC FUNGI IN
CULTIVATED PLANTS**

(57) L'invention concerne un procédé de lutte contre des champignons parasites de plantes cultivées dont la résistance à certains champignons pathogènes est modifiée, les plantes cultivées étant traitées avec une substance active de la classe des strobilurines.

(57) The invention relates to a method for controlling parasitic fungi in cultivated plants with modified pathogenic resistance against certain parasitic fungi, wherein the cultivated plants are treated with an active substance from the strobilurin class.



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<p>(21) Internationales Aktenzeichen: PCT/EP97/05534 (22) Internationales Anmeldedatum: 8. Oktober 1997 (08.10.97) (30) Prioritätsdaten: 196 42 880.7 17. Oktober 1996 (17.10.96) DE (71) Anmelder (für alle Bestimmungsstaaten ausser US): BASF AKTIENGESELLSCHAFT [DE/DE]; D-67056 Ludwigshafen (DE). (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): SCHMIDT, Ralf-Michael [DE/DE]; Gräfensteinstrasse 14, D-67434 Neustadt (DE). SAUTER, Hubert [DE/DE]; Neckarpromenade 20, D-68167 Mannheim (DE). AMMERMANN, Eberhard [DE/DE]; Von-Gagern-Strasse 2, D-64646 Heppenheim (DE). LORENZ, Gisela [DE/DE]; Erlenweg 13, D-67434 Neustadt (DE). (74) Gemeinsamer Vertreter: BASF AKTIENGESELLSCHAFT; D-67056 Ludwigshafen (DE).</p>	<p>(81) Bestimmungsstaaten: AL, AU, BG, BR, BY, CA, CN, CZ, GE, HU, IL, JP, KR, KZ, LT, LV, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, US, eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Veröffentlicht <i>Mit internationalem Recherchenbericht. Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist. Veröffentlichung wird wiederholt falls Änderungen eintreffen.</i></p>	
<p>(54) Title: METHOD FOR CONTROLLING PARASITIC FUNGI IN CULTIVATED PLANTS (54) Bezeichnung: VERFAHREN ZUR BEKÄMPFUNG VON SCHADPILZEN IN KULTURPFLANZEN (57) Abstract The invention relates to a method for controlling parasitic fungi in cultivated plants with modified pathogenic resistance against certain parasitic fungi, wherein the cultivated plants are treated with an active substance from the strobilurin class. (57) Zusammenfassung Verfahren zur Bekämpfung von Schadpilzen in Kulturpflanzen mit modifizierter Pathogenresistenz gegen bestimmte Schadpilze, wobei die Kulturpflanze mit einem Wirkstoff aus der Klasse der Strobilurine behandelt wird.</p>		

METHOD FOR CONTROLLING PARASITIC FUNGI
IN CULTIVATED PLANTS

The present invention relates to a process for controlling harmful fungi in crop plants having modified pathogen resistance against, for example, other harmful fungi.

Methods for controlling harmful fungi in crop plants by using fungicidally active compounds are known per se and are disclosed in the literature.

10 Also known are crop plants whose pathogen resistance to certain harmful fungi which have a particularly adverse effect on the respective crop plant is modified or increased as compared to the natural level. This may be achieved, for example, by selective breeding or by genetic engineering in that certain DNA sequences which cause increased pathogen resistance when they are functionally expressed in the plant are introduced into the crop plant.

However, owing to the large number of damage-causing mechanisms of harmful fungi, it is often only possible to increase the resistance to a small group of harmful fungi. In addition, plants which are modified in this way often have other disadvantages, for example a lower harvest yield, a higher susceptibility to other harmful fungi, etc.

20 It is an object of the present invention to provide a method for controlling harmful fungi which allows the control of a wide range of harmful fungi without adversely affecting the yield characteristics of the plants.

We have found that this object is achieved by the method mentioned at the outset, wherein crop plants having modified pathogen resistance to harmful fungi are treated with an active compound of the formula I (IA or IB).

30 Active compounds of the formula IA or IB are known per se and referred to in the literature as the class of the "strobilurins", in some instances also as " β -methoxyacrylates" (cf. H. Sauter et al., "Mitochondrial [sic] respiration as a target for antifungals: lessons from research in strobilurins" in "Antifungal agents - Discovery and mode of action", G.K. Dixon, L.G. Copping and D.W. Holloman (Editors), BIOS Scientific Publishers, Oxford 1995, p. 175 ff.).

In particular, representatives of active compounds of the formula I (or IA and IB) having fungicidal and in part also bioregulatory activity are described in the following publications:

- 5 EP-A 178 826, EP-A 203 606, EP-A 203 608, EP-A 206 523,
EP-A 212 859, EP-A 226 917, EP-A 226 974, EP-A 242 070,
EP-A 242 081, EP-A 243 012, EP-A 243 014, EP-A 251 082,
EP-A 253 213, EP-A 254 426, EP-A 256 667, EP-A 260 794,
EP-A 260 832, EP-A 267 734, EP-A 273 572, EP-A 274 825,
10 EP-A 278 595, EP-A 280 185, EP-A 291 196, EP-A 299 694,
EP-A 307 101, EP-A 307 103, EP-A 310 954, EP-A 312 221,
EP-A 312 243, EP-A 329 011, EP-A 331 966, EP-A 335 519,
EP-A 336 211, EP-A 337 211, EP-A 341 845, EP-A 350 691,
EP-A 354 571, EP-A 363 818, EP-A 370 629, EP-A 373 775,
15 EP-A 374 811, EP-A 378 308, EP-A 378 755, EP-A 379 098,
EP-A 382 375, EP-A 383 117, EP-A 384 211, EP-A 385 224,
EP-A 385 357, EP-A 386 561, EP-A 386 681, EP-A 389 901,
EP-A 391 451, EP-A 393 428, EP-A 393 861, EP-A 398 692,
EP-A 400 417, EP-A 402 246, EP-A 405 782, EP-A 407 873,
20 EP-A 409 369, EP-A 414 153, EP-A 416 746, EP-A 420 091,
EP-A 422 597, EP-A 426 460, EP-A 429 968, EP-A 430 471,
EP-A 433 233, EP-A 433 899, EP-A 439 785, EP-A 459 285,
EP-A 460 575, EP-A 463 488, EP-A 463 513, EP-A 464 381,
EP-A 468 684, EP-A 468 695, EP-A 468 775, EP-A 471 261,
25 EP-A 472 224, EP-A 472 300, EP-A 474 042, EP-A 475 158,
EP-A 477 631, EP-A 480 795, EP-A 483 851, EP-A 483 985,
EP-A 487 409, EP-A 493 711, EP-A 498 188, EP-A 498 396,
EP-A 499 823, EP-A 503 436, EP-A 508 901, EP-A 509 857,
EP-A 513 580, EP-A 515 901, EP-A 517 301, EP-A 528 245,
30 EP-A 532 022, EP-A 532 126, EP-A 532 127, EP-A 535 980,
EP-A 538 097, EP-A 544 587, EP-A 546 387, EP-A 548 650,
EP-A 564 928, EP-A 566 455, EP-A 567 828, EP-A 571 326,
EP-A 579 071, EP-A 579 124, EP-A 579 908, EP-A 581 095,
EP-A 582 902, EP-A 582 925, EP-A 583 806, EP-A 584 625,
35 EP-A 585 751, EP-A 590 610, EP-A 596 254, WO-A 90/07,493,
WO-A 92/13,830, WO-A 92/18,487, WO-A 92/18,494, WO-A 92/21,653,
WO-A 93/07,116, WO-A 93/08,180, WO-A 93/08,183, WO-A 93/15,046,
WO-A 93/16,986, WO-A 94/00,436, WO-A 94/05,626, WO-A 94/08,948,
WO-A 94/08,968, WO-A 94/10,159, WO-A 94/11,334, JP-A 02/121,970,
40 JP-A 04/182,461, JP-A 05/201,946, US 5 335 283,
JP-A 05/255,012, JP-A 05/294,948, JP-A 06/025,133,
JP-A 06/025,142, JP-A 06/056,756, FR-A 2 670 781, GB-A 2 210 041,
GB-A 2 218 702, GB-A 2 238 308, GB-A 2 249 092, GB-A 2 253 624,
GB-A 2 255 092, WO-A 90/10006,
45 WO-A 94/22812, EP-A-627 411,
EP-A 647 631, EP-A 741 698,

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EP-A 513 580, EP-A 515 901, WO-A 93/15,046, WO-A 94/10,159,
GB-A 2 253 624 and JP-A 04/182,461;

particularly preferred radicals "aryloxymethylene with or without
5 substitution, hetaryloxymethylene with or without substitution"
in general and in particular have the meanings described in the
following publications:

EP-A 178 826, EP-A 226 917, EP-A 253 213, EP-A 254 426,
10 EP-A 278 595, EP-A 280 185, EP-A 299 694, EP-A 335 519,
EP-A 350 691, EP-A 363 818, EP-A 373 775, EP-A 378 308,
EP-A 385 224, EP-A 386 561, EP-A 398 692, EP-A 400 417,
EP-A 407 873, EP-A 472 224, EP-A 477 631, EP-A 498 188,
EP-A 498 396, EP-A 513 580, EP-A 515 901, EP-A 579 124,
15 WO-A 93/08,180, WO-A 93/15,046, WO-A 94/00,436, JP-A 04/182,461,
WO-A 90/10006, EP-A 673 923 and EP-A 758 322.

particularly preferred radicals "arylethenylene, with or without
substitution, hetarylethenylene with or without substitution" in
20 general and in particular have the meanings described in the fol-
lowing publications:

EP-A 178 826, EP-A 203 606, EP-A 253 213, EP-A 254 426,
EP-A 280 185, EP-A 378 755, EP-A 398 692, EP-A 402 246,
25 EP-A 474 042, EP-A 475 158, EP-A 477 631, EP-A 487 409,
EP-A 498 188, EP-A 498 396, EP-A 513 580, EP-A 515 901,
EP-A 528 245, EP-A 544 587, WO-A 93/15,046, WO-A 94/11,334 and
FR-A 2 670 781 and EP-A 691 332.

30 Particularly preferred active compounds of the formula IA in
which R' is $-C[CO_2CH_3]=CHOCH_3$ in general and in particular corres-
pond to the compounds described in the following publications:

EP-A 178 826, EP-A 203 606, EP-A 226 917, EP-A 242 070,
35 EP-A 242 081, EP-A 256 667, EP-A 260 794, EP-A 278 595,
EP-A 299 694, EP-A 307 103, EP-A 335 519, EP-A 341 845,
EP-A 350 691, EP-A 370 629, EP-A 373 775, EP-A 378 308,
EP-A 378 755, EP-A 382 375, EP-A 385 224, EP-A 386 561,
EP-A 393 861, EP-A 402 246, EP-A 405 782, EP-A 407 873,
40 EP-A 414 153, EP-A 426 460, EP-A 430 471, EP-A 463 488,
EP-A 468 695, EP-A 472 224, EP-A 474 042, EP-A 475 158,
EP-A 483 985, EP-A 487 409, EP-A 515 901, EP-A 528 245,
EP-A 544 587, WO-A 90/07,493, WO-A 92/18,487, WO-A 92/18,494,
WO-A 93/08,180, WO-A 93/16,986, WO-A 94/00,436, WO-A 94/08,948,
45 WO-A 94/08,968, WO-A 94/10,159, WO-A 94/11,334, FR-A 2 670 781,
JP-A 06/025,133, EP-A 738 259, EP-A 673 923

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particularly preferred active compounds of the formula IA where R' is $-C[CO_2CH_3]=NOCH_3$ in general and in particular correspond to the compounds described in the following publications:

- 5 EP-A 253 213, EP-A 254 426, EP-A 299 694, EP-A 363 818,
 EP-A 378 308, EP-A 385 224, EP-A 386 561, EP-A 400 417,
 EP-A 407 873, EP-A 460 575, EP-A 463 488, EP-A 468 684,
 EP-A 472 300, EP-A 515 901, WO-A 94/00,436, WO-A 94/08,948,
 WO-A 94/10,159, WO-A 94/11,334, JP-A 05/201,946, JP-A 05/255,012,
 10 JP-A 05/294,948, EP-A 738 259, EP-A 673 923

particularly preferred active compounds of the formula IA in which R' is $-C[CONHCH_3]=NOCH_3$ in general and in particular correspond to the compounds described in the following publications:

- 15 EP-A 398 692, EP-A 463 488, EP-A 477 631, EP-A 515 901,
 EP-A 579 124, EP-A 585 751, WO-A 92/13,830, WO-A 93/08,180,
 WO-A 94/08,948, WO-A 94/10,159, WO-A 94/11,334, GB-A 2 253 624,
 JP-A 04/182,461, JP-A 05/201,946, JP-A 05/255,012,
 20 JP-A 05/294,948, WO-A 90/10006, EP-A 741 694, EP-A 673 923,
 EP-A 691 332 and WO-A 95/21154

particularly preferred active compounds of the formula IA in which R' is $-C[CO_2CH_3]=CHCH_3$ or $-C[CO_2CH_3]=CHCH_2CH_3$ in general and in particular correspond to the compounds described in the following publications:

- 25 EP-A 280 185, EP-A 463 488, EP-A 513 580, EP-A 515 901,
 EP-A 738 259, EP-A 673 923 and EP-A 758 322

30 particularly preferred active compounds of the formula IA in which R' is $-C[COCH_3]=NOCH_3$ or $-C[COCH_2CH_3]=NOCH_3$ in general and in particular correspond to the compounds described in EP-A 498 188;

- 35 particularly preferred active compounds of the formula IA in which R' is $-N(OCH_3)-CO_2CH_3$, $-N(CH_3)-CO_2CH_3$ or $-N(CH_2CH_3)-CO_2CH_3$ in general and in particular correspond to the compounds described in the following publications: EP-A 498 396,
 40 WO-A 93/15,046, JP-A 06/025,142 and JP-A 06/056,756;

particularly preferred active compounds of the formula IB in which R is $-OC[CO_2CH_3]=CHOCH_3$, $-OC[CO_2CH_3]=CHCH_3$,
 $-OC[CO_2CH_3]=CHCH_2CH_3$, $-SC[CO_2CH_3]=CHOCH_3$, $-SC[CO_2CH_3]=CHCH_3$,
 45 $-SC[CO_2CH_3]=CHCH_2CH_3$, $-N(CH_3)C[CO_2CH_3]=CHOCH_3$,
 $-N(CH_3)C[CO_2CH_3]=NOCH_3$, $-CH_2C[CO_2CH_3]=CHOCH_3$, $-CH_2C[CO_2CH_3]=NOCH_3$ or

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$-\text{CH}_2\text{C}[\text{CONHCH}_3]=\text{NOCH}_3$ in general and in particular correspond to the compounds described in the following publications:

EP-A 212 859, EP-A 331 966, EP-A 383 117, EP-A 384 211,
 5 EP-A 389 901, EP-A 409 369, EP-A 464 381, EP-A 471 261,
 EP-A 503 436, EP-A 546 387, EP-A 548 650, EP-A 579 908 and
 EP-A 584 625.

Examples of particularly suitable active compounds IA and IB are
 10 listed in the tables below.

Table 1.1A

Compounds of the formula IA where Q is phenyl, R' is
 $-\text{C}(\text{CO}_2\text{CH}_3)=\text{CHOCH}_3$, n is 0, R'' is (het)aryloxymethylene with or
 15 without substitution, where the (het)aryl group with or without
 substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
20 I.1A-1	2-CH ₃ -C ₆ H ₄	EP-A 226 917
I.1A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 226 917
I.1A-3	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 386 561
I.1A-4	2-CH ₂ CH ₂ CH ₃ , 6-CF ₃ -pyrimidin-4-yl	EP-A 407 873

25 Table 1.1B

Compounds of the formula IA where R' is $-\text{C}(\text{CO}_2\text{CH}_3)=\text{CHOCH}_3$, Q is
 phenyl, n is 0, R'' is (het)aryloxy with or without substitution,
 where the (het)aryl group with or without substitution has the
 following meanings:

No.	(Het)aryl with or without substitu- tion	Literature
30 I.1B-1	C ₆ H ₅	EP-A 178 826
35 I.1B-2	6-[2-CN-C ₆ H ₄ -O]-pyrimidin-4-yl	EP-A 382 375

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Table 1.1C

Compounds of the formula IA where R' is $-C(CO_2CH_3)=CHOCH_3$, Q is phenyl, n is 0, R'' is (het)arylethenylene with or without substitution, where the (het)aryl group with or without substitution 5 has the following meanings:

No.	(Het)aryl with or without substitution	Literature
I.1C-1	1-(2,4-Cl ₂ -C ₆ H ₃), 5-CF ₃ -pyrazol-4-yl	EP-A 528 245
10 I.1C-2	1-(4-Cl-C ₆ H ₄)-pyrazol-4-yl	EP-A 378 755
I.1C-3	3-CF ₃ -C ₆ H ₄	EP-A 203 606
I.1C-4	3-Cl-C ₆ H ₄	EP-A 203 606
I.1C-5	4-C ₆ H ₅ -C ₆ H ₄	EP-A 203 606

15 Table 1.1D

Compounds of the formula IA where Q is phenyl, R' is $-C(CO_2CH_3)=CHOCH_3$, n is 0, R'' is $CH_2ON=CR^aR^b$, where R^a and R^b have the following meanings:

No.	R ^a	R ^b	Literature
I.1D-1	CH ₃	4-Cl-C ₆ H ₄	EP-A 370 629
I.1D-2	CH ₃	3-CF ₃ -C ₆ H ₄	EP-A 370 629
25 I.1D-3	CH ₃	4-OCH ₂ CH ₃ -pyrimidin-2-yl	WO-A 92/18,487

Table 1.1E

Compounds of the formula IA where Q is phenyl, R' is $-C(CO_2CH_3)=CHOCH_3$, n is 0, R'' is $CH_2ON=CR^yCR^d=NOR^e$, where R^y, R^d and R^e have the following meanings:

No.	R ^y	R ^d	R ^e	Literature
I.1E-1	CH ₃	CH ₃	CH ₃	EP-A 738 259
I.1E-2	CH ₃	CH ₃	CH ₂ CH ₃	EP-A 738 259
35 I.1E-3	CH ₃	C ₆ H ₅	CH ₃	EP-A 738 259
I.1E-4	CH ₃	C ₆ H ₅	CH ₂ CH ₃	EP-A 738 259
I.1E-5	CH ₃	4-Cl-C ₆ H ₄	CH ₃	EP-A 738 259
40 I.1E-6	CH ₃	4-Cl-C ₆ H ₄	CH ₂ CH ₃	EP-A 738 259

Table 1.2A

Compounds of the formula IA where Q is phenyl, R' is $-\text{C}(\text{CO}_2\text{CH}_3)=\text{NOCH}_3$, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
10 I.2A-1	2-CH ₃ -C ₆ H ₄	EP-A 253 213
I.2A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 400 417
I.2A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 400 417
I.2A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 400 417
15 I.2A-5	2-Cl, 5-CH ₃ -C ₆ H ₃	EP-A 400 417
I.2A-6	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 386 561

Table 1.2B

Compounds of the formula IA where Q is phenyl, R' is $-\text{C}(\text{CO}_2\text{CH}_3)=\text{NOCH}_3$, n is 0, R'' is (het)aryloxy with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
25 I.2B-1	C ₆ H ₅	EP-A 253 213
I.2B-2	6-[2-CN-C ₆ H ₄ -O]-pyrimidin-4-yl	EP-A 468 684

Table 1.2C

Compounds of the formula IA where Q is phenyl, R' is $-\text{C}(\text{CO}_2\text{CH}_3)=\text{NOCH}_3$, n is 0, R'' is CH₂ON=CR^αR^β, where R^α and R^β have the following meanings:

No.	R ^α	R ^β	Literature
35 I.2C-1	CH ₃	4-Cl-C ₆ H ₄	EP-A 463 488
I.2C-2	CH ₃	3-Cl-C ₆ H ₄	EP-A 463 488
I.2C-3	CH ₃	4-CF ₃ -C ₆ H ₄	EP-A 463 488
40 I.2C-4	CH ₃	3-CF ₃ -C ₆ H ₄	EP-A 463 488
I.2C-5	CH ₃	4-CH ₃ -C ₆ H ₄	EP-A 463 488
I.2C-6	CH ₃	4-OCH ₂ CH ₃ -pyrimidin-2-yl	EP-A 472 300
I.2C-7	CH ₃	3,5-Cl ₂ -C ₆ H ₃	EP-A 463 488

Table 1.2D

Compounds of the formula IA where Q is phenyl, R' is $-C(CO_2CH_3)=NOCH_3$, n is 0, R'' is $CH_2ON=CR^{\gamma}CR^{\delta}=NOR^{\epsilon}$, where R^γ, R^δ and R^ε have the following meanings:

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No.	R ^γ	R ^δ	R ^ε	Literature
I.2D-1	CH ₃	CH ₃	CH ₃	EP-A 738 259
I.2D-2	CH ₃	CH ₃	CH ₂ CH ₃	EP-A 738 259
10 I.2D-3	CH ₃	C ₆ H ₅	CH ₃	EP-A 738 259
I.2D-4	CH ₃	C ₆ H ₅	CH ₂ CH ₃	EP-A 738 259
I.2D-5	CH ₃	4-Cl-C ₆ H ₄	CH ₃	EP-A 738 259
15 I.2D-6	CH ₃	4-Cl-C ₆ H ₄	CH ₂ CH ₃	EP-A 738 259

Table 1.3A

Compounds of the formula IA where Q is phenyl, R' is $-C(CONHCH_3)=NOCH_3$, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without

20 substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
I.3A-1	2-CH ₃ -C ₆ H ₄	EP-A 477 631
25 I.3A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 477 631
I.3A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 477 631
I.3A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 477 631
30 I.3A-5	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 579 124
I.3A-6	1-[4-Cl-C ₆ H ₄]-pyrazol-3-yl	WO-A 90/10006
I.3A-7	1-[2,4-Cl ₂ -C ₆ H ₃]-pyrazol-3-yl	WO-A 90/10006

Table 1.3B

35 Compounds of the formula IA where Q is phenyl, R' is $-C(CONHCH_3)=NOCH_3$, n is 0, R'' is (het)aryloxy with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
I.3B-1	C ₆ H ₅	EP-A 398 692
40 I.3B-2	6-[2-CN-C ₆ H ₄ -O]-pyrimidin-4-yl	GB-A 2 253 624

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Table 1.3C

Compounds of the formula IA where Q is phenyl, R' is $-C(CONHCH_3)=NOCH_3$, n is 0, R'' is (het)arylethylene with or without substitution, where the (het)aryl group with or without 5 substitution has the following meaning:

No.	(Het)aryl with or without substitution	Literature
10 I.3C-1	1-[2,4-Cl ₂ -C ₆ H ₃], 5-CF ₃ -pyrazol-4-yl	EP-A 691 332

Table 1.3D

Compounds of the formula IA where Q is phenyl, R' is $-C(CONHCH_3)=NOCH_3$, n is 0, R'' is CH₂ON=CR^αR^β, where R^α and R^β have the following meanings:

No.	R ^α	R ^β	Literature
20 I.3D-1	CH ₃	4-Cl-C ₆ H ₄	EP-A 463 488
I.3D-2	CH ₃	3-Cl-C ₆ H ₄	EP-A 463 488
I.3D-3	CH ₃	4-CF ₃ -C ₆ H ₄	EP-A 585 751
I.3D-4	CH ₃	3-CF ₃ -C ₆ H ₄	EP-A 585 751
I.3D-5	CH ₃	4-CH ₃ -C ₆ H ₄	EP-A 463 488
25 I.3D-6	CH ₃	3,5-Cl ₂ -C ₆ H ₃	EP-A 463 488
I.3D-7	CH ₃	2-OCH ₂ CH ₃ -pyrimidin-2-yl	WO-A 92/13,830

Table 1.3E

Compounds of the formula IA where Q is phenyl, R' is $-C(CONHCH_3)=NOCH_3$, n is 0, R'' is CH₂ON=CR^γCR^δ=NOR^ε, where R^γ, R^δ and R^ε have the following meanings:

No.	R ^γ	R ^δ	R ^ε	Literature
35 I.3E-1	CH ₃	CH ₃	CH ₃	WO-A 95/21154
I.3E-2	CH ₃	CH ₃	CH ₂ CH ₃	WO-A 95/21154
I.3E-3	CH ₃	C ₆ H ₅	CH ₃	WO-A 95/21154
I.3E-4	CH ₃	C ₆ H ₅	CH ₂ CH ₃	WO-A 95/21154
40 I.3E-5	CH ₃	4-Cl-C ₆ H ₄	CH ₃	WO-A 95/21154
I.3E-6	CH ₃	4-Cl-C ₆ H ₄	CH ₂ CH ₃	WO-A 95/21154

Table 1.4A

Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₃, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without 5 substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
10 I.4A-1	2-CH ₃ -C ₆ H ₄	EP-A 280 185
I.4A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 513 580
I.4A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 513 580
I.4A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 513 580
15 I.4A-5	2-Cl, 5-CH ₃ -C ₆ H ₃	EP-A 513 580
I.4A-6	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 513 580
I.4A-7	1-[4-Cl-C ₆ H ₄]-pyrazol-3-yl	EP-A 758 322

Table 1.4B

20 Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₃, n is 0, R'' is (het)aryloxy with or without substitution, where the (het)aryl group with or without substitution has the following meaning:

No.	(Het)aryl with or without substitution	Literature
25 I.4B-1	C ₆ H ₅	EP-A 513 580

Table 1.4C

30 Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₃, n is 0, R'' is CH₂ON=CR^γCR^δ=NOR^ε, where R^γ, R^δ and R^ε have the following meanings:

No.	R ^γ	R ^δ	R ^ε	Literature
35 I.4C-1	CH ₃	CH ₃	CH ₃	EP-A 738 259
I.4C-2	CH ₃	CH ₃	CH ₂ CH ₃	EP-A 738 259
I.4C-3	CH ₃	C ₆ H ₅	CH ₃	EP-A 738 259
40 I.4C-4	CH ₃	C ₆ H ₅	CH ₂ CH ₃	EP-A 738 259
I.4C-5	CH ₃	4-Cl-C ₆ H ₄	CH ₃	EP-A 738 259
I.4C-6	CH ₃	4-Cl-C ₆ H ₄	CH ₂ CH ₃	EP-A 738 259

Table 1.5A

Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₂CH₃, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
10 I.5A-1	2-CH ₃ -C ₆ H ₄	EP-A 513 580
I.5A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 513 580
I.5A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 513 580
I.5A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 513 580
15 I.5A-5	2-Cl, 5-CH ₃ -C ₆ H ₃	EP-A 513 580
I.5A-6	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 513 580

Table 1.5B

Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₂CH₃, n is 0, R'' is (het)aryloxy with or without substitution, where the (het)aryl group with or without substitution has the following meaning:

No.	(Het)aryl with or without substitution	Literature
25 I.5B-1	C ₆ H ₅	EP-A 513 580

Table 1.5C

Compounds of the formula IA where Q is phenyl, R' is -C(CO₂CH₃)=CHCH₂CH₃, n is 0, R'' is CH₂ON=CR^γCR^δ=NOR^ε, where R^γ, R^δ and R^ε have the following meanings:

No.	R ^γ	R ^δ	R ^ε	Literature
35 I.5C-1	CH ₃	CH ₃	CH ₃	EP-A 738 259
I.5C-2	CH ₃	CH ₃	CH ₂ CH ₃	EP-A 738 259
I.5C-3	CH ₃	C ₆ H ₅	CH ₃	EP-A 738 259
I.5C-4	CH ₃	C ₆ H ₅	CH ₂ CH ₃	EP-A 738 259
40 I.5C-5	CH ₃	4-Cl-C ₆ H ₄	CH ₃	EP-A 738 259
I.5C-6	CH ₃	4-Cl-C ₆ H ₄	CH ₂ CH ₃	EP-A 738 259

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Table 1.6A

Compounds of the formula IA where Q is phenyl, R' is -C(COCH₃)=NOCH₃, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
10 I.6A-1	2-CH ₃ -C ₆ H ₄	EP-A 498 188
I.6A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 498 188
I.6A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 498 188
I.6A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 498 188
15 I.6A-5	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 498 188

Table 1.6B

Compounds of the formula IA where Q is phenyl, R' is -C(COCH₃)=NOCH₃, n is 0, R'' is (het)aryloxy with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
25 I.6B-1	C ₆ H ₅	EP-A 498 188
I.6B-2	6-[2-CN-C ₆ H ₄ -O]-pyrimidin-4-yl	EP-A 498 188

Table 1.7A

Compounds of the formula IA where Q is phenyl, R' is -C(COCH₂CH₃)=NOCH₃, n is 0, R'' is (het)aryloxymethylene with or without substitution, where the (het)aryl group with or without substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
35 I.7A-1	2-CH ₃ -C ₆ H ₄	EP-A 498 188
I.7A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	EP-A 498 188
I.7A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	EP-A 498 188
40 I.7A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	EP-A 498 188
I.7A-5	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	EP-A 498 188

Table 1.7B

Compounds of the formula IA where Q is phenyl, R' is
 -C(COCH₂CH₃)=NOCH₃, n is 0, R'' is (het)aryloxy with or without
 substitution, where the (het)aryl group with or without substitu-
 5 tion has the following meanings:

No.	(Het)aryl with or without substitution	Literature
I.7B-1	C ₆ H ₅	EP-A 498 188
I.7B-2	6-[2-CN-C ₆ H ₄ -O]-pyrimidin-4-yl	EP-A 498 188

Table 1.8A

Compounds of the formula IA where Q is phenyl, R' is
 -N(OCH₃)-CO₂CH₃, n is 0, R'' is (het)aryloxymethylene with or
 without substitution, where the (het)aryl group with or without
 15 substitution has the following meanings:

No.	(Het)aryl with or without substitution	Literature
I.8A-1	2-CH ₃ -C ₆ H ₄	WO-A 93/15,046
I.8A-2	2,5-(CH ₃) ₂ -C ₆ H ₃	WO-A 93/15,046
I.8A-3	2,4-(CH ₃) ₂ -C ₆ H ₃	WO-A 93/15,046
I.8A-4	2,3,5-(CH ₃) ₃ -C ₆ H ₂	WO-A 93/15,046
I.8A-5	2-Cl, 5-CH ₃ -C ₆ H ₃	WO-A 93/15,046
I.8A-6	2-CH ₃ , 4-C[CH ₃]=NOCH ₃ -C ₆ H ₃	WO-A 93/15,046
I.8A-7	2-CH ₃ , 4-C[CH ₃]=NOCH ₂ CH ₃ -C ₆ H ₃	WO-A 93/15,046
I.8A-8	2-CH ₃ , 4-C[CH ₂ CH ₃]=NOCH ₃ -C ₆ H ₃	WO-A 93/15,046
I.8A-9	2-CH ₃ , 4-C[CH ₂ CH ₃]=NOCH ₂ CH ₃ -C ₆ H ₃	WO-A 93/15,046
I.8A-10	1-[4-Cl-C ₆ H ₄]-pyrazol-3-yl	WO-A 96/01256

Table 1.8B

Compounds of the formula IA where Q is phenyl, R' is
 -N(OCH₃)-CO₂CH₃, n is 0, R'' is CH₂ON=CR^αR^β, where R^α and R^β have
 35 the following meaning:

No.	R ^α	R ^β	Literature
I.8B-1	CH ₃	3,5-Cl ₂ -C ₆ H ₃	WO-A 93/15,046

It can be assumed that the method according to the invention can
 be employed in principle in all crop plants and horticulturally
 useful plants having a modified pathogen resistance against harm-
 45 ful fungi. Examples of such plants are bananas, coffee, potatoes,
 rape seed, turnips, asparagus, tea, tomatoes, onion species, and
 gramineae such as barley, oats, maize, rice, rye and wheat; the

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effect is particularly pronounced in potatoes, turnips, asparagus, onion species and gramineae, and the method according to the invention is particularly recommended for use in gramineae, for example in wheat, barley and rice. Methods for increasing the pathogen resistance of such crop plants are well known to a person skilled in the art and described in the literature, for example in WO-A 95/05467, WO-A 94/8009 and the publications J. Lamb et al., *Biotechnology* 10 (1992), 1436-1445, H. Anzai et al., *Mol. Gen. Genet.* 219 (1989), 492-494, R. Grison et al., *Nature Biotechnology* 14 (1996), 643-646, H. Uchimiya et al., *Biotechnology* 11 (1993), 835-837, G. Jach et al., *Biopractice* 1 (1992), 33-40, J. Logemann et al, *Biotechnology* 10 (1992), 305-308 and G. Strittmatter et al., *Biotechnology* 13 (1995), 1085-1089.

15 Depending on the kind of crop plant, the application rates of compounds IA or IB are from 0.5 to 0.01 kg/ha, preferably 0.3 to 0.01 kg/ha, in particular 0.15 to 0.05 kg/ha.

For the method according to the invention, the compounds I can be formulated and applied in a manner customary for use in crop protection (cf. literature cited at the outset).

The method according to the invention has the advantage, among others, that a large number of harmful fungi can be controlled successfully with just one active compound of the formula I; according to the prior art, this would have required a plurality of fungicidally active compounds which may in certain cases have had adverse interactions.

30 In some instances, the application rates of the active compounds of the formula I could be considerably reduced as compared to the customary application rates, without adversely affecting the activity. This result is surprising. In the case of kresoxim-methyl (methyl methoxyimino- α -(o-tolyloxy)-o-tolylacetate), for example, application rates of below 0.05 kg/ha, in particular from 0.04 to 0.01 kg/ha, are sufficient.

The method according to the invention can be employed particularly advantageously in crop plants which have an increased pathogen resistance to those harmful fungi which in general cannot be controlled completely with the individual active compounds of the formula I. Thus, it is possible to improve the usually insufficient activity of azoxystrobin (methyl (E)-2-(2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]phenyl)-3-methoxyacrylate) against cereal mildew in mildew-resistant barley or wheat varieties disproportionately.

The method according to the invention can also be employed successfully in crop plants having an increased pathogen resistance to those harmful fungi which can be effectively controlled with active compounds of the formula I. Here, it is often possible to 5 reduce the required application rate considerably.

For example, less of the active compound kresoxim-methyl is required to render entirely free of infection those varieties of crop plants such as wheat, barley, grapevines or apple trees 10 which have increased resistance to powdery mildew species, compared to the higher application rates of active strobilurin ingredient which are required to render nonresistant plants mildew-free. Comparative experiments show clearly that in the barley varieties A HOR 1528/9, A HOR 2978/80, A HOR 3141/78 and A HOR 15 5458/70, which have increased mildew resistance, considerably lower amounts of kresoxim-methyl allow the same control of barley mildew as in the common, commercially available varieties "Asse" and "Sonja" which do not have any increased mildew resistance.

20 The same applies to resistant and nonresistant grapevines and their treatment with kresoxim-methyl for controlling *Plasmopara viticola*.

This applies correspondingly to the active compound azoxystrobin 25 for the control of a large number of different phytopathogenic fungi in resistant and nonresistant crop plants. Examples of economically important phytopathogenic fungi include the following pathogen/host pairs from the class of the Basidiomycetes: *Puccinia* species in cereals and lawns, *Rhizoctonia* species in cotton, 30 rice and lawns, *Hemileia vastatrix* in coffee, *Ustilago* species in cereals and sugar cane; from the group of the Ascomycetes *Erysiphe* species in wheat, barley and rye, *Erysiphe* and *Sphaerotheca* species in cucurbits, *Podosphaera leucotricha* in apples, *Uncinula necator* in grapevines, *Venturia* species in apples and 35 pears; from the class of the Deuteromycetes *Botrytis cinerea* in strawberries, grapevines, vegetables and ornamentals, *Alternaria* species in vegetables and fruit, *Pyricularia oryzae* in rice and lawns, *Cercospora arachidicola* in groundnuts, *Pseudocercospora herpotichoides* in wheat and barley, *Helminthosporium* 40 species in cereals, *Septoria* species in cereals and vegetables; and from the class of the Phycomycetes *Phytophthora infestans* in tomatoes and potatoes, *Plasmopara viticola* in grapevines and *Pseudoperonospora* species in hops and vegetables.

Comparative experiment

Activity against powdery mildew of barley (*Erysiphe graminis* f. sp. *hordei*)

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Leaves of potted barley seedlings of the various varieties were sprayed to runoff point with an aqueous active compound formulation prepared from a stock solution comprising 10% of active compound (kresoxim-methyl), 63 % of cyclohexanone and 27 % of emul-
 10 sifier. The next day, the leaves were dusted with spores of powdery mildew of barley (*Erysiphe graminis* f. sp. *hordei*). The test plants were subsequently kept in a greenhouse at 20°-22°C and 75-80 % relative atmospheric humidity. 6 days after the inoculation, the extent of mildew development was determined visually as %
 15 infection of the total leaf area treated.

Barley variety % infection of the leaves after application of aqueous kresoxim-methyl formulation, kresoxim-methyl content in ppm

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	2 ppm	1 ppm	0.5 ppm	0.25 ppm	Untreated
25 "Asse" commercially available variety	7	80	100	100	100
30 "Sonja" commercially available variety	5	70	100	100	100

Varieties having increased resistance to mildew

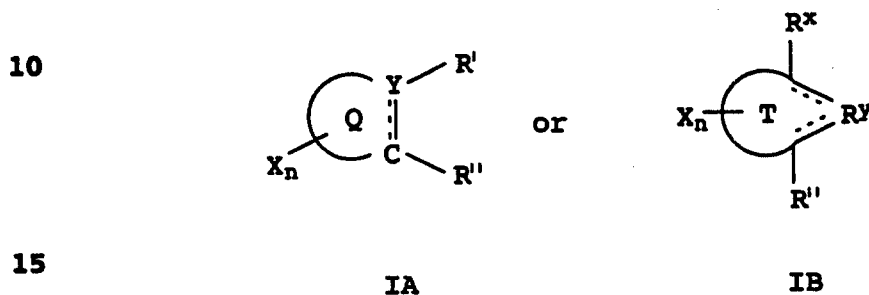
35 A HOR 1528/91	0	7	30	90	100
A HOR 2978/80	2	15	40	90	100
A HOR 3141/78	1	10	70	100	100
A HOR 5458/70	0	2	40	90	100

The barley seedlings (*Hordeum vulgare*) of the varieties used in the comparative experiment can be obtained from: Institut für Pflanzengenetik und Kulturpflanzenforschung Gatersleben, Genbank, Corrensstr. 3, 06466 Gatersleben, Germany.

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We claim:

1. A method for controlling harmful fungi in crop plants having modified pathogen resistance to harmful fungi, which comprises treating the plants with an active compound of formula IA or IB



where is a single or double bond and where:

- 20 R' is $-\text{C}[\text{CO}_2\text{CH}_3]=\text{CHOCH}_3$, $-\text{C}[\text{CO}_2\text{CH}_3]=\text{NOCH}_3$, $-\text{C}[\text{CONHCH}_3]=\text{NOCH}_3$,
 $-\text{C}[\text{CO}_2\text{CH}_3]=\text{CHCH}_3$, $-\text{C}[\text{CO}_2\text{CH}_3]=\text{CHCH}_2\text{CH}_3$, $-\text{C}[\text{COCH}_3]=\text{NOCH}_3$,
 $-\text{C}[\text{COCH}_2\text{CH}_3]=\text{NOCH}_3$, $-\text{N}(\text{OCH}_3)-\text{CO}_2\text{CH}_3$, $-\text{N}(\text{CH}_3)-\text{CO}_2\text{CH}_3$,
 $-\text{N}(\text{CH}_2\text{CH}_3)-\text{CO}_2\text{CH}_3$,

- 25 R'' is a C-organic radical,

a C-organic radical which is attached directly or via an oxy, mercapto, amino or alkylamino group, or

- 30 together with a group X and the ring Q or T to which they are attached forms a bicyclic, partially or fully unsaturated system with or without substitution which may, in addition to carbon ring members, contain hetero atoms from the group consisting of oxygen, sulfur and nitrogen,

- 35 R^x is $-\text{OC}[\text{CO}_2\text{CH}_3]=\text{CHOCH}_3$, $-\text{OC}[\text{CO}_2\text{CH}_3]=\text{CHCH}_3$,
 $-\text{OC}[\text{CO}_2\text{CH}_3]=\text{CHCH}_2\text{CH}_3$, $-\text{SC}[\text{CO}_2\text{CH}_3]=\text{CHOCH}_3$,
 $-\text{SC}[\text{CO}_2\text{CH}_3]=\text{CHCH}_3$, $-\text{SC}[\text{CO}_2\text{CH}_3]=\text{CHCH}_2\text{CH}_3$,
 $-\text{N}(\text{CH}_3)\text{C}[\text{CO}_2\text{CH}_3]=\text{CHOCH}_3$, $-\text{N}(\text{CH}_3)\text{C}[\text{CO}_2\text{CH}_3]=\text{NOCH}_3$,
 40 $-\text{CH}_2\text{C}[\text{CO}_2\text{CH}_3]=\text{CHOCH}_3$, $-\text{CH}_2\text{C}[\text{CO}_2\text{CH}_3]=\text{NOCH}_3$,
 $-\text{CH}_2\text{C}[\text{CONHCH}_3]=\text{NOCH}_3$,

R^y is oxygen, sulfur, =CH- or =N-,

- 45 n is 0, 1, 2 or 3, where the radicals X may be different if n > 1;

19

- X is cyano, nitro, halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio or, if n > 1, a C₃-C₅-alkylene, C₃-C₅-alkenylene, oxy-C₂-C₄-alkylene, oxy-C₁-C₃-alkylenoxy, oxy-C₂-C₄-alkenylene, oxy-C₂-C₄-alkenylenoxy or butadienediyl group which is attached to two adjacent carbon atoms of the phenyl ring, where these chains in turn may carry one to three of the following radicals: halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio,
- Y is =C- or -N-,
- Q is phenyl, pyrrolyl, thienyl, furyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, thiadiazolyl, triazolyl, pyridinyl, 2-pyridonyl, pyrimidinyl and triazinyl,
- T is phenyl, oxazolyl, thiazolyl, thiadiazolyl, oxadiazolyl, pyridinyl, pyrimidinyl and triazinyl.
2. A method as claimed in claim 1, wherein the crop plants are treated with from 0.5 to 0.01 kg/ha of a compound of the formula IA or IB.
3. The use of compounds of the formula IA or IB as claimed in claim 1 for controlling harmful fungi in crop plants having modified pathogen resistance to certain harmful fungi.