

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
8 August 2002 (08.08.2002)

PCT

(10) International Publication Number  
**WO 02/061043 A3**

- (51) International Patent Classification<sup>7</sup>: **A01H 5/00**, C12N 5/04, 15/29, 15/82 (74) Agent: **BIEK, David, L.**; Cargill, Incorporated, P.O. Box 5624, Minneapolis, MN 55440-5624 (US).
- (21) International Application Number: PCT/US02/02444 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 29 January 2002 (29.01.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/264,776 29 January 2001 (29.01.2001) US (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:  
US 60/264,776 (CIP)  
Filed on 29 January 2001 (29.01.2001)
- (71) Applicant (*for all designated States except US*): **CARGILL, INCORPORATED** [US/US]; P.O. Box 5624, Minneapolis, MN 55440-5624 (US). **Published:**  
— *with international search report*
- (72) Inventors; and (88) Date of publication of the international search report:  
13 March 2003
- (75) Inventors/Applicants (*for US only*): **HALLIER, Sonia** [FR/US]; 460 Maroon Bells Circle, Livermore, CO 80536 (US). **CHEN, Zhizheng** [US/US]; 3581 Pike Circle North, Fort Collins, CO 80525 (US). **DENG, Xinmin** [CA/CA]; 4336-41 Street, Camrose, Alberta T4V 4ES (CA).  
*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



**WO 02/061043 A3**

(54) Title: FUNGAL RESISTANT TRANSGENIC PLANTS

(57) Abstract: Transgenic plants that are resistant to *Sclerotinia sclerotiorum* and *Phoma lingam* because of transformation with nucleic acids encoding chitinase and one or more of  $\beta$ -1,3-glucanase, osmotin, PR-1, and AP24 are described, as are methods of making such plants.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US02/02444

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC(7) : A01H 5/00; C12N 5/04, 15/29, 15/82  
 US CL : 800/279, 287, 288, 301, 306, 312, 322, 317.4; 435/411, 415, 416, 418, 419  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
 Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : 800/279, 287, 288, 301, 306, 312, 322, 317.4; 435/411, 415, 416, 418, 419

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	ZHU et al. Enhanced Protection Against Fungal Attack by Constitutive Co-expression of Chitinase and Glucanase Genes in Transgenic Tobacco. Bio/Technology. 12 August 1994, Vol. 12, pages 807-812; see pg 807-809, pg 810, right column, paragraph 3, and pg 811, left column, paragraph 2.	1-4, 8-17 and 30-35
Y	US 6,087,161 A (MELCHERS et al) 11 July 2000 (11.07.2000), column 7, lines 20-27.	1-4, 8-17 and 30-35
Y	US 6,066,491 A (CORNELISSEN et al) 23 May 2000 (23.05.2000), column 15, line 15, to column 25, line 4.	1-4, 8-17 and 30-35
Y	WO 92/17591 A1 (DANISCO A/S) 15 October 1992 (15.10.1992), pages 42, 44-47, 138-141, and claim 46.	1-4, 8-17 and 30-35

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 02 July 2002 (02.07.2002)	Date of mailing of the international search report 11 SEP 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Rosetta Lawrence For</i> Anne Kubelik Telephone No. (703) 308-0196

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/02444

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claim Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
  4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-4, 8-17 and 30-35
- Remark on Protest  The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/02444

### BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions that are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-4, 8-17 and 30-35, drawn to a plant transformed with a nucleic acid encoding chitinase,  $\beta$ -1,3-glucanase and osmotin and a method of producing a plant that is resistant to *Sclerotinia sclerotiorum* by transformation with a nucleic acid encoding chitinase,  $\beta$ -1,3-glucanase and osmotin.

Group II, claim(s) 5-7 and 36, drawn to a plant transformed with a nucleic acid encoding chitinase,  $\beta$ -1,3-glucanase, osmotin and PR-1 and a method of producing a plant that is resistant to *S. sclerotiorum* by transformation with a nucleic acid encoding chitinase,  $\beta$ -1,3-glucanase, osmotin and PR-1.

Group III, claim(s) 18-27, drawn to a method of producing a *Brassica* plant that is resistant to *Phoma lingam* by transformation with a nucleic acid encoding AP24 and chitinase and a plant so produced.

Group IV, claim(s) 28, drawn to a method of producing a *Brassica* plant that is resistant to *P. lingam* by transformation with a nucleic acid encoding AP24, chitinase and  $\beta$ -1,3-glucanase.

Group V, claim(s) 29, drawn to a method of producing a *Brassica* plant that is resistant to *P. lingam* by transformation with a nucleic acid encoding AP24, chitinase and PR-1.

The inventions listed as Groups I-V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The inventions listed as Groups I-V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: They do not share a special technical feature. The only technical feature in common among the groups is transformation of a plant with a nucleic acid encoding more than one pathogenesis-related protein. This technical feature is taught by each of ZHU et al (1994, Bio/Technology vol. 12, pages 807-812; see abstract) and ALEXANDER et al (1993, Proc. Natl. Acad. Sci. vol. 90, pages 7327-7331; see Table 1) and suggested by MELCHERS et al (2000, US Patent 6,087,161, column 7, lines 20-27), and is therefore not special. As the technical feature does not make a contribution over the prior art, unity of invention is lacking and restriction is appropriate.

### Continuation of B. FIELDS SEARCHED Item 3:

Databases: USPAT, EPO, JPO, Derwent, PGPubs, Agricola, Biosis, Caplus, Caba

SEARCH terms: glucanase, chitinase, osmotin, transform?, (disease or pathogen) resistan?, plant