(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 02/061101 A3

(51) International Patent Classification[7]: C12N 15/82, 15/11, A01N 65/00, A01H 5/00

(21) International Application Number: PCT/US01/50427

(22) International Filing Date:
2 November 2001 (02.11.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/245,876 3 November 2000 (03.11.2000) US

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(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, EC, 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, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, 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).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
21 August 2003

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 02/061101 A3

(54) Title: METHOD OF IMPARTING DISEASE RESISTANCE TO PLANTS BY REDUCING POLYPHENOL OXIDASE ACTIVITY

(57) Abstract: The present invention relates to a method for enhancing a plant's resistance to fungal diseases by reducing expression of polyphenol oxidase (PPO). The present invention also relates to a method for improving a potato plant's anti-bruising trait. By using antisense technology to generate transgenic potato plants with tuber-specific promoters, PPO can be reduced to a level at which the potato tubers sufficiently increases its resistance to fungal disease symptoms including late blight caused by *Phytophthora infestans*. Also provided are certain novel combinations of promoters and PPO-derived sequences which also provide improvements in tuber bruise susceptibility.

INTERNATIONAL SEARCH REPORT

Intern Application No
PCT/US 01/50427

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C12N15/82 C12N15/11 A01N65/00 A01H5/00

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)
IPC 7 C12N

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 94 03607 A (KEYGENE NV ;ZABEAU MARC (BE); BACHEM CHRISTIAN (NL)) 17 February 1994 (1994-02-17) cited in the application the whole document	27,29
X	WO 93 15599 A (CORNELL RES FOUNDATION INC) 19 August 1993 (1993-08-19) cited in the application the whole document	27,29
X	WO 99 07865 A (KIMERAGEN INC) 18 February 1999 (1999-02-18) example 3	27,29

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"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

"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

"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

"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.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 2003	17.06.03

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Loubradou, G

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	THIPYAPONG PIYADA ET AL: "Defensive role of polyphenol oxidases against Pseudomonas syringae pv. tomato." PLANT PHYSIOLOGY (ROCKVILLE), vol. 111, no. 2 SUPPL., 1996, page 168 XP009007303 Annual Meeting of the American Society of Plant Physiologists;San Antonio, Texas, USA; July 27-31, 1996 ISSN: 0032-0889 ---	
A	LI LI ET AL: "Overexpression of polyphenol oxidase gene in transgenic tomato plants results in enhanced plant disease resistance." PLANT PHYSIOLOGY (ROCKVILLE), vol. 114, no. 3 SUPPL., 1997, page 227 XP009007302 PLANT BIOLOGY '97: 1997 Annual Meetings of the American Society of Plant Physiologists and the Canadian Society of Plant Physiologists, Japanese Society of Plant Physiologists and the Australian Society of Plant Physiologists;Vancouver, British Columbia, Canada; August 2-6, 1997 ISSN: 0032-0889 the whole document ---	
A	LAI ANTONIA ET AL: "Effects of glandular trichomes on the development of Phytophthora infestans infection in potato (S. tuberosum)." EUPHYTICA, vol. 114, no. 3, 2000, pages 165-174, XP009007250 ISSN: 0014-2336 the whole document ---	
A	PHUKAN S N ET AL: "Role of phenolics, peroxidase and polyphenol oxidase in the mechanism of infection and resistance of potato plants to late blight." ADVANCES IN PLANT SCIENCES, vol. 12, no. 1, June 1999 (1999-06), pages 275-278, XP001145634 ISSN: 0970-3586 the whole document ---	
A	WO 99 53050 A (WANG MING BO ;COMMW SCIENT IND RES ORG (AU); GRAHAM MICHAEL WAYNE) 21 October 1999 (1999-10-21) the whole document ---	

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INTERNATIONAL SEARCH REPORT

Intern: Application No
PCT/US 01/50427

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	THYGESEN P W ET AL: "POLYPHENOL OXIDASE IN POTATO A MULTIGENE FAMILY THAT EXHIBITS DIFFERENTIAL EXPRESSION PATTERNS" PLANT PHYSIOLOGY, AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS, ROCKVILLE, MD, US, vol. 109, 1995, pages 525-531, XP000826517 ISSN: 0032-0889 the whole document	

INTERNATIONAL SEARCH REPORT

Ir al application No.
PCT/US 01/50427

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims 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. ☐ Claims 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:

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.:

1-21, 26, 27, 29

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-21, 26, 27, 29

   The methods of claims 1-21 and 26, and the plants obtained using said methods.

2. Claims: 22-25, 28, 30 (all partially)

   The methods of claims 22 to 25 and the corresponding plants wherein the promoter is smADPGPP

3. Claims: 22-25, 28, 30 (all partially)

   The methods of claims 22 to 25 and the corresponding plants wherein the promoter is SpoA

4. Claims: 22-25, 28, 30 (all partially)

   The methods of claims 22 to 25 and the corresponding plants wherein the promoter is TFM7 tomato fruit-specific promoter

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interna Application No
PCT/US 01/50427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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