

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
7 July 2005 (07.07.2005)

PCT

(10) International Publication Number  
WO 2005/060664 A3

(51) International Patent Classification:

C12N 15/29 (2006.01) A01H 5/06 (2006.01)  
C12N 15/82 (2006.01) A01H 5/08 (2006.01)  
A01H 5/00 (2006.01) A01H 5/10 (2006.01)  
A01H 5/02 (2006.01) A01H 5/12 (2006.01)  
A01H 5/04 (2006.01)

(21) International Application Number:

PCT/US2004/042316

(22) International Filing Date:

8 December 2004 (08.12.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/528,540 10 December 2003 (10.12.2003) US

(71) Applicant (for all designated States except US): MON-SANTO TECHNOLOGY LLC [US/US]; 800 North Lindbergh Blvd., St. Louis, MO 63167 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DASGUPTA, Santana [IN/IN]; 101, Spoorthy Apartment, 40, Sirur Park Road, 3rd Corsss, Malleswaram, Bangalore, Karnataka 560 003 (IN). JAYAPRAKASH, T., L. [IN/IN]; 34, Sumukha, 60 Feet Road, RMV 2nd Stage, SanJayanagar, Bangalore 560 0094 (IN). THAI, Carolyn, J. [US/US]; 1340 Woodrige Crossing Drive, Chesterfield, MO 63005 (US). NARAYANAN, Kottaram, K. [IN/IN]; #3, Sri Rupa Apartments, 109 East Park Road, Malleshwaram, Bangalore 560 003 (IN). RUFF, Thomas, G. [US/US]; 18727 Vixen Drive, Wildwood, MO 63069 (US). DOTSON, Stanton, B. [US/US]; 379 Palomino Hill Ct., Chestreffield, MO 63005 (US).

(74) Agent: FORCHISHA, M., Davis; Monsanto Company, 800 North Lindbergh Blvd., St. Louis, MO 63167 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (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:  
9 March 2006

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.

(54) Title: STRESS TOLERANT PLANTS AND METHODS THEREOF

(57) Abstract: The present invention provides a method and DNA molecules that when expressed in a plant produces transgenic plants with improved abiotic stress tolerance. The invention includes plant expression vectors comprising the DNA molecules, and plants containing such DNA molecules.

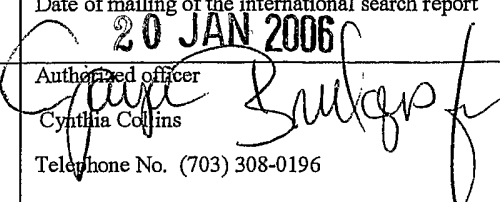


WO 2005/060664 A3

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/42316

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) : C12N 15/29, 15/82; A01H 5/00, 5/02, 5/04, 5/06, 5/08, 5/10, 5/12 US CL : 800/289,298; 536/23.6; 435/320.1 According to International Patent Classification (IPC) or to both national classification and IPC																				
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 800/289,298; 536/23.6; 435/320.1 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																				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>																				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
X --- Y	OHBA, H. et al. Diverse response of rice and maize genes encoding homologs of WPK4, and SNF1-related protein kinase from wheat, to light, nutrients, low temperature and cytokinins. Mol. Gen. Genet. 2000, Vol. 263, pages 359-366, especially pages 360-361.	14-19 ----- 1-13, 20																		
X --- Y	Database GenEmbl on STIC, European Bioinformatics Institute, (Hixton, Cambridge, UK), Accession No. AB011968, OHBA H. et al., Gene Sequence, 10 May 2000 (10.05.00).	14-19 ----- 1-13, 20																		
X --- Y	GONG D. et al. Biochemical and functional characterization of PKS11, a novel Arabidopsis protein kinase. The Journal of Biological Chemistry. 02 August 2002, Vol. 277, No. 31, pages 28340-28350, especially pages 28342-28343 and 28348-28350.	1-6, 8-11, 13-14, 19-20 ----- 7, 12, 15-18																		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.																				
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">* Special categories of cited documents:</td> <td style="width: 20%; padding: 5px;">"T"</td> <td style="padding: 5px;">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</td> </tr> <tr> <td style="padding: 5px;">"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td style="padding: 5px;">"X"</td> <td style="padding: 5px;">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</td> </tr> <tr> <td style="padding: 5px;">"B" earlier application or patent published on or after the international filing date</td> <td style="padding: 5px;">"Y"</td> <td style="padding: 5px;">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</td> </tr> <tr> <td style="padding: 5px;">"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)</td> <td style="padding: 5px;">"&amp;"</td> <td style="padding: 5px;">document member of the same patent family</td> </tr> <tr> <td style="padding: 5px;">"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> <td></td> </tr> <tr> <td style="padding: 5px;">"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			* 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	"B" 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		
* 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																		
"B" 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 27 December 2005 (27.12.2005)	Date of mailing of the international search report <b>20 JAN 2006</b>																			
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer  Cynthia Collins Telephone No. (703) 308-0196																			

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/42316

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 additional fees, this Authority did not invite payment of any additional fees.
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.: 1-20 directed to SEQ ID NO:2

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/42316

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

This application contains the following inventions or groups of inventions which 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.

Groups I-XXV, claim(s) 1-20, drawn to a method of generating a transformed plant by transforming a plant cell with a DNA construct comprising a DNA polynucleotide molecule that encodes a protein substantially homologous to a SNF1-related protein kinase. Group I is directed to a DNA polynucleotide molecule that encodes a protein substantially homologous to SEQ ID NO:2, Group II is directed to a DNA polynucleotide molecule that encodes a protein substantially homologous to SEQ ID NO:4, ... Group XXV is directed to a DNA polynucleotide molecule that encodes a protein substantially homologous to SEQ ID NO:51.

The inventions listed as Groups I-XXV 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 technical feature linking the inventions of Groups I-XXV is a DNA polynucleotide molecule that encodes a protein substantially homologous to a SNF1-related protein kinase. However, a DNA polynucleotide molecule that encodes a protein substantially homologous to a SNF1-related protein kinase is obvious or anticipated over OHBA H. et al. (Diverse response of rice and maize genes encoding homologs of WPK4, an SNF1-related protein kinase from wheat, to light, nutrients, low temperature and cytokinins. *Mol Gen Genet.* 2000 Mar;263(2):359-66), and therefore does not constitute a special technical feature as defined by PCT Rule 13.2, because it does not define a contribution over the prior art. The special technical feature of each of Groups I-XXV is the particular encoded amino acid sequence characteristic of each group.

Continuation of B. FIELDS SEARCHED Item 3:

STN (agricola, biosis, biotechno, caba, caplus, medline, uspatfull): inventor names, plant, protein kinase, OSFK7, SNF1; STIC sequence search for SEQ ID NOS: 1 and 2