



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US99/18127 (22) International Filing Date: 10 August 1999 (10.08.99) (30) Priority Data: 60/095,938 10 August 1998 (10.08.98) US 60/115,934 14 January 1999 (14.01.99) US (71) Applicant: THE GENERAL HOSPITAL CORPORATION [US/US]; 55 Fruit Street, Boston, MA 02114 (US). (72) Inventors: SHEEN, Jen; Apartment 4, 4 Longfellow Place, Boston, MA 02114 (US). CHIU, Wan-Ling; 819 Westham Parkway, Richmond, VA 23239 (US). (74) Agent: ELBING, Karen, L.; Clark & Elbing LLP, 176 Federal Street, Boston, MA 02110-2214 (US).		(81) Designated States: AU, CA, CN, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> (88) Date of publication of the international search report: 11 May 2000 (11.05.00)
(54) Title: TRANSGENIC PLANTS EXPRESSING A DUAL-SPECIFICITY MAPK PHOSPHATASE AND USES THEREOF (57) Abstract Disclosed are transgenic plants which include a transgene which expresses a phosphatase domain of a dual-specificity mitogen-activated protein kinase (MAPK) phosphatase, wherein the transgene is expressed in the transgenic plant under the control of a promoter that is functional in a plant cell. Also disclosed are methods which are useful for modifying the phenotype of a plant, including the steps of: (a) introducing into a plant cell a transgene comprising DNA encoding a phosphatase domain of a dual-specificity mitogen-activating protein kinase (MAPK) phosphatase operably linked to a promoter functional in plant cells to yield a transformed plant cell; and (b) regenerating a transgenic plant from the transformed cells, wherein the phosphatase domain of the dual-specificity MAPK phosphatase is expressed in the cells of the transgenic plant, thereby modifying the phenotype of the transgenic plant.		

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/18127

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12N 5/04, 15/29, 15/82; A01H 5/00, 5/10

US CL : 800/287, 290; 435/419; 536/23.6, 24.1

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. : 800/287; 435/419; 536/24.1

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)

DIALOG
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NAKASHIMA et al. The Expression Pattern of the Gene for NPK1 Protein Kinase Related to Mitogen-Activated Protein Kinase Kinase (MAPKKK) in a Tobacco Plant: Correlation with Cell Proliferation. Plant Cell Physiology. 1998, Vol. 39, No. 7, pages 690-700, see entire document.	1-20
Y	SEO et al. Tobacco MAP Kinase: A Possible Mediator in Wound Signal Transduction Pathways. Science. 22 December 1995, Vol. 270, pages 1988-1992, see entire document.	1-20
Y	SONG et al. A Receptor Kinase-Like Protein Encoded by the Rice Disease Resistance Gene, Xa21. Science. 15 December 1995, Vol. 270, pages 1804-1806, see entire document.	1-20

☒ 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 document 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
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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

03 JANUARY 2000

Date of mailing of the international search report

10 FEB 2000

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/18127

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FELIX et al. Rapid Changes of Protein Phosphorylation are Involved in Transduction of the Elicitor Signal in Plant Cells. Proceedings of the National Academy of Science. October 1991, Vol. 88, pages 8831-8834, see entire document.	1-20
Y	NISHIHAMA et al. Possible Involvement of Differential Splicing in Regulation of the Activity of Arabidopsis ANP1 that is Related to Mitogen-Activated Protein Kinase Kinase Kinase. The Plant Journal. 19 February 1997, Vol. 12, No.1, pages 39-48, see entire document.	1-20
Y	HUGHES et al. Complementation of byr1 in Fission Yeast By Mammalian MAP Kinase Kinase Requires Coexpression of Raf Kinase. Nature. 22 July 1993, Vol. 364, pages 349-352, see entire document.	1-20
Y	ITO et al. NPK15, a Tobacco Protein-Serine/Threonine Kinase with a Single Hydrophobic Region Near the Amino-Terminus. Molecular and General Genetics. 1994, Vol. 245, No.1, pages 1-10, see entire document.	1-20
Y	WATILLON et al. A Calcium/Calmodulin-Binding Serine/Threonine Protein Kinase Homologous to the Mammalian Type II Calcium/Calmodulin-Dependent Protein Kinase Is Expressed in Plant Cells. Plant Physiology. 1993, Vol. 101, No.4, pages 1381-1384, see entire document.	1-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/18127

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. ☐ 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:

Please See Extra 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.:
1-20

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/US99/18127

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

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

Group I, claims 1-20, drawn to nucleic acid encoding phosphatase domain of MAPK phosphatase, transformed cells and plants possessing said nucleic acid.

Group II, claims 21-25, drawn to nucleic acid encoding the full length MAPK phosphatase.

Group III, claim 29, drawn to isolated MAPK phosphatase protein.

The inventions listed as Groups I-III do not relate to a single 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 are not linked by a single special feature which constitutes an advance over the prior art, since Nakashima et al., Seo et al., Song et al., and Felix et al., cited in the Search Report, were found to suggest the claimed invention. Furthermore, each invention involves physiologically and biochemically divergent products and processes not required by any other, such as nucleic acid encoding the phosphatase domain of MAPK phosphatase, transformed cells and plants possessing said nucleic acid, nucleic acid encoding the full length MAPK phosphatase, and isolated MAPK phosphatase protein.