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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: PHYTOCHELATIN SYNTHASE

(57) Abstract: The present invention relates to an isolated nucleic acid fragment encoding a phytochelatin synthase. The invention also relates to the construction of a recombinant DNA construct encoding all or a portion of the phytochelatin synthase, in sense or antisense orientation, wherein expression of the recombinant DNA construct results in production of altered levels of the phytochelatin synthase in a transformed host cell.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/25032

A. CLASSIFICATION OF SUBJECT MATTER

IPC: C12N 15/29(2006.01),15/09(2006.01),15/82(2006.01)

USPC: 800/279,278,298,295;435/69.1,468;536/23.6

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. : 800/278, 298, 295; 435/69.1, 468; 536/23.6

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.
A	US 6,313, 374 B1 (KRISHNARAJ et al) 06 November 2001 (06.11.2001), see whole document.	1-15
A	US 6,489, 537 B1 (REA et al) 03 December 2002 (03.12.2002), see whole document.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/25032

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.: 1-15 AND SEQ ID NOS: 11-12

Remark on Protest

☐
☐

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

No protest accompanied the payment of additional search fees.

BOX II. 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.

Group I-IV, claim(s) 1-15, drawn to an isolated polynucleotide encoding phytochelatin synthase, vector/cell comprising said polynucleotide, and a plant transformation method.

Group V-VIII, claim(s) 16-21, drawn to isolated polypeptides.

Group I-IV, claim(s) 1-15, drawn to an isolated polynucleotide encoding phytochelatin synthase having specified SEQ ID NO: , recombinant DNA construct , a cell/plant/seed comprising said polynucleotide and a plant transformation method. For example, if Group II is elected, SEQ ID NO:13 or a polynucleotide sequence encoding SEQ ID NO:14, DNA construct and cell/plant/seed comprising said polynucleotide, and a method for producing said plant will be searched. If Group IV is elected, SEQ ID NO: 17 or a polynucleotide sequence encoding SEQ ID NO:18, DNA construct and plant/seed comprising SEQ ID NO:17, and a method for producing said plant will be searched, etc.

Group V-VIII claim(s) 16-21, drawn to an isolated polypeptide having phytochelatin synthase activity. For example, if Group V is elected, SEQ ID NO:12 will be searched. If Group VI is elected, SEQ ID NO: 14 will be searched, etc.

The inventions listed as Groups I-IV 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 between SEQ ID NO: 11, 13, 15 and 17 or a polynucleotide encoding SEQ ID NO: 12, 14, 16 and 18 appears to be that they all encode a phytochelatin synthase. However, polynucleotides encoding a phytochelatin synthase are known in the prior art as evidenced by Applicants' own specification (page 2, lines 10-20).

The special technical feature between inventions I-IV and V-VIII appears to be that they all relate to phytochelatin synthase. However, such a feature is known as evidenced by Krishnaraj et al (US Pat. 6, 313, 374) who teach phytoremediation of soils contaminated with heavy metals, and suggest that an isolated gene encoding a phytochelatin synthase can be used to transform plants to increase heavy metal tolerance in the plants (see column 7, lines 16-24). Therefore, the special technical feature linking inventions of Groups I-IV and V-VIII does not define a contribution over the prior art.

Furthermore, the special technical feature of each of Groups I-IV that is not recited in any of Groups V-VIII is considered to be an isolated polynucleotide having specified SEQ ID NO: , a recombinant DNA construct, cell/plant/seed and a method transforming plants with said polynucleotide.

The special technical feature of each of Groups V-VIII that is not recited in any of Groups I-IV is considered to be an isolated polypeptide having specified SEQ ID NO:

Therefore, for all the reasons discussed above, Groups I-VIII lack unity.

INTERNATIONAL SEARCH REPORT

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Continuation of B. FIELDS SEARCHED Item 3:

STNCAS;WEST

search terms: phytochelatin synthase, transgenic plant; heavy metal, tolerance/resistance

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search terms: phytochelatin synthase, transgenic plant; heavy metal, tolerance/resistance