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60/133,040 7 May 1999 (07.05.1999) US(71) Applicants (for all designated States except US): **E. I. DU PONT DE NEMOURS AND COMPANY** [US/US];
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Street, Wilmington, DE 19898 (US).(81) Designated States (national): AE, AL, AM, AT, AU, AZ,
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IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
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[Continued on next page]

(54) Title: AUXIN TRANSPORT PROTEINS

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SEQ ID NO:14 MITALDLYHVLTA VVPLYVAMT LAYGSVRWRI FTDPQCSGINRFV ALFAVPLLSFHFIS
SEQ ID NO:30 MITLTDYFHVMTAMVPLYVAMILAYGSVKWKIFSPDQCSGINRFV ALFAVPLLSFHFIA
SEQ ID NO:34 MITGKDIYDVFAAIVPLYVAMILAYGSVRWVKIFTDPQCSGINRFV AVFAVPLLSFHFIS
SEQ ID NO:38 MITGKDIYDVLA AVVPLYVAMFMAYGSVRWVGIFTDPQCSGINRFV AVFAVPLLSFHFIS
SEQ ID NO:43 MITGKDMYDVLAAMVPLYVAMILAYGSVRWVGIFTDPQCSGINRFV AVFAVPLLSFHFIS
SEQ ID NO:44 MITAADFYHVMTAMVPLYVAMILAYGSVKWKIFTDPQCSGINRFV ALFAVPLLSFHFIA
1 60

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* * * * *
SEQ ID NO:14 TNDPFAMNLRFLAADTLQKVAVLALLALASRGLSSPRALG-----LDWSITLFSLS
SEQ ID NO:30 SNNPYEMNLRFLAADTLQKIIILVLLAVW-----SNITKRG-----CLEWAITLFSLS
SEQ ID NO:34 SNDPYAMNYHFIAADCLQKVVLGALFLWNT----FTKHG-----SLDWTITLFSLS
SEQ ID NO:38 TNDPYAMDYRFLAADSLQKLVILAALAVWHNVLSRYRCRGTEAGEASSLDWTITLFSLS
SEQ ID NO:43 SNDPYAMNYHFIAADSLQKVVLAAALFLWQA----FSRRG-----SLEWMITLFSLS
SEQ ID NO:44 ANNPYAMNLRFLAADSLQKVIVLSLLFLW----CKLSRNG-----SLDWTITLFSLS
61 120

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SEQ ID NO:14 TLPNTLVMGIPLLRGMYGASSAGTLMVQVVVLQCIWYTLMLFLFEYRAARALVLDQFPD
SEQ ID NO:30 TLPNTLVMGIPLLKMGYGDFFS-GSLMVQIVVLQCIWYTLMLFLFEYRGARMLISEQFP-
SEQ ID NO:34 TLPNTLVMGIPLLKAMYGDFFS-GSLMVQIVVLQSVIYTLMLFLFEYRGAKLLITEQFP-
SEQ ID NO:38 TLPNTLVMGIPLLRAMYGDFFS-GSLMVQIVVLQSVIYTLMLFLFEYRGAKALLISEQFP-
SEQ ID NO:43 TLPNTLVMGIPLLRAMYGDFFS-GNLMVQIVVLQSIWYTLMLFLFEYRGAKLLISEQFP-
SEQ ID NO:44 TLPNTLVMGIPLLKMGYGNFFS-GDLMVQIVVLQCIWYTLMLFLFEYRGAKLLISEQFP-
121 180

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(57) Abstract: This invention relates to an isolated nucleic acid fragment encoding an auxin transport protein. The invention also relates to the construction of a chimeric gene encoding all or a substantial portion of the auxin transport protein, in sense or antisense orientation, wherein expression of the chimeric gene results in production of altered levels of the auxin transport protein in a transformed host cell. The present invention also relates to methods using the auxin transport protein in modulating root development, and in discovering compounds with potential herbicidal activity.



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MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:

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Published:

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— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

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.

INTERNATIONAL SEARCH REPORT

International Application No

PC1/US 00/12061

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/29 C12N15/82 C12N5/10 C12Q1/68 C07K14/415

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 C07K C12N C12Q

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)

EP0-Internal, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE EBI [Online] AC 081215, 1 November 1998 (1998-11-01) LUSCHNIG ET AL.: "Rice EIR1 homologue REH1" XP002146833 abstract ---	1-24
A	LUSCHNIG C ET AL: "EIR1, a root-specific protein involved in auxin transport, is required for gravitropism in Arabidopsis thaliana" GENES AND DEVELOPMENT, US, COLD SPRING HARBOR LABORATORY PRESS, NEW YORK, vol. 12, no. 14, 15 July 1998 (1998-07-15), pages 2175-2187, XP002116368 ISSN: 0890-9369 the whole document --- -/--	1-24

☒ Further documents are listed in the continuation of box C.

☒ 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

7 September 2000

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16.01.01

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/12061

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SCHWOB E ET AL: "MOLECULAR ANALYSIS OF THREE MAIZE 22 KDA AUXIN-BINDING PROTEIN GENES - TRANSIENT PROMOTER EXPRESSION AND REGULATORY REGIONS" PLANT JOURNAL,GB,BLACKWELL SCIENTIFIC PUBLICATIONS, OXFORD, vol. 4, no. 3, 1993, pages 423-432, XP002024567 ISSN: 0960-7412 the whole document ---	1-24
A	ZETTL R ET AL: "5' AZIDO-3 6-TRITIATED-1-NAPHTHYLPHTHALMIC ACID A PHOTOACTIVATABLE PROBE FOR NAPHTHYLPHTHALMIC ACID RECEPTOR PROTEINS FROM HIGHER PLANTS IDENTIFICATION OF A 23-KDA PROTEIN FROM MAIZE COLEOPTILE PLASMA MEMBRANES" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 89, no. 2, 1992, pages 480-484, XP002146831 1992 ISSN: 0027-8424 the whole document ---	1-24
A	GÄLWEILER L. ET AL.: "Regulation of polar auxin transport by AtPIN1 in Arabidopsis vascular tissue" SCIENCE, vol. 282, December 1998 (1998-12), pages 2226-2230, XP002146832 the whole document ---	1-24
A	EP 0 814 161 A (MAX PLANCK GESELLSCHAFT) 29 December 1997 (1997-12-29) cited in the application the whole document -----	1-24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/12061

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:

see additional 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.:

Claims 1-24, partially.

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

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-24 partially

An isolated polynucleotide derived from maize selected from the group of: a nucleotide sequence encoding a polypeptide of at least 30 amino acids that is at least 85% identical to the sequence set forth in SEQ ID NO:6, of at least 50 amino acids being at least 85% identical to SEQ ID NO:12, of at least 50 amino acids being at least 90% identical to SEQ ID NO:8, of at least 100 amino acids being at least 90% identical to SEQ ID NO:2, of at least 150 amino acids being at least 95% identical to SEQ ID NO:4, of at least 350 amino acids being at least 95% identical to SEQ ID NO:10, of at least 200 amino acids being at least 80% identical to SEQ ID NO:14, or of at least 250 amino acids being at least 90% identical to SEQ ID NO:48, or a polynucleotide sequence complementary thereto.

Said polynucleotide sequences comprising the sequences selected from SEQ ID NO:1,3,5,7,9,11,13,47, being DNA or RNA.

Chimeric genes, transformed host cells, proteins derived therefrom.

Use of said sequences in a method for modulating root development in plants, and for diagnostic screening purposes. Products derived from said diagnostic screening studies.

2. Claims: 1-24 partially

idem for SEQ ID NO:15-20 derived from rice

3. Claims: 1-24 partially

idem for SEQ ID NO:21-34 derived from soybean

4. Claims: 1-24 partially

idem for SEQ ID NO:35-42,45,46 derived from wheat

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/12061

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0814161 A	29-12-1997	AU 3539597 A	14-01-1998
		CA 2259125 A	31-12-1997
		WO 9749810 A	31-12-1997
		JP 2000513218 T	10-10-2000
