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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:
2 April 2009

(54) Title: INCREASING GRAIN YIELD THROUGH TARGETED REDUCTION IN ETHYLENE SIGNALING

(57) Abstract: The present invention is directed to plant genetic engineering. In particular, it is directed to producing green leaves and increasing productivity through inhibition of ethylene. The compositions and methods of the invention involve dominant negative ethylene receptors that interfere with ethylene signaling.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/70507

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12Q 1/68; C12N 15/82 (2009.01)

USPC - 435/6, 800/283

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(8) - C12Q 1/68; C12N 15/82 (2009.01)

USPC - 435/6, 800/283; 800/278, 800/282

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) - C12Q 1/68; C12N 15/82 (2009.01) - see keyword below

USPC - 435/6, 800/283; 800/278, 800/282 - see keyword below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST(USPT,PGPB,EPAB,JPAB); Medline, Google

Search terms: ethylene, insensitive, non, receptor, polypeptide, expression, promoter cereal, plant, maize, staygreen, cassette, reducing, sensitivity, promoter, transgenic, photosynthetic, capacity, multiple, embryos, single seed, senescence, biomarker,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y — A	US 2005/0066389 A1 (GALLIE et al.) 24 March 2005 (24.03.2005), entire document, especially Abstract, para [0003], [0005], [0008], [0048], [0051], [0073], [0080], [0086], [0116], [0123], [0124], and [0125]	1, 8-16, 18-19 ----- 17 --- 2, 5
Y	US 2007/0099303 A1 (ORTH et al.) 03 May 2007 (03.05.2007), para [0029]	17

☐ Further documents are listed in the continuation of Box C.

* 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 application or patent 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

12 January 2009 (12.01.2009)

Date of mailing of the international search report

22 JAN 2009

Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/70507

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:

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 claims 1, 2, 5, and 8-19 are directed to an isolated polynucleotide encoding a non-ethylene binding ethylene receptor polypeptide wherein the polypeptide sequence is SEQ ID NO:2.

Group II claims 1, 3, 6, and 8-19 are directed to an isolated polynucleotide encoding a non-ethylene binding ethylene receptor polypeptide wherein the polypeptide sequence is SEQ ID NO:4

Group III claims 1, 4, 7, and 8-19 are directed to an isolated polynucleotide encoding a non-ethylene binding ethylene receptor polypeptide wherein the polypeptide sequence is SEQ ID NO:6.

*****Continued in 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 additional fees, this Authority did not invite payment of 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.:
claims 1, 2, 5, and 8-19 are directed to SEQ ID NO: 2 and SEQ ID NO:1.

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/US 08/70507

Continuation of:

Box No III (unity of invention is lacking)

There is not a special technical feature shared by any of the Groups based on the unique polypeptide sequences as described herein below. The Groups do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the Groups lack the same or corresponding special technical features for the following reasons: The different polypeptides represented by the polypeptide sequences SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6 are not common to one another but are different because they are composed of unique amino acid sequences. (Note that SEQ ID NO 1 is a truncated representation of SEQ ID NO:2, encoding amino acids 1-110 of SEQ ID NO:2, SEQ ID NO 3 is a truncated representation of SEQ ID NO:4, encoding amino acids 1-147, of SEQ ID NO: 4, and SEQ ID NO 5 is a truncated representation of SEQ ID NO:6 encoding amino acids 1-147 of SEQ ID NO:6).