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ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: PLANT RNA BINDING PROTEIN, ENCODING NUCLEIC ACIDS, AND METHODS OF USE

(57) Abstract: A plant RNA binding protein and nucleic acid encoding it are disclosed. The RNA binding protein is a substrate for phosphorylation by protein kinase. In guard cells, the ABA-activated protein kinase (AAPK) phosphorylates the RNA binding protein resulting in an increased binding affinity for mRNA, particularly of stress-regulated mRNA. Vectors and transgenic plants containing the nucleic acid molecules are also disclosed.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/24197

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12N 15/29, 5/10, 15/63, 15/82; C07K 14/00

US CL : 536/23.6; 435/320.1, 419, 468; 530/350

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. : 536/23.6; 435/320.1, 419, 468; 530/350

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)
WEST, Agricola, CAPLUS, BIOSIS; GENESeq PIR, SWISS-PROT, SEPTEMBL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Database NCBI on STN, GenBank Accession No. AAG29156, LIN et al. "Arabidopsis thaliana Chromosome 1 BAC F11I4 Genomic Sequence". 03 November 2000, pages 1-2, see whole document.	1, 3-8, 12, 14-22
Y	LIN et al. Sequence and Analysis of Chromosome 2 of the plant Arabidopsis thaliana. Nature. 16 December 1999, Vol. 402, pages 761-768, see whole document.	1, 3-8, 12, 14-22
Y	Database NCBI on STN, GenBank Accession No. AAG29157. LIN et al. "Arabidopsis thaliana Chromosome 1 BAC F11I4 Genomic Sequence". 03 November 2000, pages 1-2, see whole document.	1, 3-8, 12, 14-22



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/US03/24197

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:
the claim is a multiple dependent claim that does not refer to previous claims in the alternative
3. ☒ Claim Nos.: 34
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, 3-8, 12, 14-22, SEQ ID NOs: 22 and 25

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.

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 1-111, claim(s) 1-12 and 14-22, all in part, drawn to products 1-111, an isolated nucleic acid molecule encoding a plant RNA binding protein comprising the RNA recognition motif of SEQ ID NO: 22, 23, or 24, and further comprises one or more sequences from the group consisting of SEQ ID NOs: 25-30, a vector comprising said isolated nucleic acid molecule, a plant cell or plant comprising said vector, and a protein produced by the expression of said nucleic acid molecule. The nucleic acid molecule of Group I encodes the RNA recognition motif of SEQ ID NO: 22 and further comprises SEQ ID NO: 25. The nucleic acid molecule of Groups 2-111 each encode a plant RNA binding protein comprising a different combination of one of SEQ ID NOs: 22-24 and one or more of SEQ ID NOs: 25-30.

Groups 112-124, claims(s) 13 and 23, both in part, drawn to products 112-124, an isolated nucleic acid molecule selected from SEQ ID NOs: 1, 3, 4, 6, 7, 9, 10, 12, 13, 14, 16, 18, or 20, and its encoded protein. Groups 112-124 each are drawn to one of the aforementioned nucleic acid molecules and its encoded protein.

Group 125, claim(s) 24, drawn to product 125, an antibody.

Group 126, claim(s) 25-28, drawn to product 126, an isolated nucleic acid molecule encoding a plant RNA binding protein comprising SEQ ID NO: 31 and SEQ ID NO: 33.

Group 127 claim(s) 25-28, drawn to product 127, an isolated nucleic acid molecule encoding a plant RNA binding protein comprising SEQ ID NO: 31 and SEQ ID NO: 34.

Group 128, claim(s) 25-28, drawn to product 128, an isolated nucleic acid molecule encoding a plant RNA binding protein comprising SEQ ID NO: 32 and SEQ ID NO: 33.

Group 129, claim(s) 25-28, drawn to product 129, an isolated nucleic acid molecule encoding a plant RNA binding protein comprising SEQ ID NO: 32 and SEQ ID NO: 34.

Group 130, claim(s) 29, 30, drawn to product 130, a genetically altered plant having altered response to ABA, comprising an ABA-mediated phosphorylation-regulated RNA binding protein that is substantially non-functional or absent, wherein said plant is produced by mutagenesis and selection.

Group 131, claim(s) 29, 31-33, drawn to product 131, a genetically altered plant having altered response to ABA, comprising an ABA-mediated phosphorylation-regulated RNA binding protein that is substantially non-functional or absent, wherein said plant is produced by introducing into a plant cell a transgene that results in the plant cell's ABA-mediated phosphorylation-regulated RNA binding protein becoming substantially non-functional or absent, and regenerating a plant from said cell.

Group 132, claim(s) 35, 36, drawn to product 132, a genetically altered plant having altered response to ABA, comprising an ABA-mediated phosphorylation-regulated RNA binding protein that is increased in amount or activity.

Group 133, claim(s) 37-40, drawn to a first method, for improving a plant's ABA-regulated response to a stressor, comprising altering the amount or activity of one or more phosphorylation-regulated RNA binding proteins in the plant.

Group 134, claim(s) 37-40, drawn to a second method, for improving a plant's ABA-regulated response to a stressor, comprising altering the amount or activity of an ABA-activated protein kinase with respect to a phosphorylation-regulated RNA binding protein.

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Group 135, claim(s) 37-40, drawn to third method, for improving a plant's ABA-regulated response to a stressor, comprising altering a gene sequence encoding a transcript such that the transcript will be bound with altered affinity by a phosphorylation-regulated RNA binding protein upon phosphorylation.

Group 136, claim(s) 41, drawn to a fourth method, to alter the expression or activity of a stress-related protein in a plant, comprising altering the amount or activity of a phosphorylation-regulated RNA binding protein.

Group 137, claim(s) 42-44, drawn to a fifth method, to alter ABA sensitivity in a plant, comprising increasing an amount or activity of ABA-mediated phosphorylation-regulated RNA binding protein.

Group 138, claim(s) 45-57, drawn to product 133, an isolate plant protein having RNA binding properties.

The inventions listed as Groups 1-138 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 sequence combination of SEQ ID NOs: 22 and 25 of Group I is a special technical feature that is not shared with any of the other groups. The alternative sequence combinations of Groups 1-111 have structures that are distinct from each other, and do not share a special technical feature. The structure of the nucleic acid molecules of Groups 1-111 are also not shared with the nucleic acid molecules of Groups 112-124, each of which also have structures that are distinct from each other. The nucleic acid sequences of Groups 1-124 each have separate structures from the antibody of Group 125. The plant of Group 130, produced by mutagenesis, is not shared with the plants of Groups 131 and 132. The plant of Group 131, produced by introduction of a transgene, is not shared with the plant of Group 132, which comprises an increased amount or activity of an ABA-mediated phosphorylation-regulated RNA binding protein. The methods of Groups 133-137 comprise different steps that are not shared with each other. The alteration of the expression or activity of a stress-related protein of Group 136 is not shared with the methods of Groups 133-135 or 137.

Claim 34 will not be searched as it is an improper multiple dependent claim.