

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 February 2003 (27.02.2003)

PCT

(10) International Publication Number
WO 03/016551 A3

(51) International Patent Classification⁷: **C12N 15/09**,
15/29, 15/82, 15/52, 15/63

(21) International Application Number: PCT/US02/26312

(22) International Filing Date: 16 August 2002 (16.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/312,863 16 August 2001 (16.08.2001) US

(71) Applicant (*for all designated States except US*): **BOYCE THOMPSON INSTITUTE FOR PLANT RESEARCH, INC.** [US/US]; Tower Road, Ithaca, NY 14853-1801 (US).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **KLESSIG, Daniel, F.** [US/US]; 35 Wedgewood Drive, Ithaca, NY 14850 (US).
KUMAR, Dharendra [IN/US]; 409 Lake Street, Apt. C35, Ithaca, NY 14850 (US).

(74) Agents: **RIGAUT, Kathleen, D.** et al.; Dann, Dorfman, Herrell and Skillman, Suite 720, 1601 Market Street, Philadelphia, PA 19103 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(88) Date of publication of the international search report:
20 November 2003

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: NOVEL SALICYLIC ACID-BINDING PROTEIN ENCODING NUCLEIC ACID, SABP2, AND METHODS OF USE THEREOF

(57) Abstract: Novel nucleic acid molecules encoding SA-binding proteins involved in SA-mediated disease resistance responses are disclosed. Methods of use of the nucleic acid molecules and proteins of the invention are also provided.



WO 03/016551 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/26312

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12N 15/09, 15/29; 15/82; 15/52, 15/63

US CL : 536/23.2, 23.6, 24.1; 435/69.1, 320.1, 419, 468; 800/278, 279, 306, 298, 295; 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. : 536/23.2, 23.6, 24.1; 435/69.1, 320.1, 419, 468; 800/278, 279, 306, 298, 295; 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)

STN CAS, WEST2.1

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 95/12304 A1 (RUTGERS UNIVERSITY) 11 May 1995 (11.05.1995), pages 61-82, Examples 20-30.	1-10, 12 18-19, 32-34, 40
Y	CHEN et al. Identification of a soluble salicylic acid-binding protein that may function in signal transduction in the plant disease-resistance response. Proc. Natl. Acad. Sci. USA. September 1991, Vol. 88, pp. 8179-8183	26-31
Y	JIRAGE et al. Arabidopsis thaliana PAD4 encodes a lipase-like gene that is important for salicylic acid signaling. PNAS. November 1999, Vol. 96, No. 23, pp. 13583-13588.	11, 13, 14
Y	SANCHEZ-CASAS et al. A Salicylic Acid-Binding and a Salicylic Acid-Inhibitable Catalase Activity Are Present in a Variety of Plant Species. Plant Physiol. 1994, Vol. 106, pp. 1675-1679, especially pages 1676-1677.	41-42
Y	CONTRATH et al. Two inducers of plant defense responses, 2,6-dichloroisonicotinic acid and salicylic acid, inhibit catalase activity in tobacco. Proc. Natl. Acad. USA. August 1995, Vol. 92, pp. 7143-7147, especially pages 7145-7146.	16-17
Y	DU et al. Identification of a Soluble, High-Affinity Salicylic Acid-Binding Protein in Tobacco. Plant Physiol. 1997, Vol. 113, pp. 1319-1327, especially pages 1320-1324.	51-58



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 application or patent 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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

30 June 2003 (30.06.2003)

Date of mailing of the international search report

14 JUL 2003

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Medina A. Ibrahim

Telephone No. (703) 308-0196

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/26312

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.: 1-14, 16-19, 26-34, 40-44, 51-60 and SEQ ID NO:1-2, and SEQ ID NO:36

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.:

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

PCT/US02/26312

The inventions listed as Groups I-LI 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 special technical feature of Group I is considered to be the isolated nucleic acid of SEQ ID NO: 1, transgenic plant comprising it, and a method for using said nucleic acid to transform a plant.

The special technical feature of Group II is considered to be an isolated polypeptide.

The special technical feature of Group III is considered to be an antibody.

The special technical feature of Group IV is considered to be a method of identifying agents that modulate SABP2 activity/expression.

The special technical feature of Group V is considered to be a method to inhibit SABP2 function by antisense molecule of SEQ ID NO: 1 or by an intron containing double-stranded RNA segment of SEQ ID NO: 1.

The special technical feature of Group VI is considered to be a screening method for identifying compounds having SABP2 binding affinity.

The special technical feature of Group VII is considered to be a method for identifying agents that modulate SABP2 homolog activity/expression in a host cell.

The special technical feature of Group VIII is considered to be a method of transforming a plant with SEQ ID NO: 36 and a transgenic plant comprising said sequence.

The special technical feature of Group IX is considered to be a method of transforming a plant with SEQ ID NO: 40 and a transgenic plant comprising said sequence.

The special technical feature of Group X is considered to be a method of transforming a plant with SEQ ID NO: 36 added with a modifying agent.

The special technical feature of Group XI is considered to be a method of transforming a plant with SEQ ID NO: 40 added with a modifying agent.

The special technical feature of Group XII is considered to be a method to inhibit SABP2 function in a plant by antisense molecule of SEQ ID NO: 36 or by an intron containing double-stranded RNA segment of SEQ ID NO: 36.

The special technical feature of Group XIII is considered to be a method to inhibit SABP2 function in a plant by antisense molecule of SEQ ID NO: 40 or by an intron containing double-stranded RNA segment of SEQ ID NO: 40.

The special technical feature of Group XIV-XXXII is considered to be a screening method for identifying compounds having binding affinity for SABP2 homolog encoded by any one of SEQ ID NO: 31-49.

The special technical feature of Group XXXIII-LI is considered to be a screening method to identify SABP2 orthologs by using functional SABP2 homolog encoded by any one of SEQ ID NO: 31-49.

In addition, inventions of SEQ ID NO: 1, 31-48 and 49 are not so linked by a single special technical feature because there is no shared significant structural element between the polynucleotides. The only technical feature in common between the polynucleotides is that they all encode a polypeptide having SA-mediated defense activity in plants. Such a feature does not define a contribution over the prior art as evidenced by Applicant's admitted prior art (Bowling et al (1994); Dietrich et al (1994); and Greenberg et al (1994).

Inventions I-II are not linked by a single special technical feature because they are drawn to functionally and structurally different products. The only special technical feature in common between the two groups is that the polypeptide of Group II is encoded by the nucleic acid of Group I. However, such a feature is known in the prior art and does not define a contribution over the prior art.

Inventions II-III are not linked by a single special technical feature because they are drawn to functionally different products. The only special technical feature in common between the two groups is that the antibody binds to the polypeptide of Group II. However, such a feature is known in the prior art and does not define a contribution over the prior art.

Finally, where multiple products and multiple methods are claimed, Applicant is entitled unity of invention between the first product and the first method of using the product (PCT rule 37 CFR 1.47(d)).

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 searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-10, 12, 18-19, 32-34 and 40, drawn to an isolated nucleic acid molecule of SEQ ID NO:1 encoding SABP2, an expression vector, a method for using said nucleic acid molecule, and transgenic plant cell and plants comprising said nucleic acid molecule.

Group II, claim(s) 11, 13 and 14, drawn to isolated polypeptides.

Group III, claim(s) 15, drawn to an antibody.

Group IV, claim(s) 16-17, drawn to a method for identifying agents that modulate SABP2 activity/expression in a host cell.

Group V, claim(s) 20-25 and 35-39, drawn to a method to inhibit SABP2 function in transgenic plants by antisense or by intron containing double stranded RNA segment of SEQ ID NO:1 and transgenic plants produced by said method.

Group VI, claim(s) 26-31, drawn to a screening method for identifying compounds having SABP2-binding affinity.

Group VII, claim(s) 41-42, drawn to a method for identifying agents that modulate SABP2 homolog activity/expression in a host cell.

Group VIII, claim(s) 43 and 59-60, drawn to a method of transforming a plant with SEQ ID NO: 36 and a transgenic plant comprising said sequence.

Group IX, claim(s) 43 and 59-60, drawn to a method of transforming a plant with SEQ ID NO: 40 and a transgenic plant comprising said sequence.

Group X, claim(s) 44, drawn to a method of transforming a plant with SEQ ID NO: 36 added with a modifying agent.

Group XI, claim(s) 44, drawn to a method of transforming a plant with SEQ ID NO: 40 added with a modifying agent.

Group XII, claim(s) 45-50 and 61-63, drawn to a method to inhibit SABP2 homolog function/ expression in a plant using antisense molecule of SEQ ID NO:36 or intron containing double stranded RNA segment of SEQ ID NO: 36.

Group XIII claim(s) 45-50 and 61-63, drawn to a method to inhibit SABP2 homolog function/expression using antisense molecule of SEQ ID NO:40 or intron containing double stranded RNA segment of SEQ ID NO: 40.

Group XIV-XXXII, claim(s) 51-58, drawn to a screening method for identifying compounds having binding affinity for SABP2 homolog encoded by any one of SEQ ID NO: 31-49. For example, if Group XIII is elected, a screening method that employs the SABP2 homolog encoded by SEQ ID NO: 31 will be searched. If Group XIV is elected, a screening method that employs the SABP2 homolog encoded by SEQ ID NO: 32 will be searched.

Group XXXIII-LI, claim(s) 64-66, drawn to a screening method to identify SABP2 orthologs by using SABP2 homolog encoded by any one of SEQ ID NO: 31-49. For example, if Group XXXIII is elected, a screening method that employs the SABP2 homolog encoded by SEQ ID NO: 31 will be searched. If Group XXXIV is elected, a screening method that employs the SABP2 homolog encoded by SEQ ID NO: 32 will be searched.