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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations 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, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, 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, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations 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, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, 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, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- of inventorship (Rule 4.17(iv)) for US only

Published:

- with international search report

[Continued on next page]

(54) Title: TOCOPHEROL BIOSYNTHESIS RELATED GENES AND USES THEREOF

(57) Abstract: The present invention relates to genes associated with the tocopherol biosynthesis pathway. More particularly, the present invention provides and includes nucleic acid molecules and proteins associated with genes that encode polypeptides associated with the tocopherol biosynthesis pathway. The present invention also provides methods for utilizing such agents, for example in gene isolation, gene analysis, and the production of transgenic plants. Moreover, the present invention includes transgenic plants modified to express the aforementioned polypeptides. In addition, the present invention includes methods for the production of products from the tocopherol biosynthesis pathway as well as in production of plants that are drought resistant.

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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.

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

3 March 2005

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/25276

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12N 15/29, 15/83; A01H 5/00, 5/10

US CL : 536/23.6; 435/419; 800/281, 289, 298

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; 435/419; 800/281, 289, 298

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.
X	Database GenEmbl on STIC, European Bioinformatics Institute, (Hinxton, Cambridge, UK), Accession No. AL162875, Arabidopsis thaliana DNA chromosome 5, BAC clone T32M21 (ESSA project), BEVAN et al., Gene Sequence, 31 March 2000.	1, 4 -----
Y		5-16, 18-22, 24, 31-33
Y	WO 00/10380 (UNIVERSITY OF NEVADA) 2 March 2000 (02.03.2000), abstract, page 3 lines 5-25, page 4 lines 5-11, page 5 line 30 to page 6 line 21, page 8 line 8 to page 9 line 10, page 16 line 26 to page 21 line 4.	5-16, 18-22, 24, 31-33

☐ 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**"E"** earlier application or patent 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

09 December 2004 (09.12.2004)

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10 JAN 2005

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/25276

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, 4-16, 18-22, 24, 31-33 directed to SEQ ID NOS: 1,2 and MT1

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

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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, claim(s) 1-24 and 31-33, drawn to a nucleic acid, plant, seed and first method of using the nucleic acid.

Group II, claim(s) 25, drawn to an oil.

Group III, claim(s) 26-29 and 34, drawn to a polypeptide.

Group IV, claim(s) 30, drawn to a second method of using the nucleic acid.

Group V, claim(s) 35-36, drawn to a third method of using the nucleic acid (dsRNAi).

Group VI, claim(s) 35-36, drawn to a third method of using the nucleic acid (antisense).

Group VII, claim(s) 35-36, drawn to a third method of using the nucleic acid (sense suppression).

In election one from Groups I-VII above, Applicant is also required to elect one of the sequences of SEQ ID NO:2, 6, 20-68, 74 and 77-79. If SEQ ID NO:74, 77, or 78 is elected, Applicant must further elect SEQ ID NO:75 or 76. If SEQ ID NO:71, 72 or 73 is elected, Applicant must further elect SEQ ID NO:69 or 70.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

SEQ ID NO:13-16, 18, 19, MT1, tMT2, GMT, tyrA, HPT, tocopherol cyclase, chlorophyllase, dxs, dxr, GGPPS, HPPD, AANT1, IDI, and GGH.

The inventions listed as Groups I-VII 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 nucleic acids encode enzymes which were known in the prior art, as they were identified using sequence alignment with prior art enzymes. Thus, it would follow that the oils obtained using these enzymes would not share the same special technical features over prior art oils; and the methods using these nucleic acids would be also applicable to prior art nucleic acids.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: the species set forth are prior art sequences/ enzymes. Accordingly, the claimed invention lacks unity.

INTERNATIONAL SEARCH REPORT

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Continuation of B. FIELDS SEARCHED Item 3:

STN (agricola, biosis, biotechno, caba, caplus, medline, uspatfull): inventor names, phytol kinase, tocopherol biosynthesis, MT1.
STIC sequence search for SEQ ID NOS: 1, 2.