

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number
WO 2004/011667 A3

(51) International Patent Classification:

C12N 15/00 (2006.01) *C12N 1/21* (2006.01)
C12N 15/63 (2006.01) *C07H 21/04* (2006.01)
C12N 5/16 (2006.01) *C12Q 1/48* (2006.01)
C12N 5/14 (2006.01) *C07K 1/00* (2006.01)

(21) International Application Number:

PCT/US2003/023159

(22) International Filing Date: 23 July 2003 (23.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/400,081 31 July 2002 (31.07.2002) US

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(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, SC, SD, SE, SG, 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, 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).

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:

13 July 2006

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: GERANYL DIPHOSPHATE SYNTHASE MOLECULES, AND NUCLEIC ACID MOLECULES ENCODING SAME

(57) Abstract: In one aspect, the present invention provides isolated nucleic acid molecules that each encode a geranyl diphosphate synthase protein, wherein each isolated nucleic acid molecule hybridizes to a nucleic acid molecule consisting of the sequence set forth in SEQ ID NO:1 under conditions of 5 X SSC at 45 °C for one hour. The present invention also provides isolated geranyl diphosphate synthase proteins, and methods for altering the level of expression of geranyl diphosphate synthase protein in a host cell.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/23159

A. CLASSIFICATION OF SUBJECT MATTER

IPC: C12N 15/00(2006.01),15/63(2006.01),5/16(2006.01),5/14(2006.01),1/21(2006.01);C07H 21/04(2006.01)
C12Q 1/48(2006.01);C07K 1/00(2006.01)

USPC: 435/320.1,69.1,193,15,440,325,252.3,410;530/350;536/23.2

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. : 435/320.1,69.1,193,15,440,325,252.3,410;530/350;536/23.2

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)
CAPLUS, MEDLINE, BIOSIS, GENBANK, SCISEARCH, EMBASE, WEST, GENESEQ, PIR, UNIPROT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6043072 A (CROTEAU et al.) 28 March 2000 (28.03.2000), column 13, line 8 through column 20, line 5; SEQ ID NO: 21 and 23 (74% sequence identity between nucleotides 7-990).	1-3,10-18,21
X,P --- Y,P	BURKE et al. Geranyl diphosphate synthase from Abies grandies: cDNA isolation, functional expression, and characterization, Archives of Biochemistry and Biophysics 2002, Vol 405, pages 130-136, entire document; 100% sequence identity.	1-3, 10-15, 21 ----- 16-18

☐ 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

02 April 2006 (02.04.2006)

Date of mailing of the international search report

12 MAY 2006

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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) 1-5, 10-18, 21-26, drawn in part to a polynucleotide encoding the polypeptide of SEQ ID NO: 3, the polypeptide of SEQ ID NO: 3, vectors and host cells comprising said polynucleotide, and a method of use of said polynucleotide for increasing or decreasing the level of geranyl diphosphate synthase activity in a cell.

Group II, claim(s) 1-3, 6-7, 10-18, 21, 23, 27, drawn in part to a polynucleotide encoding the polypeptide of SEQ ID NO: 5, the polypeptide of SEQ ID NO: 5, vectors and host cells comprising said polynucleotide and a method of use of said polynucleotide for increasing the level of geranyl diphosphate synthase activity in a cell.

Group III, claim(s) 1-3, 6-7, 10-18, 21, 23, 28, drawn in part to a polynucleotide encoding the polypeptide of SEQ ID NO: 7, the polypeptide of SEQ ID NO: 7, vectors and host cells comprising said polynucleotide and a method of use of said polynucleotide for increasing the level of geranyl diphosphate synthase activity in a cell

Group IV, claim(s) 29-32, drawn in part to the polypeptide of SEQ ID NO: 10.

Group V, claim(s) 29 and 33, drawn in part to the polypeptide of SEQ ID NO: 14.

Group VI, claim(s) 29 and 34, drawn in part to the polypeptide of SEQ ID NO: 18.

Group VII, claim(s) 19-20, 35-36, drawn to a transgenic plant/plant tissue comprising a nucleic acid which hybridizes to the polynucleotide of SEQ ID NO: 1 or the polynucleotide of SEQ ID NO: 2.

The inventions listed as Groups I-X 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:

According to PCT Rule 13.2 and to the guidelines in Section (f)(i)(B)(1) of Annex B of the PCT Administrative Instructions, all alternatives of a Markush Group must have a common property or activity. Although the polynucleotides/polypeptides of Groups I-III and the polypeptides of Groups IV-VI share a common property within Groups I-III and IV-VI in that they are either nucleic acids or proteins, the compounds are not regarded as being of similar nature because all the alternatives do not share a common structure or function. It is noted that each of the polynucleotides/polypeptides of Groups I-III and IV-VI appear to encode/be different geranyl diphosphate synthases as indicated in the Sequence Listing and page 5 of the specification.

According to PCT Rule 13.2, unity of invention exists only when there is a share same or corresponding technical feature among the claimed inventions. The transgenic plants of Group VII, the polypeptides of Groups IV-VI, and the polynucleotides/polypeptides of Groups I-III do not share the same or corresponding special technical feature. The special technical feature of Group VII is a transgenic plant which comprises a vector comprising a nucleic acid which hybridizes to the polynucleotide of SEQ ID NO: 1 or 2. The special technical feature of Groups I-III is the polypeptide of SEQ ID NO: 3, 5 or 7. The special technical feature of Groups IV-VI is the polypeptide of SEQ ID NO: 10, 14, or 18. Therefore, each of the groups have a different special technical feature not shared by the remaining groups.