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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: PRODUCTION OF FLAVONOIDS BY RECOMBINANT MICROORGANISMS

(57) Abstract: Methods and compositions are provided for production of flavonoids in microbial hosts. The compositions comprises a set of genes which encode for enzymes involved in one or more steps in the biosynthetic pathway for the conversion of phenylpropanoids to various flavonoids. The method comprises the steps of introducing the set of genes into a heterologous host cell, allowing growth of the cells in a suitable medium such that the expression of the genes results in production of enzymes. When specific substrate(s) is/are provided to the transformed cell, the enzymes act on the substrate(s) to produce the desired flavonoids.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US05/24525

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) : C12P, 1/00, C12N 15/82
 US CL : 435/041, 435/468, 435/233

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. : 435/468, 435/233, 800/278

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Hwang et al. Production of Plant-specific flavanones by E. coli containing an artificial gene cluster, Appld Environ. Microbiol., May 2003, pp 2699-2706.	1-2, 11
X, P	Ralston, et al. Partial reconstruction of flavonoid and isoflavonoid biosynthesis in yeast using soyabean type I and type II chalcone isomerase Plant Physiolo. Prereview, January 2005, PP 1-14.	1-2, 11
A	Schijlen, et. al, Modification of flavonoid biosynthesis in crop plants, Phytochemistry, September 2004, vol. 65, pp 2631-2648	1-2, 11

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

24 January 2006 (24.01.2006)

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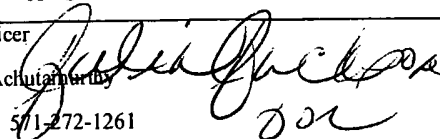
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US05/24525

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:
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 additional fees, this Authority did not invite payment of any 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.: 1-2 and 11

- 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.

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

Group I. Claims 1-2, 11, drawn to method of producing flavonoids wherein flavonoid is flavanone, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group II. Claims 1,3, 11-12, drawn to method of producing flavonoids wherein flavonoid is flavone, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group III. Claims 1, 4, 11-12, drawn to method of producing flavonoids wherein flavonoid is flavonols, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group IV. Claims 1, 5, 11-12. drawn to method of producing flavonoids wherein flavonoid is dihydroflavonols, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group V. Claims 1, 6, 11-12, drawn to method of producing flavonoids wherein flavonoid is flavan-3-ols, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group VI. Claims 1, 7, 11-12, drawn to method of producing flavonoids wherein flavonoid is flavan-4-ols, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group VII. Claims 1, 8, 11-12, drawn to method of producing flavonoids wherein flavonoid is flavan-3, 4-diols, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group VIII. Claims 1, 9,11-12, drawn to method of producing flavonoids wherein flavonoid is anthocyanins, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group IX. Claims 1, 10-12, drawn to method of producing flavonoids wherein flavanone is anthocyanidins, in a host cell comprising an introduction of set of genes encoding one or more enzymes.

Group X. Claims 14-20, drawn to composition comprising one or more vectors comprising gene encoding flavonoid-producing enzymes

The technical feature of group I-IX involve methods step of production of different class of flavonoids using host cell having different gene or set of genes. Since each class of compounds has distinct structure, properties and involve a set of genes having different structure and utilities, each contain a unique technical feature. Therefore they do not share their technical features.

The technical features of group X is composition of a set of genes that used in the method steps of group I-IX. The technical feature linking group I-IX and X, the gene or set of genes do not constitute a special technical feature as defined by PCT Rule 13.2, because it does not claim a feature which defines a contribution over the prior art as prior art taught it thorough Moriguchi et al (Sci and Tech 2003, Vol 1, 22-25)