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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: COMBINATIONS OF GENES FOR PRODUCING SEED PLANTS EXHIBITING MODULATED REPRODUCTIVE DEVELOPMENT

(57) Abstract: The present invention provides plants that exhibit modulated reproductive development and methods of modulating the timing of reproductive development in plants.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/14719

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A01H 5/00; C12N 15/82
US CL : 800/278, 290, 287, 298; 435/468, 69.1; 536/23.1, 23.6

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. : 800/278, 290, 287, 298; 435/468, 69.1; 536/23.1, 23.6

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, BIOSIS, CAPLUS, CABA, sequence search for SEQ ID NO:2 & 28

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,844,119 A (WEIGEL) 01 DECEMBER 1998 (01.12.1998), claim 1, columns 6-7 and 11-18.	32-35, 37, 39, 41, 43-46, 48-49
Y	DAVIES B., et al. Alteration of tobacco floral organ identity by expression of combinations of Antirrhinum MADS-box genes. The Plant Journal. 1996, Vol. 10, No. 4, pages 663-677, entire document.	1, 3-4, 7-10, 12, 14, 24
A	HONMA, T., et al. Complexes of MADS-box proteins are sufficient to convert leaves into floral organs. Nature. 25 January 2001, Vol. 409, pages 525-529, entire document.	1-10, 12, 14-16, 24-25, 32-35, 37, 39-50, 58-59

☐ 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
10 September 2003 (10.09.2003)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/14719

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.: 1-10, 12, 14-16, 24-25, 32-35, 37, 39-50, 58-59 SEQ ID NO:2 & 28

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

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, claims 1-10, 12, 14-16, 24-25, 32-35, 37, 39-50, and 58-59 are drawn to a transgenic plant comprising two nucleic acid coding sequences operably linked to a modified gene regulatory element wherein the SEQ ID NO:2 and SEQ ID NO:28 are both in sense orientation, and a method of modulating the timing of reproductive development.

Groups II-XXIV, claims 1-10, 12, 14-35, 37, and 39-65 are drawn to a transgenic plant comprising two nucleic acid coding sequences operably linked to a modified gene regulatory element wherein the first and second nucleic acid coding sequences are both in sense orientation, and a method of modulating the timing of reproductive development.

Group XXV-XLVIII, claims 1-10, 13-35, 38-65 are drawn to a transgenic plant comprising two nucleic acid coding sequences operably linked to a modified gene regulatory element wherein the first sequence is in sense orientation and the second nucleic acid coding sequence is in antisense orientation, and a method of modulating the timing of reproductive development.

Group XLIX-LXXII, claims 1-9, 11, 13, 14-34, 36, 38-65 are drawn to a transgenic plant comprising two nucleic acid coding sequences operably linked to a modified gene regulatory element wherein the first and second nucleic acid coding sequences are both in antisense orientation, and a method of modulating the timing of reproductive development.

Group LXXIII-XCVI, claims 1-9, 11-12, 14-34, 36-37, 39-65 are drawn to a transgenic plant comprising two nucleic acid coding sequences operably linked to a modified gene regulatory element wherein the first sequence is in antisense orientation and the second nucleic acid coding sequence is in sense orientation, and a method of modulating the timing of reproductive development.

Claims 1-9, 14-16, 24-25, 32-34, 39-50 and 58-59 are generic to Groups I-XCVI and will be examined to the extent that they read on the elected invention.

When electing one of Groups II-XCVI, Applicant is also to select two sequences; one from **GROUP "A"** and one from the **GROUP "B"**.

GROUP "A":

SEQ ID NO:2 SEQ ID NO:4 SEQ ID NO:6

SEQ ID NO:8 SEQ ID NO:10 SEQ ID NO:12

GROUP "B":

SEQ ID NO:28 SEQ ID NO:30 SEQ ID NO:32

SEQ ID NO:38

The inventions listed as Groups I-XCVI 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: transforming a plant with two MADS box genes for the purpose of altering reproductive development is taught in the prior art. Krizet et al (1996 Development 122:11-22) teach over-expressing APETALA3 and PISTILLATA genes in Arabidopsis. The expression of both genes, which are both MADS box genes, changed the reproductive development of Arabidopsis.

In addition, the claims are not linked by a single special technical feature because they are each drawn to products and processes not required by the other. The transgenic plant comprising SEQ ID NO:2 and SEQ ID NO:28 of Group I, is not required for any of the other transgenic plants expressing the combination of genes as specified in Groups II-XXIV, which is not required for the transgenic plants expressing the genes as specified in Groups XXV-XLVIII, wherein the first sequence is in sense orientation and the second nucleic acid is in antisense orientation, which is not required for the transgenic plants expressing the genes as specified in Groups XLIX-LXXII wherein the first and second nucleic acids are both in antisense orientation, or which is not required for the transgenic plants expressing the genes as specified in Groups LXXIII-XCVI wherein the first nucleic acid is in antisense orientation and the second nucleic acid is in sense orientation.