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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.

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(54) Title: COMPOSITIONS AND METHODS FOR THE MODIFICATION OF GENE TRANSCRIPTION

(57) Abstract: Novel isolated polynucleotides that encode plant transcription factors are provided, together with DNA constructs comprising such polynucleotides. Methods for using such constructs in modulating the expression of endogenous and/or heterologous genes are also disclosed, together with transgenic plants comprising such constructs.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06112

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :C12N 5/00, 15/00; C07H 21/02, 21/04

US CL :435/320.1, 325, 410; 536/23.1, 23.4, 23.6, 24.1, 24.2

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, 325, 410; 536/23.1, 23.4, 23.6, 24.1, 24.2

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	VALLE et al. Isolation and expression pattern of *hahr1*, a homeobox-containing cDNA from *Helianthus annuus*. Gene. 1997, Vol. 196, pages 61-68, see in particular abstract and figure 1 with respect to SEQ ID NOS: 3-4.	3, 11
X	SCHENA et al. HD-Zip proteins: Members of an *Arabidopsis* homeodomain protein superfamily. PNAS. May 1992, Vol. 89, pages 3894-3898, see in particular abstract and figure with respect to SEQ ID NO: 7.	3, 11

[X] 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 document 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 16 AUGUST 2000	Date of mailing of the international search report 25 SEP 2000
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 MARIANNE P. ALLEN Telephone No. (703) 308-0196

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06112

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BRADLEY et al. Complementary Floral Homeotic Phenotypes Result from Opposite Orientations of a Transposon at the *plena* Locus of Antirrhinum. Cell. 15 January 1993, Vol. 72, pages 85-95, see in particular abstract and figure 3 with respect to SEQ ID NO: 10.	3, 11
X ----- Y	AU 39013/95 A (COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION) 30 May 1996 (30-05-96), see entire document with respect to SEQ ID NOS: 9, 27, 28, and 32.	1-6, 11 ---------- 10, 13-21
X	WO 98/13503 A1 (F.B. INVESTMENTS PTY. LTD.) 02 April 1998 (02-04-98), see entire document with respect to SEQ ID NO: 31.	3, 11
X, P	US 5,907,082 A (O'NEILL et al) 25 May 1999 (25-05-99), see SEQ ID NO: 1 with respect to SEQ ID NOS:29 and 365.	3-4, 11
X	WO 98/54328 A2 (WASHINGTON STATE UNIVERSITY RESEARCH FOUNDATION) 03 December 1998 (03-12-98), see abstract and figures with respect to SEQ ID NO: 12.	3, 11
X	SOUTHERTON et al. Eucalypt MADS-Box Genes Expressed in Developing Flowers. Plant Physiol. 1998, Vol. 118, pages 365-372, see abstract and figures with respect to SEQ ID NO: 106.	4, 11
X	Genbank Accession Number AF029975, 19 November 1998 (19-11-98) with respect to SEQ ID NO: 106.	3, 11
X	KAWAHARA et al. Isolation and characterization of homeobox-containing genes of carrot. Plant Molecular Biology. 1995, Vol. 27, pages 155-164, see in particular abstract and note on page 155 regarding sequence databases with respect to SEQ ID NOS: 60 and 66.	3, 11
X	MA et al. Identification of a homeobox-containing gene with enhanced expression during soybean (*Glycine max* L.) somatic embryo development. Plant Molecular Biology. 1994, Vol. 24, pages 465-473, see in particular abstract and note on page 465 regarding nucleotide sequence databases with respect to SEQ ID NO: 76.	3, 11
X	WO 98/22592 A1 (WISCONSIN ALUMNI RESEARCH FOUNDATION) 28 May 1998 (28-05-98), see abstract and sequence listing with respect to SEQ ID NO: 97.	3, 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06112

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 93/14211 A1 (COEN et al) 22 July 1993 (22-07-93), see in particular abstract and SEQ ID NO: 1 with respect to SEQ ID NO: 223.	3, 11
X	NEWMAN et al. Genes Galore: A Summary of Methods for Accessing Results from Large-Scale Partial Sequencing of Anonymous *Arabidopsis* cDNA Clones. Plant Physiol. 1994, Vol. 105, pages 1241-1255, with reference to SEQ ID NO: 225.	3,11
X	Genbank Accession Number T42925, 06 November 1997 (06-11-97) with respect to SEQ ID NO: 225.	3, 11
X	PERREY et al. Molecular cloning of a lupin-specific gene from a cDNA library of suspension-cultured cells of *Lupinus polyphyllus*. Plant Molecular Biology. 1990, Vol. 15, pages 175-176, see in particular Figure 1 with respect to SEQ ID NO: 320.	3-4, 11
X, P	SUNDSTROM et al. MADS-Box Genes Active in Developing Pollen Cones of Norway Spruce (*Picea abies*) Are Homologous to the B-Class Floral Hometoic Genes in Angiosperms. Developmental Genetics. 1999, Vol. 25, pages 253-266, with respect to SEQ ID NOS: 333 and 350.	3-4, 11
X, P	Genbank Accession Number AF158543, 16 December 1999 (16-12-99) with respect to SEQ ID NOS: 333 and 350.	3-4, 11
X, P	Genbank Accession Number AW010840, 10 September 1999 (10-9-99) with respect to SEQ ID NO: 338.	3-5, 11
X	WO 96/35784 A2 (BOEHRINGER INGELHEIM INTERNATIONAL GMBH) 14 November 1996 (14-11-96), see in particular abstract and figures with respect to SEQ ID NO: 349.	3, 11
X, E	Genbank Accession Number AW394752, 17 July 2000 (17-07-00) with respect to SEQ ID NO: 349.	3-4, 11
X, P	Genbank Accession Number AF120097, 01 February 2000 (01-02-00) with respect to SEQ ID NO: 350.	3-6, 11
A	Genbank Accession Number U90348, 10 October 1997 (10-10-97) with respect to SEQ ID NO: 360.	1-6, 10-11, 13-20
A, E	Genbank Accession Number AW587800, 22 March 2000 (22-3-00) with respect to SEQ ID NO: 360.	1-6, 10-11, 13-20
A, P	Genbank Accession Number AI812413, 08 July 1999 (08-07-99) with respect to SEQ ID NO: 368.	1-6, 10-11, 13-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06112

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	TANDRE et al. Conifer homologues to genes that control floral development in angiosperms. Plant Molecular Biology. 1995, Vol. 27, pages 69-78 with respect to SEQ ID NO: 368 and 380.	1-6, 10-11, 13-21
X, P	Genbank Accession Number AW226013, 10 December 1999 (10-12-99) with respect to SEQ ID NO: 372.	3, 11
A	Genbank Accession Number U90091, 05 January 1999 (05-01-99) with respect to SEQ ID NOS: 373 and 386.	1-6, 10-11, 13-21
A	Genbank Accession Number U90092, 05 January 1999 (05-01-99) with respect to SEQ ID NO: 374.	1-6, 10-11, 13-21
X	ZHANG et al. Isolation and characterization of two related Arabiposis ocs-element bZIP binding proteins. Plant Journal. 1993, Vol. 4, No. 4, pages 711-716, with respect to SEQ ID NO: 1998.	3, 11
X	Genbank Accession Number X69899, 24 November 1993 (24-11-93) with respect to SEQ ID NO: 1998.	3, 11
A, P	Genbank Accession Number AW399147, 07 February 2000 (07-02-00), with respect to SEQ ID NO: 1961.	1-6, 10-11, 13-21
X ---- A	Genbank Accession Number AA867891, 28 August 1998 (28-08-98) with respect to SEQ ID NOS: 453, 469, and 2106.	3-4, 11 ---------- 5
X, P ---- Y, P	Genbank Accession Number AF086642, 08 April 1999 (08-04-99) with respect to SEQ ID NO: 168.	1, 3-6, 11 ---------- 10, 13-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06112

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. ☐ 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 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 Extra 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.:
1-6,10-11,13-21 for the SEQ ID NOS. as elected in the response to the PCT/ISA/206

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

International application No.
PCT/US00/06112

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

I. Claims 1-6, 10-11, and 13-21 drawn to polynucleotides.

II. Claims 7-9 and 35 drawn to polypeptides.

III. Claims 12 and 22-34 drawn to transgenic cells and plants and methods of making them.

Sequence Election Requirement Applicable to All Groups

In addition, each Group detailed above reads on distinct SEQ ID Numbers that share no special technical feature because they are structurally unrelated sequences. A further lack of unity is applied to each Group. In Group I, SEQ ID NOS: 1-10 form the first inventive concept and each subsequent 10 consecutive SEQ ID NOS. (e.g. 11-20, 21-30) will be treated as an additional invention. In Group II, each single polypeptide referenced by SEQ ID NO. will be treated as an additional invention. In Group III, each transgenic cell (and plant containing said cell) containing a referenced SEQ ID NO. will be treated as an additional invention.

The United States Patent Office takes the position that nucleotide sequences encoding different proteins are structurally distinct chemical compounds and are unrelated to one another and that these sequences normally constitute distinct inventions. Each such nucleotide sequence is presumed to represent a distinct invention. Nevertheless, to further aid the biotechnology industry in protecting its intellectual property without creating an undue burden on the Office, the Commissioner has decided to permit a reasonable number of such nucleotide sequences to be claimed in a single application. See Examination of Patent Applications Containing Nucleotide Sequences, 1192 O.G. 68 (November 19, 1996). It has been determined that normally ten sequences constitute a reasonable number for examination purposes.

The inventions listed as Groups I-III with the additional sequence elections as set forth above do not relate to a single 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 each polynucleotide is its own unique structure which is defined by its sequence. The totality of this structure is not shared by any other polynucleotide recited in the claims.

Note that PCT Rule 13 does not provide for multiple products or methods within a single application.