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LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
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Published:

— with international search report

(88) Date of publication of the international search report:
7 February 2002

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: METHODS AND COMPOSITIONS TO MODULATE EXPRESSION IN PLANTS

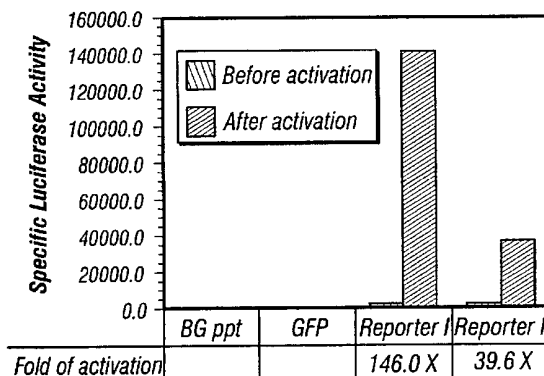
Reporters:

Reporter I
(p5'CF) -122 +72

Reporter II
(pC7rbTATA) -17 +36

Activator (pND3008): 2C7-VP64 (sixfinger ZFP)

ZmUbi ZFP2C7 VP64



(57) Abstract: The invention relates to the field of plant and agricultural technology. More specifically, the invention relates to the use of zinc finger proteins and fusions of said proteins to regulate gene expression and metabolic pathways in plants.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/12 C12N15/63 C12N15/82 C12N5/10 C12N5/14
C07K14/00 C07K16/00 C07K19/00 C12Q1/68 A01H5/00
A01H5/10

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)

IPC 7 C07K

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 practical, search terms used)

EPO-Internal, BIOSIS, WPI Data, PAJ, MEDLINE, EMBASE, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE PATER SYLVIA ET AL: "Characterization of a zinc-dependent transcriptional activator from Arabidopsis." NUCLEIC ACIDS RESEARCH, vol. 24, no. 23, 1996, pages 4624-4631, XP002169343 ISSN: 0305-1048	1-7,9, 19,20, 22,29, 30, 39-41, 44,47, 48,51, 52, 54-56, 67, 74-78, 83,85, 86,89, 91, 133-136, 138
Y		10-12, 18,21, 23-28, -/--

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 document but 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

15 June 2001

Date of mailing of the international search report

07.09.01

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	the whole document	31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100
X	MENA MONTANA ET AL: "An endosperm-specific DOF protein from barley, highly conserved in wheat, binds to and activates transcription from the prolamin-box of a native B-hordein promoter in barley endosperm." PLANT JOURNAL, vol. 16, no. 1, October 1998 (1998-10), pages 53-62, XP002169344 ISSN: 0960-7412	1-7,9, 13,19, 20,22, 29,30, 39,44, 47,48, 51,52, 54-56, 67, 74-78, 83,88, 89,91, 133, 136-138
Y	the whole document	10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100
	the whole document	

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YANAGISAWA SHUICHI ET AL: "Involvement of maize Dof zinc finger proteins in tissue-specific and light-regulated gene expression." PLANT CELL, vol. 10, no. 1, January 1998 (1998-01), pages 75-89, XP002169345 ISSN: 1040-4651	1-7,9, 13,16, 17,19, 20,22, 29,30, 32,33, 39,44, 47,48, 50-52, 54-56, 67, 74-78, 83,89, 91,133, 136-138
Y	the whole document --- -/--	10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EULGEM THOMAS ET AL: "Early nuclear events in plant defence signalling: Rapid gene activation by WRKY transcription factors." EMBO (EUROPEAN MOLECULAR BIOLOGY ORGANIZATION) JOURNAL, vol. 18, no. 17, 1999, pages 4689-4699, XP002169346 ISSN: 0261-4189	1-9, 14-17, 19,20, 22,29, 30,32, 33,39, 44,47, 48, 50-52, 54-56, 67, 74-78, 80-83, 89,91, 133-136, 138
Y	the whole document --- -/--	10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	RAVENTOS DORA ET AL: "HRT, a novel zinc finger, transcriptional repressor from barley." JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 273, no. 36, 1998, pages 23313-23320, XP002169347 ISSN: 0021-9258	1-7,9, 13,19, 20,22, 29,30, 39-41, 44,45, 47,48, 51-53, 55,56, 67, 74-78, 83, 85-87, 89,91, 133, 136-138
Y		10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100
	the whole document ---	
Y	WO 98 54311 A (BARBAS CARLOS F III ;GOTTESFELD JOEL M (US); SCRIPPS RESEARCH INST) 3 December 1998 (1998-12-03) cited in the application	10-12, 21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100
	the whole document ---	

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INTERNATIONAL SEARCH REPORT

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PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>BEERLI ROGER R ET AL: "Toward controlling gene expression at will: Specific regulation of the erbB-2/HER-2 promoter by using polydactyl zinc finger proteins constructed from modular building blocks." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 95, no. 25, December 1998 (1998-12), pages 14628-14633, XP002924795 Dec., 1998 ISSN: 0027-8424 cited in the application the whole document</p> <p>---</p>	<p>10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100</p>
Y	<p>LIU QIANG ET AL: "Design of polydactyl zinc-finger proteins for unique addressing within complex genomes." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 94, no. 11, 1997, pages 5525-5530, XP002169348 1997 ISSN: 0027-8424 cited in the application the whole document</p> <p>---</p>	<p>10-12, 18,21, 23-28, 31, 34-38, 42,43, 49, 57-66, 68,69, 79,84, 92-95, 97-100</p>
A	<p>KLUG AARON: "Zinc finger peptides for the regulation of gene expression." JOURNAL OF MOLECULAR BIOLOGY, vol. 293, no. 2, 22 October 1999 (1999-10-22), pages 215-218, XP002169349 ISSN: 0022-2836 the whole document</p> <p>---</p>	
A	<p>TAKATSUJI HIROSHI: "Zinc-finger proteins: The classical zinc finger emerges in contemporary plant science." PLANT MOLECULAR BIOLOGY, vol. 39, no. 6, April 1999 (1999-04), pages 1073-1078, XP001005447 ISSN: 0167-4412 the whole document</p> <p>---</p>	
A	<p>TAKATSUJI H: "Zinc-finger transcription factors in plants." CMLS CELLULAR AND MOLECULAR LIFE SCIENCES, vol. 54, no. 6, June 1998 (1998-06), pages 582-596, XP001005446 ISSN: 1420-682X the whole document</p> <p>---</p>	
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/01817

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 00 41566 A (EISENBERG STEPHEN P ;CASE CASEY CHRISTOPHER (US); COX GEORGE NORBE) 20 July 2000 (2000-07-20)	1-10,16, 17,19, 22,29, 30, 32-35, 38-43, 45, 47-51, 55,56, 58,59, 67, 74-78, 83-89, 91,92, 98,133, 134,138
	the whole document ---	
P,X	WO 01 00815 A (CHOO YEN ;GENDAQ LTD (GB); ULLMAN CHRISTOPHER GRAEME ULLM (GB)) 4 January 2001 (2001-01-04)	1-7,9, 16,17, 19,20, 22,29, 30,32, 33, 39-41, 45,47, 48,51, 55,67, 69, 74-79, 83,85, 89,91, 98, 133-135, 138
	the whole document -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/01817

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 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:

see additional 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.:
1-45, 47-69, 74-89, 91-95, 97-100 & 133-138

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-45, 47-69, 74-89, 91-95, 97-100, 133-138

Methods to modulate the expression of a target gene in plant cells and subject-matter relating thereto.

2. Claims: 46, 70-73, 103-115

Zinc finger proteins ZFPm1, ZFPm2, ZFPm3, ZFPm4 and ZFPAP3, and subject-matter relating thereto.

3. Claims: 101-102

Zinc finger proteins comprising a zinc finger nucleic acid binding domain and an effector domain, wherein the effector domain comprises an active domain of a restriction enzyme, an active domain of a nucleic acid modifying protein, a label or a modification.

4. Claims: 116-117

An assay method for determining a suitable position in a gene for regulating gene expression in plant cells.

5. Claims: 118-132

Fusion proteins which comprise a zinc finger of 2C7 and an effector domain of SID or SID3, and subject-matter relating thereto.

6. Claims: 90, 96

A genetically modified plant cell transformed with a nucleic acid comprising a functional geminiviral replicase gene operably linked to a fruit ripening dependent promoter, and subject-matter relating thereto.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/01817

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9854311 A	03-12-1998	US 6140466 A AU 7800398 A EP 0988377 A	31-10-2000 30-12-1998 29-03-2000
WO 0041566 A	20-07-2000	AU 2847000 A EP 1061805 A GB 2348424 A,B	01-08-2000 27-12-2000 04-10-2000
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