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(54) Title: OPTIMIZED EXPRESSION OF GLYPHOSATE RESISTANCE ENCODING NUCLEIC ACID MOLECULES IN PLANT CELLS

(57) Abstract: A nucleic acid molecule encoding a 5-enolpyruvyl-3-phosphoshikimic acid synthase (EPSPS) that provides resistance to glyphosate is provided, that has been optimized for expression in both monocotyledonous and dicotyledonous plants and preferably in soybeans. Methods of use are also provided.

Figure 3

DMMG optimized encoding 2mEPSPS

(atg)

gctggagctgaagagattgtgctccaacccatcaaggagatctctggcacagtcaaactccctggctcaaa
gtcactttcaaacgtatcctcttgcttgcagctctttctgaagggaccacagtggttgacaaccttctcaactcagag
gatgtccactacatgctcggagccttgaggactcttggcttgtctgttgaagcagacaaagctgccaagcgtgctgtt
gtggttggctgtggtggaaagttcccagttgaagatgccaaagaggaagtccagctcttccttgggaatgctgggat
tgccatgagatccttgactgcagctgtcactgcagctggtgggaatgccacctatgttcttgatggcgtgccacgcat
gagggagagacccattggcgacttggtggttggcttgaagcaacttggagctgatgttgactgcttccttggcaccg
actgtccacctgttcgtgtcaatgggattggaggtctccctggtggcaaggtcaagctctctggctccatcagctccc
agtacttgtcagccttgctcatggcagctcccttggctcttggtgatgtggagattgagatcattgacaaactcatctc
cattccctatgtggagatgaccttgagattgatggaaaggtttggtgtgaaagctgagcattctgacagctgggaca
gattctacatcaagggaggtcagaagtacaagtcacccaagaatgcctatgttgaaggtgatgccagctctgccag
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gacagagaggatggttgcaatacgcacagagttgaccaaacttggagccagcgttgaggaaggaccagactact
gcatcatcacacctcccgagaagctcaacgtgacagccatagacacctatgatgaccaccgcatggcaatggcttt
ctcccttgcagcctgtgcagaagtcccctgtcaccatacgtgaccctgggtgcactcgcaagaccttcccagactactt
tgatgtgctcagcacctttgtcaagaactga

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B. FIELDS SEARCHED

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, Sequence Search, WPI Data, BIOSIS, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DATABASE Geneseq [Online] 24 September 2001 (2001-09-24), "Partial sequence #8 of recombinant gene in genetically modified maize.", XP002687140, retrieved from EBI accession no. GSN:AAH49585 Database accession no. AAH49585 sequence ----- -/--	1-22

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DATABASE EMBL [Online] 15 July 2002 (2002-07-15), "Sequence 4 from Patent EP1217073.", XP002687141, retrieved from EBI accession no. EM_PAT:AX463795 Database accession no. AX463795 sequence -----	1-22
Y	DATABASE EMBL [Online] 4 September 1996 (1996-09-04), "Z.mays mRNA for EPSP-synthase", XP002687142, retrieved from EBI accession no. EM_STD:X63374 Database accession no. X63374 cited in the application sequence -----	1-22
Y	STEPHEN J. STREATFIELD: "Approaches to achieve high-level heterologous protein production in plants", PLANT BIOTECHNOLOGY JOURNAL, vol. 5, no. 1, 1 January 2007 (2007-01-01), pages 2-15, XP55043727, ISSN: 1467-7644, DOI: 10.1111/j.1467-7652.2006.00216.x the whole document -----	1-22
Y	CAMPBELL ET AL: "Codon usage in higher plants, green algae, and cyanobacteria", PLANT PHYSIOLOGY, AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS, ROCKVILLE, MD, US, vol. 92, 1 January 1990 (1990-01-01), pages 1-11, XP002095344, ISSN: 0032-0889 the whole document -----	1-22
Y	GEYER BRIAN C ET AL: "Translational control of recombinant human acetylcholinesterase accumulation in plants", BMC BIOTECHNOLOGY, BIOMED CENTRAL LTD. LONDON, GB, vol. 7, no. 1, 30 May 2007 (2007-05-30), page 27, XP021029467, ISSN: 1472-6750, DOI: 10.1186/1472-6750-7-27 the whole document -----	1-22
Y	WO 2008/141154 A2 (DOW AGROSCIENCES LLC [US]; LIRA JUSTIN M [US]; SNODDERLEY ERIKA MEGAN) 20 November 2008 (2008-11-20) page 43 - page 47 -----	1-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008141154 A2	20-11-2008	AR 066520 A1	26-08-2009
		AU 2008251445 A1	20-11-2008
		CA 2686835 A1	20-11-2008
		CN 101688219 A	31-03-2010
		CO 6241168 A2	20-01-2011
		EP 2145007 A2	20-01-2010
		JP 2010526535 A	05-08-2010
		US 2010251432 A1	30-09-2010
		WO 2008141154 A2	20-11-2008
		ZA 200907746 A	28-07-2010