

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
02 August 2018 (02.08.2018)



(10) International Publication Number
WO 2018/140859 A3

(51) International Patent Classification:

C12N 15/82 (2006.01) C07K 14/325 (2006.01)

(21) International Application Number:

PCT/US2018/015695

(22) International Filing Date:

29 January 2018 (29.01.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/451,914 30 January 2017 (30.01.2017) US
62/476,918 27 March 2017 (27.03.2017) US
62/543,545 10 August 2017 (10.08.2017) US

(71) Applicant: **AGBIOME, INC.** [US/US]; 104 T.W. Alexander Drive, Building 1, Durham, North Carolina 27709 (US).

(72) Inventors: **PARKS, Jessica**; 5433 Wade Park Blvd., Apt. 2305, Raleigh, North Carolina 27607 (US). **ROBERTS, Kira Bulazel**; 7810 Roxboro Road, Bahama, North Carolina 27503 (US). **THAYER, Rebecca E.**; 100 Hammond Wood Place, Morrisville, North Carolina 27560 (US).

(74) Agent: **BUCK, B. Logan**; Womble Bond Dickinson (US) LLP, P.O. Box 7037, Atlanta, Georgia 30357-0037 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,

EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- with sequence listing part of description (Rule 5.2(a))

(88) Date of publication of the international search report:

20 September 2018 (20.09.2018)

(54) Title: PESTICIDAL GENES AND METHODS OF USE

(57) Abstract: Compositions having pesticidal activity and methods for their use are provided. Compositions include isolated and recombinant polypeptide sequences having pesticidal activity, recombinant and synthetic nucleic acid molecules encoding the pesticidal polypeptides, DNA constructs comprising the nucleic acid molecules, vectors comprising the nucleic acid molecules, host cells comprising the vectors, and antibodies to the pesticidal polypeptides. Nucleotide sequences encoding the polypeptides provided herein can be used in DNA constructs or expression cassettes for transformation and expression in organisms of interest, including microorganisms and plants. The compositions and methods provided herein are useful for the production of organisms with enhanced pest resistance or tolerance. Transgenic plants and seeds comprising a nucleotide sequence that encodes a pesticidal protein of the invention are also provided. Such plants are resistant to insects and other pests. Methods are provided for producing the various polypeptides disclosed herein, and for using those polypeptides for controlling or killing a pest. Methods and kits for detecting polypeptides of the invention in a sample are also included.



WO 2018/140859 A3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/015695

A. CLASSIFICATION OF SUBJECT MATTER
INV. C12N15/82 C07K14/325
ADD.
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)
C12N 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 practicable, search terms used)
EPO-Internal, WPI Data, BIOSIS, CHEM ABS Data, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	ALEJANDRA BRAVO ET AL: "Bacillus thuringiensis: A story of a successful bioinsecticide", INSECT BIOCHEMISTRY AND MOLECULAR BIOLOGY., vol. 41, no. 7, 1 July 2011 (2011-07-01), pages 423-431, XP055281787, GB ISSN: 0965-1748, DOI: 10.1016/j.ibmb.2011.02.006 page 429, paragraph 7 the whole document	1-27
Y	WO 2016/196013 A2 (AGBIOME INC [US]) 8 December 2016 (2016-12-08) claims 1-23 ----- -/--	1-27

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 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 19 July 2018	Date of mailing of the international search report 27/07/2018
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Marchesini, Patrizia

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/015695

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/154535 A1 (ABAD ANDRE ROGER [US] ET AL) 23 June 2011 (2011-06-23) claims 1-23	1-27
Y	----- SARVJEET KAUR: "Molecular approaches for identification and construction of novel insecticidal genes for crop protection", WORLD JOURNAL OF MICROBIOLOGY AND BIOTECHNOLOGY, KLUWER ACADEMIC PUBLISHERS, DO, vol. 22, no. 3, 1 March 2006 (2006-03-01), pages 233-253, XP019271780, ISSN: 1573-0972 pages 235-236, "Methods for identification of novel insecticidal genes" the whole document	1-27
Y	----- BERRY COLIN ET AL: "Structural classification of insecticidal proteins - Towards an in silico characterisation of novel toxins", JOURNAL OF INVERTEBRATE PATHOLOGY, SAN DIEGO, CA, US, vol. 142, 29 July 2016 (2016-07-29), pages 16-22, XP029924175, ISSN: 0022-2011, DOI: 10.1016/J.JIP.2016.07.015 abstract	1-27
X	----- Anonymous: "hypothetical protein [Chryseobacterium arthrosphaerae] - Protein - NCBI", 14 July 2016 (2016-07-14), XP055491120, Retrieved from the Internet: URL:https://www.ncbi.nlm.nih.gov/protein/WP_065397681 [retrieved on 2018-07-09] the whole document	1,4,6-9
X	----- Anonymous: "hypothetical protein [Chryseobacterium cucumeris] - Protein - NCBI", 29 March 2016 (2016-03-29), XP055491121, Retrieved from the Internet: URL:https://www.ncbi.nlm.nih.gov/protein/WP_062673074 [retrieved on 2018-07-09] the whole document	1,4,6-9
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/015695

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>Anonymous: "hypothetical protein [Chryseobacterium sp. RU33C] - Protein - NCBI",</p> <p>³ 21 January 2017 (2017-01-21), XP055491123, Retrieved from the Internet: URL:https://www.ncbi.nlm.nih.gov/protein/WP_076596488.1 [retrieved on 2018-07-09] the whole document</p> <p style="text-align: center;">-----</p>	1,4,6-9
X	<p>Anonymous: "hypothetical protein [Chryseobacterium sp. YR477] - Protein - NCBI",</p> <p>³ 17 June 2015 (2015-06-17), XP055491126, Retrieved from the Internet: URL:https://www.ncbi.nlm.nih.gov/protein/WP_047426867 [retrieved on 2018-07-09] the whole document</p> <p style="text-align: center;">-----</p>	1,4,6-9
X	<p>Anonymous: "Chryseobacterium jejuense toxin ETX/toxin MTX2",</p> <p>³ 20 October 2016 (2016-10-20), XP055491134, Retrieved from the Internet: URL:https://www.ebi.ac.uk/ena/data/view/SDI38744&display=text [retrieved on 2018-07-09] the whole document</p> <p style="text-align: center;">-----</p>	1,4,6-9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/015695

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:

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 fees, this Authority did not invite payment of 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.:

1-27(partially)

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 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-27(partially)

Relates to an isolated polypeptide having insecticidal activity depicted by SEQ ID No. 1. Also relates to constructs, host cells, plants, compositions and methods comprising said polypeptide.

2-131. claims: 1-27(partially)

Relates to an isolated polypeptide having insecticidal activity depicted by SEQ ID No. 2 (inv.2), 3 -4 (inv.3), 5 -6 (inv.4), 7 -8 (inv. 5), 9 (inv 6), 10-12 (inv 7), 13-15 (inv. 8), 16-17 (inv.9), 18-19 (inv. 10), 20-21 (inv. 11), 22 (inv. 12), 23-24 (inv. 13), 25-26 (inv. 14), 27-28 (inv. 15), 29-30 (inv. 16), 31-32 (inv. 17), 33-34 (inv. 18), 35 (inv. 19), 36-37 (inv. 20), 38-39 (inv. 21), 40-42 (inv. 22), 43-44 (inv. 23), 45 (inv. 24), 46 (inv. 25), 47 (inv. 26), 48-49 (inv.27), 50 (inv. 28), 51 (inv. 29), 52-53 (inv. 30), 54-56 (inv. 31), 57-58 (inv. 32), 59-60 (inv.33), 61 (inv.34), 62-64 (inv. 35), 65-66 (inv. 36), 67 (inv. 37), 68-69 (inv. 38), 70-71 (inv.39), 72-73 (inv. 40), 74-75 (inv. 41), 76 (inv. 42), 77-78 (inv. 43), 79-80 (inv. 44), 81 (inv. 45), 82-83 (inv. 46), 84 (inv. 47), 85-87 (inv.48), 88 (inv. 49), 89 (inv. 50), 90-91 (inv. 51), 92-94 (inv. 52), 95-96 (inv. 53), 97-98 (inv. 54), 99-101 (inv. 55), 102-103 (inv. 56), 104-105 (inv. 57), 106-108 (inv. 58), 109-111 (inv. 59), 112-113 (inv. 60), 114-115 (inv. 61), 116-117 (inv. 62), 118-119 (inv. 63), 120-121 (inv. 64), 122-123 (inv. 65), 124-126 (inv. 66), 127-128 (inv. 67), 129-131 (inv. 68), 132-133 (inv. 69), 134-135 (inv. 70), 136 (inv. 71), 137-138 (inv. 72), 139-140 (inv. 73), 141-142 (inv. 74), 143-144 (inv. 75), 145-146 (inv. 76), 147-148 (inv. 77), 149-150 (inv. 78), 151 (inv. 79), 152-153 (inv. 80), 154-156 (inv. 81), 157-158 (inv. 82), 159-160 (inv. 83), 161 (inv. 84), 162-163 (inv. 85), 164-166 (inv. 86), 167 (inv. 87), 168-169 (inv. 88), 170 (inv. 89), 171-172 (inv. 90), 173-174 (inv. 91), 175-176 (inv. 92), 177-178 (inv.93), 179 (inv. 94), 180-181 (inv. 95), 182-183 (inv. 96), 184-185 (inv. 97), 186-187 (inv. 98), 188 (inv. 99), 189-190 (inv. 100), 191-192 (inv. 101) 193-194 (inv. 102), 195-196 (inv. 103), 197-199 (inv. 104), 200-201 (inv. 105), 202-203 (inv. 106), 204-206 (inv. 107), 207-208 (inv. 108), 209 (inv. 109), 210- 213 (inv. 110), 214 (inv. 111) 215-216 (inv. 112), 217-218 (inv. 113), 219-221 (inv. 114), 222 (inv. 115), 223 (inv. 116), 224-227 (inv. 117), 228 (inv. 118), 229-231 (inv. 119), 232-233 (inv. 120), 234-235 (inv. 121), 236-237 (inv. 122), 238-239 (inv. 123), 240 (inv. 124), 241-242 (inv. 125), 243-245 (inv. 126), 246 (inv. 127), 247-249 (inv. 128), 250-251 (inv. 129), 252-254 (inv. 130), 255-256 (inv. 131). Also relates to constructs, host cells, plants, compositions and methods comprising said

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

polypeptide.

132-232. claims: 1-27(partially)

Relates to an isolated polypeptide having insecticidal activity depicted by SEQ ID No. 257 (inv. 132), 258-260 (inv. 133), 261-262 (inv. 134), 263-264 (inv. 135), 265 (inv. 136), 266-267 (inv. 137), 268 (inv. 138), 269-271 (inv. 139), 272 (inv. 140), 273 (inv. 141), 274-275 (inv. 142), 276-277 (inv. 143), 278-279 (inv. 144), 280 (inv. 145), 281 (inv. 146), 282-284 (inv. 147), 285-286 (inv. 148), 287-289 (inv. 149), 290-291 (inv. 150), 292-293 (inv. 151), 294-296 (inv. 152), 297 (inv. 153), 298-299 (inv. 154), 300 (inv. 155), 301-302 (inv. 156), 303-304 (inv. 157), 305-307 (inv. 158), 308-309 (inv. 159), 310-312 (inv. 160), 313-314 (inv. 161), 315-316 (inv. 162), 317-318 (inv. 163), 319 (inv. 164), 320-321 (inv. 165), 322-323 (inv. 166), 324-325 (inv. 167), 326 (inv. 168), 327-328 (inv. 169), 329-330 (inv. 170), 331-332 (inv. 171), 333-335 (inv. 172), 336 (inv. 173), 337-338 (inv. 174), 339 (inv. 175), 340-341 (inv. 176), 342 (inv. 177), 343-344 (inv. 178), 345-346 (inv. 179), 347 (inv. 180), 348-349 (inv. 181), 350-351 (inv. 182), 353 (inv. 183), 353-354 (inv. 184), 355-356 (inv. 185), 357-358 (inv. 186), 359-360 (inv. 187), 361-362 (inv. 188), 363-364 (inv. 189), 365-366 (inv. 190), 367 (inv. 191), 368-370 (inv. 192), 371-372 (inv. 193), 373-374 (inv. 194), 375-376 (inv. 195), 377-379 (inv. 196), 380-381 (inv. 197), 383-385 (inv. 198), 386-388 (inv. 199), 389-391 (inv. 200), 392-393 (inv. 201), 394-395 (inv. 202), 396 (inv. 203), 397-398 (inv. 204), 399 (inv. 205), 400-401 (inv. 206), 402-403 (inv. 207), 404-406 (inv. 208), 407-408 (inv. 209), 409-410 (inv. 210), 411-412 (inv. 211), 413-415 (inv. 212), 416-417 (inv. 213), 418-420 (inv. 214), 421-422 (inv. 215), 423-424 (inv. 216), 425-426 (inv. 217), 427-428 (inv. 218), 429-430 (inv. 219), 431-433 (inv. 220), 434 (inv. 221), 435-436 (inv. 222), 437 (inv. 223), 438-439 (inv. 224), 440-442 (inv. 225), 443-446 (inv. 226), 447-448 (inv. 227), 449-450 (inv. 228), 451 (inv. 229), 452-453 (inv. 230), 454-455 (inv. 231), 456-458 (inv. 232). Also relates to constructs, host cells, plants, compositions and methods comprising said polypeptide.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/015695

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016196013 A2	08-12-2016	AR 104867 A1	23-08-2017
		CA 2987598 A1	08-12-2016
		CN 108271390 A	10-07-2018
		EP 3303595 A2	11-04-2018
		US 2016355842 A1	08-12-2016
		US 2018163223 A1	14-06-2018
		WO 2016196013 A2	08-12-2016

US 2011154535 A1	23-06-2011	CA 2785195 A1	14-07-2011
		US 2011154535 A1	23-06-2011
		WO 2011084314 A2	14-07-2011
