



(51) International Patent Classification:

C12N 1/00 (2006.01) C12R 1/01 (2006.01)
C12N 1/20 (2006.01)

(21) International Application Number:

PCT/US2016/043933

(22) International Filing Date:

25 July 2016 (25.07.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/196,951 25 July 2015 (25.07.2015) US

(71) Applicant: BIOCONSORTIA, INC. [US/US]; 1940 Research Park Drive, Davis, California 95618 (US).

(72) Inventors: WIGLEY, Peter; 4/10 St. Georges Bay Road, Parnell, Auckland, 1052 (NZ). TURNER, Susan; 2341 Benton Place, Davis, California 95618 (US). GEORGE, Caroline; 149A Gowing Drive, Meadowbank, Auckland, 1072 (NZ). WRIGHT, Damian; 13 Garland Road, Greenlane, Auckland, 1061 (NZ). WILLIAMS, Thomas; 2359 Galvin Way, Woodland, California 95776 (US).

ROBERTS, Kelly; 1810 Magnolia Place, Davis, California 95618 (US). HYMUS, Graham; 1100 Ovejas Avenue, Davis, California 95616 (US).

(74) Agents: BOLLAND, Jeffrey R. et al.; Cooley LLP, 1299 Pennsylvania Avenue, N.W., Suite 700, Washington, District of Columbia 20004-2400 (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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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,

[Continued on next page]

(54) Title: AGRICULTURALLY BENEFICIAL MICROBES, MICROBIAL COMPOSITIONS, AND CONSORTIA

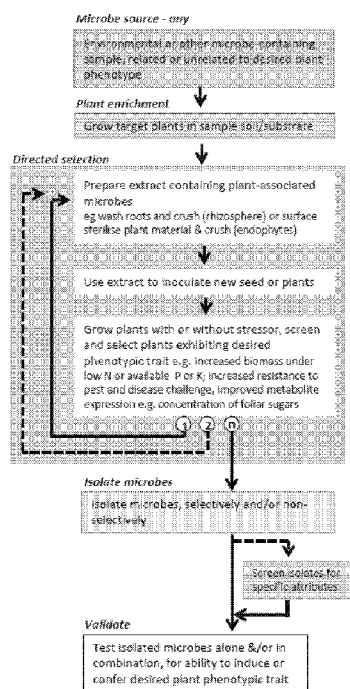


FIG. 1

(57) Abstract: The disclosure relates to isolated microorganisms-including novel strains of the microorganisms-microbial consortia, and agricultural compositions comprising the same. Furthermore, the disclosure teaches methods of utilizing the described microorganisms, microbial consortia, and agricultural compositions comprising the same, in methods for imparting beneficial properties to target plant species. In particular aspects, the disclosure provides methods of increasing desirable plant traits in agronomically important crop species.



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 (an) indication(s) in relation to deposited biological material furnished under Rule 13bis separately from the description (Rules 13bis.4(d)(i) and 48.2(a)(viii))

— with sequence listing part of description (Rule 5.2(a))

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

23 March 2017

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/43933

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:

-Please See Supplemental Page-

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 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.:
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.:

1-6, 8-14, 28-62, 70-77

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/43933

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C12N 1/00, 1/20; C12R 1/01 (2016.01)

CPC - C12N 1/00, 1/20; C12R 1/01

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(8): C12N 1/00, 1/20; C12R 1/01 (2016.01)

CPC: C12N 1/00, 1/20; C12R 1/01

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)

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); EBS CO Discovery; PubMed; Google Scholar; The Lens; ENA; NCBI Blast; isolated, bacteria, Chryseobacterium daecheongense, Accession, NRRL B-67291

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2014/0082770 A1 (WIGLEY, P et al.) March 20, 2014; paragraphs [0012], [0024], [0026], [0071], [0087], [0107], [0324]; Table 5	46
Y	(YU, X et al.) GENBANK accession FJ455451. Publication [online]. 10 December 2008 [retrieved 28 September 2016]. Retrieved from the Internet: <URL: https://www.ncbi.nlm.nih.gov/nuccore/FJ455451 > page 1.	46
A	US 2012/0129794 A1 (DOWD, S et al.) May 24, 2012; column 21; column 2, Third Table	1-6, 8-14, 28-45, 47-62, 70-77

☐ 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

21 November 2016 (21.11.2016)

Date of mailing of the international search report

26 JAN 2017

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/US16/43933

-Continued from Box III-

Groups I+, Claims 1-6, 8-14, 28-77; *Chryseobacterium daecheongense* NRRL B-67291; and *Chryseobacterium rhizosphaerae* NRRL B-67288 are directed toward a microbial consortium comprising at least two microbes; a culture of said strains; progeny of said strains; mutants of said strains; a cell-free or inactivated preparation of said strains; an agricultural composition comprising said strains; metabolites produced by said strains; and methods of imparting a beneficial trait upon a plant species therewith.

The consortium will be searched to the extent it encompasses *Chryseobacterium daecheongense* NRRL B-67291 (first exemplary bacterial strain); and *Chryseobacterium rhizosphaerae* NRRL B-67288 (second exemplary bacterial strain). Applicant is invited to elect additional isolated bacterial strain(s) to be searched. Additional strain(s) will be searched upon the payment of additional fees. It is believed that claims 1 (in-part), 2 (in-part), 3 (in-part), 4 (in-part), 5 (in-part), 6 (in-part), 8 (in-part), 9 (in-part), 10 (in-part), 11 (in-part), 12 (in-part), 13 (in-part), 14 (in-part), 28 (in-part), 29 (in-part), 30 (in-part), 31 (in-part), 32 (in-part), 33 (in-part), 34 (in-part), 35 (in-part), 36 (in-part), 37 (in-part), 38 (in-part), 39 (in-part), 40 (in-part), 41 (in-part), 42 (in-part), 43 (in-part), 44 (in-part), 45 (in-part), 46, 47 (in-part), 48 (in-part), 49 (in-part), 50 (in-part), 51 (in-part), 52 (in-part), 53 (in-part), 54 (in-part), 55 (in-part), 56 (in-part), 57 (in-part), 58 (in-part), 59 (in-part), 60 (in-part), 61 (in-part), 62 (in-part), 70 (in-part), 71 (in-part), 72 (in-part), 73 (in-part), 74 (in-part), 75 (in-part), 76 (in-part) and 77 (in-part) encompass this first named invention and thus these claims will be searched without fee to the extent that they encompass *Chryseobacterium daecheongense* NRRL B-67291 (bacterial strain); and *Chryseobacterium rhizosphaerae* NRRL B-67288 (bacterial strain). Applicants must specify the claims that encompass any additionally elected strain(s). Applicants must further indicate, if applicable, the claims which encompass the first named invention, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined. An exemplary election would be *Chryseobacterium rhizosphaerae* NRRL B-67287 (first exemplary elected bacterial strain).

Groups II+, Claim 7 and SEQ ID No: 1 are directed toward an isolated bacterial strain comprising a polynucleotide sequence sharing at least 97% sequence identity with any one of SEQ ID Nos: 1-307.

The bacterial strain can be searched to the extent that it encompasses SEQ ID NO: 1 (first exemplary polynucleotide sequence). Applicant is invited to elect additional polynucleotide sequence(s), with specified SEQ ID NO: for each, to be searched. Additional sequences can be searched upon the payment of additional fees. It is believed that claim 7 (in-part) encompasses this first named invention of Groups II+, and thus this claim can be searched with payment of a fee for the search of Groups II+, to the extent that it encompasses SEQ ID NO: 1 (polynucleotide sequence). Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) can result in only the first claimed invention of Groups II+ to be searched/examined. An exemplary election would be a polynucleotide encompassing SEQ ID NO: 2 (first exemplary elected polynucleotide sequence).

Groups III+, Claims 15-27; *Stenotrophomonas maltophilia* and *Chryseobacterium daecheongense* are directed toward a microbial consortium, comprising at least two microbes; a culture thereof; a subsequent generation thereof; a mutant thereof; a metabolite produced thereby; an agricultural composition comprising: a microbial consortium; and a method of imparting at least one beneficial trait upon a plant species therewith.

The consortium can be searched to the extent that it encompasses *Stenotrophomonas maltophilia* (first exemplary bacterial species) and *Chryseobacterium daecheongense* (second exemplary bacterial species). Applicant is invited to elect additional isolated bacterial species(s) to be searched. Additional species(s) can be searched upon the payment of additional fees. It is believed that claims 15 (in-part), 16 (in-part), 17 (in-part), 18 (in-part), 19 (in-part), 20 (in-part), 21 (in-part), 22 (in-part), 23 (in-part), 24 (in-part), 25 (in-part), 26 (in-part) and 27 (in-part) encompass this first named invention of Groups III+, and thus these claims can be searched with payment of a fee for the search of Groups III+ to the extent that they encompass *Stenotrophomonas maltophilia* (bacterial species) and *Chryseobacterium daecheongense* (bacterial species). Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) can result in only the first claimed invention of Groups III+ to be searched/examined. An exemplary election would be *Rhodococcus erythropolis* (first exemplary elected bacterial species).

The inventions listed as Groups I+, II+ and III+ 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: the special technical features of Groups I+ include *Chryseobacterium daecheongense* NRRL B-67291, not present in any other Groups; the special technical features of Groups II+ include SEQ ID NO: 299, not present in any other Groups; the special technical features of Groups III+ include *Bacillus aryabhattai*, not present in any other Groups.

-Continued Within the Next Supplemental Box-

***-Continued from Previous Supplemental Page:

No technical features are shared between the bacterial strains of Groups I+ and, accordingly, these groups lack unity a priori. No technical features are shared between the sequences of Groups II+ and, accordingly, these groups lack unity a priori. No technical features are shared between the bacterial strains of Groups III+ and, accordingly, these groups lack unity a priori.

Groups I+, II+ and III+ share the technical features including: at least one bacterial strain. Groups I+ and II+ share the technical features including: a bacterial strain comprising a polynucleotide sequence sharing at least 97% sequence identity with SEQ ID NO: 2. Groups I+ and III+ share the technical features including: a microbial consortium, comprising at least two microbes selected from the groups consisting of: A) *Stenotrophomonas maltophilia*, *Rhodococcus erythropolis*, *Pantoea vagans*, *Pseudomonas oryzae*, *Rahnella aquatilis*, *Duganella radialis*, *Exiguobacterium acetylicum*, *Arthrobacter pascens*, *Pseudomonas putida*, *Bacillus megaterium*, *Bacillus cereus*, *Novosphingobium sediminicola*, *Rhizobium etli*, *Ensifer adhaerens*, *Chitinophaga terrae*, *Variovorax ginsengisoli*, *Pedobacter terrae*, *Massilia albidiflava*, *Dyadobacter soli*, *Sphingopyxis alaskensis*, *Chryseobacterium rhizosphaerae*, and *Microbacterium oleivorans*; B) *Chryseobacterium daecheongense*, *Frigidibacter albus*, *Arthrobacter nicotinovorans*, *Pseudomonas helmanticensis*, *Agrobacterium fabrum*, *Achromobacter pulmonis*, *Exiguobacterium sibiricum*, *Exiguobacterium antarcticum*, *Leifsonia lichenia*, *Tumebacillus permanentifrigoris*, *Novosphingobium lindaniclasticum*, and *Massilia kyonggiensis*; and combinations thereof, and wherein at least one microbe from B) is selected; a substantially pure culture of a microbial consortium; a subsequent generation of any microbe recited in the microbial consortium; a mutant of any microbe recited in the microbial consortium; a cell-free or inactivated preparation of the microbial consortium or mutant thereof; a metabolite produced by the microbial consortium or a mutant thereof; an agricultural composition comprising: an microbial consortium; and an agriculturally acceptable carrier; a microbial consortium having substantially similar morphological and physiological characteristics as a microbial consortium; a microbial consortium having substantially similar genetic characteristics as a microbial consortium; and a method of imparting at least one beneficial trait upon a plant species, comprising: applying a microbial consortium to said plant, or to a growth medium in which said plant is located. Groups I+ share the technical features including: an isolated bacterial strain; a substantially pure culture of an isolated bacterial strain; a progeny of an isolated bacterial strain; a mutant of an isolated bacterial strain; a cell-free or inactivated preparation of an isolated bacterial strain or a mutant thereof; a metabolite produced by an isolated bacterial strain or a mutant thereof; an agricultural composition comprising: an isolated bacterial strain; and an agriculturally acceptable carrier; a method of imparting at least one beneficial trait upon a plant species, comprising: a) applying an isolated bacterial strain to said plant, or to a growth medium in which said plant is located; a method of imparting at least one beneficial trait upon a plant species, comprising: applying at least one isolated bacterial species to said plant, or to a growth medium in which said plant is located, wherein said at least one isolated bacterial species is selected from the group consisting of: *Agrobacterium fabrum*, *Novosphingobium lindaniclasticum*, *Pedobacter terrae*, *Chryseobacterium daecheongense*, *Chryseobacterium rhizosphaerae*, *Frigidibacter albus*, *Arthrobacter nicotinovorans*, *Pseudomonas helmanticensis*, *Agrobacterium fabrum*, *Achromobacter pulmonis*, *Exiguobacterium sibiricum*, *Exiguobacterium antarcticum*, *Pedobacter terrae*, *Leifsonia lichenia*, *Massilia kyonggiensis*, *Tumebacillus permanentifrigoris*, and combinations thereof; a microbe for use in agriculture; a synthetic combination of a plant and microbe, comprising: at least one plant and at least one microbe; a method of increasing or promoting a desirable phenotypic trait of a plant species, comprising: a) applying at least one bacteria to said plant, or to a growth medium in which said plant is located; and a plant seed enhanced with a microbial seed coating, comprising: a) a plant seed; and b) a seed coating applied onto said plant seed, wherein the seed coating comprises at least two microbes. Groups II+ share the technical features including: an isolated bacterial strain comprising a polynucleotide sequence. Groups III+ share the technical features indicated above to be shared with Groups I+, further including species *Bacillus aryabhattai*, *Bosea robiniae*, *Microbacterium maritropicum*, *Microbacterium azadirachtae*, *Variovorax paradoxus*, and *Hydrogenophaga atypica*.

-Continued on Next Supplemental Page-

***-Continued from Previous Supplemental Page:

However, these shared technical features are previously disclosed by US 2014/0082770 A1 to Wigley et al. (hereinafter 'Wigley') in view of GenBank accession FJ455451 (hereinafter 'FJ455451') and EP 2434019 A1 to BASF Plant Science GmbH (hereinafter 'BASF').

Wigley discloses at least one bacterial strain (at least one bacterial strain; paragraphs [0071], [0107]); a microbial consortium (a microbial consortium; paragraph [0026], [0324]), comprising at least two microbes (comprising at least two microbes; paragraphs [0026], [0324]) including *Stenotrophomonas maltophilia* (*Stenotrophomonas maltophilia*; paragraph [0089], Table 2), *Rhodococcus erythropolis* (*Rhodococcus erythropolis*; Table 2), *Bacillus cereus* (*Bacillus cereus*; Table 5), *Pseudomonas putida* (*Pseudomonas putida*; Table 2, Table 6) and *Arthrobacter nicotianovorans* (*Arthrobacter nicotianovorans*; paragraph [0089], Table 5, Table 6); a substantially pure culture of a microbial consortium (a substantially pure culture of a microbial consortium; paragraph [0115]); a subsequent generation of any microbe recited in the microbial consortium (a single isolate produced from an isolated colony on growth media, with or without subsequent culturing (a subsequent generation of any microbe recited in the microbial consortium); paragraphs [0189], wherein, in order to produce the original colony, or upon subsequent culturing, the production of subsequent generations occurs during culture); an inactivated preparation of the microbial consortium (an inactivated preparation of the microbial consortium; paragraph [0201]); a metabolite produced by the microbial consortium or a mutant thereof (a metabolite produced by the microbial consortium or a mutant thereof; paragraph [0207]); an agricultural composition (a composition to support plant growth (an agricultural composition); paragraph [0203]) comprising: an microbial consortium (comprising a microbial consortium; paragraphs [0026], [0204]); and an agriculturally acceptable carrier (and an agriculturally acceptable carrier; paragraph [0204]); a microbial consortium having substantially similar morphological and physiological characteristics as a microbial consortium (bacterial colonies having similar morphotypes (a microbial consortium having substantially similar morphological and physiological characteristics as a microbial consortium); paragraph [0322]); a microbial consortium having substantially similar genetic characteristics as a microbial consortium (microbes having a similar effect on a plant, and from the same genera (microbial consortium having substantially similar genetic characteristics as a microbial consortium); paragraph [0322]; Table 2); and a method of imparting at least one beneficial trait upon a plant species (a method of imparting at least one beneficial trait upon a plant species; paragraph [0087]), comprising: applying a microbial consortium to said plant (comprising: applying a microbial consortium to said plant; paragraphs [0012], [0026]), or to a growth medium in which said plant is located (or to a growth medium in which said plant is located; paragraph [0012]); a microbe for use in agriculture (a microorganism (microbe) capable of imparting a beneficial property to a plant (for use in agriculture); paragraph [0011]); a synthetic combination of a plant and microbe (a synthetic combination of a plant and a microbe; paragraphs [0012], [0113]), comprising: at least one plant and at least one microbe (comprising: at least one plant and at least one microbe; paragraphs [0012], [0113]); a method of increasing or promoting a desirable phenotypic trait of a plant species (a method of increasing or promoting a desirable phenotypic trait of a plant species; paragraphs [0011], [0012], [0244]), comprising: a) applying at least one bacteria to said plant, or to a growth medium in which said plant is located (comprising: a) applying at least one bacteria to said plant, or to a growth medium in which said plant is located; paragraph [0012]); and a plant seed enhanced with a microbial seed coating (a plant seed enhanced with a microbial seed coating; paragraph [0181]), comprising: a) a plant seed; and b) a seed coating applied onto said plant seed (comprising: a) a plant seed; and b) a seed coating applied onto said plant seed; paragraph [0181]), wherein the seed coating comprises at least two microbes (wherein the seed coating comprises at least two microbes; paragraphs [0026], [0181]); an isolated bacterial strain comprising a polynucleotide sequence (an isolated bacterial strain comprising a polynucleotide sequence; paragraph [0322]).

Wigley does not disclose a bacterial strain comprising a polynucleotide sequence sharing at least 97% sequence identity with SEQ ID NO: 2; a mutant of any microbe recited in the microbial consortium.

FJ455451 discloses a bacterial strain (*Chryseobacterium daecheongense* (a bacterial strain); page 1) comprising a polynucleotide sequence at least 97% identical to Applicants' SEQ ID NO: 2 (comprising a nucleic acid sequence (a polynucleotide sequence 97% identical to Applicants' SEQ ID NO: 2); Page 1; wherein nucleotides 606-1353 are 97.7% identically complementary to Applicants' SEQ ID NO: 2).

BASF discloses a mutant of a microbe (a mutated strain of a microorganism (a mutant of a microbe); paragraph [0004]) for the production of a chemical (for the production of a chemical; paragraph [0004]).

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to have modified the disclosure of Wigley to have included the use of additional strains of *Chryseobacterium*, including *Chryseobacterium daecheongense* having a characteristic nucleic acid comprising SEQ ID NO: 2, as disclosed by FJ455451, in order to expand the range of related microbial strains tested for the capacity to provide a beneficial trait to a plant species, as disclosed by Wigley. It further would have been obvious to a person of ordinary skill in the art at the time of the invention was made to have modified the disclosure of Wigley to have included mutant strains, as disclosed by BASF, of the beneficial strains, as disclosed by Wigley, in order to identify strains having improved production of a chemical, as disclosed by BASF, such as a useful metabolite, as disclosed by Wigley, in order to improve the level of benefit provided to a plant by the mutant strain.

Since none of the special technical features of the Groups I+ inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by a combination of the Wigley, FJ455451 and BASF references, unity of invention is lacking.