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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 June 2023 (15.06.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/104627 A1

(51) International Patent Classification:
A01N 25/30 (2006.01) *A01P 3/00* (2006.01)
A01N 43/16 (2006.01) *A01P 13/00* (2006.01)

(21) International Application Number:
PCT/EP2022/084029

(22) International Filing Date:
01 December 2022 (01.12.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20210100856 08 December 2021 (08.12.2021) GR

(71) Applicant: **SYNGENTA CROP PROTECTION AG** [CH/CH]; Rosentalstrasse 67, 4058 Basel (CH).

(72) Inventors: **SEVASTOS, Apostolos**; Syngenta Limited Syngenta, Jealott's Hill International Research Centre, Bracknell RG42 6EY (GB). **PADIA, Faheem Noorahmed**; Syngenta Jealott's Hill International Research Centre, Bracknell RG42 6EY (GB). **RAMSAY, Julia Lynne**; Syngenta Jealott's Hill International Research Centre, Bracknell RG42 6EY (GB). **TAYLOR, Philip**; Syngenta Limited Syngenta, Jealott's Hill International Research Centre, Bracknell Berkshire RG42 6EY (GB).

(74) Agent: **SYNGENTA IP**; Rosentalstrasse 67, 4058 Basel (CH).

(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, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, 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, ME, 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))*
— *of inventorship (Rule 4.17(iv))*

Published:
— *with international search report (Art. 21(3))*
— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

(54) Title: COMPOSITION CONTAINING A RHAMNOLIPID

(57) Abstract: A composition comprising an active ingredient and a rhamnolipid.

WO 2023/104627 A1

COMPOSITION CONTAINING A RHAMNOLIPID

The present invention relates to compositions comprising rhamnolipids, methods of preparing and uses of the same.

The efficacy of a biologically active ingredient (AI), for example an agrochemical, in a composition can often be improved by the addition of further ingredients. The observed efficacy of the combination of ingredients can sometimes be significantly higher than that which would be expected from the individual ingredients used. An adjuvant is a substance which can increase the biological activity of an AI but is itself not significantly biologically active.

In addition to the effect on biological activity, the physical properties of an adjuvant are of key importance and must be selected with a view to compatibility, stability, toxicity and biodegradability of the formulation concerned.

An adjuvant is often a surfactant and may be included in a formulation or added separately and is often referred to as being built into formulations or added as tank mix additives. Currently, adjuvant technologies that are used to improve biological activity of agrochemicals are synthetic surfactants often present human safety and environmental issues and are usually sensitive to environmental conditions like temperature, salinity and pH variations.

In order to address these problems, the present invention therefore provides composition comprising an active ingredient and a rhamnolipid. Preferably the rhamnolipid is an adjuvant.

Rhamnolipids are a glycolipid biosurfactants (i.e., synthesised by microorganisms) with one or more rhamnose hydrophilic moieties linked to one or more β-hydroxylated fatty acid chains.

It has surprisingly been found that rhamnolipids, in comparison to known adjuvants, exhibit lower toxicity, higher biodegradability, better environmental capability, higher foaming, high selectivity, specific activity at extreme temperatures, pH and salinity, and the ability to be synthesized from renewable feed stocks. The application of this type of biosurfactants can therefore increase the potential of adjuvant application under adverse local environments and increase registrability of any final commercial product.

There is thus provided the use of a rhamnolipid to improve the biological performance of an agrochemical.

There is also provide the use of a composition as described herein in the treatment of weeds, pests, nematodes, molluscs and/or fungi.

Preferably, the active ingredient is an agrochemical. Advantageously, the active ingredient is soluble in water. Preferably the active ingredient has a solubility in water of from 0.1 to 30000 mg/L, such as from 0.55 to 22000 mg/L (20- 25 °C).

Preferably the rhamnolipid has two rhamnose moieties and/or one or two β-hydroxylated fatty acid chains. Advantageously the fatty acid chains contain from 5 to 20 carbons, such as from 6 to 19, from 7 to 18, or even from 8 to 16 carbons.

The rhamnolipid may be obtained from *Pseudomonas aeruginosa*.

There is also provided a method of preparing a composition as defined herein.

The noun "agrochemical" and term "agrochemically active ingredient" are used herein interchangeably, and include herbicides, insecticides, nematicides, molluscicides, fungicides, plant growth regulators and safeners; preferably herbicides, insecticides and fungicides.

An agrochemical, or a salt of the agrochemical, selected from those given below is suitable for the present invention.

Suitable herbicides include pinoxaden, bicyclopyrone, mesotrione, fomesafen, tralkoxydim, napropamide, amitraz, propanil, pyrimethanil, dicloran, tecnazene, toclofos methyl, flamprop M, 2,4-D, MCPA, mecoprop, clodinafop-propargyl, cyhalofop-butyl, diclofop methyl, haloxyfop, quizalofop-P, indol-3-ylacetic acid, 1-naphthylacetic acid, isoxaben, tebutam, chlorthal dimethyl, benomyl, benfuresate, dicamba, dichlobenil, benazolin, triazoxide, fluazuron, teflubenzuron, phenmedipham, acetochlor, alachlor, metolachlor, pretilachlor, thenylchlor, alloxydim, butroxydim, clethodim, cyclodim, sethoxydim, tepraloxydim, pendimethalin, dinoterb, bifenox, oxyfluorfen, acifluorfen, fluazifop, S-metolachlor, glyphosate, glufosinate, paraquat, diquat, fluoroglycofen-ethyl, bromoxynil, ioxynil, imazamethabenz-methyl, imazapyr, imazaquin, imazethapyr, imazapic, imazamox, flumioxazin, flumiclorac-pentyl, picloram, amodosulfuron, chlorsulfuron, nicosulfuron, rimsulfuron,

triasulfuron, triallate, pebulate, prosulfocarb, molinate, atrazine, simazine, cyanazine, ametryn, prometryn, terbuthylazine, terbutryn, sulcotrione, isoproturon, linuron, fenuron, chlorotoluron, metoxuron, iodosulfuron, mesosulfuron, diflufenican, flufenacet, fluroxypyr, aminopyralid, pyroxsulam, XDE-848 Rinskor and halauxifen-methyl.

Suitable fungicides include isopyrazam, mandipropamid, azoxystrobin, trifloxystrobin, kresoxim methyl, mefenoxam, famoxadone, metominostrobin, picoxystrobin, cyprodanil, carbendazim, thiabendazole, dimethomorph, vinclozolin, iprodione, dithiocarbamate, imazalil, prochloraz, fluquinconazole, epoxiconazole, flutriafol, azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, hexaconazole, paclobutrazole, propiconazole, tebuconazole, triadimefon, trtiticonazole, fenpropimorph, tridemorph, fenpropidin, mancozeb, metiram, chlorothalonil, thiram, ziram, captafol, captan, folpet, fluazinam, flutolanil, carboxin, metalaxyl, bupirimate, ethirimol, dimoxystrobin, fluoxastrobin, orysastrobin, metominostrobin, prothioconazole, adepidyn, bixafen, fluxapyroxad, prothioconazole, pyraclostrobin, revysol, solatenol and xemium.

Suitable insecticides include thiamethoxam, imidacloprid, acetamiprid, clothianidin, dinotefuran, nitenpyram, fipronil, abamectin, emamectin, tefluthrin, emamectin benzoate, bendiocarb, carbaryl, fenoxycarb, isoprocarb, pirimicarb, propoxur, xylylcarb, asulam, chlorpropham, endosulfan, heptachlor, tebufenozide, bensultap, diethofencarb, pirimiphos methyl, aldicarb, methomyl, cyprmethrin, bioallethrin, deltamethrin, lambda cyhalothrin, cyhalothrin, cyfluthrin, fenvalerate, imiprothrin, permethrin, halfenprox, oxamyl, flupyradifurone, sedaxane, inscalis, rynaxypyr, cyantraniliprole, sulfoxaflor and spinetoram.

Suitable plant growth regulators include paclobutrazole, trinexapac-ethyl and 1 methylcyclopropene. Suitable safeners include benoxacor, cloquintocet-mexyl, cyometrinil, dichlormid, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, mefenpyr-diethyl, MG-191, naphthalic anhydride and oxabetrinil.

Suitably, the agrochemical is selected from bicyclopyrone, mesotrione, pinoxaden, fomesafen, tralkoxydim, napropamide, amitraz, propanil, pyrimethanil, dicloran, tecnazene, toclofos methyl, flamprop M, 2,4-D, MCPA, mecoprop, clodinafop-propargyl, cyhalofop-butyl, diclofop methyl, haloxyfop, quizalofop-P, indol-3-ylacetic acid, 1-naphthylacetic acid, isoxaben, tebutam, chlorthal dimethyl, benomyl, benfuresate, dicamba, dichlobenil, benazolin, triazoxide, fluazuron, teflubenzuron, phenmedipham, acetochlor, alachlor, metolachlor, pretilachlor, thenylchlor,

alloxydim, butroxydim, clethodim, cyclodim, sethoxydim, tepraloxydim, pendimethalin, dinoterb, bifenox, oxyfluorfen, acifluorfen, fluoroglycofen-ethyl, bromoxynil, ioxynil, imazamethabenz-methyl, imazapyr, imazaquin, imazethapyr, imazapic, imazamox, flumioxazin, flumiclorac-pentyl, picloram, amodosulfuron, chlorsulfuron, nicosulfuron, rimsulfuron, triasulfuron, triallate, pebulate, prosulfocarb, molinate, atrazine, simazine, cyanazine, ametryn, prometryn, terbuthylazine, terbutryn, sulcotrione, isoproturon, linuron, fenuron, chlorotoluron, metoxuron, isopyrazam, mandipropamid, azoxystrobin, trifloxystrobin, kresoxim methyl, famoxadone, metominostrobin and picoxystrobin, cyprodanil, carbendazim, thiabendazole, dimethomorph, vinclozolin, iprodione, dithiocarbamate, imazalil, prochloraz, fluquinconazole, epoxiconazole, flutriafol, azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, hexaconazole, paclobutrazole, propiconazole, tebuconazole, triadimefon, trtiticonazole, fenpropimorph, tridemorph, fenpropidin, mancozeb, metiram, chlorothalonil, thiram, ziram, captafol, captan, folpet, fluazinam, flutolanil, carboxin, metalaxyl, bupirimate, ethirimol, dimoxystrobin, fluoxastrobin, orysastrobin, metominostrobin, prothioconazole, thiamethoxam, imidacloprid, acetamiprid, clothianidin, dinotefuran, nitenpyram, fipronil, abamectin, emamectin, bendiocarb, carbaryl, fenoxycarb, isoprocarb, pirimicarb, propoxur, xylylcarb, asulam, chlorpropham, endosulfan, heptachlor, tebufenozide, bensultap, diethofencarb, pirimiphos methyl, aldicarb, methomyl, cyprmethrin, bioallethrin, deltamethrin, lambda cyhalothrin, cyhalothrin, cyfluthrin, fenvalerate, imiprothrin, permethrin, halfenprox, paclobutrazole, 1-methylcyclopropene, benoxacor, cloquintocet-mexyl, cyometrinil, dichlormid, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, mefenpyr-diethyl, MG-191, naphthalic anhydride and oxabetrinil. Preferred agrochemical active ingredients are selected from fomesafen (suitably as the sodium salt), mesotrione, nicosulfuron, pinoxaden, isopyrazam, epoxiconazole, solatenol and cyantraniliprole.

More preferably, the agrochemical is Nicosulfuron, Mesotrione, isopyrazam or Solatenol.

Suitably, compositions of the invention may comprise one or more of the agrochemicals described above.

Generally, any agrochemically active ingredient will be present at a concentration of from about 0.000001% to about 90% w/w; preferably from about 0.001% to about 90% w/w.

Agrochemical compositions of the invention may be in the form of a ready-to-use formulation or in concentrate form suitable for further dilution by the end user, and the concentration of agrochemical and rhamnolipid will be adjusted accordingly. In concentrated form, compositions of the invention

typically contain an agrochemical at from 5 to 90% w/w, more preferably from 5 to 75% w/w, even more preferably from 10 to 50% w/w, of the total composition. Ready-to-use compositions of the invention will typically contain an agrochemical at from 0.000001% to 1% w/w, more preferably from 0.000001% to 0.5% w/w, and more preferably still from 0.001% to 0.1% w/w, of the total composition.

Typically, a rhamnolipid will have a concentration of from about 0.0005% to about 90% w/w of the total composition; preferably from about 0.01% to about 90% w/w. When in concentrated form, compositions of the invention typically contain a rhamnolipid at from 1% to 80% w/w, preferably from 5% to 60% w/w, more preferably from 5% w/w to 40% w/w and even more preferably from 5% w/w to 20% w/w of the total composition. Ready to use compositions of the invention typically contain a rhamnolipid at from about 0.0005% to about 2% w/w of the total composition, more preferably from about 0.01% to about 1% w/w and even more preferably from 0.05% w/w to 0.5% w/w of the total composition.

The compositions of the present invention may relate to concentrates designed to be added to a farmer's spray tank of water or they may be applied directly without further dilution.

Preferably compositions are selected from an SC (suspension concentrate); an SL (soluble liquid); an EC (emulsifiable concentrate); a DC (dispersible concentrate); a WG (water dispersible granule); a SG (soluble granule); an EW (emulsion in water); a SE (suspension-emulsion); a CS (capsule suspension); and an OD (oil dispersion).

Furthermore, an adjuvant system as herein described may be designed to be added to a formulation of an agrochemical (for example by mixing with water in a farmer's spray tank).

The compositions of the present invention may include other ingredients such as a dispersing agent, a surfactant, an emulsifier, a solvent, a polymer, an anti-foam agent, an anti-bacterial agent, a colourant and a perfume, which are well known to the man skilled in the art. Standard formulation publications disclose such formulation components suitable for use with the present invention (for example, Chemistry and Technology of Agrochemical Formulations, Ed. Alan Knowles, published by Kluwer Academic Publishers, The Netherlands in 1998; and Adjuvants and Additives: 2006 Edition by Alan Knowles, Agrow Report DS256, published by Informa UK Ltd, December 2006). The compositions may also comprise other ingredients for improving formulation compatibility; such as hydrotropes and

viscosity reducing aids, which may be suitable for use with the alcohol alkoxylate adjuvants of the present invention.

The compositions of the present invention may include other adjuvants. Examples are surfactants (e.g. non-ionic, anionic, cationic or amphoteric), wetting agents, spreading agents, sticking agents, humectants and penetration agents. Further examples of suitable adjuvants are mineral oils, vegetable oils, fatty acid esters, esters of aliphatic or aromatic dicarboxylic acids, alcohol ethoxylates, alkylphenol ethoxylates, alkylamine ethoxylates, ethoxylates of triglycerides, ethoxylates of fatty acids, ethoxylates of fatty acid esters, ethoxylates of sorbitan fatty acid esters, alkyl polyglycosides and silicone-based adjuvants. Preferred suitable adjuvants are surfactants which provide improved wetting or improved spray retention properties.

Unless otherwise stated are percentages are given as percentages by total weight and all embodiments and preferred features may be combined in any combination.

The invention is described by the following non-limiting Examples.

Examples

The following examples demonstrate the effect on biological performance of the present invention.

Herbicides

Nicosulfuron

The efficacy of rhamnolipids as an adjuvant for the herbicide nicosulfuron was tested in a glasshouse against two weed species. Nicosulfuron was added to the spray tank as a standard WG (water dispersible granule) formulation. All spray solutions also contained 12.5% v/v of iso-Propanol as an inert non-adjuvant additive to provide spray retention.

The plants were sprayed with nicosulfuron (in the absence of an adjuvant) at rates of 15 and 60 grams of pesticide per hectare using a laboratory track sprayer which delivered the aqueous spray composition at a rate of 200 litres per hectare. The spray tests were also carried out using nicosulfuron in conjunction with the rhamnolipids at a rate of 0.2% v/v. The weed species and their growth stage

at spraying were *Abutilon theophrasti* (ABUTH; growth stage 13), *Chenopodium album* (CHEAL; growth stage 14-15), *Digitaria sanguinails* (DIGSA; growth stage 14) and *Setaria viridis* (SETVI; growth stage 13-14). Each spray test was replicated three times.

The efficacy of the herbicide was assessed visually and expressed as a percentage of the leaf area killed. Samples were assessed at a time period of 21 days following application. The results shown in Tables 1- 4 below are mean averages over the three replicates at the two rates of nicosulfuron.

Table 1 – Abutilon theophrasti

Adjuvant	**15g/ha**	**60g/ha**
No Adjuvant	15	42
0.2% rhamnolipids	35	68

Table 2- *Chenopodium album*

Adjuvant	**15g/ha**	**60g/ha**
No Adjuvant	12	22
0.2% rhamnolipids	55	70

Table 3 – Digitaria sanguinalis

Adjuvant	**15g/ha**	**60g/ha**
No Adjuvant	8	17
0.2% rhamnolipids	75	87

Table 4- Setaria viridis

Adjuvant	**15g/ha**	**60g/ha**
No Adjuvant	47	73
0.2% rhamnolipids	78	87

Mesotrione

The efficacy of rhamnolipids as an adjuvant for the herbicide mesotrione was tested in a glasshouse against four weed species. Mesotrione was added to the spray tank as a standard SC (suspension concentrate) formulation. All spray solutions also contained 12.5% v/v of iso-Propanol as an inert non-adjuvant additive to provide spray retention

The plants were sprayed with mesotrione (in the absence of an adjuvant) at rates of 30 and 60 grams of pesticide per hectare using a laboratory track sprayer which delivered the aqueous spray composition at a rate of 200 litres per hectare. The rhamnolipids were added to the spray solution at a rate of 0.2% v/v. The four weed species were *Polygonum convolvulus* (POLCO; growth stage 13-15), *Brachiaria* platyphylla (BRAPL; growth stage 13-14), Euphorbia heterophylla (EPHHL; growth stage 11-12) and Digitaria sanguinalis (DIGSA; growth stage 14). Each spray test was replicated three times.

The efficacy of the herbicide was assessed visually and expressed as a percentage of the leaf area killed. Samples were assessed at a time period of 21 days following application. The results shown in the tables below are mean averages over the three replicates at the two rates of mesotrione.

Table 5 - Brachiaria platyphylla

Adjuvant	**30g/ha**	**60g/ha**
No Adjuvant	18	27
0.2% rhamnolipids	60	65

Table 6 – Digitaria sanguinalis

Adjuvant	**30g/ha**	**60g/ha**
No Adjuvant	25	68
0.2% rhamnolipids	85	93

Table 7 – Euphorbia heterophylla

Adjuvant	**30g/ha**	**60g/ha**
No Adjuvant	37	48
0.2% rhamnolipids	67	72

Table 8 – Polygonum convolvulus

Adjuvant	**30g/ha**	**60g/ha**
No Adjuvant	55	62
0.2% rhamnolipids	82	96

Fungicide

The test data relate to curative testing against *Septoria tritici* on wheat. The wheat plants in pots are inoculated 3 to 5 days prior to spraying as indicated.

The isopyrazam is formulated as an aqueous suspension concentrate formulation containing 250 g/L of isopyrazam. The suspension concentrate formulation is diluted to the concentrations of 1.3, 3.2, 8 and 20 grams of pesticide per hectare with water prior to spraying.

The Solatenol™ is formulated as a wettable granule (WG) containing 150 g/L of fungicide. The wettable granule formulation is diluted to the concentrations of 0.3, 1, 3 and 9 grams of pesticide per hectare with water prior to spraying.

In both fungicides, when adjuvant is included it is used at 0.1 %w/v in the spray dilution unless otherwise indicated. All spray solutions also contained 10.0% v/v of iso-Propanol as an inert non-adjuvant additive to provide spray retention. The spray application is 200l L/ha. Three assessments are made per pot of wheat with 4 replicate pots fully randomised. The three replicate pots are visually assessed and given a score of disease severity. The percent efficacy corresponds to the reduction in average disease severity in the treated pots compared to the untreated pots as a percentage of the average disease severity of the untreated pots. The results are shown in Table 9 below and represent side-by-side experiments.

Table 9

AI	Rate [g/ha]	Adjuvant	Efficacy
Isopyrazam	20	-	32.1
Isopyrazam	8	-	16.6
Isopyrazam	20	Rhamnolipids	44.1
Isopyrazam	8	Rhamnolipids	50.6
Isopyrazam	3.2	Rhamnolipids	41.1
Isopyrazam	1.3	Rhamnolipids	17.6
Solatenol	9		14.0
Solatenol	3		-4.1
Solatenol	9	Rhamnolipids	75.6
Solatenol	3	Rhamnolipids	55.9
Solatenol	1.0	Rhamnolipids	1.0
Solatenol	0.3	Rhamnolipids	30.6

It can be seen that rhamnolipids surprisingly act as extremely effective adjuvant for a range of active ingredients and compositions.

The invention is defined by the claims.

Claims

1. A composition comprising an active ingredient and a rhamnolipid.

2. A composition according to claim 1, wherein the rhamnolipid is an adjuvant.

3. A composition according to claim 1 or 2, wherein the active ingredient is an agrochemical.

4. A composition according to any of the preceding claims, wherein the active ingredient is soluble in water.

5. A composition according to any of the preceding claims, wherein the rhamnolipid has two rhamnose moieties.

6. A composition according to any of the preceding claims, wherein the rhamnolipid has one or two β-hydroxylated fatty acid chains.

7. A composition according to claim 6, wherein the fatty acid chains contain from 8 to 16 carbons.

8. A composition according to any of the preceding claims, wherein the rhamnolipid is obtained from *Pseudomonas aeruginosa*.

9. A composition according to any of the preceding claims, wherein the composition is an SC (suspension concentrate); an SL (soluble liquid); an EC (emulsifiable concentrate); a DC (dispersible concentrate); a WG (water dispersible granule); a SG (soluble granule); an EW (emulsion in water); a SE (suspension-emulsion); a CS (capsule suspension); or an OD (oil dispersion).

10. A method of preparing a composition as defined in any of the preceding claims.

11. Use of a rhamnolipid to improve the biological performance of an agrochemical.

12. Use of a composition according to any of claims 1 to 9 in treatment of weeds, pests, nematodes, molluscs and/or fungi.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/084029

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N25/30 A01N43/16 A01P3/00 A01P13/00
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)
A01N A01P

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 111 134 125 A (UNIV ZHEJIANG) 12 May 2020 (2020-05-12) examples 5-6	1-12
X	US 2007/191292 A1 (GANDHI N R [US] ET AL) 16 August 2007 (2007-08-16) examples 3B-3D	1-12
X	CN 102 090 394 A (ZHEJIANG SHENGHUA BIOK BIOLOGY) 15 June 2011 (2011-06-15) the whole document	1-12
X	CN 113 575 608 A (GUANGDONG ZHONGXUN AGRI SCIENCE CORP) 2 November 2021 (2021-11-02) examples	1-12

-/--

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

[X] 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	Date of mailing of the international search report
8 March 2023	16/03/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bertrand, Franck

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/084029

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 108 617 666 A (NANJING SHINEKING BIOTECH CO LTD) 9 October 2018 (2018-10-09) examples	1-12
X	US 2019/269158 A1 (SCHILLING MARTIN [DE] ET AL) 5 September 2019 (2019-09-05) examples	1-12
X	CN 103 070 167 B (HUZHOU GEMKING BIOLOG TECHNOLOGY CO LTD; MENG QIN) 26 November 2014 (2014-11-26) the whole document	1-12
X	US 2012/220464 A1 (GIESSLER-BLANK SABINE [DE] ET AL) 30 August 2012 (2012-08-30) paragraph [0006] - paragraph [0019]	1-12

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2022/084029

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 111134125 A	12-05-2020	NONE	
US 2007191292 A1	16-08-2007	AR 059445 A1	09-04-2008
		DO P2007000029 A	15-01-2008
		PE 20080132 A1	10-02-2008
		TW 200803726 A	16-01-2008
		US 2007191292 A1	16-08-2007
		UY 30142 A1	28-09-2007
		WO 2007095259 A2	23-08-2007
CN 102090394 A	15-06-2011	NONE	
CN 113575608 A	02-11-2021	NONE	
CN 108617666 A	09-10-2018	NONE	
US 2019269158 A1	05-09-2019	CN 110167347 A	23-08-2019
		EP 3522707 A1	14-08-2019
		KR 20190068565 A	18-06-2019
		US 2019269158 A1	05-09-2019
		US 2021337835 A1	04-11-2021
		WO 2018065314 A1	12-04-2018
CN 103070167 B	26-11-2014	NONE	
US 2012220464 A1	30-08-2012	AU 2010300168 A1	19-04-2012
		BR 112012007570 A2	15-09-2015
		CA 2776029 A1	07-04-2011
		CN 102548398 A	04-07-2012
		DE 102009045077 A1	31-03-2011
		DK 2482647 T3	24-08-2015
		EP 2482647 A1	08-08-2012
		ES 2544266 T3	28-08-2015
		HU E027031 T2	29-08-2016
		JP 5699153 B2	08-04-2015
		JP 2013505906 A	21-02-2013
		KR 20120091015 A	17-08-2012
		NZ 598963 A	28-02-2014
		PL 2482647 T3	30-10-2015
		PT 2482647 E	11-09-2015
		US 2012220464 A1	30-08-2012
		US 2016249604 A1	01-09-2016
		WO 2011039014 A1	07-04-2011