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(54) Title: BIODEGRADABLE POLYESTER USED AS DISPERSANT AND THE AGRICULTURAL COMPOSITION COMPRISING THE SAME

(57) Abstract: The present invention provides a biodegradable polyester which can be used as dispersant for agricultural formulations. In addition, the present invention further provide an agricultural composition comprising the same.

Biodegradable polyester used as dispersant and the Agricultural Composition Comprising the Same

This application claims priority(ies) filed on 08 August 2022 in INTERNATIONAL PROCEDURE with Nr PCT/EP2022/072231, the whole content of this application being incorporated herein by reference for all purposes.

FIELD OF THE INVENTION

[0001] The present invention provides a biodegradable polyester which can be used as dispersant for agricultural formulations. In addition, the present invention further provide an agricultural composition comprising the same.

BACKGROUND OF THE INVENTION

[0002] Agricultural compositions are more and more complex with high loading of active ingredients which may be sparingly soluble, or even insoluble, in water, and/or combo systems combining said active ingredients with several modes of action having different physicochemical characteristics: for example, one active can be in the form of a soluble salt and the other one dispersed in an aqueous phase.

[0003] Thus, agricultural compositions typically include dispersants to improve the dispersion, and in particular to provide homogeneity and to help reduce and/or prevent flocculation and agglomeration.

[0004] Dispersion is the process through which agglomerates of solid particles become separated, and a new interface forms between each of the smaller particles and the surrounding media. This process is facilitated by the application of external force (milling) and the use of amphiphilic additives such as dispersants.

[0005] However, nowadays there is an increasing demand in most areas for compounds that are readily biodegradable. This is also the case within the agrochemical field, where surfactants including dispersant with a good environmental profile combined with a good stability and efficacy of pesticides and fertilizers are being sought for., there will be a need to replace such non-biodegradable dispersants.

[0006] There are some biodegradable non-polymeric surfactants such as phosphate esters, but they are not very versatile for many active ingredients and there is a need to utilize polymeric dispersants in order to stabilize the agricultural

formulations. Lignosulfonates and EO-POs are biodegradable and can be used as polymeric dispersant, however they are not versatile.

[0007] So far, it is still desirable to develop more versatile polymeric biodegradable dispersant, particularly for agricultural formulations.

SUMMARY OF THE INVENTION

[0008] In one aspect of the present invention, it is provided a biodegradable polyester which can be used as dispersant for agricultural formulations.

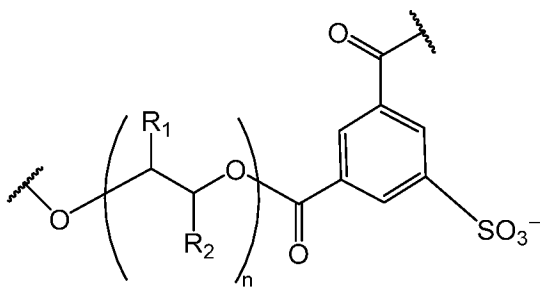
[0009] The biodegradable polyester can be prepared from a monomer composition comprising:

(a) a sulphonated dicarboxylic acid monomer (SA) selected from the group consisting of at least one sulphonated aromatic or sulphonated aliphatic dicarboxylic acid or the derivatives thereof;

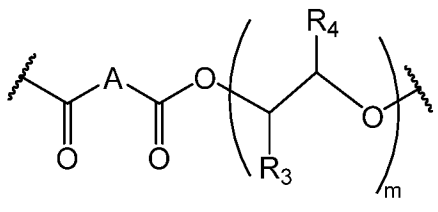
(b) a polyhydric polyol (P) selected from the group consisting of at least one ethylene glycol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol or polyethylene glycol having an ethylene oxide number ranging from 1 to 200, dipropylene glycol, glycerol, 1,2,4-butanetriol and 1,2,3-butanetriol, and oligomers of thereof having from 1 to 100 monomer units; and

(c) a dihydroxyl compound (DH) selected from C_5 - C_{10} cycloaliphatic diol, C_5 - C_{10} cycloaliphatic diacidic acid, C_2 - C_8 hydroxylated aliphatic acid, or the combination thereof.

[0010] The biodegradable polyester can comprises the following repeating units (I) and (II):



(I)



(II)

wherein R_1, R_2, R_3, and R_4 are independently selected from H or C_1-C_8 alkyl;

A is selected from C_5 - C_{10} cycloaliphatic group or aromatic group; and

n and m is a number ranging from 1 to 200.

[0011] In another aspect of the present invention, it is provided an agricultural composition comprising a pesticide and the biodegradable polyester of the present invention.

[0012] It has been noted that the agricultural compositions according to the invention reduce, or even prevent, crystal growth of dispersed agricultural material, and also guarantee good performances at dilution including a good suspensibility of the agricultural material, even for high loading formulations.

[0013] The agricultural compositions according to the invention present a high storage stability over time.

[0014] It has been also noted that the agricultural compositions according to the invention have a good viscosity and a good dispersion of agricultural materials, which allows easier application onto soils, plants and/or seeds.

[0015] In still another aspect of the present invention, it is provided the use of the biodegradable polyester of the present invention as dispersant for agricultural compositions.

[0016] In still yet another aspect of the present invention, it is provided the use of the agricultural composition according to the invention for the treatment of soils, plants and/or seeds to control pests and/or to regulate the growth of plants.

[0017] In still yet another aspect of the present invention, it is provided a method for treating soils, plants and/or seeds to control pests and/or to regulate the growth of plants, by applying the composition according to the invention to at least one plant,

area adjacent to a plant, soil adapted to support growth of a plant, root of a plant, foliage of a plant, and/or seed adapted to produce a plant.

DETAILED DESCRIPTION

[0018] Throughout the description, including the claims, the term "comprising one" or “comprising a" should be understood as being synonymous with the term "comprising at least one", unless otherwise specified. The terms "between" and “from … to…” should be understood as being inclusive of the limits.

[0019] The articles “a”, “an” and “the” are used to refer to one or to more than one (i.e., to at least one) of the grammatical object of the article.

[0020] It should be noted that in specifying any range of concentration, weight ratio or amount, any particular upper concentration, weight ratio or amount can be associated with any particular lower concentration, weight ratio or amount, respectively.

[0021] As used herein, the term "alkyl" means a saturated hydrocarbon radical, which may be straight, branched or cyclic, such as, methyl, ethyl, n-propyl, iso-propyl, n-butyl, sec-butyl, t-butyl, pentyl, n-hexyl, cyclohexyl.

[0022] As used herein, the terminology "(Cn-Cm)" in reference to an organic group, wherein n and m are each integers, indicates that the group may contain from n carbon atoms to m carbon atoms per group.

[0023] The suspensibility of the agricultural composition is defined as the percentage in weight of one or more agricultural material(s) remaining in suspension relative to the total weight of compounds after a given time, after the dilution of said composition at a certain %wt in water (CIPAC A or D standard waters), for example at 1%wt in water. The term “good suspensibility” is intended to denote a suspensibility greater than or equal to 70%, in particular greater than or equal to 80%, more particularly greater than or equal to 85%, for example greater than or equal to 90%.

[0024] The suspensibility of a composition can for example be determined according to the CIPAC method MT184.

[0025] The term “good storage stability” is intended to denote compositions which remain homogeneous (that is to say which exhibit substantially no, or limited, phase separation (sedimentation, syneresis, etc.)) over time, in particular which remain substantially homogeneous when stored for at least one week at 0°C, or for at least 2 weeks at 54°C or at least 3 months at 45°C (CIPAC MT 39.3 and MT 46.3 standardized tests).

[0026] The term “good viscosity” or “flowable” is intended to denote compositions exhibiting “good flowability”, that is to say compositions of suitable viscosity, for example of viscosity greater than 300 cP (i.e. 300 mPa.s), in particular of viscosity greater than 300 cP (i.e. 300 mPa.s) and less than 10,000 cP (i.e. 10,000 mPa.s), measured at 20 rpm and at 25°C using a Brookfield RV viscometer. In addition, a shear thinning profile, that is to say a viscosity which decreases when the shear rate increases, is generally required, in order to allow good flowability of the composition. A concentrated agricultural composition of the invention must in particular remain pumpable.

[0027] The term “suitable dispersion” or “good dispersion” is intended to mean a dispersion after dilution in water (CIPAC A or D standard waters) which is homogeneous (that is to say which exhibits substantially no phase separation. (sedimentation, syneresis, etc.)) over time, in particular which remains substantially homogeneous when stored for 30 minutes in a water bath thermostatically controlled at 30°C, preferably for 2 hours in a water bath thermostatically controlled at 30°C and ideally for 24 hours in a water bath thermostatically controlled at 30°C (adaptation of the CIPAC MT180 test). Such a dispersion must in particular make it possible to ensure good properties of use of the dispersed compounds.

[0028] Crystal growth, by "Ostwald ripening", generally occurs when smaller crystals (which have a larger surface area than bigger crystals) dissolve in the aqueous phase and the material is transported through the continuous phase, to nucleation sites of bigger crystals. As a result, the crystals of the agricultural material may aggregate and sediment, the composition becomes inhomogeneous; during application, filters and nozzles of the spray equipment can block and the biological efficacy may be reduced.

[0029] The particle size D(50) and D(90) values were determined by dynamic light scattering analysis using a Malvern Mastersizer 2000 with Hydro 2000SM

attachments running on deionized water. The particle size D(50) and D(90) values corresponding to the particle diameter such as the cumulative undersized volume fraction of particles is respectively equal to 50 % and to 90%. From the particle size values obtained, D(50) and D(90) values were readily determined.

[0030] The crystalline morphology of the material was assessed by optical microscopy observation. The sample was diluted to a 5%w/w solution in deionized water, and images of crystalline material taken and processed. In some cases, arbitrary line measurements on the resultant image were used to confirm particle size of the crystals.

Biodegradable polyester

[0031] In one aspect of the present invention, it is provided a biodegradable polyester used as dispersant for agricultural compositions. The biodegradable polyester can be prepared from a monomer composition comprising:

(a) a sulphonated dicarboxylic acid monomer (SA) selected from the group consisting of at least one sulphonated aromatic or sulphonated aliphatic dicarboxylic acid or the derivatives thereof;

(b) a polyhydric polyol (P) selected from the group consisting of at least one ethylene glycol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol or polyethylene glycol having an ethylene oxide number ranging from 1 to 200, dipropylene glycol, glycerol, 1,2,4-butanetriol and 1,2,3-butanetriol, and oligomers of thereof having from 1 to 100 monomer units; and

(c) a dihydroxyl compound (DH) selected from C_5 - C_{10} cycloaliphatic diol, C_5 - C_{10} cycloaliphatic diacidic acid, C_2 - C_8 hydroxylated aliphatic acid, or the combination thereof.

[0032] The sulphonated dicarboxylic acid monomer (SA) has at least one sulphonic acid group, preferably in the form of an alkali metal or alkali earth metal (preferably sodium) sulphonate, and two acidic functional groups or acidic functional group equivalents (that is to say an anhydride functional group or two ester functional groups) attached to one or a number of aromatic rings, when aromatic dicarboxylic acids or anhydrides or their diesters are involved, or to the aliphatic chain when aliphatic dicarboxylic acids or anhydrides or their alkyl diesters are involved.

[0033] Among the sulphonated dicarboxylic acid monomers (SA), there may be mentioned aromatic sulphonated dicarboxylic acids or anhydrides such as sulphoisophthalic, sulphoterephthalic, sulpho-ortho-phthalic acids or anhydrides, 4-sulpho-2,7-naphthalenedicarboxylic acids or anhydrides, sulpho-4,4'-bis(hydroxycarbonyl)diphenyl sulphones, sulphodiphenyldicarboxylic acids or anhydrides, sulpho-4,4'-bis(hydroxycarbonyl)diphenylmethanes, sulpho-5-phenoxyisophthalic acids or anhydrides or their lower (methyl, ethyl, propyl, isopropyl, butyl) diesters and sulphonated aliphatic sulphonated dicarboxylic acids or anhydrides such as sulphosuccinic acids or anhydrides or their lower (methyl, ethyl, propyl, isopropyl, butyl) diester. In one embodiment of the present invention, the sulphonated dicarboxylic acid monomers (SA) are selected from aromatic sulphonated dicarboxylic acids, preferably sulphoisophthalic, sulphoterephthalic, sulpho-ortho-phthalic acids or anhydrides lower diesters thereof.

[0034] The polyhydric polyol (P) used in the present invention is at least one polyol selected from the group consisting of ethylene glycol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol or polyethylene glycol having an ethylene oxide number ranging from 1 to 200, dipropylene glycol, glycerol, 1,2,4-butanetriol and 1,2,3-butanetriol, and oligomers of thereof having from 1 to 100 monomer units; preferably used is ethylene glycol and/or glycerol.

[0035] The dihydroxyl compound (DH) used in the present invention is selected from C_5 - C_{10} cycloaliphatic diol, C_5 - C_{10} cycloaliphatic diacidic acid, C_2 - C_8 hydroxylated aliphatic acid, or the combination thereof. The illustrative example of C_5 - C_{10} cycloaliphatic diol include but not limited to cyclohexane dimethanol, the illustrative example of C_2 - C_8 hydroxylated aliphatic acid include but not limited to glycolic acid, the illustrative example of C_5 - C_{10} cycloaliphatic diacidic acid monomer include but not limited to cyclohexane dicarboxylic acid.

[0036] In one embodiment of the present invention, more than one dihydroxyl compounds can be used, for example, cyclohexane dimethanol and cyclohexane dicarboxylic acid can be used together in the present invention.

[0037] In another embodiment of the present invention, the dihydroxyl compound(s) is used in an amount of 0.1% to 50 %, preferably between 0.5% to 25%, more preferably between 0.5% to 15%, based on the 100 molar % of the biodegradable polyester.

[0038] In one embodiment of the present invention, the monomer composition for preparing the polyester further comprises:

(d) a diacidic component which is at least one selected from

d1) an unsulphonated dicarboxylic acid monomer (A) consisting of at least one dicarboxylic acid or derivatives thereof selected from the group consisting of terephthalic, isophthalic, 2,6-naphthalenedicarboxylic acids and furan dicarboxylic acid; and

d2) a polyester prepolymer prepared from the unsulphonated dicarboxylic acid monomers (A) or derivatives thereof and the polyhydric polyol (P).

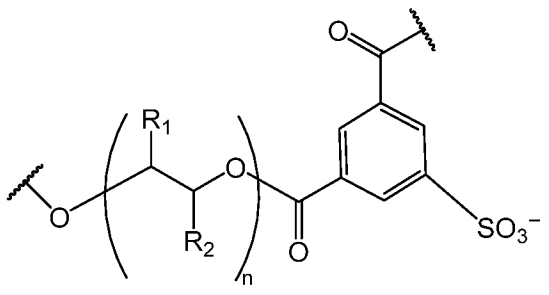
[0039] In one embodiment of the present invention, the unsulphonated dicarboxylic acid monomerdicarboxylic acid monomers (A) are consisted of isophthalic and/or furan dicarboxylic acids.

[0040] In the unsulphonated dicarboxylic acid monomer (A) there may additionally be present minor quantities of aromatic diacids other than those mentioned above, such as orthophthalic acid, anthracene, 1,8-naphthalene, 1,4-naphthalene and biphenyl dicarboxylic acids or aliphatic diacids such as adipic, glutaric, succinic, trimethyladipic, pimelic, azelaic, sebacic, suberic, itaconic and maleic acids, etc. in the form of acid, anhydride or lower (methyl, ethyl, propyl, isopropyl, butyl) diesters.

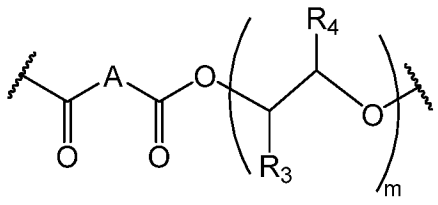
[0041] The prepolymer c2) used in the present invention is prepared from the unsulphonated dicarboxylic acid monomerdicarboxylic acid monomers (A) or the derivatives thereof and the polyhydric polyol (P). In one embodiment of the present invention, the prepolymer c2) is polyethylene terephthalate which can be prepared from terephthalic acid, isophthalic acid, ethylene glycol and/or diethylene glycol. Preferably the prepolymer c2) has an intrinsic viscosity range between 0.1 to 0.9 dL/g determined according to ASTM method D-4603 and has a maximum melting point of 250 ^{o}C.

[0042] The biodegradable polyester used as dispersant of the present invention can be prepared by the process of esterification or transesterification and polycondensation according to the common knowledge in the art. US 09/887664 discloses such a process of preparing the water-dispersible polyester polymer, which are hereby incorporated herein by reference in their entirety.

[0043] In one embodiment of the present invention, biodegradable polyester comprises the following repeating units (I) and (II):



(I)



(II)

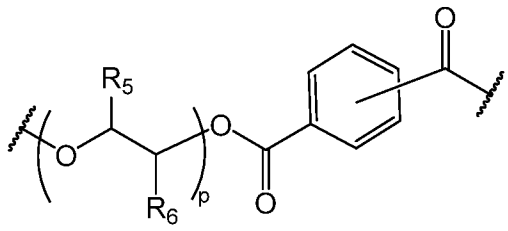
wherein R_1, R_2, R_3, and R_4 are independently selected from H or C_1-C_8 alkyl;

A is selected from C_5 - C_{10} cycloaliphatic group or aromatic group; and

n and m is a number ranging from 1 to 200.

[0044] In one embodiment of the present invention, one of R_1 and R_2 is selected from H, the other is selected from H, methyl, ethyl, propyl, or butyl, preferably methyl.

[0045] In one embodiment of the present invention, the biodegradable polyester further comprises the repeating units (III)



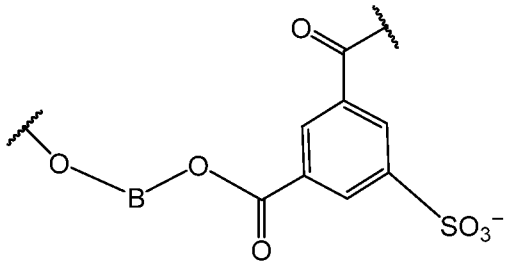
(III)

wherein R_5 and R_6 are independently selected from H or C_1-C_8 alkyl; and

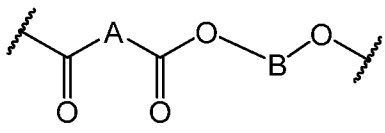
p is a number ranging from 1 to 200.

[0046] In one embodiment of the present invention, one of R_5 and R_6 is selected from H, the other is selected from H, methyl, ethyl, propyl, or butyl, preferably methyl.

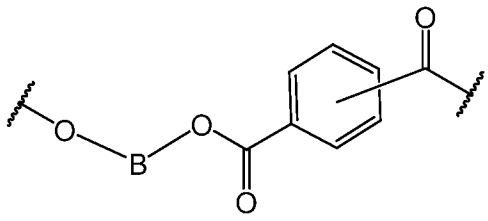
[0047] In another embodiment of the present invention, the biodegradable polyester further comprises at least one of the repeating units IV to VI,



(IV)



(V)



(VI)

wherein A is defined as above, B is selected from C_5 - C_{10} cycloaliphatic group.

[0048] In one embodiment of the present invention, as presented in repeating units IV to VI, B is represented hexamethylenyl.

[0049] In one embodiment of the present invention, as presented in repeating units II to V, A is selected from hexamethylenyl.

[0050] Agricultural formulations.

[0051] In another aspect of the present invention, it is provided an agricultural composition comprising:

(I) an agricultural material; and

(II) a biodegradable polyester as defined above.

[0052] The agricultural composition according to the invention comprises at least one agricultural material.

[0053] As used herein, the term “agricultural material” means an active ingredient used in the practice of farming, including cultivation of the soil for the growing of crops. However, the use of agricultural materials is not limited to application to crops. Agricultural materials may be applied to any surface, e.g., for the purpose of cleaning or aiding or inhibiting growth of a living organism. Other non-crop applications include, but are not limited to, application to an animal, e.g. livestock, application to turf and ornamentals, and application to railroad weed.

[0054] Preferably, the agricultural material(s) are chosen from pesticides, antimicrobials, nutrients, biostimulants, plant growth regulators, and mixtures thereof.

[0055] For example, pesticides include fungicides, herbicides, insecticides, algicides, moluscicides, miticides, nematicides, and rodenticides.

[0056] For example, antimicrobials include germicides, antibiotics, antibacterials, antivirals, antifungals, antiprotozoals, antiparasites.

[0057] More preferentially, the agricultural material(s) are selected from fungicides, herbicides, insecticides, algicides, moluscicides, miticides, nematicides, rodenticides, germicides, antibiotics, antibacterials, antivirals, antifungals, antiprotozoals, antiparasites, and mixtures thereof.

[0058] Suitable pesticides, antimicrobials, plant growth regulators, nutrients and biostimulants for use in the composition according to the invention may be chosen from those cited in the international application WO 2019/185851 from CRODA.

[0059] The term ‘pesticide' will be understood to refer to any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. A pesticide may be a chemical substance, a biological agent (such as a macroorganisms, a microorganisms), a semiochemicals (such as pheromone) or natural substances of mineral, plant or animal origin used against pests including insects, plant pathogens, weeds, mollusks, birds, mammals, fish, nematodes (roundworms) and microbes that compete with humans for food, destroy property, spread disease or are a nuisance. Pesticides includes biopesticides. The skilled worker is familiar with such pesticides, which can be found, for example, in the Pesticide Manual, 16th Ed. (2013), The British Crop Protection Council, London.

In the following examples, pesticides suitable for the agricultural compositions according to the present invention are given.

[0060] Preferably, according to the invention, the pesticides are chosen from insecticides, fungicides, herbicides, miticides, and mixtures thereof.

[0061] A fungicide refers to any substance or mixture of substances used to prevent the spread of fungi in gardens and crops. Fungicides are also used to fight fungal infections. Fungicides can either be contact or systemic. A contact fungicide kills fungi when it comes into contact with the fungicide retained on leaf surfaces. A systemic fungicide is absorbed into plant tissues and kills the fungus when it attempts to invade the host.

[0062] Examples of fungicides that can be employed in the present disclosure include, but are not limited to: (3-ethoxypropyl)-mercury bromide, 2-methoxyethylmercury chloride, 2-phenylphenol, 8-hydroxyquinoline sulfate, 8-phenylmercurioxyquinoline, acibenzolar, acibenzolar-S-methyl, acypetacs, acypetacs-copper, acypetacs-zinc, aldimorph, allyl alcohol, ametoctradin, amisulbrom, ampropylfos, anilazine, aureofungin, azaconazole, azithiram, azoxystrobin, barium polysulfide, benalaxyl, benalaxyl-M, benodanil, benomyl, benquinox, bentaluron, benthiavalicarb, benthiavalicarb-isopropyl, benzalkomum chloride, benzamacril, benzamacril-isobutyl, benzamorf, benzohydroxamic acid, bethoxazin, binapacryl, biphenyl, bitertanol, bithionol, bixafen, blasticidin-S, Bordeaux mixture, boscalid, bromuconazole, bupirimate, Burgundy mixture, buthiobate, butylamine, calcium polysulfide, captafol, captan, carbamorph, carbendazim, carboxin, carpropamid, carvone, Cheshunt mixture, chinomethionat, chlobenthiazone, chloraniformethan, chloranil, chlorfenazole, chlorodinitronaphthalene, chloroneb, chloropicrin, chlorothalonil, chlorquinox, chlozolinate, climbazole, clotrimazole, copper acetate, copper carbonate, basic, copper hydroxide, copper naphthenate, copper oleate, copper oxychloride, copper silicate, copper sulfate, copper zinc chromate, cresol, cufraneb, cuprobam, cuprous oxide, cyazofamid, cyclafuramid, cycloheximide, cyflufenamid, cymoxanil, cypendazole, cyproconazole, cyprodinil, dazomet, dazomet-sodium, DBCP, debacarb, decafentin, dehydroacetic acid, dichlofluanid, dichlone, dichlorophen, dichlozoline, diclobutrazol, diclocymet, diclomezine, diclomezine-sodium, dicloran, diethofencarb, diethyl pyrocarbonate, difenoconazole, diflumetorim, dimethirimol, dimethomorph, dimoxystrobin, diniconazole, diniconazole-M, dinobuton, dinocap,

dinocap-4, dinocap-6, dinocton, dinopenton, dinosulfon, dinoterbon, diphenylamine, dipyrithione, disulfiram, ditalimfos, dithianon, DNOC, DNOC-ammonium, DNOC-potassium, DNOC-sodium, dodemorph, dodemorph acetate, dodemorph benzoate, dodicin, do dicin- sodium, do dine, drazoxolon, edifenpho s, epoxiconazole, etaconazole, etem, ethaboxam, ethirimol, ethoxyquin, ethylmercury 2,3-dihydroxypropyl mercaptide, ethylmercury acetate, ethylmercury bromide, ethylmercury chloride, ethylmercury phosphate, etridiazole, famoxadone, fenamidone, fenaminosulf, fenapanil, fenarimol, fenbuconazole, fenfuram, fenhexamid, fenitropan, fenoxanil, fenpiclonil, fenpropidin, fenpropimorph, fentin, fentin chloride, fentin hydroxide, ferbam, ferimzone, fluazinam, fiudioxonil, flumetover, flumorph, fluopicolide, fluopyram, fluoroimide, fluotrimazole, fluoxastrobin, fluquinconazole, flusilazole, flusulfamide, flutianil, flutolanil, flutriafol, fluxapyroxad, folpet, formaldehyde, fo setyl, fo setyl- aluminium, fuberidazole, furalaxyl, furametpyr, furcarbanil, furconazole, furconazole-cis, furfural, furmecyclox, furophanate, glyodin, griseofulvin, guazatine, halacrinate, hexachlorobenzene, hexachlorobutadiene, hexaconazole, hexylthiofos, hydrargaphen, hymexazol, imazalil, imazalil nitrate, imazalil sulfate, imibenconazole, iminoctadine, iminoctadine triacetate, iminoctadine trialbesilate, iodomethane, ipconazole, iprobenfos, iprodione, iprovalicarb, isoprothiolane, isopyrazam, isotianil, isovaledione, kasugamycin, kresoxim-methyl, mancopper, mancozeb, mandipropamid, maneb, mebenil, mecarbinzid, mepanipyrim, mepronil, meptyldinocap, mercuric chloride, mercuric oxide, mercurous chloride, metalaxyl, metalaxyl-M, metam, metam-ammonium, metam-potassium, metam-sodium, metazoxolon, metconazole, methasulfocarb, methfuroxam, methyl bromide, methyl isothiocyanate, methylmercury benzoate, methylmercury dicyandiamide, methylmercury pentachlorophenoxide, metiram, metominostrobin, metrafenone, metsulfovax, milneb, myclobutanil, myclozolin, N-(efhylmercury)-p-toluene-sulphonanilide, nabam, natamycin, nitro styrene, nitrothal-isopropyl, nuarimol, OCH, octhilinone, ofurace, orysastrobin, oxadixyl, oxine-copper, oxpoconazole, oxpoconazole fumarate, oxycarboxin, pefurazoate, penconazole, pencycuron, penflufen, pentachlorophenol, penthiopyrad, phenylmercuriurea, phenylmercury acetate, phenylmercury chloride, phenylmercury derivative of pyrocatechol, phenylmercury nitrate, phenylmercury salicylate, phosdiphen, phthalide, picoxystrobin, piperalin, polycarbamate, polyoxins, polyoxorim, polyoxorim-zinc, potassium azide, potassium polysulfide, potassium thiocyanate, probenazole, prochloraz, procymidone, propamocarb, propamocarb

hydrochloride, propiconazole, propineb, proquinazid, prothiocarb, prothiocarb hydrochloride, prothioconazole, pyracarbolid, pyraclostrobin, pyraclostrobin, pyrametostrobin, pyraoxystrobin, pyrazophos, pyribencarb, pyridinitril, pyrifenox, pyrimethanil, pyriofenone, pyroquilon, pyroxychlor, pyroxyfur, quinacetol, quinacetol sulfate, quinazamid, quinconazole, quinoxyfen, quintozene, rabenzazole, salicylanilide, sedaxane, silthiofam, simeconazole, sodium azide, sodium orthophenylphenoxide, sodium pentachlorophenoxide, sodium polysulfide, spiroxamine, streptomycin, sulfur, sultropen, TCMTB, tebuconazole, tebufloquin, tecloftalam, tecnazene, tecoram, tetraconazole, thiabendazole, thiadifluor, thicyofen, thifluzamide, thiochlorfenphim, thiomersal, thiophanate, thiophanate-methyl, thioquinox, thiram, tiadinil, tioxymid, tolclofos-methyl, tolylfluanid, tolylmercury acetate, triadimefon, triadimenol, triamiphos, triarimoi, triazbutil, triazoxide, tributyltin oxide, trichlamide, tricyclazole, tridemorph, trifloxystrobin, triflumizole, triforine, triticonazole, uniconazole, uniconazole-P, validamycin, valifenalate, vinclozolin, zarilamid, zinc naphthenate, zineb, ziram, zoxamide and mixtures thereof.

[0063] An herbicide is a pesticide used to kill unwanted plants. Selective herbicides kill specific targets while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often based on plant hormones. Herbicides used to clear waste ground are non-selective and kill all plant material with which they come into contact. Herbicides are widely used in agriculture and in landscape turf management. They are applied in total vegetation control (TVC) programs for maintenance of highways and railroads. Smaller quantities are used in forestry, pasture systems, and management of areas set aside as wildlife habitat.

[0064] Examples of herbicides that can be employed in the present disclosure include, but are not limited to: 4-CPA, 4-CPB, 4-CPP, 2,4-D, 3,4- DA, 2,4-DB, 3,4-DB, 2,4-DEB, 2,4-DEP, 3,4-DP, 2,3,6-TBA, 2,4,5-T, 2,4,5-TB, acetochlor, acifluorfen, aclonifen, acrolein, alachlor, allidochlor, alloxydim, allyl alcohol, alorac, ametridione, ametryn, amibuzin, amicarbazone, amidosulfuron, aminocyclopyrachlor, aminopyralid, amiprofos-methyl, amitrole, ammonium sulfamate, anilofos, anisuron, asulam, atraton, atrazine, azafenidin, azimsulfuron, aziprotryne, barban, BCPC, beflubutamid, benazolin, bencarbazone, benfluralin, benfuresate, bensulfuron, bensulide, bentazone, benzadox, benzfendizone, benzipram, benzobicyclon, benzofenap, benzofiuor, benzoylprop, benzthiazuron,

bicyclopyrone, bifenox, bilanafos, bispyribac, borax, bromacil, bromobonil, bromobutide, bromofenoxim, bromoxynil, brompyrazon, butachlor, butafenacil, butamifos, butenachlor, buthidazole, buthiuron, butralin, butroxydim, buturon, butylate, cacodylic acid, cafenstrole, calcium chlorate, calcium cyanamide, cambendichlor, carbasulam, carbetamide, carboxazole chiorprocarb, carfentrazone, CDEA, CEPC, chlomethoxyfen, chloramben, chloranocryl, chlorazifop, chlorazine, chlorbromuron, chlorbufam, chloreturon, chlorfenac, chlorfenprop, chlorflurazole, chlorflurenol, chloridazon, chlorimuron, chlornitrofen, chloropon, chlorotoluron, chloroxuron, chloroxynil, chlorpropham, chlorsulfuron, chlorthal, chlorthiamid, cinidon-ethyl, cinmethylin, cinosulfuron, cisanilide, clethodim, cliodinate, clodinafop, clofop, clomazone, clomeprop, cloprop, cloproxydim, clopyralid, cloransulam, CMA, copper sulfate, CPMF, CPPC, credazine, cresol, cumyluron, cyanatryn, cyanazine, cycloate, cyclosulfamuron, cycloxydim, cycluron, cyhalofop, cyperquat, cyprazine, cyprazole, cypromid, daimuron, dalapon, dazomet, delachlor, desmedipham, desmetryn, diallate, dicamba, dichlobenil, dichloralurea, dichloiTnate, dichlorprop, dichlorprop-P, diclofop, diclosulam, diethamquat, diethatyl, difenopenten, difenoxuron, difenzoquat, diflufenican, diflufenzopyr, dimefuron, dimepiperate, dimethachlor, dimethametryn, dimethenamid, dimethenamid-P, dimexano, dimidazon, dinitramine, dinofenate, dinoprop, dinosam, dinoseb, dinoterb, diphenamid, dipropetryn, diquat, disul, dithiopyr, diuron, DMPA, DNOC, DSMA, EBEP, eglinazine, endothal, epronaz, EPTC, erbon, esprocarb, ethalfluralin, ethametsulfuron, ethidimuron, ethiolate, ethofumesate, ethoxyfen, ethoxysulfuron, etinofen, etnipromid, etobenzanid, EXD, fenasulam, fenoprop, fenoxaprop, fenoxaprop-P, fenoxasulfone, fenteracol, fenthiaprop, fentrazamide, fenuron, ferrous sulfate, flamprop, flamprop-M, flazasulfuron, florasulam, fluazifop, fluazifop-P, fluazolate, flucarbazone, flucetosulfuron, fluchloralin, flufenacet, flufenican, flufenpyr, flumetsulam, flumezin, flumiclorac, flumioxazin, flumipropyn, fluometuron, fluorodifen, fluoroglycofen, fluoromidine, fluoronitrofen, fluothiuron, flupoxam, flupropacil, flupropanate, flupyrsulfuron, fluridone, fluorochloridone, fluoroxypyr, flurtamone, fluthiacet, fomesafen, foramsulfuron, fosamine, furyloxyfen, glufosinate, glufosinate-P, glyphosate, halosafen, halosulfuron, haloxydine, haloxyfop, haloxyfop-P, hexachloroacetone, hexaflurate, hexazinone, imazamethabenz, imazamox, imazapic, imazapyr, imazaquin, imazethapyr, imazosulfuron, indanofan, indazifiam, iodobonil, iodomethane, iodo sulfuron, ioxynil, ipazine, ipfencarbazone, iprymidam, isocarbamid, isocil, isomethiozin,

isonoruron, isopolinate, isopropalin, isoproturon, isouron, isoxaben, isoxachlortole, isoxaflutole, isoxapyrifop, karbutilate, ketospiradox, lactofen, lenacil, linuron, MAA, MAMA, MCPA, MCPA-thioethyl, MCPB, mecoprop, mecoprop-P, medinoterb, mefenacet, mefluidide, mesoprazine, mesosulfuron, mesotrione, metam, metamifop, metamitron, metazachlor, metazosulfuron, metflurazon, methabenzthiazuron, methalpropalin, methazole, methiobencarb, methiozolin, methiuron, methometon, methoprotryne, methyl bromide, methyl isothiocyanate, methyldymron, metobenzuron, metobromuron, metolachlor, meto sulam, metoxuron, metribuzin, metsulfuron, molinate, monalide, monisouron, monochloroacetic acid, monolinuron, monuron, morfamquat, MSMA, naproanilide, napropamide, naptalam, neburon, nicosulfuron, nipyraclofen, nitralin, nitrofen, nitrofluorfen, norflurazon, noruron, OCH, orbencarb, orthodichlorobenzene, orthosulfamuron, oryzalin, oxadiargyl, oxadiazon, oxapyrazon, oxasulfuron, oxaziclomefone, oxyfluorfen, parafluoron, paraquat, pebulate, pelargonic acid, pendimethalin, penoxsulam, pentachlorophenol, pentanochlor, pentoxazone, perfluidone, pethoxamid, phenisopham, phenmedipham, phenmedipham-ethyl, phenobenzuron, phenylmercury acetate, picloram, picolinafen, pinoxaden, piperophos, potassium arsenite, potassium azide, potassium cyanate, pretilachlor, primisulfuron, procyazine, prodiamine, profluazol, profluralin, profoxydim, proglinazine, prometon, prometryn, propachlor, propanil, propaquizafop, propazine, propham, propisochlor, propoxycarbazone, propyrisulfuron, propyzamide, pro sulfalin, prosulfocarb, prosulfuron, proxan, prynachlor, pydanon, pyraclonil, pyraflufen, pyrasulfotole, pyrazolynate, pyrazosulfuron, pyrazoxyfen, pyribenzoxim, pyributicarb, pyriclor, pyridafol, pyridate, pyriftalid, pyriminobac, pyrimisulfan, pyrithiobac, pyroxasulfone, pyroxsulam, quinclorac, quinmerac, quinoclamine, quinonamid, quizalofop, quizalofop-P, rhodethanil, rimsulfuron, saflufenacil, S-metolachlor, sebuthylazine, secbumeton, sethoxydim, siduron, simazine, simeton, simetryn, SMA, sodium arsenite, sodium azide, sodium chlorate, sulcotrione, sulfallate, sulfentrazone, sulfometuron, sulfosulfuron, sulfuric acid, sulglycapin, swep, TCA, tebutam, tebuthiuron, tefuryltrione, tembotrione, tepraloxydim, terbacil, terbucarb, terbuchlor, terbumeton, terbuthylazine, terbutryn, tetrafluoron, thenylchlor, thiazafluoron, thiazopyr, thidiazimin, thidiazuron, thiencarbazone-methyl, thifensulfuron, thiobencarb, tiocarbazil, tioclorim, topramezone, tralkoxydim, tri-allate, triasulfuron, triaziflam, tribenuron, tricamba, triclopyr, tridiphane, trietazine, trifloxysulfuron, trifluralin,

triflusulfuron, trifop, trifopsime, trihydroxytriazine, trimeturon, tripropindan, tritac tritosulfuron, vemolate, xylachlor and mixtures thereof.

[0065] Safeners mean active ingredients applied with herbicides to protect crops against their injury. Some of the safeners that can be employed in the present disclosure include, but are not limited to: benoxacor, benthiocarb, brassinolide, cloquintocet (mexyl), cyometrinil, daimuron, dichlormid, dicyclonon, dimepiperate, disulfoton, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen-ethyl, mefenpyr-diethyl, MG 191, MON 4660, naphthalic anhydride (NA), oxabetrinil, R29148, N-phenylsulfonylbenzoic acid amides and mixtures thereof.

[0066] An insecticide is a pesticide used against insects in all developmental forms, and include ovicides and larvicides used against the eggs and larvae of insects. Insecticides are used in agriculture, medicine, industry and the household.

[0067] Examples of insecticides that can be employed in the present disclosure include, but are not limited to: 1,2- dichloropropane, abamectin, acephate, acetamiprid, acethion, acetoprole, acrinathrin, acrylonitrile, alanycarb, aldicarb, aldoxycarb, aldrin, allethrin, allosamidin, allyxycarb, alpha-cypermethrin, alpha-ecdysone, alpha-endosulfan, amidithion, aminocarb, amiton, amiton oxalate, amitraz, anabasine, athidathion, azadirachtin, azamethiphos, azinphos-ethyl, azinphos-methyl, azothoate, barium hexafluoro silicate, barthrin, bendiocarb, benfuracarb, bensultap, beta-cyfluthrin, beta-cypermethrin, bifenthrin, bioallethrin, bioethanomethrin, biopermethrin, bistrifluoron, borax, boric acid, bromfenvinfos, bromocyclen, bromo-DDT, bromophos, bromophos-ethyl, bufencarb, buprofezin, butacarb, butathiofos, butocarboxim, butonate, butoxycarboxim, cadusafos, calcium arsenate, calcium polysulfide, camphechlor, carbanolate, carbaryl, carbofuran, carbon disulfide, carbon tetrachloride, carbophenothion, carbosulfan, cartap, cartap hydrochloride, chlorantraniliprole, chlorbicyclen, chlordane, chlordecone, chlordimeform, chlordimeform hydrochloride, chlorethoxyfos, chlorfenapyr, chlorfenvinphos, chlorfluazuron, chlormephos, chloroform, chloropicrin, chlorphoxim, chlorprazophos, chlorpyrifos, chlorpyrifos- methyl, chlorthiophos, chiOmafenozide, cinerin I, cinerin II, cinerins, cismethrin, cloethocarb, closantel, clothianidin, copper acetoarsenite, copper arsenate, copper naphthenate, copper oleate, coumaphos, coumithoate, crotamiton, crotoxyphos, crufomate, cryolite, cyanofenphos, cyanophos, cyanthoate, cyantraniliprole, cyclethrin, cycloprothrin, cyfluthrin, cyhalothrin, cypermethrin,

cyphenothrin, cyromazine, cythioate, DDT, decarbofuran, deltamethrin, demephion, demephion-O, demephion-S, demeton, demeton-methyl, demeton-O, demeton-0-methyl, demeton-S, demeton-S-methyl, demeton- S-methylsulphon, diafenthiuron, dialifos, diatomaceous earth, diazinon, dicapthon, dichlofenthion, dichlorvos, dicresyl, dicrotophos, dicyclanil, dieldrin, diflubenzuron, dilor, dimefluthrin, dimefox, dimetan, dimethoate, dimethrin, dimethylvinphos, dimetilan, dinex, dinex-diclexine, dinoprop, dinosam, dinotefuran, diofenolan, dioxabenzofos, dioxacarb, dioxathion, disulfoton, dithicrofos, d-limonene, DNOC, DNOC-ammonium, DNOC-potassium, DNOC-sodium, doramectin, ecdysterone, emamectin, emamectin benzoate, EMPC, empenfhrin, endosulfan, endothion, endrin, EPN, epofenonane, eprinomectin, esdepallethrine, esfenvalerate, etaphos, ethiofencarb, ethion, ethiprole, ethoate-methyl, ethoprophos, ethyl formate, ethyl-DDD, ethylene dibromide, ethylene dichloride, ethylene oxide, etofenprox, etrimfos, EXD, famphur, fenamiphos, fenazaflor, fenchlorphos, fenethacarb, fenfluthrin, fenitrothion, fenobucarb, fenoxacrim, fenoxycarb, fenpirithrin, fenpropathrin, fensulfothion, fenthion, fenthion-ethyl, fenvalerate, fipronil, flonicamid, flubendiamide, flucofuron, flucycloxuron, flucythrinate, flufenerim, flufenoxuron, flufenprox, fluvalinate, fonofos, formetanate, formetanate hydrochloride, formothion, fomiparanate, fomiparanate hydrochloride, fosmethilan, fospirate, fosthietan, fufenozide, furathiocarb, furethrin, gamma-cyhalothrin, gamma- HCH, halfenprox, halofenozide, HCH, HEOD, heptachlor, heptenophos, heterophos, hexaflumuron, HHDN, hydramethylnon, hydrogen cyanide, hydroprene, hyquincarb, imidacloprid, imiprothrin, indoxacarb, iodomethane, IPSP, isazofos, isobenzan, isocarbophos, isodrin, isofenphos, isofenphosmethyl, isoprocarb, isoprothiolane, isothioate, isoxathion, ivermectin, jasmolin I, jasmolin II, jodfenphos, juvenile hormone I, juvenile hormone II, juvenile hormone III, kelevan, kinoprene, lambda- cyhalothrin, lead arsenate, lepimectin, leptophos, lindane, lirimfos, lufenuron, lythidathion, malathion, malonoben, mazidox, mecarbam, mecarphon, menazon, meperfluthrin, mephosfolan, mercurous chloride, mesulfenfos, metaflumizone, methacrifos, methamidophos, methidathion, methiocarb, methocrotophos, methomyl, methoprene, methothrin, methoxychlor, methoxyfenozide, methyl bromide, methyl isothiocyanate, methylchloroform, methylene chloride, metofluthrin, metolcarb, metoxadiazone, mevinphos, mexacarbate, milbemectin, milbemycin oxime, mipafox, mirex, molosultap, mo no crotopho s, monomehypo, mono sultap, morphothion, moxidectin, naftalofos, naled, naphthalene, nicotine, nifluridide, nitenpyram,

nithiazine, nitrilacarb, novaluron, noviflumuron, omethoate, oxamyl, oxydemeton-methyl, oxydeprofos, oxydisulfoton, para-dichlorobenzene, parathion, parathion-methyl, penfluoron, pentachlorophenol, permethrin, phenkapton, phenothrin, phenthoate, phorate, phosalone, phosfolan, phosmet, phosnichlor, phosphamidon, phosphine, phoxim, phoxim-methyl, pirimetaphos, pirimicarb, pirimiphos-ethyl, pirimiphos-methyl, potassium arsenite, potassium thiocyanate, pp'-DDT, prallethrin, precocene I, precocene II, precocene III, primidophos, profenofos, profluralin, profluthrin, promacyl, promecarb, propaphos, propetamphos, propoxur, prothidathion, prothiofos, prothoate, protrifenbute, pymetrozine, pyraclofos, pyrafluprole, pyrazophos, pyresmethrin, pyrethrin I, pyrethrin II, pyrethrins, pyridaben, pyridalyl, pyridaphenthion, pyrifluquinazon, pyrimidifen, pyrimitate, pyriprole, pyriproxyfen, quassia, quinalphos, quinalphos-methyl, quinothion, rafoxanide, resmethrin, rotenone, ryania, sabadilla, schradan, selamectin, silafluofen, silica gel, sodium arsenite, sodium fluoride, sodium hexafluorosilicate, sodium thiocyanate, sophamide, spinetoram, spinosad, spiromesifen, spirotetramat, sulcofuron, sulcofuron-sodium, sulfluramid, sulfotep, sulfoxaflor, sulfuryl fluoride, sulprofos, tau-fluvalinate, tazimcarb, TDE, tebufenozide, tebufenpyrad, tebupirimfos, teflubenzuron, tefluthrin, temephos, TEPP, terallethrin, terbufos, tetrachloroethane, tetrachlorvinphos, tetramethrin, tetramethylfluthrin, theta-cypei-methiin, thiacloprid, thiamethoxam, thicrofos, thiocarboxime, thiocyclam, thiocyclam oxalate, thiodicarb, thiofanox, thiometon, thiosultap, thiosultap-disodium, thiosultap- monosodium, thuringiensin, tolfenpyrad, tralomethrin, transfluthrin, transpermethrin, triarathene, triazamate, triazophos, trichlorfon, trichlormetaphos-3, trichloronat, trifenofos, triflumuron, trimethacarb, triprene, vamidothion, vaniliprole, XMC, xylylcarb, zeta-cypermethrin, zolaprofos and mixtures thereof.

[0068] Miticides are pesticides that kill mites. Antibiotic miticides, carbamate miticides, formamidine miticides, mite growth regulators, organochlorine, permethrin and organophosphate miticides all belong to this category.

[0069] Molluscicides are pesticides used to control mollusks, such as moths, slugs and snails. These substances include metaldehyde, methiocarb and aluminium sulphate.

[0070] A nematicide is a type of chemical pesticide used to kill parasitic nematodes (a phylum of worm).

[0071] Preferably, the amount of pesticide(s) in the composition ranges from 1 to 95 % by weight, relative to the total weight of the composition.

[0072] Preferably, the amount of antimicrobial(s) in the composition ranges from 1 to 95 % by weight, relative to the total weight of the composition.

[0073] Preferably, the sum of the amount of antimicrobial(s) and of the amount of pesticide(s) in the composition ranges from 1 to 95 % by weight, relative to the total weight of the composition

[0074] The composition according to the invention may comprise at least one biopesticide.

[0075] According to the invention, the term "biopesticide" includes microorganisms that control pests (microbial pesticides), macroorganisms that control pests, semiochemicals that control pests and natural substance of mineral, plant or animal origin that control pests.

[0076] Microbial pesticides means any microorganism, whether in a vegetative state, a dormant state (e.g., spore) or a whole broth culture, any substance derived from a microorganism (e.g., metabolites), or any fermentation product (e.g., supernatants, filtrates, extracts, etc.) that are pathogenic to a pest (e.g., capable of attacking, infecting, killing, disabling, causing disease, compete with and/or causing injury to a pest), and is thus able to be used in the control of a pest by adversely affecting the viability or growth of the target pest. Non-limiting examples of "microbial pesticides" include microbial nematocides, microbial insecticides, microbial fungicides, microbial bactericides, and microbial viricides).

[0077] Preferably, the biopesticide are chosen from fungal spores and/or bacterial spores.

[0078] Examples of fungal spores or conidia that are insecticidal or nematicidal or fungicidal include but not limited to the following classes: Basidiomycetes, Chytridiomycetes, Deuteromycetes, Hyphochytridiomycetes, Oomycetes, Plasmodiophoromycetes, Sordahomycetes, Thchomycetes and Zygomycetes, specifically the following fungi; Arthrobotrys superba, Arthrobotrys irregular, Beauveria bassiana, Erynia neoaphidis, Fusarium spp., Hirsute/ la rhossiliensis, Hirsutella thompsonii, Lagenidium giganteum, Metarhiziurn anisopliae, Myrothecium, Neozygietes fresenii (Nowakowski), Nomuraea rileyi, Paecilomyces lilacinus, Pseudomonas chloroaphis, Pseudomonas spp., Psedozyma Flocculosa,

Trichoderma harzianum, and Vericillium lecanii., Verticillium lecanii, plus those endoparasitic fungi described in the book of "Nematology Advances and Perspectives, Vol. 2 (2004)", which is incorporated herein by reference in its relevant portion. Also included is a fungus genus "Esteya vermicola as described in US Patent No 6,168,947 (incorporated by reference), as well as the "Arkansas Fungus 18' as described in US Patent No 5,019,389 (incorporated herein by reference).

[0079] Examples of bacterial spores include but not limited to Bacillus agri, Bacillus aizawai, Bacillus albolactis, Bacillus amyloliquefaciens, Bacillus cereus, Bacillus circulans, Bacillus coagulans, Bacillus endoparasiticus, Bacillus endorhythmos, Bacillus firmus, Bacillus kurstaki, Bacillus lacticola, Bacillus lactimorbus, Bacillus lactis, Bacillus laterosporus, Bacillus lentimorbus, Bacillus licheniformis, Bacillus macerans, Bacillus megatehum, Bacillus medusa, Bacillus metiens, Bacillus natto, Bacillus nigricans, Bacillus popillae, Bacillus pumiliss, Bacillus pumilus, Bacillus siamensis, Bacillus sphaehcus, Bacillus spp., Bacillus subtilis, Bacillus thuringiensis, Bacillus uniflagellatus, plus those listed in the category of Bacillus Genus in the "Todar's Online Textbook of Bacteriology, (2009)" which is incorporated herein by reference in its relevant portion. Also included are Photorhabdus luminescens, Xenorhabdus nematophilus, pantoea agglomerans, and those nematicidal bacterial antagonists listed in "Nematology Advances and Perspectives, Vol. 2 (2004)".

[0080] Preferably, the amount of biopesticide(s) in the composition ranges from 1 to 95 % by weight, relative to the total weight of the composition.

[0081] The composition according to the invention may comprise at least one nutrient.

[0082] Nutrients refer to chemical elements and compounds which are desired or necessary to promote or improve plant growth. Nutrients generally are described as macronutrients or micronutrients.

[0083] Suitable nutrients for use in the compositions according to the invention may be micronutrient compounds, preferably those which are solid at room temperature (25°C) or are partially soluble.

[0084] Micronutrients typically refer to trace metals or trace elements, and are often applied in lower doses. Suitable micronutrients include trace elements selected from zinc, boron, chlorine, copper, iron, molybdenum, and manganese.

[0085] The micronutrients may be in a soluble form or included as insoluble solids, and may in the form of salts or chelates. Preferably, the micronutrient is in the form of a carbonate or oxide.

[0086] Preferably, the micronutrients may be selected from zinc, calcium, molybdenum or manganese, or magnesium. More preferentially micronutrients for use in the compositions according to the invention may be selected from zinc oxide, manganese carbonate, manganese oxide, or calcium carbonate.

[0087] The composition according to the present invention may also comprise at least one macronutrient.

[0088] Macronutrients typically refer to those comprising nitrogen, phosphorus, and potassium, and include fertilisers such as ammonium sulphate, and water conditioning agents. Suitable macronutrients include fertilisers and other nitrogen, phosphorus, or sulphur containing compounds, and water conditioning agents.

[0089] Suitable fertilisers include inorganic fertilisers that provide nutrients such as nitrogen, phosphorus, potassium or sulphur. Examples of such fertilisers include:

- for nitrogen as the nutrient: nitrates and or ammonium salts such as ammonium nitrate, including in combination with urea e.g. as uran type materials, calcium ammonium nitrate, ammonium sulphate nitrate, ammonium phosphates, particularly mono-ammonium phosphate, di-ammonium phosphate and ammonium polyphosphate, ammonium sulphate, and the less commonly used calcium nitrate, sodium nitrate, potassium nitrate and ammonium chloride;

- for phosphorus as the nutrient: acidic forms of phosphorus such as phosphoric, pyrophosphoric or polyphosphoric acids, but more usually salt forms such as ammonium phosphates, particularly mono-ammonium phosphate, di-ammonium phosphate, and ammonium polyphosphate, potassium phosphates, particularly potassium dihydrogen phosphate and potassium polyphosphate;

- for sulphur as the nutrient: ammonium sulphate and potassium sulphate, e.g. the mixed sulphate with magnesium.

[0090] Preferably, the amount of nutrient(s) in the composition range from 1 to 40 % by weight, more preferentially from 10 to 35 % by weight; even more preferentially from 15 to 30 % by weight, relative to the total weight of the composition.

[0091] Preferably, the amount of micronutrient(s) in the composition range from 1 to 40 % by weight, more preferentially from 10 to 35 % by weight; even more preferentially from 15 to 30 % by weight, relative to the total weight of the composition.

[0092] Preferably, the amount of macronutrient(s) in the composition range from 1 to 40 % by weight, more preferentially from 10 to 35 % by weight; even more preferentially from 15 to 30 % by weight, relative to the total weight of the composition.

[0093] The term “biostimulant” is intended to mean a compound which may enhance metabolic or physiological processes such as respiration, photosynthesis, nucleic acid uptake, ion uptake, nutrient delivery, or a combination thereof.

[0094] Non-limiting examples of biostimulants include seaweed extracts (e.g., ascophyllum nodosum), humic acids (e.g., potassium humate), fulvic acids, myoinositol, glycine, and combinations thereof.

[0095] Preferably, the amount of biostimulant(s) in the composition range from 0.001 to 10 % by weight, more preferentially from 0.01 to 5 % by weight; even more preferentially from 0.1 to 1 % by weight, relative to the total weight of the composition.

[0096] The composition according to the invention may comprise at least one plant growth regulator.

[0097] Plant growth regulators mean active ingredients used to influence the growth characteristics of plants. Examples of plant growth regulators which may be used in the present disclosure include, but are not limited to: 1-naphthaleneacetic acid, 1-naphthaleneacetic acid -salt, 1-napthol, 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4-DB, 2,4-DEP, 2,3,5-triiodobenzoic acid, 2,4,5-trichlorophenoxyacetic acid, 2-naphthoxyacetic acid, 2-naphthoxyacetic acid sodium salt, 3-chloro-4-hydroxyphenylacetic acid, 3-indoleacetic acid, 4-biphenylacetic acid, 4-chlorophenoxyacetic acid (4-CPA), 4-hydroxyphenylacetic acid, 6-

benzylaminopurine, auxindole, a-naphthaleneacetic acid K-salt, ß-naphfhoxyacetic acid, p-chlorophenoxyacetic acid, dicamba, dichlorprop, fenoprop, indole-3 -acetic acid (IAA), indole-3 -acetyl-DL-aspartic acid, indole-3 -acetyl-DL-tryptophan, indole- 3-acetyl-L-alanine, indole-3 -acetyl-L-valine, indole-3 -butyric acid (IBA), indole-3- butyric acid K-salt, indole-3 -propionic acid; a-naphthaleneacetic acid, methyl indole- 3 -acetate, naphthaleneacetamide, naphthaleneacetic acid (NAA), phenylacetic acid, picloram, potassium naphthenate, sodium naphthenate, 4-hydroxyphenethyl alcohol, 4-CPPU, 6-benzylaminopurine (BA), 6-(Y,Y-dimethylallylamino)purine (2iP), 2-iP- 2HC1, adenine, adenine hemisulfate, benzyladenine, kinetin, meta-topolin, N6-benzoyladenine, N- benzyl-9-(2-tetrahydropyranyl) adenine (BP A), N-(2-chloro-4- pyridyl)-N-phenylurea, gibberellic acid (GA3), gibberellins, gibberellins A4 + A7 (GA n), ethylene and abscisic acid.

[0098] Preferably, the amount of plant growth regulator(s) in the composition ranges from 1 to 95 % by weight, relative to the total weight of the composition.

[0099] Preferably, the agricultural composition according to the invention is aqueous.

[0100] More preferentially, the water content of the composition ranges from 5% to 99% by weight, more preferentially from 20% to 98% by weight, even more preferentially from 25% to 97% by weight, relative to the total weight of the composition.

[0101] Preferably, the pH of the agricultural composition ranges from 1 to 11; more preferentially from 3 to 9; and even better from 4 to 8.

[0102] The pH of the agricultural compositions can be adjusted to the desired value by means of basifying agents or acidifying agents. Use may be made, among the basifying agents, of one or more alkaline agents, such as ammonia, sodium hydroxide or ethanolamine. Mention may be made, by way of examples, among the acidifying agents, of inorganic or organic acids, such as hydrochloric acid or orthophosphoric acid.

[0103] The agricultural composition according to the invention may further contains additives different from the ingredients described previously, such as binders, diluents, absorbents, dispersants different from those described previously, carriers, disintegration agents, wetting agents, emulsifiers, antifoam agents,

antifreeze agents, solvents, viscosity modifiers, preservatives and/or anti-microbials.

[0104] Mention may be made for instance of (C_1-C_8) monoalcohols, (C_2-C_8) polyols, and mixtures thereof; such as ethanol, isopropanol, ethylene glycol, propylene glycol, and mixtures thereof.

[0105] Each additive can be present in the agricultural composition according to the invention in an amount ranging from 0% to 20% by weight, more preferably from 0% to 10% by weight, relative to the total weight of the composition.

[0106] A person skilled in the art will be able to choose these optional additives and their amounts so that they do not harm the properties of the agricultural compositions of the present invention.

[0107] Preferably, the viscosity of an aqueous agricultural composition according to the invention, measured at 20 rpm using a Brookfield RV viscometer at 25°C and at atmospheric pressure ($1.013x10^5$ Pa), ranges from 500 mPa.s to 1 500 mPa.s; more preferentially from 700 to 1 300 mPa.s.

[0108] The agricultural composition according to the invention may be in the form of a concentrate of agricultural material(s), a diluted concentrate, or a sprayable diluted. In particular, the agricultural composition according to the invention may be in the form of an emulsifiable concentrate (EC), emulsion in water concentrate (EW), suspension concentrate (SC), capsule suspension (CS), ZC formulation, flowable concentrate for seed treatment (FS), water dispersible granules (WDG) and/or suspoemulsions (SE).

[0109] More preferentially, the agricultural composition according to the invention is formulated as a suspension concentrate (SC), a flowable concentrate for seed treatment (FS) or a suspoemulsions (SE).

[0110] According to a preferred embodiment of the invention, the agricultural composition is an aqueous suspension having a concentration of greater than 0.05 g/L of agricultural material(s).

[0111] More preferentially according to this embodiment, the agricultural composition is an aqueous suspension having a concentration of between 0.05 g/L to 1 200 g/L of agricultural material(s).

[0112] According to another preferred embodiment of the invention, the agricultural composition is a concentrated aqueous suspension having a concentration of greater than 50 g/L of agricultural material(s).

[0113] More preferentially according to this embodiment, the agricultural composition is a concentrated aqueous suspension having a concentration of between 50 g/L to 1 200 g/L of agricultural material(s), even more preferentially between 400 g/L to 1 200 g/L, for instance higher than 700 g/L.

[0114] According to another preferred embodiment of the invention, the concentrated agricultural composition may be diluted in water for use resulting in a dilute composition having a concentration of greater than 0.05 g/L of agricultural material(s).

[0115] More preferentially according to this embodiment, the concentrated agricultural composition may be diluted in water for use resulting in a dilute composition having a concentration of between 0.05 g/L to 120 g/L of agricultural material(s), even more preferentially between 0.4 g/L to 120 g/L, for instance higher than 0.7 g/L.

[0116] The copolymer according to the invention may also reduce the viscosity of the agricultural composition during milling of the composition compared to the viscosity of the same agricultural composition during milling without addition of the copolymer according to the invention.

[0117] In addition, the copolymer according to the invention may also reduce the temperature during milling of the agricultural composition compared to the temperature during milling of the same agricultural composition during milling without addition of the copolymer according to the invention.

[0118] Wet milling is a process used for preparing suspension concentrate formulations. The copolymer layer formed on the particles by the copolymer according to the invention may lower/reduce interactions between the particles thereby, reducing viscosity and allowing the suspension to be loaded with a high concentration of particles without increasing the temperature of the system.

[0119] Accordingly, the present copolymer according to the invention permits greater density of the formulations and an efficient, low temperature wet milling. process.

[0120] According to a particular embodiment of the invention, the agricultural composition according to the invention is formulated as water dispersible granules (WDG).

[0121] The granules can include solid support, filler or diluent material(s) which is desirably inert to the agricultural material(s), but which is readily dispersible in water, if necessary in conjunction with dispersing agents. These materials may also have the benefit of reducing granule dry clumping and the disintegration rate (on addition to water) and can also be used to adjust the agricultural material(s) concentration(s).

[0122] Examples include clays such as kaolin (china clay) and bentonite clays, which may be natural bentonites or modified e.g. activated bentonites, synthetic and diatomaceous silicas, calcium and magnesium silicates, titanium dioxide, aluminium, calcium or magnesium carbonate, ammonium, sodium, potassium, calcium or barium sulphate, charcoal, starch, including modified starches such as alkyl and carboxyalkyl starches, cellulose, such as microcrystalline cellulose, and cellulose derivatives such as carboxyalkyl cellulose, and mixtures of two or more such solid support, filler, diluent materials.

[0123] The copolymer according to the invention facilitates the disintegration of the granules after the addition of water to form a homogeneous dispersion and guarantee good performances at dilution including a good suspensibility of the active ingredients, and lead to low residues, when passing the diluted formulation through a sieve of mesh size of 200. The suspensibility performances can be evaluated with the CIPAC method MT184 after a dilution at 0.5% or 1.0% in CIPAC standard waters A, D or C. In the present application, the suspensibility performances was evaluated with the CIPAC method MT184 after a dilution at 1.0% in CIPAC standard waters C. The easiness of disintegration of the granules to form a dispersion is evaluated after a dilution at 1% in CIPAC standard water D in a measuring cylinder. The number of inversions of the measuring cylinder to disintegrate completely the granules and to form a suspension is assessed, with an acceptance criteria to be below than 30 inversions. Furthermore, the copolymer according to the invention significantly reduces the amount of non-dispersible material obtained after dilution of the WDG formulation. The amount of non-dispersible material can be evaluated with the CIPAC method MT185 (wet sieve test). A sample of the formulation is dispersed in water and the suspension formed

is transferred to a sieve, for example of 200 mesh size, and washed. The amount of the material retained on the sieve is determined by drying and weighing.

[0124] Furthermore, the copolymer according to the invention may reduce the pressure during the possible granulation of the agricultural composition compared to the pressure during granulation of the same agricultural composition without addition of the copolymer according to the invention.

[0125] Granulation is a process used for preparing water dispersible granules formulations. In the process of granulation, after milling the agricultural material(s) with solid additives, some amount of water (up to 30% w/w) is added. The copolymer according to the invention is added together with this water. Then the powder is introduced to the granulator. The granulator, made of wings rotating at a certain speed (which is determined by the user), pushes the powder through a screen with small holes. In hard cases the powder creates a large pressure that resists this transfer through the screen.

[0126] The copolymer layer formed on the particles using the copolymer according to the invention may improve granulation by remarkably reducing the pressure that develops during the granulation process.

[0127] In another aspect of the present invention, it is provided the use of the biodegradable polyester defined above as dispersant for agricultural compositions.

[0128] In addition, the invention relates to the use of the agrochemical composition as described previously, for the treatment of soils, plants and/or seeds to control pests and/or to regulate the growth of plants.

[0129] The invention also relates to a method for treating soils, plants and/or seeds to control pests and/or to regulate the growth of plants, by applying the composition according to the invention as described previously to at least one plant, area adjacent to a plant, soil adapted to support growth of a plant, root of a plant, foliage of a plant, and/or seed adapted to produce a plant.

[0130] The application of the composition according to the invention may kill or inhibit pests and/or clean and/or inhibit growth of undesired plants.

[0131] The agrochemical composition according to the invention can be diluted and applied to at least one plant, area adjacent to a plant, soil adapted to support

growth of a plant, root of a plant, foliage of a plant, and/or seed adapted to produce a plant, in a customary manner; for example by watering (drenching), drip irrigation, spraying, and/or atomizing.

[0132] Should the disclosure of any patents, patent applications, and publications which are incorporated herein by reference conflict with the description of the present application to the extent that it may render a term unclear, the present description shall take precedence.

EXAMPLE

[0133] The biodegradable polyester

[0134] The biodegradable polyesters were prepared by the process below:

A stainless steel reactor equipped with an overhead stirrer, nitrogen inlet, condenser setup with receiving vessel and a solid addition port was charged with 384.2g (2.209mol) of 1,4 cyclohexanedicarboxylic acid, 155.9g (0.552 mol) of 5-Sulfoisophthalic acid sodium salt, 3.49g (0.011 mmol) of Titanium(IV) (triethanolaminato)isopropoxide solution (80 wt. % in isopropanol) [Tyzor TE] and 519.4 g (8.28 mol) of Ethylene Glycol. The mixture was heated to 160 °C under nitrogen blanket and the reaction mixture was maintained at the same temperature for 60 minutes under agitation, then the reaction temperature was raised to 200 °C and gradually a reduced pressure of 100mBar was achieved, under this condition ethylene glycol started distilling and was collected in a receiver. The reaction temperature was then increased to 235 °C under reduced pressure. As the reaction achieved 235 °C the pressure was further reduced to 20 mBar. The reaction was maintained for 60 minutes in this condition after which the temperature was decreased to stop the polymerization. Polymer was discharged after it reached room temperature

Table 1: the prepared biodegradable polyesters

Sample code	Polymer Composition (Feed mole %)			
	CHDA	SSIA	TA	EG
S1	40	10		50
S2	35	10	5	50

S3	30	10	10	50
S4	20	10	20	50
S5	38	12		50

CHDA – Cyclohexyl dicarboxylic acid

SSIA –5-Sulfoisophthalic acid sodium salt

TA- Terphthalic acid

EG – Ethylene glycol

[0135] 2. The biodegradability test

[0136] The biodegradability test is done according inherent biodegradability test with OECD 302B.

[0137] If the biodegradability test result is over 70% calculated based on the theoretical oxygen demand or ThOD and fulfilled the validity criteria of the test, it will be deemed as passing the readily biodegradability test.

Table 2: the biodegradability test results

Polymer	Biodegradability, % after 28 days
S1	70
S2	71
S3	88
S4	97
S5	95

[0138] According to table 2, all the polyesters are biodegradable.

[0139] The agricultural compositions

[0140] The Imidaclorid 48% SC of the present invention were prepared as following:

- Take D.M water in the vessel, add propylene glycol, Proxel GXL, Gensil 2030 (part qty).

- Now add dispersant and Rhodasurf LA 9 mix well until the solution is uniform & the surfactants have dissolved properly.
- Add slowly Imidacloprid & mix until homogeneous.
- Now start the milling the slurry obtained above in a bead mill & maintain cool water circulation during milling between 20 to 30 deg C.
- Check the particle size at intermediate stage. If okay, transfer it to another vessel.
- Add Gensil 2030 (if required) under slow stirring to remove entrapped foam. Check the density if within specification.
- Add required amount of 2% Agrhopol 23W solution to the milled slurry.

[0141] After the composition was obtained, then subject to the dispersion test. As shown in table 3, all the polyesters of the present invention shows favorable dispersant performance and even better than Geropon DA 1349 which are current sold on the market.

Table 3: dispersion test results

Parameter	Appearance		Viscosity (cps), 3/30 @ 25^{O}C		Particle Size, D 90 in µm		Suspensibility		pH, As such	
Dispersant	Ambient, 0 day	14 day at 54^{O}C	Ambient 0 day	14 day at 54^{O}C	Ambient 0 day	14 day at 54^{O}C	Ambient 0 day	14 day at 54^{O}C	Ambient 0 day	14 day at 54^{O}C
Geropon DA 1349	Uniform Suspension	Suspension turned viscous	624	Non Flowable	11.1	> 50	>98	Not tested	7.43	7.52
S1	Uniform Suspension	Uniform Suspension	752	796	14.9	18.8	>98	>98	7.83	6.86
S2	Uniform Suspension	Uniform Suspension	664	692	8.94	13.4	>98	>98	7.9	6.8
S3	Uniform Suspension	Uniform Suspension	680	768	13.2	16.7	>98	>98	7.95	6.75
S4	Uniform Suspension	Uniform Suspension	772	800	13.9	14.9	>98	>98	8.1	6.88
S5	Uniform Suspension	Uniform Suspension	668	696	12.2	14.6	>98	>98	8.1	6.74

[0142] The Carbendazim 46.27% SC of the present invention were prepared as following:

- Take D.M water in the vessel, add propylene glycol, Proxel GXL, Gensil 2030 (part qty).
- Now add dispersant and Rhodasurf LA 9 mix well until the solution is uniform & the surfactants have dissolved properly.
- Add slowly Carbendazim, mix until homogeneous.
- Now start the milling the slurry obtained above in a bead mill & maintain cool water circulation during milling between 20 to 30 deg C.
- Check the particle size at intermediate stage. If okay, transfer it to another vessel.
- Add Gensil 2030 (if required) under slow stirring to remove entrapped foam. Check the density if within specification.
- Add required amount of 2% Agrhopol 23W solution to the milled slurry.

[0143] The dispersion test result was shown in table 4 below. As showed, Geropon is not biodegradable, the dispersion performance of S1 is comparable to Geropon.

[0144] The Diuron 80% WDG of the present invention were prepared as following:

- Jet milling to get the fine powder of ingredient Diuron;
- Weigh the ingredient Diuron, dispersant (S4), wetting agent (GEROPON L-WET F) and fillers (Benzoate sodium, Starch, EDTA-2Na) according to proportion and put into the plastic mixer. Mix at high speed until homogeneous;
- Add appropriate water and mix at high speed until homogeneous;
- Put wet powder into extruder and get the wet granules;
- Dry in 60℃ oven 2hr to insure moisture below 1%.

[0145] The Imidacloprid 70% WDG of the present invention were prepared as following:

- Jet milling to get the fine powder of ingredient Imidacloprid;
- Weigh the ingredient Imidacloprid, dispersant (S4), wetting agent (GEROPON L-WET F) and fillers (Gluconate sodium, EDTA-2Na) and put into the plastic mixer; Mix at high speed until homogeneous;
- Add appropriate water and mix at high speed until homogeneous;
- Put wet powder into extruder and get the wet granules;
- Dry in 60℃ oven 2hr to insure moisture below 1%.

[0146] The Atrazine 87% WDG of the present invention were prepared as following:

- Jet milling to get the fine powder of ingredient Atrazine;

- Weigh the ingredient Atrazine, dispersant (S4), wetting agent (GEROPON L-WET F) and filler (EDTA-2Na) and put into the plastic mixer; Mix at high speed until homogeneous;
- Add appropriate water and mix at high speed until homogeneous;
- Put wet powder into extruder and get the wet granules;
- Dry in 60℃ oven 2hr to insure moisture below 1%.

[0147] Table 5 shows the dispersant of the present invention can also be used in WDG formulation, and endows favorable suspensibility to the WDG formulation comprising the same.

Table 4: dispersion test results

Parameter	Appearance		Viscosity (cps), 3/30 @ 25°C		Particle Size, D 90 in µm		Suspensibility		pH, As such	
Dispersant	Ambient, 0 day	14 day at 54°C	Ambient 0 day	14 day at 54°C	Ambient 0 day	14 day at 54°C	Ambient 0 day	14 day at 54°C	Ambient 0 day	14 day at 54°C
Geropon DA 1349	Uniform Suspension	Suspension turned viscous	848	784	11.8	12.4	>98	95	7.16	7.2
S1	Uniform Suspension	Suspension turned viscous	840	1116	12.1	12.3	>98	97	7.18	6.85

Table 5: agricultural composition

	Dispersant	Appearance	suspensibility %		pH(1% soluiton)		Wet sieve test %		Disintegration time/s	
			Ambient, 0 day	14 day at 54°C	Ambient , 0 day	14 day at 54°C	Ambient, 0 day	14 day at 54°C	Ambient, 0 day	14 day at 54°C
Diuron WDG	S4	white granule	83.8	82.5	6.2	6.3	0	0	40	42
Imidacloprid WDG	S4	white granule	87.8	87.2	6	6.1	0	0	46	46
Atrazine WDG	S4	white granule	86.3	85.3	6	6.1	0	0	30	32

CLAIMS

1. A biodegradable polyester used as dispersant for agricultural formulations, prepared from a monomer composition comprising:

(a) a sulphonated dicarboxylic acid monomer (SA) selected from the group consisting of at least one sulphonated aromatic or sulphonated aliphatic dicarboxylic acid or the derivatives thereof;

(b) a polyhydric polyol (P) selected from the group consisting of at least one ethylene glycol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol or polyethylene glycol having an ethylene oxide number ranging from 1 to 200, dipropylene glycol, glycerol, 1,2,4-butanetriol and 1,2,3-butanetriol, and oligomers of thereof having from 1 to 100 monomer units; and

(c) a dihydroxyl compound (DH) selected from C_5 - C_{10} cycloaliphatic diol, C_5 - C_{10} cycloaliphatic diacidic acid, C_2 - C_8 hydroxylated aliphatic acid, or the combination thereof.

2. The biodegradable polyester used as dispersant according to claim 1, wherein the monomer composition further comprises:

(d) an diacidic component which is at least one selected from

d1) an unsulphonated dicarboxylic acid monomer (A) consisting of at least one dicarboxylic acid or derivatives thereof selected from the group consisting of terephthalic, isophthalic, 2,6-naphthalenedicarboxylic acids and furan dicarboxylic acid; and

d2) a polyester prepolymer prepared from the unsulphonated dicarboxylic acid monomers (A) or derivatives thereof and the polyhydric polyol (P).

3. The biodegradable polyester used as dispersant according to claim 1 or 2, wherein the sulphonated dicarboxylic acid monomer (SA) is one or more selected from the group consisting of sulphoisophthalic, sulphoterephthalic, sulpho-ortho-phthalic acids or anhydrides, 4-sulpho-2,7-naphthalenedicarboxylic acids or anhydrides, sulpho-4,4'-bis(hydroxycarbonyl)diphenyl sulphones, sulphodiphenyldicarboxylic acids or anhydrides, sulpho-4,4'-

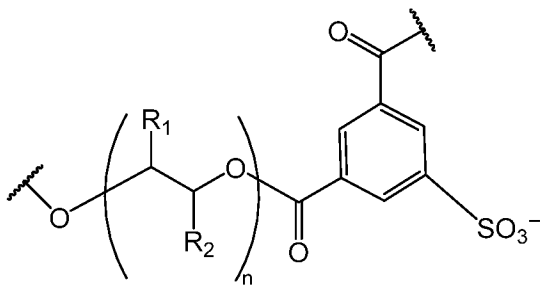
bis(hydroxycarbonyl)diphenylmethanes, sulpho-5-phenoxyisophthalic acids or anhydrides, sulphosuccinic acids or anhydrides or lower diesters thereof.

4. The biodegradable polyester used as dispersant according to claim 1 or 2, wherein the polyhydric polyol (P) is selected from ethylene glycol or glycerol.

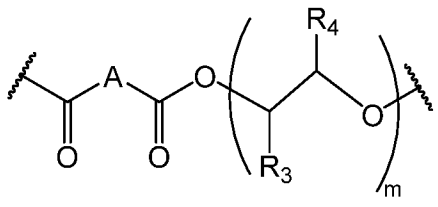
5. The biodegradable polyester used as dispersant according to claim 1 or 2, wherein the dihydroxyl compound (DH) presents in an amount ranging from 0.1% to 50%, preferably 0.5% to 25%, more preferably 0.5% to 15%, based on the 100 molar % of the biodegradable polyester used as dispersant.

6. The biodegradable polyester used as dispersant according to any one of claims 1 to 5, wherein the dihydroxyl compound (DH) is selected from cyclohexane dimethanol cyclohexane dicarboxylic acid.

7. A biodegradable polyester used as dispersant for agricultural formulations, wherein the biodegradable polyester comprises the following repeating units (I) and (II):



(I)



(II)

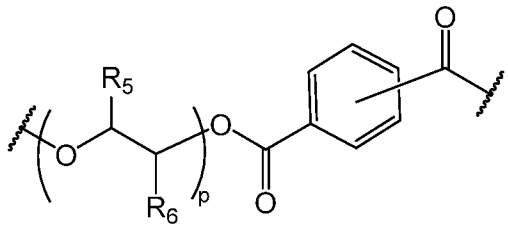
wherein R_1, R_2, R_3, and R_4 are independently selected from H or C_1-C_8 alkyl;

A is selected from C_5 - C_{10} cycloaliphatic group or aromatic group; and

n and m is a number ranging from 1 to 200.

8. A biodegradable polyester used as dispersant for agricultural formulations according to claim 7, wherein one of R_1 and R_2 is selected from H, the other is selected from H, methyl, ethyl, propyl, or butyl.

9. A biodegradable polyester used as dispersant for agricultural formulations according to claim 7 or 8, wherein the biodegradable polyester further comprises the repeating units (III)

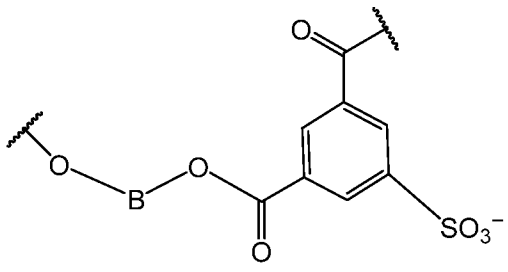


(III)

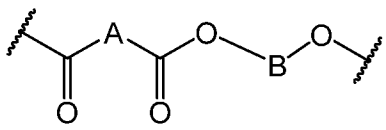
wherein R_5 and R_6 are independently selected from H or C_1-C_8 alkyl; and

p is a number ranging from 1 to 200.

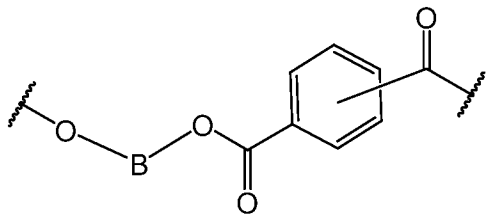
10. A biodegradable polyester used as dispersant for agricultural formulations according to claim 7 to 9, wherein the biodegradable polyester further comprises at least one of the repeating units IV to IV,



(IV)



(V)



(VI)

wherein A is defined as above, and B is seleted from C_5 - C_{10} cycloaliphatic group.

11. A biodegradable polyester used as dispersant for agricultural formulations according to claim 10, wherein B is selected from hexamethylenyl.

12. A biodegradable polyester used as dispersant for agricultural formulations according to claim 7 to 11, wherein A is selected from hexamethylenyl.

13. An agricultural composition comprising:

(I) an agricultural material; and

(II) the biodegradable polyester according to any one of claims 1 to 12.

14. The agricultural composition according claim 13, wherein the agricultural composition is formulated as emulsifiable concentrate (EC), emulsion in water concentrate (EW), suspension concentrate (SC), capsule suspension (CS), ZC formulation, flowable concentrate for seed treatment (FS), water dispersible granules (WDG) or suspoemulsions (SE).

15. The agricultural composition according claim 13, wherein the biodegradable polyester presents in an amount ranging from 0.1 to 5 wt.%, preferably from 0.2 to 3 wt.%, more preferably 0.5 to 1 wt.%, based on the total weight of the agricultural composition.

16. The agricultural composition according claim 13, wherein the biodegradable polyester presents in an amount ranging from 3 to 20 wt%, preferably 4 to10 wt%, based on the total weight of the agricultural composition.

17. Use of the biodegradable polyester defined according any one of claims 1 to 12 as dispersant for agricultural formulations.

18. Use of the agricultural composition as defined in any one of claims 13 to 15 for the treatment of soils, plants and/or seeds to control pests and/or to regulate the growth of plants

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2023/071619

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N25/10 C08G63/199 C08G63/672 C08G63/688 C08L67/02
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 C08G C08L

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 2021/029989 A1 (KNIGHT KATHRYN MARIE [GB] ET AL) 4 February 2021 (2021-02-04) claims 1-11 table 1 paragraphs [0138] - [0142]	13-18

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2023	08/11/2023

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	Mensah, Laure

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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