Adjuvant Compositions

[0001] The present invention relates generally to adjuvants for agrochemicals. In particular, the present invention relates to the use of certain terpenic alkoxylates as adjuvants to improve the performance of agrochemicals and to agrochemical compositions containing such adjuvants.

[0002] The present invention provides mixtures comprising certain terpenic alkoxylate adjuvants A and an agrochemical component B. Component B is an agrochemical active ingredient. Suitable agrochemical active ingredients include insecticides, acaricides, nematocides, molluscicides, fungicides, herbicides, plant growth regulators as well as fertilizers and micronutrients.

[0003] It has now been found, surprisingly, that the agrochemical active ingredient – adjuvant mixture according to the invention can extend the range of action of the agrochemical active ingredient e.g. by achieving a synergistic effect. Thus, the rates of application of the components are lowered whilst the action remains equally good. Secondly, the active ingredient mixture still achieves a high degree of pest or weed control, sometimes even where the two individual components have become totally ineffective in such a low application rate range. This allows increased safety in use or any other advantages familiar to a person skilled in the art.

[0004] Accordingly, the present invention provides an adjuvant composition comprising at least one terpenic alkoxylate A and at least one agrochemical active ingredient B. When used herein, the term "terpenic" in the context of the terpenic alkoxylate component is indicative of a moiety having terpenic origin. In a further embodiment, the adjuvant composition of the invention may also contain water and/or one or more organic diluents such alkyl alcohols and/or glycols.

[0005] The present invention also provides a method of using of the above described adjuvant composition to enhance plant growth in plant growth media by contacting the plants, parts of plants, seeds, their locus of growth or the plant growth media with an effective amount of said adjuvant composition.

[0006] In another aspect of the present invention, there is provided a method of enhancing the bio-efficacy or bio-availability of at least one agrochemical B said method comprising applying the agrochemical to plants, parts of plants, seeds, or at their locus of growth in any desired sequence, including simultaneously, separately, or in succession with a terpenic alkoxylate component according to the present invention in an amount effective to enhance bio-efficacy or bio-availability of said at least one agrochemical.

[0007] In the practice of the invention, the terpenic alkoxylate component of the invention can be applied as a concentrate or by dispersing the concentrate according to the present invention in water for use as a diluted aqueous end-use formulation.

[0008] The inventive adjuvant composition may be applied directly or with dilution in water alone or in combination with agrochemical materials such as insecticides, acaricides, nematocides, molluscicides, fungicides, herbicides, plant growth regulators as well as fertilizers and micronutrients.

[0009] The various aspects of the present invention mentioned above, as well as many other aspects of the invention are described in greater detail below.

[0010] Accordingly, in one embodiment, the at least one terpenic alkoxylate is selected from a compound of the formulae (II):

R_3-O-$(CH(R_4)CH_2O)_n$-$(CH(R_4)CH_2O)_m$-R_5 (II)

wherein R_3 is a terpenic moiety selected from the group consisting of terpenic carbides, oxidized derivatives of terpenic carbides (such as hydroformylation derivatives), terpenic alcohols, terpenic aldehydes and ketones, and mixtures thereof; R_4 is selected from hydrogen and methyl (i.e., the -$(CH(R_4)CH_2O)$- units of the alkylene oxide moiety of formula (II) are selected from ethylene oxide (EO) and propylene oxide (PO) in either a block or random configuration); R_5 is selected from hydrogen and linear or branched C_1-C_8 alkyl; and where n and m are each other than zero and wherein the sum of n and m is chosen so that there are from 2 to 10 propylene oxide units and from 5 to 25 ethylene oxide units.

[0011] In one aspect, the terpenic moiety R_3 is a moiety derived from monoterpenes, sesquiterpenes, diterpenes, and hydroformylation derivatives thereof. In particular, there may be mentioned the terpenes containing ten carbon atoms in their structure and, more specifically, acyclic, monocyclic or bicyclic monoterpenes. Among the suitable monoterpenes there are, for example, monocyclic terpenic carbides such as dipentene, terpinolene, p-cymene, limonene, etc.; bicyclic terpenic carbides such as α-pinene, β-pinene or δ-3-carene, etc.; and terpenic alcohols such as borneol, fenchol, menthanol, terpineols, geraniol, etc.; hydroformylation derivatives thereof; and mixtures thereof.

[0012] In another aspect, in the terpenic alkoxylate of formula (II) the sum of n and m is chosen so that there are from 3 to 7 propylene oxide units and from 5 to 15 ethylene oxide units; more particularly, from 3 to 7 propylene oxide units and from 5 to 9 ethylene oxide units – in any case, in either a block or a random configuration.

[0013] In one embodiment, the terpenic alkoxylate of formula (II) is selected from a block copolymer of the formulae (IIa) or (IIb):

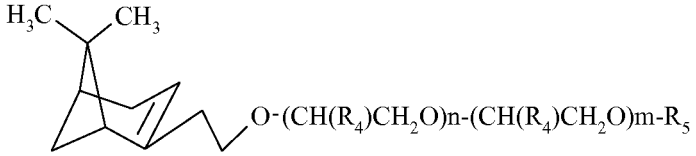
R_3-PO_n-EO_m-R_5 (IIa)

R_3-EO_n-PO_m-R_5 (IIb)

[0014] In another embodiment, the terpenic alkoxylate of formula (II) is a random EO/PO copolymer (IIc):

R_3-(random EO/PO)$_{n+m}$-R_5 (IIc)

[0015] In a specific embodiment, the R_3 moiety of formula (II) is derived from the hydroformulation of β-pinene so that the terpenic alkoxylate (b) is a Nopol alkoxylate of the formula (IId)



(IId)

wherein R_4, R_5, m and n are as defined above. In a more specific embodiment, the terpenic alkoxylate (b) is Nopol-(PO_n-EO_m)-H, where Nopol is the hydroformylation product of β-pinene, and wherein n=5 and m=7.

[0016] Suitable terpenic alkoxylates (b) for use in the adjuvant composition of the present invention generally are known from the literature or may be prepared by processes known from the literature and are also commercially available, for example, under the RHODOCLEAN® family of terpenic alkoxylates (Rhodia).

[0017] The components B are known, e.g. from "The Pesticide Manual", Fifteenth Edition, Edited by Clive Tomlin, British Crop Protection Council.

[0018] The combinations according to the invention may also comprise more than one of the active components B, if, for example, a broadening of the spectrum of pest control is desired. For instance, it may be advantageous in the agricultural practice to combine two or three components B with a terpenic alkoxylate. The mixtures of the invention may also comprise other active ingredients in addition to a terpenic alkoxylate and component B.

[0019] Suitably, component B is a herbicide such as pinoxaden or fluazifop P butyl, or is also selected from:
1,2,4-triazin-5-ones such as metamitron and metribuzin

dimethylpyrazoles such as benzofenap, pyrazolynate (pyrazolate) and pyrazoxyfen.

acylanilides such as propanil

amide herbicides such as benfluamid, bromobutide, carbetamide, flufenacet, isoxaben, naproanilide, napropamide, naptalam, propyzamide and tebutam

amino acids and salts and esters thereof, such as bialaphos and salts and esters thereof, glufosinate salts and esters thereof, glyphosate and salts and esters thereof, and sulfosate.

aryloxypropionates, including the optically active isomers thereof, such as clodinafop-propargyl, cyhalofop-butyl, diclofop & esters thereof e.g. methyl ester, fenoxaprop & esters thereof eg ethyl ester, fluazifop-butyl, haloxyfop and esters thereof, propaquizafop, quizalofop and esters thereof and quizalofop-p-tefuryl

arylanilides such as diflufenican, flamprop, flamprop-M and esters thereof

arylureas such as chlorbromuron, chlorotoluron, daimuron (dymron), dimefuron, diuron, fenuron, fluometuron, isoproturon, isouron, linuron, methabenzthiazuron, methyldymron, metobromuron, metoxuron, monolinuron, neburon and tebuthiuron

benzo-2,1,3-thiadiazin-4-one-dioxides such as bentazone

benzoic acids such as 2,3,6-trichlorobenzoic acid, chloramben and dicamba

bipyridyliums such as diquat and salts thereof, and paraquat and salts thereof.

carbamates such as chlorpropham and propham, and phenylcarbamoyloxyphenyl carbamates such as desmedipham and phenmedipham

acetamides such as acetochlor, alachlor, butachlor, dimethachlor, dimethenamid and isomers thereof, metazachlor, metolachlor and isomers thereof, pretilachlor, propachlor, propisochlor and thenylchlor.

cyclohexanediones such as alloxydim and salts thereof, butroxydim, clethodim, cycloxydim, sethoxydim, tepraloxydim and tralkoxydim.

dihalobenzonitriles such as dichlobenil

dinitrophenols such as dinoterb and dintro ortho-cresol (DNOC)

diphenyl ethers such as aciflurofen and salts and esters thereof, aclonifen, bifenox, chlomethoxyfen, chlornitrofen, fluroglycofen or salts or ester thereof, fomesafen, lactofen and oxyfluorfen.

dinitroanilines such as dinitramine, ethalfluralin, fluchloralin, oryzalin, pendimethalin, prodiamine and trifluralin.

haloalkanoic herbicides such as dalapon and trichloroacetic acid and salts thereof.

hydroxybenzonitrile (HBN) herbicides such as bromoxynil and ioxynil, and HBN precursors such as bromofenoxim

hormone herbicides such as 2,4,5-trichlorophenoxyacetic acid, 2,4-dichlorophenoxyacetic acid, 2,4-dichlorophenoxybutyric acid, clopyralid, dichlorprop & dichlorprop-p, fluroxypyr, 4-chloro-2-methoxyacetic acid (MCPA), MCPA-thioethyl, 4-(4-chloro-2-

methylphenoxy)butyric acid (MCPB), mecoprop & mecoprop-p, picloram, thiazopyr and triclopyr.

imidazolinones such as imazapic, imazamox, imazamethabenz-methyl, imazapyr & isopropylammonium salts thereof, imazaquin and imazethapyr.

methyl isothiocyanate precursors such as dazomet.

miscellaneous herbicides such as ammonium sulfamate, asulam, azafenidin, benazolin, benzobicyclon/benbiclon, cinmethylin, clomazone, difenzoquat & salts thereof eg methyl sulphate salt, diflufenzopyr-sodium (SAN-835H), dimethipin, dimexyflam, diphenamid, dithiopyr, epoprodan, ethofumesate, etobenzanid, fluazolate, fentrazamide, flucarbazone, flumiclorac-pentyl, flumioxazin, flupoxam, flurenol-butyl, flurochloridone, flurtamone, fluthiacet-methyl, hexazinone, mefenacet, oxadiazon, oxaziclomefone, pentoxazone, pyraflufen-ethyl, pyridatol/pyridafol, pyridate, isoxachlortole, isoxaflutole and sodium chlorate.

organoarsenical herbicides such as disodium methylarsonate (DSMA) and monosodium methylarsonate (MSMA)

organophosphorus herbicides such as anilofos and fosamine-sodium

phosphorothioates such as butamifos, bensulide and piperophos

pyridazinones such as chloridazon and norflurazon

pyridones such as fluridone

pyrimidinyloxybenzoic acids and salts and esters thereof, such as pyrithiobac-sodium, bispyribac-sodium, pyriminobac-methyl and pyribenzoxim.

quinolinecarboxylic acids such as quimerac and quinclorac

herbicide antidotes such as benoxacor, cloquintocet-mexyl, dichlormid, fenchlorazole-ethyl, fenclorim, fluxofenim, furilazole, naphthalic anhydride, oxabentrinil, mefenpyr-diethyl, N-(dichloroacetyl)-1-oxa-4-azaspirobicyclo-(4,5)-decane (AD-67), 3-dichloroacetyl-2,2,5-trimethyloxazolidine (R-29148) and 2-dichloromethyl-2-methyl-1,3-dioxolane (MG-191).

sulfamoylureas such as cyclosulfamuron.

sulfonanilides such as chloransulam-methyl, diclosulam, florasulam, flumetsulam and metosulam.

sulfonylureas such as amidosulfuron, azimsulfuron, bensulfuron and esters thereof, chlorimuron & esters eg ethyl ester thereof, chlorsulfuron, cinosulfuron, ethametsulfuron-methyl, flazasulfuron, flupyrsulfuron and salts thereof, halosulfuron-methyl, ethoxysulfuron, imazosulfuron, iodosulfuron, metsulfuron and esters thereof, nicosulfuron, oxasulfuron, primisulfuron & esters eg methyl ester thereof, prosulfuron, pyrazosulfuron-ethyl, rimsulfuron, sulfometuron-methyl, sulfosulfuron, thifensulfuron-methyl, triasulfuron, tribenuron, tribenuron-methyl and triflusulfuron-methyl

thiocarbamates such as butylate, cycloate, dimepiperate, S-ethyl dipropylthiocarbamate (EPTC), esprocarb, molinate, orbencarb, pebulate, prosulfocarb, thiobencarb, tiocarbazil, triallate and vernolate.

triazine herbicides such as ametryn, atrazine, cyanazine, dimethametryn, prometon, prometryn, propazine, simazine, simetryn, terbuthylazine, terbutryn and trietazine.

triazole herbicides such as amitrole.

triazolinones such as carfentrazone-ethyl and sulfentrazone.

triketones such as sulcotrione and mesotrione.

uracils such as bromacil, lenacil and terbacil.

[0020] In one embodiment, component B is a fungicidal compound such as (E)-N-methyl-2-[2-(2,5-dimethylphenoxymethyl)phenyl]-2-methoxy-iminoacetamide (SSF-129), 4-bromo-2-cyano-N,N-dimethyl-6-trifluoromethylbenzimidazole-1-sulfonamide, α-[N-(3-chloro-2,6-xylyl)-2-methoxyacetamido]-γ-butyrolactone, 4-chloro-2-cyano-N,N-dimethyl-5-p-tolylimidazole-1-sulfonamide (IKF-916, cyamidazosulfamid), 3-5-dichloro-N-(3-chloro-1-ethyl-1-methyl-2-oxopropyl)-4-methylbenzamide (RH-7281, zoxamide), N-allyl-4,5,-dimethyl-2-trimethylsilylthiophene-3-carboxamide (MON65500), N-(1-cyano-1,2-dimethylpropyl)-2-(2,4-dichlorophenoxy)propionamide (AC382042), N-(2-methoxy-5-pyridyl)-cyclopropane carboxamide, N-[(1RS,4SR)-9-(Dichloromethylidene)-1,2,3,4-tetrahydro-1,4-methanonaphthalen-5-yl]-3-(difluoromethyl)-

1-methyl-1H-pyrazole-4-carboxamide, acibenzolar (CGA245704), alanycarb, aldimorph, anilazine, azaconazole, azoxystrobin, benalaxyl, benomyl, biloxazol, bixafen, bitertanol, blasticidin S, boscalid, bromuconazole, bupirimate, butylamine, captafol, captan, carbendazim, carbendazim chlorhydrate, carboxin, carpropamid, carvone, CGA41396, CGA41397, chinomethionate, chloraniformethan, chlorothalonil, chlorozolinate, clozylacon, copper containing compounds such as copper oxychloride, copper oxyquinolate, copper sulfate, copper tallate and Bordeaux mixture, cyflufenamid, cymoxanil, cyproconazole, cyprodinil, debacarb, di-2-pyridyl disulfide 1,1'-dioxide, dichlofluanid, diclocymet, diclomezine, dicloran, diethofencarb, difenoconazole, difenzoquat, diflumetorim, O,O-di-iso-propyl-S-benzyl thiophosphate, dimefluazole, dimetconazole, dimethomorph, dimethirimol, diniconazole, dinocap, dithianon, dodecyl dimethyl ammonium chloride, dodemorph, dodicin, dodine, doguadine, edifenphos, epoxiconazole, ethamoxam, ethirimol, ethyl-(Z)-N-benzyl-N-([methyl(methyl-thioethylideneaminooxycarbonyl)amino]thio)-β -alaninate, etridiazole, famoxadone, fenamidone (RPA407213), fenarimol, fenbuconazole, fenfuram, fenhexamid (KBR2738), fenoxanil, fenpiclonil, fenpropidin, fenpropimorph, fentin acetate, fentin hydroxide, ferbam, ferimzone, fluazinam, fludioxonil, flumetover, fluoroimide, fluquinconazole, flusilazole, flutolanil, flutriafol, fluxapyroxad, folpet, fuberidazole, furalaxyl, furametpyr, furfural, guazatine, hexaconazole, hydroxyisoxazole, hymexazole, imazalil, imibenconazole, iminoctadine, iminoctadine triacetate, ipconazole, iprobenfos, iprodione, iprovalicarb (SZX0722), isopropanyl butyl carbamate, isoprothiolane, isopyrazam, isotianil, kasugamycin, kresoxim-methyl, leptomycin, LY186054, LY211795, LY248908, mancozeb, mandipropamid, maneb, mefenoxam, mepanipyrim, mepronil, metalaxyl, metconazole, metiram, metiram-zinc, metominostrobin, metsulfovax, myclobutanil, neoasozin, nickel dimethyldithiocarbamate, nitrothal-isopropyl, nuarimol, OCH, ofurace, organomercury compounds, oxadixyl, oxasulfuron, oxolinic acid, oxpoconazole, oxycarboxin, pefurazoate, penconazole, pencycuron, penthiopyrad, phenazin oxide, phosetyl-Al, phosphorus acids, phthalide, picoxystrobin (ZA1963), polyoxin D, polyram, probenazole, prochloraz, procymidone, propamocarb, propiconazole, propineb, propionic acid, prothiaconazole, pyrazophos, pyrifenox, pyrimethanil, pyroquilon, pyroxyfur, pyrrolnitrin, quaternary ammonium compounds, quinazamid, quinomethionate, quinoxyfen, quintozene, silthiofam, sipconazole (F-155), sodium pentachlorophenate, spiroxamine, streptomycin, sulfur, tebuconazole, tecloftalam, tecnazene, tetraconazole, thiabendazole, thifluzamid, 2-(thiocyanomethylthio)benzothiazole, thiophanate-methyl, thiram, timibenconazole,

tolclofos-methyl, tolylfluanid, triadimefon, triadimenol, triazbutil, triazoxide, tricyclazole, tricyclic amine derivatives as disclosed in WO 07/48556, tridemorph, trifloxystrobin (CGA279202), triforine, triflumizole, triticonazole, validamycin A, valifenalate, vapam, vinclozolin, xiwojunan, zineb and ziram.

[0021] In another embodiment, component B is an insecticides including:
a) a pyrethroid selected from the group consisting of permethrin, cypermethrin, fenvalerate, esfenvalerate, deltamethrin, cyhalothrin, lambda-cyhalothrin, gamma-cyhalothrin, bifenthrin, fenpropathrin, cyfluthrin, tefluthrin, ethofenprox, natural pyrethrin, tetramethrin, S-bioallethrin, fenfluthrin, prallethrin and 5-benzyl-3-furylmethyl-(E)-(1R,3S)-2,2-dimethyl-3-(2-oxothiolan-3-ylidenemethyl)cyclopropane carboxylate;

b) an organophosphate selected from the group consisting of acephate, profenofos, triazophos, methamidophos, dimethoate, chlorpyrifos, pirimiphos-methyl, pirimiphos-ethyl, fenitrothion, fosthiazate;

c) a carbamate selected from the group consisting of pirimicarb, triazamate, carbosulfan, bendiocarb, fenobucarb, propoxur, methomyl and oxamyl;

d) a benzoyl urea selected from the group consisting of hexaflumuron, flufenoxuron, lufenuron and chlorfluazuron;

an organic tin compound selected from the group consisting of cyhexatin, fenbutatin oxide and azocyclotin;

f) a pyrazole selected from the group consisting of tebufenpyrad and fenpyroximate;

g) a macrolide selected from the group consisting of abamectin, emamectin (e.g. emamectin benzoate), ivermectin, milbemycin, spinosad, azadirachtin and spinetoram;

h) an organochlorine compound selected from the group consisting of endosulfan (in particular alpha-endosulfan),

j) a fumigant agent selected from the group consisting of chloropicrin, dichloropropane, methyl bromide and metam;

k) a neonicotinoid compound selected from the group consisting of imidacloprid, thiacloprid, acetamiprid, nitenpyram, dinotefuran, thiamethoxam, clothianidin, nithiazine and flonicamid;

l) a diacylhydrazine selected from the group consisting of tebufenozide, chromafenozide and methoxyfenozide;

m) a diphenyl ether selected from the group consisting of pyriproxyfen;

n) indoxacarb;

o) chlorfenapyr;

p) pymetrozine;

q) spirotetramat, spirodiclofen and spiromesifen;

r) a diamide selected from the group consisting of flubendiamide, chlorantraniliprole (Rynaxypyr®) and cyantraniliprole;

s) sulfoxaflor;

t) metaflumizone;

u) fipronil and ethiprole;

v) pyrifluqinazon; and

w) buprofezin

[0022] In one embodiment of the invention component B is a compound selected from a neonicotinoid compound selected from the group consisting of imidacloprid, thiacloprid, acetamiprid, nitenpyram, dinotefuran, thiamethoxam, clothianidin, nithiazine and flonicamid.

[0023] Plant growth regulators Examples of suitable plant growth regulators that may be used as a further active ingredient in the mixture of the invention may be any compound selected from ancymidol, chlormequat chloride, ethephon, flumetralin, flurprimidol, gibberellic acid, gibberellin A4/gibberellin A7, maleic hydrazide, mepiquat chloride, paclobutrazol, prohexadione calcium, thiadiazuron, trinexapac ethyl and uniconazole.

[0024] The adjuvant composition of the present invention may further contain other inert additives such as standard formulation components and diluents. Such inert additives include

flow enhancers, other wetting agents, antifoaming agents, biocides, drift control agents, deposition enhancers, adjuvants, evaporation retardants, freeze protecting agents, UV protecting agents, fragrances, and the like.

[0025] In addition, adjuvant composition according to the invention may be applied with other horticultural components for lawn, garden, or other vegetation treatment, including, further wetting agents, colorants (for aesthetic purposes or for application identification), perfumes, water, electrolytes, fertilizer, growth hormones, minerals, spray pattern indicators and the like. Suitably, application to plants, parts of plants, seeds, or at their locus of growth may be made in any desired sequence, including simultaneously, separately, or in succession, and soil or foliar applied.

[0026] According to the invention "useful plants" typically comprise the following species of plants: grape vines; cereals, such as wheat, barley, rye or oats; beet, such as sugar beet or fodder beet; fruits, such as pomes, stone fruits or soft fruits, for example apples, pears, plums, peaches, almonds, cherries, strawberries, raspberries or blackberries; leguminous plants, such as beans, lentils, peas or soybeans; oil plants, such as rape, mustard, poppy, olives, sunflowers, coconut, castor oil plants, cocoa beans or groundnuts; cucumber plants, such as marrows, cucumbers or melons; fibre plants, such as cotton, flax, hemp or jute; citrus fruit, such as oranges, lemons, grapefruit or mandarins; vegetables, such as spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes, cucurbits or paprika; lauraceae, such as avocados, cinnamon or camphor; maize; tobacco; nuts; coffee; sugar cane; tea; vines; hops; durian; bananas; natural rubber plants; turf or ornamentals, such as flowers, shrubs, broad-leaved trees or evergreens, for example conifers. This list does not represent any limitation and is to be understood as including also useful plants which have been so transformed by the use of recombinant DNA techniques

[0027] In one embodiment, the adjuvant of the invention is well tolerated by all major turf species various turf grasses including the cool-season turf grasses (at seeding or to established annual ryegrass, fine fescue, Kentucky bluegrass, perennial ryegrass, tall fescue) and warm-season turf grasses (centipede, hybrid bermudagrass, and St. Augustinegrass. There may also be mentioned common bermuda and zoysiagrass).

[0028] In general, the formulations include from 0.01 to 90% by weight of active agent, from 0 to 20% agriculturally acceptable surfactant and 10 to 99.99% solid or liquid formulation inerts and adjuvant(s), the active agent consisting of at least the terpenic alkoxylate A together with a compound of component B, and optionally other active agents, particularly microbiocides or conservatives or the like. Concentrated forms of compositions generally contain in between about 2 and 80%, preferably between about 5 and 70% by weight of active agent. Application forms of formulation may for example contain from 0.01 to 20% by weight, preferably from 0.01 to 5% by weight of active agent. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ diluted formulations.

[0029] In one embodiment, the adjuvant component A of the invention is applied in an effective amount which is typically at a rate of 20 l/ha in a water volume of 200-1000 litres per hectare using conventional spray equipment.

EXAMPLES

[0030] The following examples are provided for illustration purposes and should not be considered as limiting the scope of the invention.

[0031] In general, active ingredient is formulated (SC, SL) and just before spraying the formulations are mixed with water and ultrasonically agitated in order to achieve homogeneous distribution. Spray solutions are made up in water. Adjuvants are added as tank mix to the spray solution just before application. Foliar application is at 200 L/ha in an application device spraying with a single nozzle (type Lechler) 60 cm above the plants. Preventative tests are performed as 1 or 2 day preventative applications, i.e. plants are treated with the compounds 1 or 2 days prior to artificial inoculation with fungal spores, whereas for curative tests the inoculation is carried out prior to application. A single evaluation of disease level is made 5 to 48 days after inoculation, depending on the pathosystem. Disease control relative to the untreated check plants is then calculated. In the following examples, all treatments were sprayed at 200l/ha spray volume in 10% isopropanol solution to normalise foliar retention: Azoxystrobin; - Quadris SC250, Isopyrazam; - SC250, Cyproconazole: - Alto SL100, Chlorothalonil; Bravo SC720

Detailed Method Descriptions

[0032] Alternaria solani / tomato / preventative (Alternaria on tomato) -> ALTELYP/ff-pr-S: 4-week old tomato plants cv. Roter Gnom are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying them with a spore suspension two days after application. The inoculated test plants are incubated at 22/18oC (day/night) and 95% rh in a greenhouse and the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (5 – 7 days after application).

[0033] Mycosphaerella graminicola (Septoria tritici) / wheat / preventative (Septoria tritici leaf spot on wheat) -> SEPTTRZ/ff-pr-S: 2-week old wheat plants cv. Riband are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying a spore suspension on them one day after application. After an incubation period of 1 day at 22°C/21 oC (day/night) and 95% rh, the inoculated test plants are kept at 22°C/21oC (day/night) and 70% rh in a greenhouse. Percentage leaf area covered by disease was assessed and efficacy was calculated compare to untreated controls when an appropriate level of disease appears on untreated check plants (16 – 19 days after application).

[0034] Puccinia recondita f. sp. tritici / wheat / preventative (Brown rust on wheat) -> PUCCTRZ/ff-pr-S: 2-week old wheat plants cv. Arina are sprayed in a spray chamber with the formulated test compound diluted in water. The test plants are inoculated by spraying them with a spore suspension one day after application. After an incubation period of 1 day at 20° C and 95% rh, the inoculated test plants are kept at 20° C / 18° C (day/night) and 60% rh in a greenhouse. The percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (12 – 14 days after application).

[0035] Puccinia recondita f. sp. tritici / wheat / curative (Brown rust on wheat) -> PUCCTRZ/ff-cu-S: 2-week old wheat plants cv. Arina are inoculated by spraying them with a spore suspension two days before application. After an incubation period of 1 day at 20o C and 95% rh followed by 1 day at 20o C and 60% rh in a greenhouse, the inoculated test plants are sprayed in a spray chamber with the formulated test compound diluted in water. After

additional incubation at 20o C / 18oC (day/night) and 60% rh in a greenhouse, the percentage leaf area covered by disease is assessed when an appropriate level of disease appears on untreated check plants (9 – 12 days after application).

Examples 1 – 6 – Azoxystrobin

[0036] Results for Puccinia preventative test (pr-column) and Puccinia curative test (cu-column) on wheat. Visual assessments of control; average of three replicates per treatment. Nimbus commercial adjuvant and methyl oleate are standard adjuvants for comparison.

TABLE 1

Substance	Conc. in ppm ai	Conc. in g ai/ha	Adjuv. Conc. In %	PUCCTRZ/ff-pr	PUCCTRZ/ff-cu
(1) Control					
Water + Isopropanol				**0**	**13**
Nopol-5PO-9EO (Rhodoclean MSC)			0.20	**0**	**0**
Nopol-5PO-25EO (Rhodoclean 525)			0.20	**0**	**0**
Nopol-5PO-7EO (Rhodoclean EFC)			0.20	**0**	**0**
Methyl oleate			0.20	**0**	**0**
Nimbus			0.20	**0**	**0**
Azoxystrobin	800	160			**96**
(Quadris SC 250)	200	40		**99**	**93**
	50	10		**90**	**79**
	12.5	2.5		**54**	**79**
	3	0.6		**0**	**54**
	0.75	0.15		**0**	
(2)					
Azoxystrobin	800	160	0.20		**100**
(Quadris SC 250)	200	40	0.20	**98**	**100**
	50	10	0.20	**97**	**100**
	12.5	2.5	0.20	**97**	**96**
+	3	0.6	0.20	**79**	**88**
Nopol-5PO-9EO	0.75	0.15	0.20	**42**	

(3)					
Azoxystrobin	800	160	0.20		**98**
(Quadris SC 250)	200	40	0.20	**96**	**96**
	50	10	0.20	**96**	**98**
	12.5	2.5	0.20	**93**	**96**
+	3	0.6	0.20	**71**	**79**
Nopol-5PO-25EO	0.75	0.15	0.20	**8**	
(4)					
Azoxystrobin	800	160	0.20		**97**
(Quadris SC 250)	200	40	0.20	**94**	**100**
	50	10	0.20	**99**	**98**
	12.5	2.5	0.20	**85**	**96**
+	3	0.6	0.20	**85**	**93**
Nopol-5PO-7EO	0.75	0.15	0.20	**33**	
(5)					
Azoxystrobin	800	160	0.20		**100**
(Quadris SC 250)	200	40	0.20	**98**	**100**
	50	10	0.20	**100**	**99**
	12.5	2.5	0.20	**90**	**100**
+	3	0.6	0.20	**92**	**100**
Methyl oleate	0.75	0.15	0.20	**38**	
(6)					
Azoxystrobin	800	160	0.20		**100**
(Quadris SC 250)	200	40	0.20	**99**	**100**
	50	10	0.20	**98**	**98**
	12.5	2.5	0.20	**94**	**100**
+	3	0.6	0.20	**87**	**100**
Nimbus 0.2%	0.75	0.15	0.20	**29**	

Examples 7 – 12 – Isopyrazam

[0037] Results for Puccinia preventative test and Puccinia curative test on wheat. Visual assessments of control; average of three replicates per treatment. Nimbus commercial adjuvant and methyl oleate are standard adjuvants for comparison.

TABLE 2

Substance	Conc. in ppm ai	Conc. in g ai/ha	Adjuv. Conc. In %	PUCCTRZ/ff-pr	PUCCTRZ/ff-cu
(7) Control					
Water + Isopropanol				0	13
Nopol-5PO-9EO (Rhodoclean MSC)			0.20	0	0
Nopol-5PO-25EO (Rhodoclean 525)			0.20	0	0
Nopol-5PO-7EO (Rhodoclean EFC)			0.20	0	0
Methyl oleate			0.20	0	0
Nimbus			0.20	0	0
Isopyrazam (SC 250)	2500	500			94
	625	125		83	79
	156	31		67	50
	39	7.8		29	42
	9.75	1.95		4	4
	2.5	0.5		0	
(8)					
Isopyrazam (SC 250)	2500	500	0.20		97
	625	125	0.20	93	100
	156	31	0.20	83	96
	39	7.8	0.20	46	67
+	9.75	1.95	0.20	21	21
Nopol-5PO-9EO	2.5	0.5	0.20	0	
(9)					
Isopyrazam (SC 250)	2500	500	0.20		95
	625	125	0.20	90	98
	156	31	0.20	88	95
	39	7.8	0.20	88	92

+	9.75	1.95	0.20	21	33
Nopol-5PO-25EO	2.5	0.5	0.20	0	
(10)					
SYN 520 453	2500	500	0.20		100
SC 250	625	125	0.20	96	98
A15309C	156	31	0.20	88	98
	39	7.8	0.20	54	79
+	9.75	1.95	0.20	0	42
Nopol-5PO-7EO	2.5	0.5	0.20	0	
(11)					
Isopyrazam (SC 250)	2500	500	0.20		100
	625	125	0.20	95	96
	156	31	0.20	96	92
	39	7.8	0.20	77	88
+	9.75	1.95	0.20	46	46
Methyl oleate	2.5	0.5	0.20	17	
(12)					
Isopyrazam (SC 250)	2500	500	0.20		90
	625	125	0.20	98	97
	156	31	0.20	99	94
	39	7.8	0.20	79	79
+	9.75	1.95	0.20	38	42
Nimbus 0.2%	2.5	0.5	0.20	21	

Examples 13 – 18 - Cyproconazole

[0038] Results for Septoria preventative test and Puccinia preventative test on wheat. Visual assessments of control; average of three replicates per treatment. Nimbus commercial adjuvant and methyl oleate are standard adjuvants for comparison.

Table 3

Substance	Conc. in ppm ai	Conc. in g ai/ha	Adjuv. Conc. In %	SEPTTRZ/ff-pr	PUCCTRZ/ff-pr
(13)					
Water + Isopropanol				3	0
Nopol-5PO-9EO (Rhodoclean MSC)			0.20	15	0
Nopol-5PO-25EO (Rhodoclean 525)			0.20	7	0
Nopol-5PO-7EO (Rhodoclean EFC)			0.20	0	0
Methyl oleate			0.20	0	0
Nimbus			0.20	0	0
Cyproconazole (Alto SL 100)	800	160			
	200	40		19	100
	50	10		0	75
	12.5	2.5		0	17
	3	0.6		0	0
	0.75	0.15		0	0
(14)					
Cyproconazole (Alto SL 100)	800	160	0.20		
	200	40	0.20	24	100
	50	10	0.20	3	92
	12.5	2.5	0.20	0	67
+	3	0.6	0.20	0	33
Nopol-5PO-9EO	0.75	0.15	0.20	0	46
(15)					
Cyproconazole (Alto SL 100)	800	160	0.20		
	200	40	0.20	66	100
	50	10	0.20	53	99
	12.5	2.5	0.20	15	75

+	3	0.6	0.20	7	21
Nopol-5PO-25EO	0.75	0.15	0.20	0	33
(16)					
Cyproconazole (Alto SL 100)	800	160	0.20		
	200	40	0.20	49	100
	50	10	0.20	3	97
	12.5	2.5	0.20	0	67
+	3	0.6	0.20	0	33
Nopol-5PO-7EO	0.75	0.15	0.20	0	0
(17)					
Cyproconazole (Alto SL 100)	800	160	0.20		
	200	40	0.20	3	92
	50	10	0.20	0	77
	12.5	2.5	0.20	0	33
+	3	0.6	0.20	0	13
Methyl oleate	0.75	0.15	0.20	0	0
(18)					
Cyproconazole (Alto SL 100)	800	160	0.20		
	200	40	0.20	3	92
	50	10	0.20	0	63
	12.5	2.5	0.20	0	42
+	3	0.6	0.20	0	0
Nimbus 0.2%	0.75	0.15	0.20	0	0

Examples 19 – 24 - Chlorothalonil

[0039] Results for Altenaria preventative test and Puccinia preventative test on wheat. Visual assessments of control; average of three replicates per treatment. Nimbus commercial adjuvant and methyl oleate are standard adjuvants for comparison.

Table 4

Substance	Conc. in ppm ai	Conc. in g ai/ha	Adjuv. Conc. In %	ALTELYP/ff-pr	PUCCTRZ/ff-pr
(19)					
Water + Isopropanol				2	0
Nopol-5PO-9EO (Rhodoclean MSC)			0.20	0	0
Nopol-5PO-25EO (Rhodoclean 525)			0.20	2	0
Nopol-5PO-7EO (Rhodoclean EFC)			0.20	6	0
Methyl oleate			0.20	0	0
Nimbus			0.20	0	0
Chlorothalonil (Bravo SC 720)	8000	1600		74	
	2000	400		55	97
	500	100		47	94
	125	25		32	42
	30	6		17	0
	7.5	1.5			0
(20)					
Chlorothalonil (Bravo SC 720)	8000	1600	0.20	81	
	2000	400	0.20	66	99
	500	100	0.20	51	100
	125	25	0.20	40	95
+	30	6	0.20	21	75
Nopol-5PO-9EO	7.5	1.5	0.20		21
(21)					
Chlorothalonil (Bravo SC 720)	8000	1600	0.20	81	
	2000	400	0.20	77	100
	500	100	0.20	62	98

	125	25	0.20	47	98
+	30	6	0.20	2	67
Nopol-5PO-25EO	7.5	1.5	0.20		33
(22)					
Chlorothalonil (Bravo SC 720)	8000	1600	0.20	89	
	2000	400	0.20	81	100
	500	100	0.20	70	100
	125	25	0.20	51	90
+	30	6	0.20	51	17
Nopol-5PO-7EO	7.5	1.5	0.20		0
(23)					
Chlorothalonil (Bravo SC 720)	8000	1600	0.20	91	
	2000	400	0.20	59	99
	500	100	0.20	51	99
	125	25	0.20	32	96
+	30	6	0.20	29	75
Methyl oleate	7.5	1.5	0.20		33
(24)					
Chlorothalonil (Bravo SC 720)	8000	1600	0.20	74	
	2000	400	0.20	62	98
	500	100	0.20	55	98
	125	25	0.20	14	88
+	30	6	0.20	14	54
Nimbus 0.2%	7.5	1.5	0.20		25

[0040] The foregoing description and example are for the purpose of illustration only and does not limit the scope of protection which should be accorded this invention.

What is claimed is:

1. An adjuvant composition comprising (a) at least one terpenic alkoxylate and (b) at least one agrochemical active ingredient.

2. The adjuvant composition of claim 1, wherein the terpenic alkoxylate (a) comprises at least one terpenic alkoxylate selected from a compound of the formula (II):

$$R_3\text{-}O\text{-}(CH(R_4)CH_2O)_n\text{-}(CH(R_4)CH_2O)_m\text{-}R_5 \qquad (II)$$

wherein R_3 is a terpenic moiety selected from the group consisting of terpenic carbides, oxidized derivatives of terpenic carbides, terpenic alcohols, terpenic aldehydes and terpenic ketones, and mixtures thereof; R_4 is selected from hydrogen and methyl; R_5 is selected from hydrogen and linear or branched C_1-C_8 alkyl; and where n and m are each other than zero and the sum of n and m is chosen so that there are from 2 to 10 propylene oxide units and from 5 to 25 ethylene oxide units.

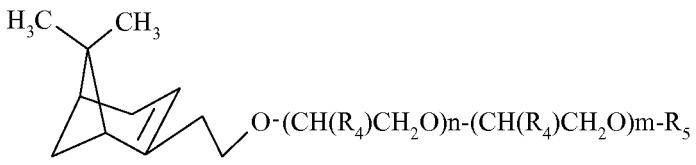
3. The adjuvant composition of claim 2, wherein the terpenic alkoxylate (a) comprises at least one terpenic alkoxylate is a compound of the formulae (IIa) or (IIb):

$$R_3\text{-}PO_n\text{-}EO_m\text{-}R_5 \qquad (IIa)$$

$$R_3\text{-}EO_n\text{-}PO_m\text{-}R_5 \qquad (IIb)$$

wherein the sum of n and m is chosen so that there are from 3 to 7 propylene oxide units and from 5 to 15 ethylene oxide units.

4. The adjuvant composition of claim 3, wherein the terpenic alkoxylate (b) is a Nopol alkoxylate of the formula (IId)



(IId)

wherein R_4, R_5, m and n are as defined in claim 6.

5. A method of enhancing plant growth in a plant growth media by contacting the plants, parts of plants, seeds, their locus of growth or the plant growth media with an effective amount of an adjuvant composition according to claim 1.

6. A method of enhancing the bio-efficacy or bio-availability of at least one agrochemical said method comprising applying the agrochemical to plants, parts of plants, seeds, or at their locus of growth in any desired sequence, including simultaneously, separately, or in succession with a terpenic alkoxylate adjuvant of formula (II) according to claim 2 in an amount effective to enhance the bio-efficacy or bio-availability of said at least one agrochemical.

7. The method of claim 6, wherein the agrochemical is selected from a pesticide, a growth regulator and a fertilizer.

8. The method of claim 7, wherein the agrochemical is selected from pinoxaden, fluazifop P butyl, azoxystrobin, thiamethoxam, isopyrazam and trinexapac ethyl).