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(54) **Title**: SEED TREATMENT FORMULATION AID CONTAINING POLYMERIC STICKER AND SILICON OIL

(57) **Abstract**: Seed dressing formulation aid The present invention relates to a seed dressing formulation aid comprising at least one sticker and a silicon oil, to seed dressing formulations comprising such seed dressing formulation aid and to the use of silicon oil for increasing the flowability of seeds and for reduction of dust in seed treatment.

SEED TREATMENT FORMULATION AID CONTAINING POLYMERIC STICKER AND SILICON OIL

The present invention relates to a seed dressing formulation aid comprising (1) at least one sticker from 8 to 70% by weight; and (2) a silicon oil from 1-40% by weight.

One of the problems occurring with plant propagation materials treated with formulations comprising pesticides is the generation of dust.
Dust is generated when plant propagation materials are moved after drying - i.e. at the bagging ("Absackung") of the plant propagation materials, during handling and transportation of the plant propagation materials and during sowing.

Besides parts from the plant propagation materials (rubbed off during handling), other plant parts like spelt parts that were not fully removed during plant propagation material cleaning, the dust may comprise partly also pesticides present in the seed treatment formulation rubbed off during handling of treated plant propagation materials.

To avoid or reduce the development of dust comprising pesticides, seed treatment formulations often comprise specified polymers (sticker) that ensure adhesion of the pesticides to the respective plant propagation material. However, polymers (also termed as "sticker") which enable the adhesion of the agrochemical formulation to the seed in many cases negatively influence properties of the treated seed important to the customer, such as unwanted accumulation (clustering) of plant propagation material parts, which has direct impact on the flowability of the plant propagation materials.
Potential consequences of negatively affected flowablilty are problems with plant propagation material handling in the factory (transport, bagging, e.g. for processes used for cereals) and/or reduction of "sowability", i.e. the precision of the planting with state of the art machinery (pneumatic sowing machines as used for row crops like corn, soybean or sunflower).

These problems can be reduced by the selection of suitable sticker, but not avoided.

The sowability is very important for row crops, whereas the plant propagation material flow in the factory is more of an issue with cereals.

A further task for seed treatment formulations is to ensure that the pesticide loading needs to be uniform across a batch or lot of treated seeds.

Thus, there is a need in the art to find auxiliaries, which improve the flowability of seeds on the one hand, but do not negatively affect the germination rate and which in addition might also provide reduced dust production. Furthermore, they should also provide a uniform distribution of seed dressing formulations across the seeds treated with such formulation.

Thus, the object of the present invention was to provide a suitable formulation aid for seed treatment formulations comprising at least one sticker.

Surprisingly, it has been found that the object could be solved by a seed dressing formulation aid comprising (1) at least one sticker from 8 to 70% by weight; and (2) a silicon oil from 1-40% by weight .

Thus, the present invention relates to the use of the seed dressing formulation aid for increasing the flowability of seeds and/or reduction of dust and/or production of a uniform distribution of seed dressing formulations comprising such suitable seed dressing formulation aid or to which such seed dressing formulation aid has been added. In a broader sense, the present application also comprises the use of a silicon oil for increasing the flowabiliy of seeds.

Thus, the present invention relates to a seed dressing formulation aid comprising

(1) from 8% by weight to 70% by weight of a sticker;
(2) from 1% by weight to 40% by weight of a silicone oil;

more preferably

(1) from 15% by weight to 65% by weight of a sticker;
(2) from 2% by weight to 30% by weight of a silicone oil;

most preferably

(1) from 15% by weight to 60% by weight of a sticker;
(2) from 5% by weight to 25% by weight of a silicone oil;

In an utmost preferred embodiment, the seed dressing formulation aid comprises

(1) from 20% by weight to 50% by weight of a sticker; and
(2) from 5% by weight to 25% by weight of a silicone oil.

The ratio by weight of sticker and silicon oil is from 20:1 to 1:5, more preferably from 12:1 to 1:3, most preferably from 2:1 to 1:2.

The silicon oil is preferably a polydimethylsiloxane oil.

Preferably, the silicon oil has a kinematic viscosity from 40.000 to 300.000 mm^2/s, preferably from 80.000 to 150.000 mm^2/s. The kinematic viscosity values relate to values measured at 25°C according to DIN 53018-1.

The silicon oil is preferably present in form of an aqueous disperson, more preferably an emulsion in water and can, in addition to water also optionally comprise surfactants, for example non-ionic and/or anionic surfactants. Examples of suitable surfactants are given below.

Thus, in one embodiment of the present invention the seed treatment formulation aid comprises – as defined above-

(1) from 8% by weight to 70% by weight, preferably 15% by weight to 65% by weight, more preferably 15% by weight to 60% and utmost preferably 20% by weight to 50% by weight of a sticker;

(2) from 1% by weight to 40% by weight, preferably 2% by weight to 30% by weight, more preferably 5% by weight to 25% by weight, utmost preferably 5% by weight to 25% by weight of a silicone oil;

(3) from 0.2 to 10%, preferably 0.2 to 5% by weight of surfactants; and

(4) from 10 to 70% by weight of water.

This seed treatment formulation aid as defined above can optionally comprise in addition further formulation auxiliaries.

For example, seed treatment formulation aid can optionally comprise a pigment and/or a filler preferably in the range of 0 to 60%, more preferably 0 to 30% by weight, which ensures that e.g. a uniform distribution can be easily monitored. Suitable examples of pigments and fillers are given below.

For example, the seed treatment formulation aid can further comprise an antifoam. Preferably, the antifoam is present from 0.01 to 1% by weight, more preferably 0.05 to 0.5% by weight.

Furthermore, the seed treatment formulation aid can optionally comprise further formulation auxiliaries further formulation auxiliaries, for example additional surfactants, antifreeze, pigment, thickener and biocides in ranges usually known in the art.

The sticker can be a conventionally available sticker, for example polyesters, polyamides, polycarbonates, polyurea and polyurethanes, acrylate polymers and copolymers, styrene copolymers, butadiene copolymers, polsaccharides such as starch and cellulose derivatives, vinylalcohol, vinylacetate and vinylpyrrolidone polymers and copolymers, polyethers, epoxy, phenolic and melamine resins, polyolefins and olefine copolymersand mixtures thereof. Examples of preferred polymers are acrylate polymers such as poly(methacrylate), poly(ethyl methacrylate), poly(methylmethacrylate), acrylate copoylmers and styrene-acrylic copolymers as defined herein below , poly(styrene-co maleic anhydride), cellulosic polymers such as ethyl cellulose, cellulose acetate, cellulose acetatebutyrate, acetylated mono-, di-, and triglycerides, poly(vinylpyrrolidone), vinyl acetate polymers and copolymers, poly(alkylene glycol), styrene butadiene copolymers, poly(orthoesters), alkyd resins, and mixtures of two or more of these. Polymers that are biodegradable are also useful in the present invention. As used herein, a polymer is biodegradable if is not water soluble, but is degraded over a period of several weeks when placed in an application environment. Examples of biodegradable polymers that are useful in the present method include biodegradable polyesters, starch, polylactic acid -starch blends, polylactic acid, poly(lactic acid-glycolic acid) copolymers, polydioxanone, cellulose esters, ethyl cellulose, cellulose acetate butyrate, starch esters, starch ester - aliphatic polyester blends, modified corn starch, polycaprolactone, poly(n-amylmethacrylate), wood rosin, polyan-

hydrides, polyvinylalcohol, polyhydroxybutyrate-valerate, biodegradable aliphatic polyesters, and polyhydroxybutyrate.

Preferably, the sticker is selected from the group of polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols and cellulose ethers, acrylate polymers and acrylate copolymers, more preferably from acrylate copolymers.

Preferably, the acrylate copolymer comprises

a) at least one comonomer a) chosen from the group of acrylic acid, methacrylic acid or acrylamide, and
b) at least one comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate

in polymerized form.

Herein, utmost preferred acrylate copolymers comprise

a) acrylic acid as comonomer a), and
b) n-butyl acrylate as comonomer b),

in polymerized form and have preferably a Tg between -80°C and +30°C, more preferably -75 to 0°C, in particular of -65 to -5°C. Utmost preferred is a Tg between -65 and -35°C.

In principal, the glass transition temperature of the polymers, copolymers is determined by differential scanning calorimetry (DSC). All samples were dried at 110°C for one hour to eliminate the effect of water/solvent on Tg of copolymers. DSC sample size is about 10-15 mg. The measurement is usually carried out from –100°C to 100°C at 20°C/min under N_2-atomosphere. The Tg is determined by midpoint of the transition region.

These polymers are hereinafter referred to as "A-I".

Further more preferred acrylate copolymer are those comprising

a) at least one comonomer a) chosen from the group of acrylic acid, methacrylic acid or acrylamide, and
b) at least one comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, and
c) vinylacetate as comonomer c),

in polymerized form.

The sticker, which comprises

a) at least one comonomer a) chosen from the group of acrylic acid, methacrylic acid or acrylamide, and
b) at least one comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, and
c) vinyl acetate as comonomer c), hereinbelow referred to as "B-I".

In a preferred embodiment, the B-I comprises

a) comonomer a) chosen from acrylic acid, and

b) comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, and
c) vinyl acetate as comonomer c),
in polymerized form.

In a more preferred embodiment, the B- I comprises
a) acrylic acid as comonomer a), and
b) 2-ethylhexyl acrylate as comonomer b), and
c) vinyl acetate as comonomer c),
in polymerized form.

In a further embodiment of the present invention B- I additionally comprises at least one comonomer d).

Thus, sticker B-I, which comprises
a) at least one comonomer a) chosen from the group of acrylic acid, methacrylic acid or acrylamide, and
b) at least one comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, and
c) vinyl acetate as comonomer c), and
d) at least one comonomer d) chosen from methyl acrylate, methyl methacrylate,
in polymerized form, is hereinbelow referred to as "B- II".

In a preferred embodiment, the B-II comprises
a) comonomer a) chosen from the group consisting of methacrylic acid or acrylamide or mixtures of acrylic acid and acrylamide, and
b) comonomer b) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, and
c) vinyl acetate as comonomer c), and
d) methyl methacrylate as comonomer d),
in polymerized form.

In a more preferred embodiment, the B- II comprises
a) acrylic acid as comonomer a), and
b) 2-ethylhexyl acrylate as comonomer b), and
c) vinyl acetate as comonomer c), and
d) methyl methacrylate as comonomer d),
in polymerized form.

Preferably, the glass transition temperature (Tg) of the sticker A and B-I and B-II as defined above is between -80°C and +30°C, more preferably -75 to 0°C, in particular -65 to -5°C. Utmost preferred is a Tg between -65 and -15°C.

Utmost preferably, the Tg for B-I is -65°C to -15°C

Utmost preferably, the Tg for B-II is -50 to -30°C

Preferably, sticker B-I or B-II comprises 0.05 to 15% by weight, preferably 0.1 to 8% by weight, in particular 0.1 to 5% by weight of comonomer a).

Preferably, the sticker B-I or B-II comprises 40 to 99% by weight, preferably 50 to 99% by weight, more preferably 60 to 95% of comonomer b).

Preferably, the sticker sticker B-I or B-II according to the present invention comprises 0.5 to 50% by weight, preferably 1 to 40% by weight, more preferably 2 to 35% by weight of comonomer c).

Preferably, sticker B-II comprises 0.5 to 30% by weight, preferably 1 to 25% by weight, more preferably 1 to 20% by weight, in particular 1 to 15 % by weight % of comonomer d).

Utmost preferably, the sum of the comonomers present in the sticker according to the present invention adds up to 100% by weight.

Further more preferred acrylate copolymers are those comprising

a) at least one comonomer a) chosen from the group of acrylic acid, methacrylic acid or acrylamide, and
b) at least one comonomer b) chosen from methyl methacrylate, methyl acrylate or styrene, and
c) at least one comonomer c) chosen from n-butyl acrylate or 2-ethylhexyl acrylate,

in polymerized form.

This embodiment of the sticker is hereinafter referred to as "C-I".

In a preferred embodiment, the sticker of type C comprises

a) comonomer a) chosen from methacrylic acid or acrylamide or mixtures of acrylic acid and acrylamide, and
b) comonomer b) chosen from methyl methacrylate, methyl acrylate or styrene, and
c) comonomer c) chosen from n-butyl acrylate or 2-ethylhexyl acrylate,

in polymerized form.

This embodiment is hereinafter referred to as "C-II".

In a further preferred embodiment, the sticker of type C comprises

a) comonomer a) chosen from acrylic acid or methacrylic acid, and
b) comonomer b) chosen from methyl methacrylate or methyl acrylate, and
c) comonomer c) chosen from n-butyl acrylate or 2-ethylhexyl acrylate,

in polymerized form.

This embodiment is hereinafter referred to as "C-III".

In a more preferred embodiment, the sticker of type C comprises

a) comonomer a) chosen from methacrylic acid or acrylamide or a mixture of acrylic acid and acrylamide, and
b) comonomer b) chosen from methyl methacrylate or methyl acrylate, and
c) comonomer c) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, wherein comonomer c) is preferably n-butyl acrylate,

in polymerized form.

This embodiment is hereinafter referred to as "C-IV":

In a further more preferred embodiment, the sticker of type C comprises

a) comonomer a) chosen from acrylamide, or a mixture of acrylic acid and acrylamide, and
b) styrene as comonomer b), and
c) comonomer c) chosen from n-butyl acrylate or 2-ethylhexyl acrylate, wherein comonomer c) is preferably n-butyl acrylate,

in polymerized form.

This embodiment is hereinafter referred to as "C-V".

Preferably, the glass transition temperature (Tg) of C-I, II, III, IV, and V is between -45 and +30°C.

In an utmost preferred embodiment, the sticker of type C comprises

a) comonomer a) chosen from acrylic acid or a combination of acryl amide and acrylic acid, and
b) styrene as comonomer b), and
c) n-butyl acrylate as comonomer c),

in polymerized form and has preferably a Tg between -30 and +30°C, more preferably -20 to +25°C, in particular -15 to +10°C.

This embodiment is hereinafter referred to as "C-VI".

In an utmost preferred embodiment, the sticker of type C comprises

a) a mixture of acrylic acid and acrylamide as comonomer a), and
b) styrene as comonomer b), and
c) n-butyl acrylate as comonomer c,

in polymerized form and has preferably a Tg between -30 and +30°C, more preferably -20 to +28°C, in particular +15 to +28°C.

This embodiment is hereinafter referred to as "C-VII".

In an utmost preferred embodiment, the sticker of type C comprises

a) methacrylic acid as comonomer a), and

b) methyl methacrylate as comonomer b), and

c) n-butyl acrylate as comonomer c),

in polymerized form and has preferably a Tg between -30 and +30°C, more preferably -20 to +28°C, in particular -15 to +10°C.

This embodiment is hereinafter referred to as "C-VIII".

C-I, C-II, C-III, C-IV, C-V, C-VI, C-VII and C-VIII are herein below referred to as "C-sticker "

Preferably, the C-sticker according to the invention comprises 0.05 to 20% by weight, preferably 0.1 to 10% by weight, in particular 0.5 to 8% by weight of comonomer a).

Preferably, the C-sticker according to the invention comprises 10 to 90% by weight, preferably 15 to 70% by weight, more preferably 18 to 55% by weight, in particular 20 to 55 % by weight % by weight of comonomer b).

Preferably, the C-sticker according to the invention comprises 10 to 90% by weight, preferably 40 to 85% by weight of comonomer c).

The sticker of type A, B or C can be prepared according to methods known in the art, for example in analogy to the processes described in EP 1077237 A, EP 0810274 A or US 6790272.

The present invention also relates to the use of a sticker according to the invention for the treatment of seeds.

In a preferred embodiment, the sticker of type A, B or C is present in the form of an aqueous dispersion. As a result of their preparation, stickers present in form of an aqueous dispersion generally contain emulsifiers which serve to stabilize the polymer particles in the aqueous dispersion. Thus, they may comprise at least one anionic emulsifier and/or at least one nonionic emulsifier. Appropriate emulsifiers are the compounds commonly used for such purposes. An overview of appropriate emulsifiers can be found in Houben-Weyl, Methoden der organischen Chemie, volume XIV/1, Makromolekulare Stoffe [Macromolecular Substances], Georg-Thieme-Verlag, Stuttgart, 1961, pp. 192-208. Further details for suitable emulsifier can also be found in WO 2010/086303.

The seed treatment formulation aid can be prepared by combining available silicon oil emulsions (for example commercially available from Dow Corning or Wacker) and sticker dispersions by simple mixing.

The seed treatment formulation aid can also be prepared emulsifying available silicon oils using suitable surfactants by methods known in the art (silicon oil emulsions are for example commercially available from Wacker).

The silicon oil and the stickers can also be applied separately to the seed in the amounts specified for each component above.
Final amounts of the silicon oil and sticker on the seed are given herein below.

The seed dressing formulation aid may be applied either in combination with an agrochemical formulation comprising a pesticide or be incorporated in a seed dressing formulation. Such formulation comprise, in addition to the seed treatment formulation aid at least one pesticide and further formulation auxiliaries.

The term “at least one pesticide” within the meaning of the invention states that one or more compounds can be selected from the group consisting of fungicides, insecticides, nematicides, herbicide and/or safener or growth regulator, preferably from the group consisting of fungicides, insecticides or nematicides. Also mixtures of pesticides of two or more the aforementioned classes can be used. The skilled artisan is familiar with such pesticides, which can be, for example, found in the Pesticide Manual, 13th Ed. (2003), The British Crop Protection Council, London.

The following list of pesticides is intended to illustrate the possible examples, but not to impose any limitation.
Examples of fungicides include:

A) Respiration inhibitors

- Inhibitors of complex III at Qo site (e.g. strobilurins): azoxystrobin, coumethoxy¬strobin, coumoxystrobin, dimoxystrobin, enestroburin, fenaminstrobin, fenoxy¬strobin/flufenoxystrobin, fluoxastro¬bin, kresoxim-methyl, meto¬minostrobin, orysastrobin, picoxy¬strobin, pyraclostrobin, pyrametostrobin, pyraoxystrobin, trifloxystrobin, 2-[2-(2,5-dimethyl-phenoxymethyl)-phenyl]-3-methoxy-acrylic acid methyl ester and 2 (2-(3-(2,6-di¬chlorophenyl)-1-methyl-allylidene¬aminooxy¬methyl)-phenyl)-2-methoxyimino-N methyl-acetamide, pyribencarb, triclopyricarb/chlorodincarb, famoxadone, fenamidone,
- inhibitors of complex III at Qi site: cyazofamid, amisulbrom,
- inhibitors of complex II (e. g. carboxamides): benodanil, bixafen, boscalid, carboxin, fen¬furam, fluopyram, flutolanil, fluxapyroxad, furametpyr, isopyrazam, mepronil, oxycarboxin, penflufen, penthiopyrad, sedaxane, tecloftalam, thifluz¬amide, N-(4'-trifluoromethylthiobiphenyl-2-yl)-3 difluoromethyl-1-methyl-1H pyr¬azole-4-carboxamide, N-(2-(1,3,3-trimethyl-butyl)-phenyl)-1,3-dimethyl-5 fluoro-1H-pyrazole-4 carboxamide and N-[9-(dichloromethylene)-1,2,3,4-tetrahydro-1,4-me¬thanonaphthalen-5-yl]-3-(difluoromethyl)-1-methyl-1H-pyrazole-4-carboxamide (Hambra/SYN192),
- other respiration inhibitors (e.g. complex I, uncouplers): diflumetorim, nitrophenyl derivates: binapacryl, dinobuton, dinocap, fluazinam, ferimzone, organometal compounds: fentin salts, such as fentin-acetate, fentin chloride or fentin hydroxide, ametoctradin, and silthiofam,

B) Sterol biosynthesis inhibitors (SBI fungicides)

- C14 demethylase inhibitors (DMI fungicides): triazoles: azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole, diniconazole-M, epoxiconazole, fenbuconazole, fluquinconazole, flusilazole, flutriafol, hexaconazole, imibenconazole, ipconazole, metconazole, myclobutanil, oxpoconazole, paclobutrazole, penconazole, propiconazole, prothio¬conazole, simeconazole, tebuconazole, tetraconazole, triadimefon, triadimenol, triticonazole, uniconazole, imidazoles: imazalil, pefurazoate, prochloraz, triflumizol, pyrimidines, pyridines and piperazines: fenarimol, nuarimol, pyrifenox, triforine,
- Delta14-reductase inhibitors: aldimorph, dodemorph, dodemorph-acetate, fenpropimorph, tridemorph, fenpropidin, piperalin, spiroxamine,
- Inhibitors of 3-keto reductase: fenhexamid,

C) Nucleic acid synthesis inhibitors

- phenylamides or acyl amino acid fungicides: benalaxyl, benalaxyl-M, kiralaxyl, metalaxyl, metalaxyl-M (mefenoxam), ofurace, oxadixyl,
- others: hymexazole, octhilinone, oxolinic acid, bupirimate,

D) Inhibitors of cell division and cytoskeleton

- tubulin inhibitors, such as benzimidazoles, thiophanates: benomyl, carbendazim, fuberidazole, thiabendazole, thiophanate-methyl, triazolopyrimidines: 5-chloro-7 (4 methyl¬piperidin-1-yl)-6-(2,4,6-trifluorophenyl)-[1,2,4]tri¬azolo[1,5 a]pyrimidine
- other cell division inhibitors: diethofencarb, ethaboxam, pencycuron, fluopicolide, zoxamide, metrafenone, pyriofenone,

E) Inhibitors of amino acid and protein synthesis

- methionine synthesis inhibitors (anilino-pyrimidines): cyprodinil, mepanipyrim, pyrimethanil,
- protein synthesis inhibitors: blasticidin-S, kasugamycin, kasugamycin hydrochloride-hydrate, mildiomycin, streptomycin, oxytetracyclin, polyoxine, validamycin A,

F) Signal transduction inhibitors

- MAP / histidine kinase inhibitors: fluoroimid, iprodione, procymidone, vinclozolin, fenpiclonil, fludioxonil,
- G protein inhibitors: quinoxyfen,

G) Lipid and membrane synthesis inhibitors

- Phospholipid biosynthesis inhibitors: edifenphos, iprobenfos, pyrazophos, isoprothiolane,
- lipid peroxidation: dicloran, quintozene, tecnazene, tolclofos-methyl, biphenyl, chloroneb, etridiazole,
- phospholipid biosynthesis and cell wall deposition: dimethomorph, flumorph, mandipropamid, pyrimorph, benthiavalicarb, iprovalicarb, valifenalate and N-(1-(1-(4-cyanophenyl)¬ethanesulfonyl)-but-2-yl) carbamic acid-(4-fluorophenyl) ester,
- compounds affecting cell membrane permeability and fatty acides: propamocarb, propamo¬carb-hydrochlorid

H) Inhibitors with Multi Site Action

- inorganic active substances: Bordeaux mixture, copper acetate, copper hydroxide, copper oxychloride, basic copper sulfate, sulfur,

- thio- and dithiocarbamates: ferbam, mancozeb, maneb, metam, metiram, propineb, thiram, zineb, ziram,
- organochlorine compounds (e.g. phthalimides, sulfamides, chloronitriles): anilazine, chlorothalonil, captafol, captan, folpet, dichlofluanid, dichlorophen, flusulfamide, hexachlorobenzene, pentachlorphenole and its salts, phthalide, tolylfluanid, N-(4-chloro-2-nitro-phenyl)-N-ethyl-4-methyl-benzenesulfonamide,
- guanidines and others: guanidine, dodine, dodine free base, guazatine, guazatine-acetate, iminoctadine, iminoctadine-triacetate, iminoctadine-tris(albesilate), dithianon,

I) Cell wall synthesis inhibitors

- inhibitors of glucan synthesis: validamycin, polyoxin B, melanin synthesis inhibitors: pyro-quilon, tricyclazole, carpropamid, dicyclomet, fenoxanil,

J) Plant defence inducers

- acibenzolar-S-methyl, probenazole, isotianil, tiadinil, prohexadione-calcium, phospho-nates: fosetyl, fosetyl-aluminum, phosphorous acid and its salts,

K) Unknown mode of action

- bronopol, chinomethionat, cyflufenamid, cymoxanil, dazomet, debacarb, diclo¬mezine, difenzoquat, difenzoquat-methylsulfate, diphenylamin, fenpyrazamine, flumetover, flusulfamide, flutianil, methasulfocarb, nitrapyrin, nitrothal-isopropyl, oxin-copper, proquinazid, tebufloquin, tecloftalam, triazoxide, 2-butoxy-6-iodo-3 propylchromen-4-one, N-(cyclo¬propylmethoxyimino-(6-difluoro-methoxy-2,3 di¬fluoro-phenyl)-methyl)-2-phenyl acetamide, N'-(4-(4-chloro-3-trifluoromethyl-phen¬oxy)-2,5-dimethyl-phenyl)-N-ethyl-N methyl formamidine, N' (4-(4-fluoro-3-trifluoro¬methyl-phenoxy)-2,5-dimethyl-phenyl)-N-ethyl-N-methyl formamidine, N'-(2-methyl-5-trifluoromethyl-4-(3-trimethyl¬silanyl-prop¬oxy)-phenyl)-N-ethyl-N-methyl forma¬midine, N'-(5-difluoromethyl-2 methyl-4-(3-tri¬methylsilanyl-propoxy)-phenyl)-N-ethyl-N-methyl formamidine, 2-{1-[2-(5-methyl-3-trifluoromethyl-pyrazole-1-yl)-acetyl]-piperidin-4-yl}-thiazole-4 carboxylic acid methyl-(1,2,3,4-tetrahydro-naphthalen-1 yl)-amide, 2-{1-[2-(5-meth¬yl-3-trifluoromethyl-pyrazole-1-yl)-acetyl]-piperidin-4-yl}-thiazole-4-carboxylic acid methyl-(R)-1,2,3,4-tetrahydro-naphthalen-1-yl-amide,
1-[4-[4-[5-(2,6-difluorophenyl)-4,5-dihydro-3-isoxazolyl]-2-thiazolyl]-1-piperidinyl]-2-[5-methyl-3-(trifluoromethyl)-1H-pyrazol-1-yl]ethanone, methoxy-acetic acid 6-tert-butyl-8-fluoro-2,3-dimethyl-quinolin-4-yl ester, N-Methyl-2-{1-[(5-methyl-3-tri¬fluoro¬methyl-1H-pyr¬azol-1-yl)-acetyl]-piperi¬din-4-yl}-N-[(1R)-1,2,3,4-tetrahydro¬naphthalen-1-yl]-4-thi¬azolecarboxamide, 3-[5-(4-methylphenyl)-2,3-dimethyl-isoxazolidin-3 yl]-pyridine, 3-[5-(4-chloro-phenyl)-2,3-dimethyl-isoxazolidin-3-yl]-pyridine (pyrisoxazole), N-(6-methoxy-pyridin-3-yl) cyclopropane¬carboxylic acid amide, 5-chloro-1 (4,6-dimethoxy-pyrimidin-2-yl)-2-methyl-1H-ben¬zoimidazole,
2-(4-chloro-phenyl)-N-[4-(3,4-dimeth¬oxy-phenyl)-isoxazol-5-yl]-2-prop-2-ynyloxy-acetamide,

L) Antifungal biocontrol agents, plant bioactivators: Ampelomyces quisqualis (e.g. AQ 10® from Intrachem Bio GmbH & Co. KG, Germany), Aspergillus flavus (e.g. AFLAGUARD® from Syngenta, CH), Aureobasidium pullulans (e.g. BOTECTOR® from bio-ferm GmbH, Germany), Bacillus pumilus (e.g. NRRL Accession No. B 30087 in SONATA® and BALLAD® Plus from AgraQuest Inc., USA), Bacillus subtilis (e.g. isolate NRRL-Nr. B-21661 in RHAPSODY®, SER-

ENADE® MAX and SERENADE® ASO from AgraQuest Inc., USA), Bacillus subtilis var. amyloliquefaciens FZB24 (e.g. TAEGRO® from Novozyme Biologicals, Inc., USA), Candida oleophila I-82 (e.g. ASPIRE® from Ecogen Inc., USA), Candida saitoana (e.g. BIOCURE® (in mixture with lysozyme) and BIOCOAT® from Micro Flo Company, USA (BASF SE) and Arysta), Chitosan (e.g. ARMOUR-ZEN from BotriZen Ltd., NZ), Clonostachys rosea f. catenulata, also named Gliocladium catenulatum (e.g. isolate J1446: PRESTOP® from Verdera, Finland), Coniothyrium minitans (e.g. CONTANS® from Prophyta, Germany), Cryphonectria parasitica (e.g. Endothia parasitica from CNICM, France), Cryptococcus albidus (e.g. YIELD PLUS® from Anchor Bio-Technologies, South Africa), Fusarium oxysporum (e.g. BIOFOX® from S.I.A.P.A., Italy, FUSACLEAN® from Natural Plant Protection, France), Metschnikowia fructicola (e.g. SHEMER® from Agrogreen, Israel), Microdochium dimerum (e.g. ANTIBOT® from Agrauxine, France), Phlebiopsis gigantea (e.g. ROTSOP® from Verdera, Finland), Pseudozyma flocculosa (e.g. SPORODEX® from Plant Products Co. Ltd., Canada), Pythium oligandrum DV74 (e.g. POLYVERSUM® from Remeslo SSRO, Biopreparaty, Czech Rep.), Reynoutria sachlinensis (e.g. REGALIA® from Marrone BioInnovations, USA), Talaromyces flavus V117b (e.g. PROTUS® from Prophyta, Germany), Trichoderma asperellum SKT-1 (e.g. ECO-HOPE® from Kumiai Chemical Industry Co., Ltd., Japan), T. atroviride LC52 (e.g. SENTINEL® from Agrimm Technologies Ltd, NZ), T. harzianum T-22 (e.g. PLANTSHIELD® der Firma BioWorks Inc., USA), T. harzianum TH 35 (e.g. ROOT PRO® from Mycontrol Ltd., Israel), T. harzianum T-39 (e.g. TRICHODEX® and TRICHODERMA 2000® from Mycontrol Ltd., Israel and Makhteshim Ltd., Israel), T. harzianum and T. viride (e.g. TRICHOPEL from Agrimm Technologies Ltd, NZ), T. harzianum ICC012 and T. viride ICC080 (e.g. REMEDIER® WP from Isagro Ricerca, Italy), T. polysporum and T. harzianum (e.g. BINAB® from BINAB Bio-Innovation AB, Sweden), T. stromaticum (e.g. TRICOVAB® from C.E.P.L.A.C., Brazil), T. virens GL-21 (e.g. SOILGARD® from Certis LLC, USA), T. viride (e.g. TRIECO® from Ecosense Labs. (India) Pvt. Ltd., Indien, BIO-CURE® F from T. Stanes & Co. Ltd., Indien), T. viride TV1 (e.g. T. viride TV1 from Agribiotec srl, Italy), Ulocladium oudemansii HRU3 (e.g. BOTRY-ZEN® from Botry-Zen Ltd, NZ),

Examples of insecticides include:

- organo(thio)phosphates: acephate, azamethiphos, azinphos-methyl, chlorpyrifos, chlorpyrifos-methyl, chlorfenvinphos, diazinon, dichlorvos, dicrotophos, dimethoate, disulfoton, ethion, fenitrothion, fenthion, isoxathion, malathion, methamidophos, methidathion, methylparathion, mevinphos, monocrotophos, oxydemeton-methyl, paraoxon, parathion, phenthoate, phosalone, phosmet, phosphamidon, phorate, phoxim, pirimiphos-methyl, profenofos, prothiofos, sulprophos, tetrachlorvinphos, terbufos, triazophos, trichlorfon,
- carbamates: alanycarb, aldicarb, bendiocarb, benfuracarb, carbaryl, carbofuran, carbosulfan, fenoxycarb, furathiocarb, methiocarb, methomyl, oxamyl, pirimicarb, propoxur, thiodicarb, triazamate,
- pyrethroids: allethrin, bifenthrin, cyfluthrin, cyhalothrin, cyphenothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, zeta-cypermethrin, deltamethrin, esfenvalerate, etofenprox, fenpropathrin, fenvalerate, imiprothrin, lambda-cyhalothrin, permethrin, prallethrin, pyrethrin I and II, resmethrin, silafluofen, tau-fluvalinate, tefluthrin, tetramethrin, tralomethrin, transfluthrin, profluthrin, dimefluthrin,

- insect growth regulators: a) chitin synthesis inhibitors: benzoylureas: chlorfluazuron, cyramazin, diflubenzuron, flucycloxuron, flufenoxuron, hexaflumuron, lufenuron, novaluron, teflubenzuron, triflumuron, buprofezin, diofenolan, hexythiazox, etox¬azole, clofentazine, b) ecdysone antagonists: halofenozide, methoxyfenozide, tebufenozide, azadirachtin, c) juvenoids: pyriproxyfen, methoprene, fenoxycarb, d) lipid biosynthesis inhibitors: spirodiclofen, spiromesifen, spirotetramat,
- nicotinic receptor agonists/antagonists compounds: clothianidin, dinotefuran, imidacloprid, thiamethoxam, nitenpyram, acetamiprid, thiacloprid, 1-(2-chloro-thiazol-5-ylmethyl)-2-nitrimino-3,5-dimethyl-[1,3,5]triazinane,
- GABA antagonist compounds: endosulfan, ethiprole, fipronil, vaniliprole, pyrafluprole, pyriprole, 5-amino-1-(2,6-dichloro-4-methyl-phenyl)-4-sulfinamoyl-1H pyrazole-3-carbothioic acid amide,
- macrocyclic lactone insecticides: abamectin, emamectin, milbemectin, lepimectin, spinosad, spinetoram,
- mitochondrial electron transport inhibitor (METI) I acaricides: fenazaquin, pyridaben, tebufenpyrad, tolfenpyrad, flufenerim,
- METI II and III compounds: acequinocyl, fluacyprim, hydramethylnon,
- Uncouplers: chlorfenapyr,
- oxidative phosphorylation inhibitors: cyhexatin, diafenthiuron, fenbutatin oxide, propargite,
- moulting disruptor compounds: cryomazine,
- mixed function oxidase inhibitors: piperonyl butoxide,
- sodium channel blockers: indoxacarb, metaflumizone,
- others: benclothiaz, bifenazate, cartap, flonicamid, pyridalyl, pymetrozine, sulfur, thiocyclam, flubendiamide, chlorantraniliprole, cyazypyr (HGW86), cyenopyrafen, flupyrazofos, cyflumetofen, amidoflumet, imicyafos, bistrifluron, and pyrifluquinazon.

Preferred insecticides are sulfoxaflor, acetamiprid, alpha-cypermethrin, clothianidin, fipronil, imidacloprid, spinosad, tefluthrin, thiamethoxam, metaflumizon, beta-cefluthrin, chlorantraniliprole (rynaxypyr), cyantraniliprole (cyazapyr), sulfoxaflor and flubendiamide, more preferably
acetamiprid, clothianidin, imidacloprid, thiamethoxam, spinosad, metaflumizone, , fipronil, chlorantraniliprole (rynaxypyr) and cyantraniliprole (cyazapyr).

Preferred fungicides are selected from metalaxyl, mefenoxam, pyrimethanil, epoxiconazole, fluquiconazole, flutriafol, hymexazole, imazalil, metconazole, prochloraz, tebuconazole, triticonazole, iprodione, metiram, thiram, boscalid, carbendazim, silthiofam, fludioxonil, azoxystrobin, , kresoxim-methyl, orysastrobin, pyraclostrobin trifloxystrobin, thiophanate methyl, ipconazole, prothiconazole, difenoconazole, triadimenol, triazoxide, fluoxastrobin, fluxapyroxad, bixafen, penflufen , sedaxane, isopyrazam and penthiopyrad,
more preferably metalaxyl, mefenoxam, epoxiconazole, fluquiconazole, prochloraz, triticonazole, iprodion, thiram, tebuconazole, boscalid, carbendazim, silthiofam, fludioxonil, azoxystrobin, orysastrobin, pyraclostrobin, trifloxystrobin, thiophante methyl, ipconazole, prothio-

caonazole, difenoconazole, fluxapyroxad, penflufen , sedaxane and penthiopyrad.

As mentioned above, the seed dressing formulation aid may be converted together with at least one pesticide into a customary formulation useful in the field of seed treatment.

Such formulations are prepared in a known manner, such as described by Mollet and Grubemann, Formulation technology, Wiley VCH, Weinheim, 2001 or Agrow Reports " New Developments in Crop. Protection Product Formulation" by Alan Knowles, 2005.

The formulations may also comprise auxiliaries which are customary in agro-chemical formulations. Examples for suitable auxiliaries are solvents, liquid and solid carriers or fillers, surfactants (e.g. as dispersants, emulsifiers, wetters, solubilizers, protective colloids, adhesion agents), thickeners, biocides, anti-freezing agents, anti-foaming agents, agents for adjusting the pH, anticaking agents or colorants.

Suitable solvents and liquid carriers are water and organic solvents, such as mineral oil fractions of medium to high boiling point, e.g. kerosene, diesel oil, oils of vegetable or animal origin, aliphatic, cyclic and aromatic hydrocarbons, e. g. toluene, xylene, paraffin, tetrahydronaphthalene, alkylated naphthalenes, alcohols e.g. ethanol, propanol, butanol, benzylalcohol, cyclo¬hexanol, glycols, DMSO, ketones, e.g. cyclohexanone, esters, e.g. lactates, carbonates, fatty acid esters, gamma-butyrolactone, fatty acids, phosphonates, amines, amides, e.g. N-methylpyrrolidone, fatty acid dimethylamides, and mixtures thereof.

Suitable solid carriers are mineral earths, e.g. silicates, e.g. mica, silica gels, talc, kaolins, limestone, lime, chalk, clays, dolomite, diatomaceous earth, bentonite, calcium sulfate, magnesium sulfate, magnesium oxide, polysaccharide powders, e.g. cellulose, starch, fertilizers, e.g. ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas, products of vegetable origin, e.g. ce-real meal, tree bark meal, wood meal and nutshell meal, and mixtures thereof.

Suitable surfactants are surface-active compounds, such as anionic, cationic, nonionic and amphoteric surfactants, block polymers, polyelectrolytes, and mixtures thereof. Such surfactants can be used as emusifier, dispersant, solubilizer, wetter, or adjuvant. Examples of surfactants are listed in McCutcheon's, Vol.1: Emulsifiers & Detergents, McCutcheon's Directories, Glen Rock, USA, 2008 (International Ed. Or North American Ed.).

Suitable anionic surfactants are alkali, alkaline earth or ammonium salts of sulfonates, sul-fates, phosphates, carboxylates, and mixtures thereof. Examples of sulfonates are alkylarylsulfonates, diphenylsulfonates, alpha-olefin sulfonates, lignine sulfonates, sulfonates of fatty acids and oils, sulfonates of ethoxylated alkylphenols, sulfonates of alkoxylated arylphenols, sulfonates of condensed naphthalenes, sulfonates of dodecyl- and tridecylbenzenes, sulfonates of naphthalenes and alkyl¬naphthalenes, sulfosuccinates or sulfosuccinamates. Examples of sulfates are sulfates of fatty acids and oils, of ethoxylated alkylphenols, of alcohols, of ethoxylated

alcohols, or of fatty acid esters. Examples of phosphates are phosphate esters. Examples of carboxylates are alkyl carboxylates and carboxylated alcohol or alkylphenol ethoxylates.

Suitable nonionic surfactants are alkoxylates, N-subsituted fatty acid amides, amine oxides, esters, sugar-based surfactants, polymers, and mixtures thereof. Examples of alkoxylates are compounds such as alcohols, alkylphenols, amines, amides, arylphenols, fatty acids or fatty acid esters which have been alkoxylated with 1 to 50 equivalents. Ethylene oxide and/or propylene oxide may be employed for the alkoxylation, preferably ethylene oxide. Examples of N-subsititued fatty acid amides are fatty acid glucamides or fatty acid alkanolamides. Examples of esters are fatty acid esters, glycerol esters or monoglycerides. Examples of sugar-based surfactants are sorbitans, ethoxylated sorbitans, sucrose and glucose esters or alkylpolyglucosides. Examples of polymers are homo- or copolymers of vinylpyrrolidone, vinylalcohols, or vinylacetate.

Suitable cationic surfactants are quaternary surfactants, for example quaternary ammonium compounds with one or two hydrophobic groups, or salts of long-chain primary amines. Suitable amphoteric surfactants are alkylbetains and imidazolines. Suitable block polymers are block polymers of the A-B or A-B-A type comprising blocks of polyethylene oxide and polypropylene oxide or of the A-B-C type comprising alkanol, polyethylene oxide and polypropylene oxide. Suitable polyelectrolytes are polyacids or polybases. Examples of polyacids are alkali salts of polyacrylic acid or polyacid comb polymers. Examples of polybases are polyvinylamines or polyethyleneamines.

Suitable thickeners are polysaccharides (e.g. xanthan gum, carboxymethylcellulose), inorganic clays (organically modified or unmodified), polycarboxylates, and silicates.

Suitable biocides are bronopol and isothiazolinone derivatives such as alkylisothiazoli-nones and benzisothiazolinones.

Suitable anti-freezing agents are ethylene glycol, propylene glycol, urea and glycerin.

Suitable anti-foaming agents are silicones, long chain alcohols, and salts of fatty acids.

Suitable colorants (e.g. in red, blue, or green) are pigments of low water solubility and water-soluble dyes. Examples are inorganic colorants (e.g. iron oxide, titan oxide, iron hexacyanoferrate) and organic colorants (e.g. alizarin-, azo- and phthalocyanine colorants).

Formulation types, which are especially useful for seed treatment are including, but not limited to soluble concentrates (LS), emulsions (ES), suspensions (FS), -water-dispersible powders and water-soluble powders (WS), dustable powders (DS), and suspoemulsions (SE).

The amount of pesticide in the formulation depends on the formulation type. Principally, the agrochemical formulations generally comprise between 0.01 and 95%, preferably between 0.1 and 90%, most preferably between 0.5 and 90%, by weight of the pesticide.

For example, in the liquid fomulations (as set forth above), the amount of the at least one pesticide is usually in the range from 2 to 70% by weight, in particular from 2 to 60% by weight

In the solid formulations (as set forth above), the amount of the at least one pesticide is usually in the range from 10 to 70% by weight, in particular in the range from 15 to 50% by weight, based on the total weight of the solid formulation.

The total amount of further formulation auxiliaries depends on the type of formulation used. Generally, it varies from 0.1 to 90% by weight based on the total weight of the formulation.

In particular, the amount of surfactants varies depending on the formulation type. Usually, it is in the range from 0.1 to 20% by weight, in particular from 0,2 to 15% by weight and particularly preferably from 0,5 to 10% by weight based on the total weight of the formulation.

The amount of carriers and solvents varies depending on the formulation type. Usually, the solvent is present in an amount to add 100 by weight of the total formulaion, for example it is in the range from 1 to 90 % by weight, in particular from 10 to 60 % by weight and particularly preferably from 15 to 50 % by weight based on the total weight of the formulation.

The amount of the remaining formulation auxiliaries (thickeners, anti-foam agents, anti-freeze agents, agents for adjusting the pH, anticaking agents and biocides (preservatives), colorants, fillers) varies depending on the formulation type. Usually, it is in the range from 0,1 to 60 % by weight, in particular from 0,5 to 40 % by weight and particularly preferably from 1 to 20 % by weight based on the total weight of the formulation.
For example, the content of antifoams or biocides is as a rule below 1% by weight.

In these formulations, the amount of the seed treatment formulation aid as defined above is preferably in the range from 2 to 70 % by weight, more preferably from 3 to 65 % by weight and particularly preferably from 4 to 50 % by weight based on the total weight of the formulation.

These formulations can be applied to plant propagation materials, particularly seeds, diluted or undiluted. The compositions in question give, after two-to-tenfold dilution, pesticide concentrations of from 0.01 to 60% by weight, preferably from 0.1 to 40% by weight, in the ready-to-use preparations. Application can be carried out before or during sowing. Methods for applying or treating agrochemical compounds and compositions thereof, respectively, on to plant propagation material, especially seeds, are known in the art, and include dressing, coating, pelleting, dusting and soaking application methods of the propagation material (and also in furrow treatment). In a preferred embodiment, the sticker according to the invention or formulations com-

prising the sticker according to the invention, respectively, are applied on to the plant propagation material by a method such that germination is not induced, e. g. by seed dressing, pelleting, coating and dusting.

The present invention also comprises a method for treating seeds with a formulation aid as defined above. Thereby, flowability of the treated seeds can be maintained and/or adhesion of the resulting formulation on machineries used in the seed treatment process can be reduced and/or dust reduction occurs and/or uniformity of seed treatment is imporived.

The present invention furthermore comprises a method of for controlling pests, which comprises treating plant propagation material treating seeds with

1) a seed treatment formulation aid as defined above and an agrochemical formulation comprising at least one pesticide, or
2) a seed dressing formulation as defined above.

In case 1), the seed treatment formulation aid and the agrochemical formulation comprising at least one pesticide can be applied simultaneously, that is jointly or separately, or in succession.

The present invention also relates to seeds treated with a seed treatment formulation aid as defined above or a seed dressing formulation as defined above.

The term "seed" is to be understood to denote all the generative parts of the plant such as seeds and vegetative plant material such as cuttings and tubers (e. g. potatoes), which can be used for the multiplication of the plant. This includes seeds, roots, fruits, tubers, bulbs, rhizomes, shoots, sprouts and other parts of plants, including seedlings and young plants, which are to be transplanted after germination or after emergence from soil. These young plants may also be protected before transplantation by a total or partial treatment by immersion or pouring. Preferably, the term plant seed denotes seeds.

Useful for the present invention is the seed of various cultivated plants, for example cereals such as wheat, rye, barley, triticale, oats or rice, beet, e. g. sugar beet or fodder beet, fruits, such as pomes, stone fruits or soft fruits, e. g. apples, pears, plums, peaches, almonds, cherries, strawberries, raspberries, blackberries or gooseberries, leguminous plants, such as lentils, peas, alfalfa or soybeans, oil plants, such as rape, oil seed rape / canola, mustard, olives, sunflowers, coconut, cocoa beans, castor oil plants, oil palms, ground nuts or soybeans, cucurbits, such as squashes, cucumber or melons, fiber plants, such as cotton, flax, hemp or jute, citrus fruit, such as oranges, lemons, grapefruits or mandarins, vegetables, such as spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes, cucurbits or paprika, lauraceous plants, such as avocados, cinnamon or camphor, energy and raw material plants, such as corn, soybean, rape, sugar cane or oil palm, corn, tobacco, nuts, coffee, tea, bananas, vines (table grapes and grape juice grape vines), hop, turf, natural rubber plants or ornamental and forestry plants, such as flowers, shrubs, broad-leaved trees or evergreens, e. g. conifers, preferably corn, sunflower, cereals such as wheat, rye, barley, triticale, oats or rice, soybean, cotton, oil

seed rape / canola, more preferably corn, sunflower, soybean, cereals such as wheat, rye, barley, triticale, oats or rice, most preferably corn, soybean and cereals such as wheat, rye, barley, triticale, oats or rice, utmost preferably wheat, rye, barley, triticale or oats.

The term "plants" is to be understood as including plants which have been modified by breeding, mutagenesis or genetic engineering including but not limiting to agricultural biotech products on the market or in development (cf. http://www.bio.org/speeches/pubs/er/agri_products.asp). Genetically modified plants are plants, which genetic material has been so modified by the use of recombinant DNA techniques that under natural circumstances cannot readily be obtained by cross breeding, mutations or natural recombination. Typically, one or more genes have been integrated into the genetic material of a genetically modified plant in order to improve certain properties of the plant. Such genetic modifications also include but are not limited to targeted post-translational modification of protein(s), oligo- or polypeptides e. g. by glycosylation or polymer additions such as prenylated, acetylated or farnesylated moieties or PEG moieties.

Plants that have been modified by breeding, mutagenesis or genetic engineering, e. g. have been rendered tolerant to applications of specific classes of herbicides, such as auxin herbicides such as dicamba or 2,4-D, bleacher herbicides such as hydroxylphenylpyruvate dioxygenase (HPPD) inhibitors or phytoene desaturase (PDS) inhibittors, acetolactate synthase (ALS) inhibitors such as sulfonyl ureas or imidazolinones, enolpyruvylshikimate-3-phosphate synthase (EPSPS) inhibitors, such as glyphosate, glutamine synthetase (GS) inhibitors such as glufosinate, protoporphyrinogen-IX oxidase inhibitors, lipid biosynthesis inhibitors such as acetyl CoA carboxylase (ACCase) inhibitors, or oxynil (i. e. bromoxynil or ioxynil) herbicides as a result of conventional methods of breeding or genetic engineering. Furthermore, plants have been made resistant to multiple classes of herbicides through multiple genetic modifications, such as resistance to both glyphosate and glufosinate or to both glyphosate and a herbicide from another class such as ALS inhibitors, HPPD inhibitors, auxin herbicides, or ACCase inhibitors. These herbicide resistance technologies are e. g. described in Pest Managem. Sci. 61, 2005, 246, 61, 2005, 258, 61, 2005, 277, 61, 2005, 269, 61, 2005, 286, 64, 2008, 326, 64, 2008, 332, Weed Sci. 57, 2009, 108, Austral. J. Agricult. Res. 58, 2007, 708, Science 316, 2007, 1185, and references quoted therein. Several cultivated plants have been rendered tolerant to herbicides by conventional methods of breeding (mutagenesis), e. g. Clearfield® summer rape (Canola, BASF SE, Germany) being tolerant to imidazolinones, e. g. imazamox, or ExpressSun® sunflowers (DuPont, USA) being tolerant to sulfonyl ureas, e. g. tribenuron. Genetic engineering methods have been used to render cultivated plants such as soybean, cotton, corn, beets and rape, tolerant to herbicides such as glyphosate and glufosinate, some of which are commercially available under the trade names RoundupReady® (glyphosate-tolerant, Monsanto, U.S.A.), Cultivance® (imidazolinone tolerant, BASF SE, Germany) and LibertyLink® (glufosinate-tolerant, Bayer CropScience, Germany).

Furthermore, plants are also covered that are by the use of recombinant DNA techniques capable to synthesize one or more insecticidal proteins, especially those known from the bacterial genus Bacillus, particularly from Bacillus thuringiensis, such as δ-endotoxins, e. g. CrylA(b),

CrylA(c), CrylF, CrylF(a2), CrylIA(b), CrylIIA, CrylIIB(b1) or Cry9c, vegetative insecticidal proteins (VIP), e. g. VIP1, VIP2, VIP3 or VIP3A, insecticidal proteins of bacteria colonizing nematodes, e. g. Photorhabdus spp. or Xenorhabdus spp., toxins produced by animals, such as scorpion toxins, arachnid toxins, wasp toxins, or other insect-specific neurotoxins, toxins produced by fungi, such Streptomycetes toxins, plant lectins, such as pea or barley lectins, agglutinins, proteinase inhibitors, such as trypsin inhibitors, serine protease inhibitors, patatin, cystatin or papain inhibitors, ribosome-inactivating proteins (RIP), such as ricin, maize-RIP, abrin, luffin, saporin or bryodin, steroid metabolism enzymes, such as 3-hydroxysteroid oxidase, ecdysteroid-IDP-glycosyl-transferase, cholesterol oxidases, ecdysone inhibitors or HMG-CoA-reductase, ion channel blockers, such as blockers of sodium or calcium channels, juvenile hormone esterase, diuretic hormone receptors (helicokinin receptors), stilben synthase, bibenzyl synthase, chitinases or glucanases. In the context of the present invention these insecticidal proteins or toxins are to be understood expressly also as pre-toxins, hybrid proteins, truncated or otherwise modified proteins. Hybrid proteins are characterized by a new combination of protein domains, (see, e. g. WO 02/015701). Further examples of such toxins or genetically modified plants capable of synthesizing such toxins are disclosed, e. g., in EP-A 374 753, WO 93/007278, WO 95/34656, EP-A 427 529, EP-A 451 878, WO 03/18810 und WO 03/52073. The methods for producing such genetically modified plants are generally known to the person skilled in the art and are described, e. g. in the publications mentioned above. These insecticidal proteins contained in the genetically modified plants impart to the plants producing these proteins tolerance to harmful pests from all taxonomic groups of athropods, especially to beetles (Coleoptera), two-winged insects (Diptera), and moths (Lepidoptera) and to nematodes (Nematoda). Genetically modified plants capable to synthesize one or more insecticidal proteins are, e. g., described in the publications mentioned above, and some of which are commercially available such as YieldGard® (corn cultivars producing the Cry1Ab toxin), YieldGard® Plus (corn cultivars producing Cry1Ab and Cry3Bb1 toxins), Starlink® (corn cultivars producing the Cry9c toxin), Herculex® RW (corn cultivars producing Cry34Ab1, Cry35Ab1 and the enzyme Phosphinothricin-N-Acetyltransferase [PAT]), NuCOTN® 33B (cotton cultivars producing the Cry1Ac toxin), Bollgard® I (cotton cultivars producing the Cry1Ac toxin), Bollgard® II (cotton cultivars producing Cry1Ac and Cry2Ab2 toxins), VIPCOT® (cotton cultivars producing a VIP-toxin), NewLeaf® (potato cultivars producing the Cry3A toxin), Bt-Xtra®, NatureGard®, KnockOut®, BiteGard®, Protecta®, Bt11 (e. g. Agrisure® CB) and Bt176 from Syngenta Seeds SAS, France, (corn cultivars producing the Cry1Ab toxin and PAT enyzme), MIR604 from Syngenta Seeds SAS, France (corn cultivars producing a modified version of the Cry3A toxin, c.f. WO 03/018810), MON 863 from Monsanto Europe S.A., Belgium (corn cultivars producing the Cry3Bb1 toxin), IPC 531 from Monsanto Europe S.A., Belgium (cotton cultivars producing a modified version of the Cry1Ac toxin) and 1507 from Pioneer Overseas Corporation, Belgium (corn cultivars producing the Cry1F toxin and PAT enzyme).

Furthermore, plants are also covered that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the resistance or tolerance of those plants to bacterial, viral or fungal pathogens. Examples of such proteins are the so-called “pathogenesis-related proteins” (PR proteins, see, e. g. EP-A 392 225), plant disease resistance genes (e. g.

potato cultivars, which express resistance genes acting against Phytophthora infestans derived from the mexican wild potato Solanum bulbocastanum) or T4-lysozym (e. g. potato cultivars capable of synthesizing these proteins with increased resistance against bacteria such as Erwinia amylvora). The methods for producing such genetically modified plants are generally known to the person skilled in the art and are described, e. g. in the publications mentioned above.

Furthermore, plants are also covered that are by the use of recombinant DNA techniques capable to synthesize one or more proteins to increase the productivity (e. g. bio mass production, grain yield, starch content, oil content or protein content), tolerance to drought, salinity or other growth-limiting environmental factors or tolerance to pests and fungal, bacterial or viral pathogens of those plants.

Furthermore, plants are also covered that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve human or animal nutrition, e. g. oil crops that produce health-promoting long-chain omega-3 fatty acids or unsaturated omega-9 fatty acids (e. g. Nexera® rape, DOW Agro Sciences, Canada).

Furthermore, plants are also covered that contain by the use of recombinant DNA techniques a modified amount of substances of content or new substances of content, specifically to improve raw material production, e. g. potatoes that produce increased amounts of amylopectin (e. g. Amflora® potato, BASF SE, Germany).

The invention also relates to the seed comprising, that is, coated with and/or containing, a seed dressing formulation aid.

Preferably, the seed comprises the seed dressing formulation aid components, i.e. the sticker and the silicone oil, in an amount of from 1 to 100g, preferably from 3 to 50 g, more preferably 5 to 25g per 100 kg of seed, wherein the ratio by weight of the sticker [g] and the silicone oil [g] is from 20:1 to 1:5, preferably from 12:1 to 1:3, more preferably from 2:1 to 1:2.

If a pesticide is additionally present, the seed comprises such pesticide(s) in an amount of from 0.1 g to 10 kg per 100 kg of seed.

In a preferred embodiment, the seed is cereal seed, which comprises the seed dressing formulation aid in an amount of from 1 to 100, preferably from 3 to 50 g, more preferably 5 to 25g per 100 kg of seed, wherein the ratio by weight of the sticker [g] and the silicone oil [g] is from 5:1 to 1:3, preferably from 1:2 to 2:1.

In a further preferred embodiment, the seed is soy seed, which comprises the seed dressing formulation aid in an amount of from 1 to 100, preferably from 3 to 50 g, more preferably 5 to 25g per 100 kg of seed, wherein the ratio by weight of the sticker [g] and the silicone oil [g] is from 20:1 to 1:5, preferably from 12:1 to 1:2.

In a further preferred embodiment, the seed is corn seed, which comprises the seed dressing formulation aid in an amount of from 1 to 100, preferably from 3 to 50 g, more preferably 5 to

25g per 100 kg of seed, wherein the ratio by weight of the sticker [g] and the silicone oil [g] is from 20:1 to 1:5, preferably from 12:1 to 1:2.

The invention is further illustrated, but not limited by the following examples:

Example 1 – Preparation of Seed Treatment Formulation Aids

All polymer dispersions according to the invention have been synthesized according to the methods described in EP 1077237 A, EP 0810274 A or US 6790272:

Table I		b)	b)	c)	a)
	Tg	Butylacrylat	Hexylacrylat	Vinylacetate	Acrylic acid
Polymer 1	-43	95-99			1
Polymer 2	-58		90	3-8	0-2

The seed treatment formulation aids 1, 2 and 3 were prepared by mixing the polymer dispersions with the ingredients as set forth in table II below. The slurries can be prepared by simple mixing of the components, like e.g. starting with the aqueous polymer dispersion, addition of a silicone oil emulsion, addition of antifoam and antifreeze.

Table II	Formulation Aid 1 [% w/w]	Formulation Aid 2 [% w/w]
Dispersion of polymer 1 [a)]		49,95
Dispersion of polymer 2 [a)]	50,0	
Wacker E22[b)]	50,0	49,95
Antifoam		0,1

a) commercially available aqueous polymer dispersions, comprising 40-60% polymer w/w
b) commercially available silicone oil emulsion, comprising 35% silicone oil w/w

Seed treatment compositions

Ready-to-use treatment slurries were be prepared by mixing an (commercial) FS formulation containing pesticides mixed with an amount of formulation aid and water as defined below in table III. Rubin TT® is a commercially avaliable FS formulation that does not contain any sticker or flow aids. It contains 25g/L Triticonazole, 42 g/L Prochloraz copper chloride and 42 g/L Pyrimethanil. The slurries have been prepared by simply mixing water and the FS formulation followed by the addition of the formulation aid.

Table IIII

Dose rate in	1	2	3	4	5

ml/100kg seeds					
Formulation Aid 1		30			
Formulation Aid 2				20	30
Rubin TT	200	200	200	200	200
Water	100	100	200	200	200

Example 2 – Seed Treatment

Seed treatment experiments were carried out with the slurries of table III by applying the correspiending ml of slurry (see table IV) to 2 kg untreated wheat in a batch treater from SATEC. The seeds were stored in a conditioning cabinet for 24 h at 20°C and 50% r.h. prior to the treatment. The batch treater moved the seeds following the rotor stator principle. The slurry was applied on the seeds via a spinning disc, being dosed with a peristaltic pump. 30 s after treatment start, the treated seeds were discharged from the treater.

Example 3

A) Dust measurements

The dust measurements were performed one day after the above mentioned treatment in the same SATEC batch treater. Treated seeds are stored in a conditioning cabinet for 24 h at 20°C and 50% r.h. The rotation speed and air flow rate of the treater was the same as during treatment. Conditioning of the treater was done by turning on the empty treater for 10 minutes. A pre-weighted filter (Fisherbrand glassfiber filter 38 mm, Product No. FB59403) was placed in a nutsche filter connected to a vacuum pump and located in the treater cover. The pump sucked a part of the air blown into the treater incl. potential dust through the filter. The running treater was filled with 1 kg of treated seeds. The pump is stopped after 30 s, the filter weighed again and the dust per 100 kg of seed calculated.
The test results correlate well with measurements done with the Heubach dustmeter (Heubach GmbH).
Results are given in Table IV set forth below.

B) Determination of flowability

The flow measurements have been carried out with the following setup: a steel funnel with defined opening diameter was filled with 2kg of treated seeds immediately after treatment whereat the funnel hole was still closed to inhibit flowing of the seeds. At a time of 30s after treatment, the hole was opened to start the seed flow and the time for the seeds to flow completely out of the funnel was measured. The relative flow is quantified as flow time of the untreated seeds divided by the flow time of treated seeds.
Results are given in Table IV set forth below.

The Slurries comprising seed treatment formulation aid showed increased flowability combined with dust reduction, if compared to treatments with a commercial seed treatment formulation without such flow-aid.

Table IV	Total slurry [ml]	Dust-off [g/100kg]	relative flow [% of untreated]
1 (Comparative)*	6,0	1,1	69
2	6,6	0,2	93
3 (Comparative)*	8,0	1,1	69
4	8,4	0,5	89
5	8,6	0,4	94

*) No seed treatment formulation aid present / Commerical FS Formulation (see above)

Claims

1. A seed dressing formulation aid comprising
   (1) from 8% by weight to 70% weight of a sticker
   (2) from 1% by weight to 40% weight of a silicone oil.

2. The formulation aid of claim 1, wherein the sticker is selected from the group of polyvinylpyrrolidons, polyvinylacetates, polyvinyl alcohols and cellulose ethers, poly(alkyl)acrylates and acrylate copolymers

3. The formulation aid of claim 1 or 2, additionally comprising (3) water and (4) surfactants.

4. The formulation aid of any of claims 1 to 3, additionally comprising a pigment.

5. The formulation aid of any of claims 1 to 4, additionally comprising an antifoam.

6. The formulation aid as claimed in any of claims 1 to 5, wherein the ratio by weight of sticker and silicone oil is from 20:1 to 1:5.

7. The formulation aid as claimed in any of claims 1 to 6, wherein at least one sticker is selected from the group of acrylate copolymers.

8. A seed treatment formulation additionally comprising
   (i) a seed dressing formulation aid as defined in any of claims 1 to 7; and
   (ii) at least one pesticide; and
   (iii) further formulation auxiliaries

9. A method for treating seeds comprising contacting seeds with a seed dressing formulation aid as defined in any of claims 1 to 7 or a seed dressing formulation as defined in claim 8.

10. Seed coated with or containing a seed dressing formulation aid as defined in any of claims 1 to 7.

11. Seed coated with or containing a seed treatment formulation as defined in claim 8.

12. A method for increasing the flowability of seed and/or reduction of dust , which comprises treating plant propagation material with a seed dressing formulation aid as defined in any of claims 1 to 7 or with a seed treatment formulation according to claim 8.

13. A method for regulating for controlling pests, which comprises treating plant propagation material
    (i) with a seed treatment formulation according to claim 8; or
    (j) with a seed dressing formulation aid as defined in any of claims 1 to 7 and a pesticidal formulation comprising at least one pesticide.

14. Use of a silicon oil for increasing the flowability of seeds.

15. Use of a silicon oil for seed treatment for reduction of dust.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/060548

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01C1/06 A01N25/00 A01N25/24 C09D183/04 A01P3/00
A01P7/04
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)
A01C A01N C09D

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 106 649 A (SPICER ANDREW R [GB] ET AL) 21 April 1992 (1992-04-21) column 3, line 44 - line 52 column 9, line 55 - line 61 column 5 - column 11; examples 1-7, 12-22 column 1	1-15
X	US 4 227 911 A (LEONARD JAMES D ET AL) 14 October 1980 (1980-10-14) "Proportions"; column 11 column 10, line 28 - line 34 column 11, line 41 - line 43	8-15

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

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2012	12/09/2012

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

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/298965 A1 (SCHNEIDER KARL-HEINRICH [DE] ET AL) 27 December 2007 (2007-12-27) paragraph [0001] - paragraph [0003] page 8, paragraphs 130 , 132 page 14; table 3 -----	8-15
A	"SHIN-ETSU SILICONE - SILICONE FLUID - DM-FLUID (For North and South America) , Performance Test Results", SHIN-ETSU TECHNICAL DATA, , 1 March 2005 (2005-03-01), pages 1-35, XP001544693, Retrieved from the Internet: URL:http://www.silicone.jp/e/catalog/pdf/kf96_us.pdf [retrieved on 2011-11-13] page 4 - page 5; figure 1 -----	1-15

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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