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(54) Titre : COMPOSITION POUR CHASSER DES ORGANISMES NUISIBLES
(54) Title: REPELLENT COMPOSITION FOR HARMFUL ORGANISMS

(57) Abrégé/Abstract:

The invention relates to a composition for repelling harmful organisms in agriculture and forestry and in agriculture and horticulture for the protection of cultivated and ornamental plants, and to the use of the composition as a repellent for harmful organisms.

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(54) Title: REPELLENT COMPOSITION FOR HARMFUL ORGANISMS

(54) Bezeichnung: ZUSAMMENSETZUNG ZUR VERGRÄMUNG VON SCHADORGANISMEN

(57) Abstract: The invention relates to a composition for repelling harmful organisms in agriculture and forestry and in agriculture and horticulture for the protection of cultivated and ornamental plants, and to the use of the composition as a repellent for harmful organisms.

(57) Zusammenfassung: Die Erfindung betrifft eine Zusammensetzung zur Vergrämung von Schadorganismen in der Land- und Forstwirtschaft sowie Landschafts- und Gartenbau zum Schutz von Kultur- und Zierpflanzen sowie die Verwendung der Zusammensetzung als Repellent zur Vergrämung von Schadorganismen.



WO 2020/035547 A1

Repellent composition for harmful organisms

Description

The invention relates to a composition for repelling harmful organisms in agriculture and forestry as well as in landscaping and horticulture for the protection of cultivated and ornamental plants, and to a method for the production of this compound and the use of a repellent for repelling harmful organisms.

Harmful organisms such as wild animals can cause considerable damage in agriculture and forestry. For example, browsing by forest animals such as deer, red deer and wild boar causes enormous crop damage. Bird predation on seeds by pheasants, pigeons, and crows and others is also a widespread problem, for example in corn cultivation. Other known bird damage includes feeding damage and trampling of migrating, roosting or wintering geese. Various songbird species are known to bite the buds of fruit trees (finch birds), feed on corn cobs (tree sparrow, tit, bullfinch, magpie, jay and carrion crow), visit emerging grain or rapeseed (rook, carrion crow, woodpigeon), play with exposed potato tubers (common raven) or damage protective silage film (carrion crow). Game damage prevention agents are thus used to protect seeds and plants.

Substances have been developed against harmful birds to prevent the birds from feeding on fruit or young plants. The seeds to be treated are dressed with these substances, which are intended to make the spread seeds and subsequently the seedlings inedible for birds. However, these substances are often toxic, so that their use as plant protection agent is only permitted to a limited extent or for a limited period of time.

For example, anthraquinone has been used as seed dressing (e.g. corn, wheat, oats and rye) to ward off bird predation after sowing. Because of its carcinogenic effect in animal tests and suspected carcinogenicity in humans, the EU rejected a further application for authorization as a plant protection agent under Directive 91/414/EEC.

Another repellent against birds and rodents used for seed dressing is thiram. The active ingredient is also used as game damage prevention agent for plants. However, thiram is toxic,

can cause allergies and damage the liver. Reaction of thiram with nitrosating agents can result in the formation of carcinogenic N-nitrosamines. Traces (100-500 ppm) of thiram over a longer period of time in the feed of birds lead to soft eggshells, reduced laying performance and malformations in poultry.

The active ingredient ziram is used as repellent against browsing and bird predation. According to Austrian regulations, ziram can be used to protect dressed seed from bird predation. Ziram is currently not approved in Germany. Ziram may have an endocrine disrupting activity, which is why the effects of the active ingredient on human health are currently being evaluated under REACH as part of Denmark's substance evaluation.

The active ingredient methiocarb (mercaptodimethur) is also used as repellent, particularly as bird repellent in seed treatment of corn and ornamental plants. However, it is so toxic that the EU approval for its use as molluscicide (snail pellets) was withdrawn on February 26, 2014, to protect birds, mammals and non-target arthropods. Its effect as neurotoxin occurs via inhibition of acetylcholinesterase. Methiocarb also affects the nervous system of snails, which initially become hyperactive but then lose the muscle tone and die on the spot. The active ingredient is also very toxic to aquatic life. It is also toxic to humans and can cause vomiting, diarrhea, respiratory distress and pulmonary edema.

The repellents known in the prior art are toxic and/or harmful in other ways or are suspected of being toxic and/or harmful in other ways. Accordingly, the invention was based on the object of providing an improved agent for repelling harmful organisms, in particular against game bites and bird predation.

The object is achieved by the composition according to the invention and the use according to the invention.

Express reference is made to the preferred embodiments of the invention set forth in the dependent claims.

The composition according to the invention for repelling harmful organisms comprises a mixture, wherein the mixture comprises at least one compound selected from the group consisting of humulones (α -acids), lupulones (β -acids), isohumulones (iso- α -acids), oxidation products of the

lupulones such as hulupones and luputrones, allo-isohumulones, abeo-isohumulones (oxidized isohumulones), anti-isohumulones, spiro-isohumulones, humelic acids, dihydro-isohumulones (Rho-isohumulones), tetrahydro-isohumulones and hexahydro-isohumulones.

5 The composition according to the invention for repelling harmful organisms may further comprise at least one plant protection agent and/or plant additive.

Depending on the at least one plant protection agent and/or plant additive, the composition according to the invention is biodegradable, non-toxic, safe to use and environmentally safe,
10 and can thus also be used in organic agriculture (organic farming) and in organic forestry.

The composition according to the invention serves to repel harmful organisms, in particular birds and/or mammals. In particular, it can be used as repellent or game damage prevention agent. It can be used to protect seeds, cultivated plants and/or ornamental plants from bird
15 predation and/or game bites.

The term "harmful organisms" as used herein in the description and in the claims designates pests and nuisances, such as, for example, birds (including, but not limited to, crows, in particular rooks, pigeons, pheasants) and mammals (including, but not limited to, hares, rats, mice, deer, wild boars), insects, spiders and the like, as well as bacteria, viruses and fungi. In
20 the context of the term "game damage prevention agent," the term "harmful organisms" indicates exclusively birds (including, but not limited to, crows, especially rooks, pigeons, pheasants) and mammals (including, but not limited to, rabbits, rats, mice, deer, wild boars) as pests and nuisances, wherein these are expressly not limited to game or wild animals.

25 The term "game damage prevention agent" as used herein in the description and in the claims indicates an agent for the control of harmful organisms (birds and mammals) which, in agriculture, cause damage to land used by farmers and their seeds and crops, or which, in forestry, cause damage to flora by browsing, peeling and rubbing (sweeping) on forest plants.

30 The term "cultivated and ornamental plants" as used herein in the description and in the claims comprises all plants cultivated in agriculture and forestry, and in landscaping and horticulture, such as cereals like wheat, spelt, rye, oats, barley, triticale, millet, corn, rice and bamboo seeds, legumes, vegetables such as potatoes, stone fruit, pome fruit, soft fruit and nut fruit plants,

cucurbits, woody plants, vines, as well as spice and medicinal plants, ornamental plants and the like.

5 The term "repellent" as used herein in the description and in the claims comprises agents which have a repellent or expulsive effect on other living organisms, especially harmful organisms. Frequently, such agents, by their unpleasant taste or odor, cause the harmful organisms to keep away, for example, from food or from certain places.

10 In a particular embodiment, the composition according to the invention comprises at least 1 vol%, based on the volume of the composition, of the mixture, preferably at least 5 vol%, at least 7 vol%, at least 8 vol% or at least 10 vol% of the mixture, based on the volume of the composition. In another preferred embodiment, the composition according to the invention comprises at least 12 vol%, based on the volume of the composition, of the mixture, preferably at least 17 vol%, at least 21 vol%, at least 25 vol% or at least 27 vol% of the mixture, based on
15 the volume of the composition. In another particular embodiment, the composition according to the invention comprises up to 99.9 vol%, based on the volume of the composition, of the mixture, preferably 1-99 vol%, 5-98 vol%, 30-95 vol%, or 35-80 vol% of the mixture, based on the volume of the composition.

In an embodiment, the composition may comprise water as remainder.

20 In a further embodiment, the composition according to the invention comprises at least 1 vol% based on the volume of the composition, of the plant protection agent and/or plant additive, preferably at least 2 vol%, at least 5 vol%, at least 8 vol% or at least 10 vol%, of the plant protection agent and/or plant additive, based on the volume of the composition. In a further
25 embodiment, the composition according to the invention comprises at least 20 vol%, based on the volume of the composition, of the plant protection agent and/or plant additive, preferably at least 35 vol%, at least 50 vol%, at least 65 vol% or at least 80 vol% of the plant protection agent and/or plant additive, based on the volume of the composition. In another particular
30 embodiment, the composition according to the invention comprises up to 99.9 vol%, based on the volume of the composition, of the plant protection agent and/or plant additive, preferably 1-99 vol%, 5-98 vol%, 30-95 vol% or 35-80 vol% of the plant protection agent and/or plant additive, based on the volume of the composition.

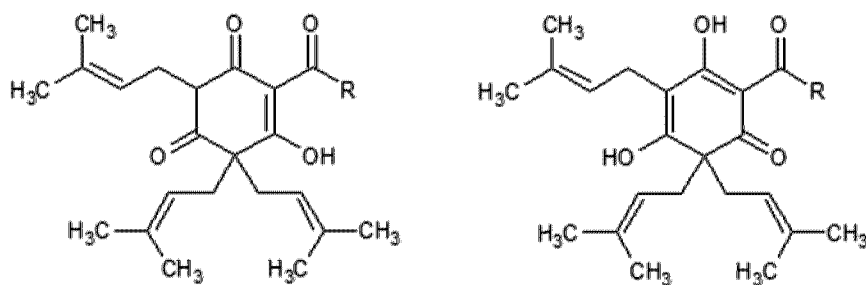
35 In another embodiment, the composition according to the invention comprises at least 1 vol%, based on the volume of the composition, of the mixture,

at least 1 vol%, based on the volume of the composition, of a plant protection agent and/or plant additive, and water as remainder.

- 5 Suitable humulones include cohumulone, adhumulone, humulone (n-humulone), prehumulone and posthumulone, preferably cohumulone, adhumulone and humulone.

Suitable lupulones include colupulone, adlupulone, lupulone (n-lupulone), prelupulone and postlupulone.

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Lupulones

Humulones

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	-R
Colupulone	-CH(CH ₃) ₂
N-lupulone	-CH ₂ CH(CH ₃) ₂
Adlupulone	-CH(CH ₃)-CH ₂ -CH ₃
Prelupulone	-CH ₂ -CH ₂ -CH(CH ₃) ₂
Postlupulone	-CH ₂ -CH ₃

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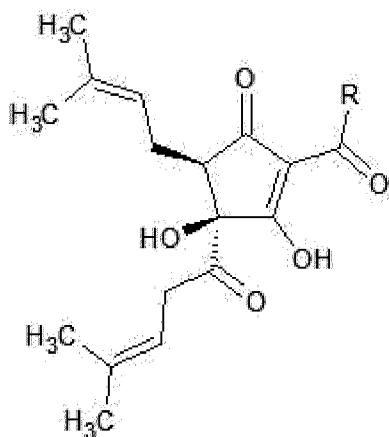
	-R
Cohumulone	-CH(CH ₃) ₂
N-humulone	-CH ₂ CH(CH ₃) ₂
Adhumulone	-CH(CH ₃)-CH ₂ -CH ₃
Prehumulone	-CH ₂ -CH ₂ -CH(CH ₃) ₂
Posthumulone	-CH ₂ -CH ₃

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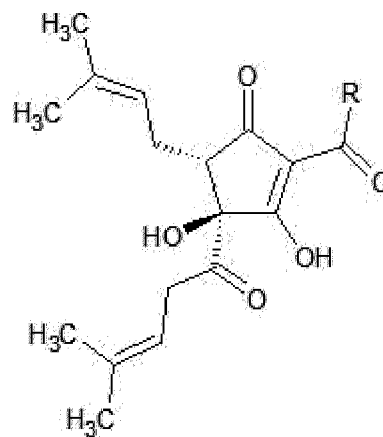
Suitable isohumulones are *cis*-isohumulones and *trans*-isohumulones, in particular isocohumulone, isoadhumulone, isohumulone (*iso-n*-humulone), isoprehumulone and isoposthumulone, preferably isocohumulone, isoadhumulone, isohumulone. Suitable isohumulones include *cis*-isocohumulone, *cis*-isoadhumulone, *cis*-isohumulone (*cis-iso-n*-humulone), *cis*-isoprehumulone, *cis*-isoposthumulone, *trans*-isocohumulone, *trans*-isoadhumulone, *trans*-isohumulone (*trans-iso-n*-humulone), *trans*-isoprehumulone and *trans*-isoposthumulone, and chemically modified isohumulone derivatives such as dihydro-

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isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones. Preferred are *cis*-isohumulones.



***cis*-Isohumulone**



***trans*-Isohumulone**

Isocohumulone
Iso-n-humulone
Isoadhumulone
Isoprehumulone-
Isoposthumulone

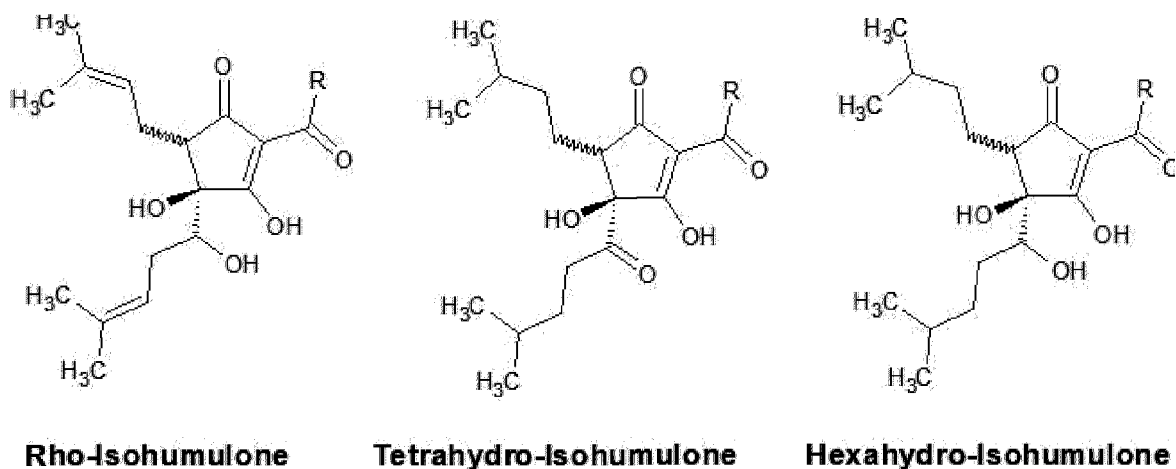
-R
-CH(CH₃)₂
-CH₂CH(CH₃)₂
-CH(CH₃)-CH₂-CH₃
-CH₂-CH₂-CH(CH₃)₂
-CH₂-CH₃

Suitable dihydro-isohumulones include *cis*-dihydro-isocohumulone, *cis*-dihydro-isoadhumulone, *cis*-dihydro-isohumulone (*cis*-dihydro-iso-n-humulone), *cis*-dihydro-isoprehumulone, *cis*-dihydro-isoposthumulone, *trans*-dihydro-isocohumulone, *trans*-dihydro-isoadhumulone, *trans*-dihydro-isohumulone (*trans*-dihydro-iso-n-humulone), *trans*-dihydro-isoprehumulone and *trans*-dihydro-isoposthumulone.

Suitable tetrahydro-isohumulones include *cis*-tetrahydro-isocohumulone, *cis*-tetrahydro-isoadhumulone, *cis*-tetrahydro-isohumulone (*cis*-tetrahydro-iso-n-humulone), *cis*-tetrahydro-isoprehumulone, *cis*-tetrahydro-isoposthumulone, *trans*-tetrahydro-isocohumulone, *trans*-

tetrahydro-isoadhumulone, *trans*-tetrahydro-isohumulone (*trans*-tetrahydro-iso-n-humulone), *trans*-tetrahydro-isoprehumulone and *trans*-tetrahydro-isoposthumulone.

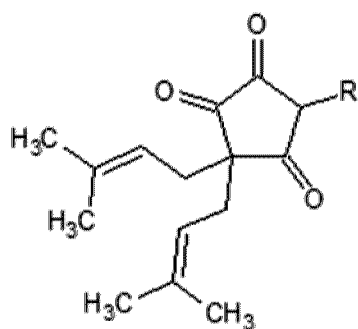
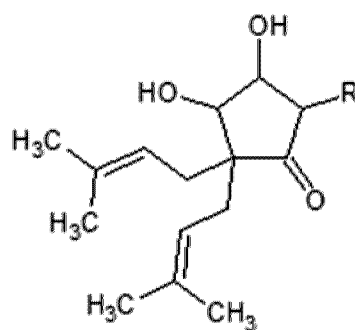
Suitable hexahydro-isohumulones include *cis*-hexahydro-isocohumulone, *cis*-hexahydro-isoadhumulone, *cis*-hexahydro-isohumulone (*cis*-hexahydro-iso-n-humulone), *cis*-hexahydro-isoprehumulone, *cis*-hexahydro-isoposthumulone, *trans*-hexahydro-isocohumulone, *trans*-hexahydro-isoadhumulone, *trans*-hexahydro-isohumulone (*trans*-hexahydro-iso-n-humulone), *trans*-hexahydro-isoprehumulone, and *trans*-hexahydro-isoposthumulone.



Rho-/Tetrahydro-/Hexahydro-Isocohumulone
 Rho-/Tetrahydro-/Hexahydro-Iso-n-Humulone
 Rho-/Tetrahydro-/Hexahydro-Isoadhumulone
 Rho-/Tetrahydro-/Hexahydro-Isoprehumulone
 Rho-/Tetrahydro-/Hexahydro-Isoposthumulone

-R
 -CH(CH₃)₂
 -CH₂CH(CH₃)₂
 -CH(CH₃)-CH₂-CH₃
 -CH₂-CH₂-CH(CH₃)₂
 -CH₂-CH₃

Suitable hulupones include n-hulupone, cohulupone, and adhulupone.

**Hulupone****Luputrione**

	-R
Cohulupone/-luputrione	-CH(CH ₃) ₂
N-hulupone/-luputrione	-CH ₂ CH(CH ₃) ₂
Adhulupone/-luputrione	-CH(CH ₃)-CH ₂ -CH ₃
Prehulupone/-luputrione	-CH ₂ -CH ₂ -CH(CH ₃) ₂
Posthulupone/-luputrione	-CH ₂ -CH ₃

In an embodiment, the mixture comprises humulones, lupulones, isohumulones, hulupones, dihydro-isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones. In a preferred embodiment, the mixture comprises humulones, isohumulones, dihydro-isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones. In a further preferred embodiment, isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones.

In a particularly preferred embodiment, the mixture comprises isohumulones. The mixture may comprise other of the aforementioned compounds, such as humulones or lupulones. Due to their bitterness, isohumulones achieve a particularly good effect in repelling harmful organisms, especially birds and/or mammals.

In a preferred embodiment, the mixture comprised by the composition according to the invention is obtained from hops, in particular from hop cones (hop umbels, female inflorescences, ears) and/or their glandular hairs (hop glands, lupuli glandula, hop meal, lupulin). The term hop cones includes fresh, dried, ground, and pressed/pelleted hop cones unless otherwise described. Hop cones may be used fresh and/or dried, among others. The mixture is preferably obtained from raw hops, hop pellets or hop extracts. Hop pellets may

consist of ground hops. Hop extracts may include, but are not limited to, ethanol extracts, ether extracts, and CO₂ extracts (extraction with supercritical carbon dioxide).

Suitable mixtures are selected from the group consisting of ground hop cones, hop meal, hop resin, hop hard resin, hop soft resin, α -soft resin, β -soft resin, humulones (α -acids) as well as their derivatives, in particular isohumulones dihydro-isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones, and lupulones (β -acids) as well as their derivatives, in particular hulupones and luputrones.

In a preferred embodiment, the mixture comprises a fully or partially isomerized ethanol or CO₂ extract. The term "isomerized" refers to the whole or partial conversion of the humulones to isohumulones. In an embodiment, 1 – 100 % of the humulones are converted, more preferably more than 5 %, 15 %, 30 % or more than 60 % of the humulones are converted. In a preferred embodiment, 50 – 100 % of the humulones are converted, in particular more than 65 %, 80 %, 95 % or more than 99 % of the humulones are converted. In an embodiment, the mixture comprises an ethanol extract of hop cones, in particular a fully or partially isomerized extract in which hop cones have been extracted with an alcohol-water mixture. Preferably, the mixture comprises the so-called pure resin extract. In another embodiment, the mixture comprises the so-called tannin extract as well as the pure resin extract. In a particularly preferred embodiment, the mixture comprises a fully or partially isomerized CO₂ extract.

The mixture may contain blends of different extracts.

Suitable hop varieties include wild hops, cultivated hops, aroma hops, bitter hops, high alpha bitter varieties, high alpha varieties, wherein high alpha bitter varieties, high alpha varieties are being preferred.

Suitable plant protection agents and plant additives (also called plant strengthening agents) comprise pesticides (pest control agents), such as insecticides, rodenticides, acaricides, bactericides, fungicides, nematocides, ovicides, virucides and molluscicides, herbicides (weed control agents), in particular graminicides, growth regulators, seed protection agents, storage protection agents, fertilizers. Preferably, the plant protection agents and the plant additives are suitable for organic agriculture and organic forestry.

Suitable fertilizers comprise liquid fertilizers, such as fertilizer solutions and suspensions, fertilizer granules or salts. Suitable liquid fertilizers include foliar fertilizers.

In a preferred embodiment, the plant protection agent and/or plant additive is a liquid fertilizer.

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Suitable fertilizers include, but are not limited to, nitrogen, potassium, phosphorus, magnesium, sulfur, and calcium fertilizers, as well as fertilizers containing boron, chlorine, copper, iron, manganese, molybdenum, nickel, and/or zinc.

10 In an embodiment, the composition according to the invention comprises 5-30 vol%, preferably 7-25 vol%, based on the volume of the composition, of a fully isomerized CO₂ extract of hops. Preferably, the composition according to the invention comprises at least 10-17 vol%, based on the volume of the composition, of the extract.

15 In an embodiment, the composition according to the invention comprises 8-30 vol%, preferably 12-25 vol%, based on the volume of the composition, of a fully isomerized CO₂ extract of aroma hops. Preferably, the composition according to the invention comprises at least 17 vol%, based on the volume of the composition, of the extract.

20 In a further embodiment, the composition according to the invention comprises 5-27 vol%, preferably 7-21 vol%, based on the volume of the composition, of a fully isomerized CO₂ extract of high alpha varieties. Preferably, the composition according to the invention comprises at least 10 vol%, based on the volume of the composition, of the extract.

25 In another embodiment, the composition according to the invention comprises 10-35 vol%, preferably 15-25 vol%, based on the volume of the composition, of a mixture comprising 30 % (w/w) isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, preferably isohumulones. Preferably, the composition according to the invention comprises at least 20 vol%, based on the volume of the composition, of the mixture. The mixture may also comprise
30 a different proportion of isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, preferably isohumulones, for example between 10 and 60 % (w/w).

In an embodiment, the composition contains at least 3 wt%wt% (w/w), preferably at least 4.5 wt% isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, based on the
35 weight of the composition.

For example, the composition contains 3-10.5 wt% (w/w), preferably 4.5-7.5 wt% isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, preferably isohumulones, based on the weight of the composition. For example, the mixture is an isomerized hop extract containing 30 % (w/w) isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones in aqueous solution (in particular, isomerized alpha acids of hops). Since the density of such a mixture is similar to that of water or conventional plant additive, a composition comprising 10-35 vol% (based on the volume of the composition) of the mixture contains a proportion of about 3-10.5 wt% isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones.

In another embodiment, the composition according to the invention comprises 20 vol%, based on the volume of the composition, of the mixture, and 80 vol%, based on the volume of the composition, of a liquid fertilizer, the mixture comprising 30 % (w/w) isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, preferably isohumulones.

The composition according to the invention can be used as dressing agent for the treatment of seeds, seedlings or young plants of all cultivated and ornamental plants. Furthermore, the composition according to the invention can be used as repellent for protection against game bites and/or bird predation.

The composition according to the invention may comprise further additives such as dyes, adhesives, carriers, wetting agents, diluents, solvents such as water and/or formulation aids.

In an embodiment, the composition according to the invention additionally comprises colorants. A conspicuous coloration of seed potatoes, cereal seeds such as corn, or other seeds may prevent their accidental use as feed or for food purposes. In addition, a colored composition is helpful in assessing the completeness of the dressing.

In an embodiment, the composition according to the invention additionally comprises an adhesion agent. Suitable adhesion agents enable the composition according to the invention to adhere better to the seed or to the plant. In an embodiment, the composition according to the invention is rainproof, i.e. it is not or only slightly rinsed from the seed or from the plant by falling water.

The composition according to the invention can be formulated as liquid, in particular as aqueous solution, as powder, as water-soluble granules or as a water-soluble powder.

In an embodiment, the composition according to the invention additionally comprises customary formulation aids to enable an easiest possible application and good distribution on the seeds or the plants. In the case of plants, this is achieved by improved wetting of the leaf surfaces.

According to a further aspect of the present invention, there is provided seed treated, in particular dressed, with one of the compositions described above.

A further object of the invention is a method for preparing the composition according to the invention, comprising the following step

a) mixing a plant protection agent and/or plant additive and a mixture comprising at least one compound selected from the group consisting of humulones, lupulones, isohumulones, oxidation products of lupulones such as hulupones and luputriones, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, dihydro-isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones.

Step a) of the method according to the invention can be performed before use of the composition to be prepared. In another embodiment, in step a1) a plant protection agent and/or plant additive is applied to seeds or to plants and in step a2) a mixture comprising at least one compound selected from the group consisting of humulones, lupulones, isohumulones, oxidation products of lupulones such as hulupones and luputrions, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, dihydro-isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones, is applied to the same seeds or the same plants. The steps a1) and a2) may be performed in any order, staggered in time, overlapping in time, or sequentially, to perform mixing of the plant protection agent and/or plant additive and the mixture (step a)) on the seed or the plant.

The method according to the invention may further comprise the following step
b) adding additives such as colorants and/or formulation aids.

The step b) may be performed before, after or simultaneously with step a). Step b) may be performed several times during the method.

Another object of the invention is the use of a repellent for repelling harmful organisms, wherein the repellent comprises a mixture derived from hops and/or wherein the repellent comprises a mixture comprising at least one compound selected from the group consisting of humulones, lupulones, isohumulones, oxidation products of lupulones such as hulupones and luputrones, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, dihydro-isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones.

The use according to the invention may be used to protect any cultivated or ornamental plant, in particular any seed and any plant used in agriculture, in landscaping and horticulture and/or in forestry.

In an embodiment, the repellent comprises the composition according to the invention.

In an embodiment, a fully or partially isomerized hop extract, for example fully isomerized CO₂ extract, in particular as part of the composition, is used as repellent for repelling harmful organisms.

In an embodiment, isohumulones are used for repelling the harmful organisms, such as birds and/or mammals. For example, the isohumulones are comprised in a mixture derived from hops, and which may in particular be a fully or partially isomerized hop extract. The isohumulones may be contained as iso-alpha acids in the hop extract and may contain, for example, isohumulone, isocohumulone and isoadhumulone and others of the isohumulones mentioned above. The isohumulones may be included in the mixture, wherein the mixture may be part of one of the compositions described above or the repellent.

In an embodiment, the repellent is used for treating seed, in particular for seed dressing. In agriculture and forestry, as well as in landscaping and horticulture, dressing or seed dressing indicates the treatment of seed and seedlings, to protect the seed or planting for example from pests to which seedlings and young plants are particularly susceptible.

In an embodiment, seed, for example cereals such as wheat, spelt, rye, oats, barley, triticale, millet, corn, rice, legumes and bamboo seeds, is dressed with the repellent prior to planting. Dressing preferably takes place in a dressing drum, a concrete mixer, a mortar trough, or another suitable container. The dressed seed can be properly stored until sowing or be used immediately

after dressing. If necessary, talc can be added to the dressed seed before sowing to improve its flowability.

In another embodiment, seed potatoes are dressed with the repellent prior to laying. Dressing can be performed directly in the planter. In another embodiment, dressed seed potatoes are properly stored until planting.

In another embodiment, the repellent is applied to the plants to be protected using plant protection equipment such as the field sprayer, garden sprayer or other spraying equipment.

The invention is further described in more detail by, but not limited to, the following examples.

Example 1

One unit of corn seed (50,000 grains) is placed in a dressing drum. A well-mixed dressing containing 50 ml of a hop extract, which contains 30 % (w/w) isohumulones in aqueous solution, and 200 ml of a zinc oxide fertilizer suspension (700 g Zn/l) is added briskly to the seed while stirring constantly. The seed is stirred until the dressing is evenly distributed on the grains.

Example 2

One unit of cereal seed (50 kg) is placed in a dressing drum. A well-mixed dressing containing 50 ml of a hop extract, which contains 30 % (w/w) isohumulones in aqueous solution, and 200 ml of a zinc oxide fertilizer suspension (700 g Zn/l) is added briskly to the seed while stirring constantly. The seed is stirred until the dressing is evenly distributed on the grains.

Example 3

To protect against bird predation, corn dressed as in Example 1 was sown in the open on nine fields where bird predation by crows occurs regularly.

Experimentally, it was observed that the damage that regularly occurred due to bird predation of the corn seed in previous years was drastically reduced and partially no longer occurred due to the application of the inventive composition or the inventive use of a repellent. The results of the experiments are shown in Table 1.

Table 1: Bird predation

Field No.	Damage caused by bird predation to seed (comparative example)*	Damage caused by bird predation to dressed seed from example 1
1	present	none
2	very strong	none
3	very strong	low
4	massive	none
5	very strong	low
6	strong	none
7	massive	low
8	very strong	low
9	very strong	low

** Damages in previous years without dressing with the inventive composition*

CLAIMS

1. A composition for repelling birds, wherein the composition is a repellent for protection against bird predation, bites or damage, said composition comprising:
 - at least one plant protection agent and/or plant strengthening agent, and
 - a mixture which is a fully or partially isomerized hops extract comprising: isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones in an amount of at least 3 wt% based on the weight of the composition; a carrier; and optionally one or more compound selected from the group consisting of humulones, lupulones, oxidation products of lupulones, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, and dihydro-isohumulones;
 wherein:
 - the at least one plant protection agent and/or plant strengthening agent comprises a fertilizer; and
 - the mixture is from 5.0-99.9 vol% of the composition, based on the volume of the composition.
2. The composition for repelling birds according to claim 1, wherein the oxidation products of lupulones are selected from the group consisting of hulupones and luputrones.
3. The composition for repelling birds according to claim 1 or 2, wherein the mixture is at least 10 vol% of the composition, based on the volume of the composition.
4. The composition for repelling birds according to any one of claims 1 to 3, wherein the mixture is a fully isomerized hops extract.
5. The composition for repelling birds according to claim 4, wherein the fully isomerized hops extract is a fully isomerized CO₂ extract of hops.

6. The composition for repelling birds according to any one of claims 1 to 3, wherein the mixture is a partially isomerized hops extract.
7. The composition for repelling birds according to claim 1 or 2, wherein the mixture is a fully isomerized CO₂ extract of hops in an amount of from 5-30 vol%, based on the volume of the composition.
8. The composition for repelling birds according to claim 7, wherein the fully isomerized CO₂ extract of hops is in an amount of from 7-25 vol%, based on the volume of the composition.
9. The composition for repelling birds according to claim 7, wherein the fully isomerized CO₂ extract of hops is in an amount of from 10-17 vol%, based on the volume of the composition.
10. The composition for repelling birds according to any one of claims 1 to 9, wherein the mixture comprises isohumulones.
11. The composition for repelling birds according to any one of claims 1 to 10, wherein the mixture comprises 3-10.5 wt% of isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, based on the weight of the composition.
12. The composition for repelling birds according to claim 11, wherein the mixture comprises 3-10.5 wt% isohumulones, based on the weight of the composition.
13. The composition for repelling birds according to claim 11, wherein the mixture comprises 4.5-7.5 wt% of isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones, based on the weight of the composition.
14. The composition for repelling birds according to claim 13, wherein the mixture comprises 4.5-7.5 wt% isohumulones, based on the weight of the composition.

15. The composition for repelling birds according to claim 1 or 2, wherein the mixture is 10-35 vol% of the composition, based on the volume of the composition, said mixture containing 30 % (w/w) isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones.

16. The composition for repelling birds according to claim 15, wherein the mixture is 15-25 vol% of the composition, based on the volume of the composition, said mixture containing 30 % (w/w) isohumulones, tetrahydro-isohumulones and/or hexahydro-isohumulones.

17. The composition for repelling birds according to claim 15, wherein the mixture is 10-35 vol% of the composition, based on the volume of the composition, said mixture containing 30 % (w/w) isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones.

18. The composition for repelling birds according to claim 15 or 16, wherein the mixture contains 30 % (w/w) isohumulones.

19. The composition for repelling birds according to any one of claims 1 to 18, wherein the composition is a damage prevention agent.

20. The composition for repelling birds according to any one of claims 1 to 19, wherein the fertilizer is a liquid fertilizer.

21. A composition for repelling birds, wherein the composition is a repellent for protection against bird predation, bites, or damage, said composition comprising:

at least one plant protection agent and/or plant strengthening agent; and

a mixture which is a completely isomerized CO₂ extract of hops comprising: isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones in an amount of at least 3 wt% based on the weight of the composition; a carrier; and optionally one or more compound selected from the group consisting of humulones, lupulones, oxidation products of lupulones, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, and dihydro-isohumulones;

wherein the mixture is 5-30 vol% of the composition, based on the volume of the composition.

22. The composition for repelling birds according to claim 21, wherein the oxidation products of lupulones are selected from the group consisting of hulupones and luputrones.

23. The composition for repelling birds according to claim 21 or 22, wherein the mixture is 7-25 vol% of the composition, based on the volume of the composition.

24. The composition for repelling birds according to claim 23, wherein the mixture is 10-17 vol% of the composition, based on the volume of the composition.

25. Use of a repellent for repelling birds, wherein the repellent comprises a mixture which is a fully or partially isomerized hop extract, said mixture comprising:

isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones in an amount of at least 3 wt% based on the weight of the repellent;

a carrier; and

optionally one or more compound selected from the group consisting of humulones, lupulones, oxidation products of lupulones, allo-isohumulones, abeo-isohumulones, anti-isohumulones, spiro-isohumulones, humelic acids, and dihydro-isohumulones.

26. The use according to claim 25, wherein the oxidation products of lupulones are selected from the group consisting of hulupones and luputrones.

27. The use according to claim 25 or 26, wherein the mixture is derived from a CO₂ extract of hops.

28. The use according to any one of claims 25 to 27, wherein said use comprises treating seeds with the repellent for repelling birds.

29. The use according to any one of claims 25 to 28, wherein the mixture comprises isohumulones, tetrahydro-isohumulones and hexahydro-isohumulones.
30. The use according to any one of claims 25 to 28, wherein the mixture comprises isohumulones.
31. The use according to claim 25, wherein the repellent is the composition defined in any one of claims 1 to 24.
32. The use according to any one of claims 25 to 31, wherein the use is for protecting seed, cultivated plants, and/or ornamental plants from bird predation.
33. The use of isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones together with a carrier, in a mixture obtained from a fully or partially isomerized hop extract, for repelling birds,
wherein the isohumulones, tetrahydro-isohumulones, and/or hexahydro-isohumulones are present in an amount of at least 3 wt%, based on the weight of the mixture.