

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



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DIRECCIÓN DE NUEVAS CREACIONES

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

E. S. D.

REF: Expediente No. 13 103.730 - Solicitud de Patente
a favor de **CHEMINOVA A/S**

Titulada: COMBINACIÓN PESTICIDA SINÉRGICA DE LUFENURÓN Y MALATIÓN
CONTRA ARTRÓPODOS

JUAN PABLO CADENA SARMIENTO, vecino de Bogotá, portador de la tarjeta profesional No. 57492, obrando como apoderado de la sociedad **CHEMINOVA A/S**, según lo acredita el documento de poder presentado en esa Dirección, me permito anexar al presente escrito los siguientes documentos:

1. Documento donde consta la cesión del derecho a la patente otorgado por los inventores al solicitante junto con su correspondiente traducción al español.
2. Copia certificada por la Oficina de Patentes de Dinamarca de la primera solicitud presentada para la misma invención de la cual REIVINDICAMOS PRIORIDAD.

Del señor Director atentamente,

JUAN PABLO CADENA SARMIENTO

C.C. No. 80.410.337 de Usaquén

T.P. No. 57492 del C.S.J.

Calle 70A No. 4-41

Bogotá, 05 de agosto de 2013
JPCjpg
Folios: 30

DOCUMENT OF ASSIGNMENT OF
PATENT APPLICATION

ASSIGNMENT

The Undersigned, **TEICHER, Harald B.** and
ANDERSEN, Eric Harrestrup.

acting as Inventors

of Colombian Patent Application

Titled: **SYNERGISTIC ANTHROPOD PESTICIDAL
COMBINATION OF LUFENURON AND
MALATHION.**

with domicile in, Drosselvej 3, 7680 Thyborøn,
Denmark; Sportsvej 19, 7500 Holstebro, Denmark
(respectively).

hereby declare(s) that he (they) assign(s) all rights of
ownership as well as all rights and privileges relating
thereto without exception over the following patent
application in Colombia:

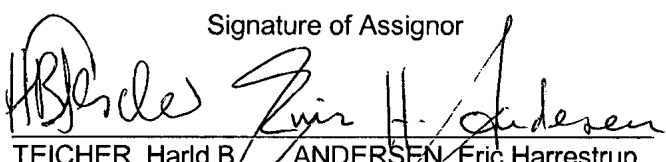
Title: **SYNERGISTIC ANTHROPOD PESTICIDAL
COMBINATION OF LUFENURON AND
MALATHION.**

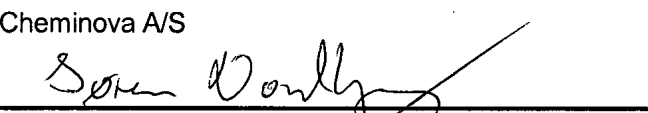
to: **CHEMINOVA A/S**

domiciled in, Thyborønvej 78, 7673 Harboøre,
Denmark

The assignor and the assignee(s) sign this document
as proof of their acceptance of the assignment.

Given and signed on the 23 day of April
of 2013

Signature of Assignor

TEICHER, Harald B. ANDERSEN, Eric Harrestrup
Signature of Assignee

Cheminova A/S

Søren Nordlyng – Patent Manager

DOCUMENTO DE TRASPASO DE
SOLICITUD DE PATENTE

CESION

El (nosotros), **TEICHER, Harald B.** y
ANDERSEN, Eric Harrestrup.

en calidad de Inventores

de la solicitud de patente Colombiana
No.

Titulada: *Composicion Pesticida Sinérgica
de Lufenurión y Malatión contra
Artrópodos.*

con domicilio en, , Drosselvej 3, 7680 Thyborøn,
Dinamarca; Sportsvej 19, 7500 Holstebro,
Dinamarca (respectivamente).

declara(n) por el presente documento que cede(n)
todos los derechos de propiedad que le(s)
correspondan, así como las prerrogativas, sin
excepción alguna, sobre la siguiente solicitud de
patente en Colombia

Titulada:

a: **CHEMINOVA A/S**

domiciliada Thyborønvej 78, 7673 Harboøre,
Dinamarca.

El cedente y el(los) cesionario(s) firma(n) este
documento como prueba de su aceptación de la
cesión.

Dado y firmado a los días del mes de
de 2013

Firma del Cedente

Firma del Cesionario



Kongeriget Danmark

Patent application No.: PA 2012 00295

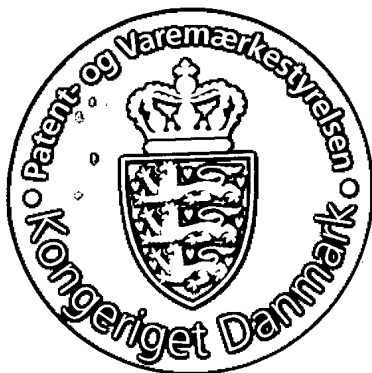
Date of filing: 01 May 2012

Applicant: Cheminova A/S
(Name and address) Thyborønvej 78
7673 Harboøre
Denmark

Title: Synergistic arthropod pesticidal combination of lufenuron and malathion

IPC: A 01 N 47/34, A 01 N 57/12, A 61 K 31/17, A 61 K 31/661

This is to certify that the attached documents are exact copies of the above mentioned patent application as originally filed.



Patent- og Varemærkestyrelsen
Økonomi- og Erhvervsministeriet

26 March 2013


Lette Dalby
Head Clerk

The present invention relates to an arthropod pesticidal composition comprising the compounds lufenuron and malathion as active ingredients. The combination
5 shows a synergistic effect in the control of harmful arthropod pests. The invention further relates to a method for the control of harmful arthropod pests, and to the use of the composition for that purpose. The term arthropod pests include insects, nematodes and arachnids throughout the present patent application.

10

Background

The pesticidal active compound lufenuron is a member of the family of Benzoylurea pesticides and is known from European patent application number EP 179022 A2. Lufenuron is a chitin synthesis inhibitor and acts primarily by
15 ingestion. Lufenuron is an insect growth regulator used for control of several pests, such as *Lepidoptera* and *Coleoptera* larvae, rust mites, and western flower thrips.

Malathion is an organophosphate pesticide and is described in United States
20 patent number US 2578652. Malathion is a Cholinesterase inhibitor and a non-systemic pesticide, which acts by contact, stomach, and respiratory action. Malathion is used to control several pests such as *Coleoptera*, *Diptera*, *Hemiptera*, *Hymenoptera*, and *Lepidoptera* in a wide range of crops or in public health.

25

Mixtures of plant protection products have been proposed in the literature to control e.g. inhibit or destroy arthropod pests. However, lower application doses of pesticides and greater control of pests are required for safer handling as well as for environmental protection. This is achievable by applying combinations of
30 pesticides, which do not only generate an additive enhancement, but also a synergistic effect.

It is impossible to predict if a combination of pesticides has a synergistic effect, and it is therefore of high importance to develop novel pesticidal combinations, which exhibit a synergistic effect. Surprisingly, it has now been found that the combination of lufenuron and malathion exhibit a synergistic effect against
5 arthropod pests.

Description of the invention

The present invention relates to an arthropod pesticidal composition comprising an arthropodal effective amount of the combination of lufenuron and malathion,
10 and to a method of controlling pests with said combination. The invention further relates to a process for the preparation of the novel composition, and to the use thereof. The invention also relates to plants including plant propagation material treated with the combination. The invention additionally relates to the treatment of animal and humans against harmful pests. The invention further
15 relates to a method for controlling harmful pests comprising exposing said harmful pests to an effective amount of lufenuron and malathion. In a preferred embodiment the harmful pests are exposed to an effective amount of lufenuron and malathion, wherein lufenuron and malathion are present in a synergistically effective amount.

20

Lufenuron and malathion have a synergistic effect that increases the activity spectrum of both compounds from two points of view. On the one hand, the concentrations of lufenuron and malathion are reduced with no reduction in the activity of said compounds. On the other hand, the combination also achieves a
25 high degree of pest control where the individual compounds are completely inactive at low concentrations. This feature permits on the one hand a widening of the pest spectrum against the controllable arthropod pests and, on the other hand, an enhancement in operator and environmental safety.

30 Accordingly, the invention relates to an arthropod pesticidal composition comprising a synergistically acting combination of the pesticidal active

compound lufenuron, in the free form or in the form of an agrochemically acceptable salt thereof, and of the active compound malathion.

The agrochemically acceptable salts of lufenuron are typically acid addition salts of inorganic and organic acids, preferably of hydrochloric acid, hydrobromic acid, sulfuric acid, nitric acid, perchloric acid, phosphoric acid, formic acid, acetic acid, trifluoroacetic acid, oxalic acid, malonic acid, toluenesulfonic acid or benzoic acid.

10 Preferred compositions within the scope of this invention are those that contain lufenuron in the free form as active ingredient.

An effective amount of lufenuron and malathion is any amount that has the ability to control harmful pests. In general, satisfactory results are obtained
15 when employing from about 1 to about 100 g/ha, preferably 5 to about 75 g/ha of lufenuron, and more preferably from about 10 to about 50 g/ha; and from about 100 to about 2500 g/ha, preferably about 300 to about 2000 g/ha of malathion, and more preferably from about 500 to about 1500 g/ha. However, higher and in particular lower doses may also provide adequate control.

20

The weight ratio of lufenuron and malathion is preferably selected to provide a synergistic pesticidal action and such ratios can be determined by the skilled person using well known principles. In general, the weight ratio of lufenuron:malathion range from about 1:10 to about 1:200, preferably 1:15 to
25 1:175 and more preferably 1:20 to 1:150 and most preferably 1:25 to 1:125. The weight ratio of lufenuron:malathion will depend on various factors such as the mode of application, the harmful pests to be controlled, the useful plant to be protected, the application time, etc.

30 A method for controlling animal and human arthropod pests by exposing said harmful pests to 0.01 to 800 mg pr. Kg of bodyweight, preferably 0.1 to 200 mg

pr. Kg of bodyweight of lufenuron and more preferably 1 to 50 mg pr. Kg of bodyweight, and 0.1 to 1000 mg pr. kg of bodyweight, preferably 1 to 500 mg pr. Kg of bodyweight of malathion.

- 5 This composition is particularly suitable for controlling representatives of the orders *Hemiptera*, *Lepidoptera*, *Hymenoptera*, *Thysanoptera*, *Coleoptera*, *Diptera* and the sub-class *Acarina*.

These orders typically include: of the order *Lepidoptera*, for example *Acleris* spp., *Adoxophyes* spp., *Aegeria* spp., *Agrotis* spp., *Alabama argillaceae*,

- 10 *Amylois* spp., *Anticarsia gemmatilis*, *Archips* spp., *Argyrotaenia* spp., *Autographa* spp., *Brassolis sophorae*, *Busseola fusca*, *Cadra cautella*, *Carposina nipponensis*, *Chilo* spp., *Choristoneura* spp., *Clysia ambiguella*, *Cnaphalocrocis* spp., *Cnephasia* spp., *Cochylis* spp., *Coleophora* spp., *Crocidolomia binotalis*, *Cryptophlebia leucotreta*, *Cydia* spp., *Diaphania*
15 *nitidalis*, *Diatraea* spp., *Diparopsis castanea*, *Earias* spp., *Ecdytolopha aurantiana*, *Ephestia* spp., *Eucosma* spp., *Eupoecilia ambiguella*, *Euproctis* spp., *Euxoa* spp., *Grapholita* spp., *Hedya nubiferana*, *Heliothis* spp., *Hellula andalis*, *Hyphantria cunea*, *Keiferia lycopersicella*, *Leucoptera coffeella*, *Leucoptera scitella*, *Lithocollethis* spp., *Lobesia botrana*, *Lymantria* spp.,
20 *Lyonetia* spp., *Malacosoma* spp., *Mamestra brassicae*, *Manduca sexta*, *Neoleucinodes elegantis*, *Operophtera* spp., *Ostrinia nubilalis*, *Pammene* spp., *Pandemis* spp., *Panolis flammea*, *Pectinophora gossypiella*, *Phthorimaea operculella*, *Phyllocnistis citrella*, *Pieris rapae*, *Pieris* spp., *Plutella xylostella*, *Prays* spp., *Pseudaletia sequax*, *Pseudoplusia includes*, *Scirpophaga* spp.,
25 *Sesamia* spp., *Sparganothis* spp., *Spodoptera* spp., *Synanthedon* spp., *Thaumetopoea* spp., *Tortrix* spp., *Trichoplusia ni*, *Tuta absoluta* and *Yponomeuta* spp.;

of the order *Coleoptera*, for example *Agriotes* spp., *Anthonemus* spp., *Atomaria linearis*, *Chaetocnema tibialis*, *Cosmopolites* spp., *Curculio* spp., *Dermestes*

- 30 spp., *Diabrotica* spp., *Epilachna* spp., *Eremnus* spp., *Leptinotarsa decemlineata*, *Lissorhoptrus* spp., *Melolontha* spp., *Oryzaephilus* spp., *Otiorhynchus* spp.,

- Phlyctinus* spp., *Popillia* spp., *Psylliodes* spp., *Rhizopertha* spp., *Scarabeidae*,
Sitophilus spp., *Sitotroga* spp., *Tenebrio* spp., *Tribolium* spp. and *Trogoderma*
spp.;
- of the order *Orthoptera*, for example *Blatta* spp., *Blattella* spp., *Gryllotalpa*
5 spp., *Leucophaea maderae*, *Locusta* spp., *Periplaneta* spp. and *Schistocerca*
spp.;
- of the order *Isoptera*, for example *Reticulitermes* spp.;
- of the order *Psocoptera*, for example *Liposcelis* spp.;
- of the order *Anoplura*, for example *Haematopinus* spp., *Linognathus* spp.,
10 *Pediculus* spp., *Pemphigus* spp. and *Phylloxera* spp.;
- of the order *Mallophaga*, for example *Damalinea* spp. and *Trichodectes* spp.;
- of the order *Thysanoptera*, for example *Frankliniella* spp., *Hercinothrips* spp.,
Taeniothrips spp., *Thrips palmi*, *Thrips tabaci* and *Scirtothrips* spp.;
- of the order *Heteroptera*, for example *Cimex* spp., *Distantiella theobroma*,
15 *Dysdercus* spp., *Euchistus* spp., *Eurygaster* spp., *Leptocorisa* spp., *Nezara* spp.,
Piesma spp., *Rhodnius* spp., *Sahlbergella singularis*, *Scotinophara* spp., and
Triatoma spp.;
- of the order *Hemiptera*, for example *Aleurothrixus floccosus*, *Aleyrodes*
brassicae, *Aonidiella* spp., *Aphididae*, *Aphis* spp., *Aspidiotus* spp., *Bemisia*
20 *tabaci*, *Cemplaster* spp., *Chrysomphalus aonidium*, *Chrysomphalus*
dictyospermi, *Coccus hesperidum*, *Empoasca* spp., *Eriosoma lanigerum*,
Erythroneura spp., *Gascardia* spp., *Laodelphax* spp., *Lecanium corni*,
Lepidosaphes spp., *Macrosiphus* spp., *Myzus* spp., *Nephotettix* spp., *Nilaparvata*
spp., *Paratricia* spp., *Pemphigus* spp., *Planococcus* spp., *Pseudaulacaspis* spp.,
25 *Pseudococcus* spp., *Psylla* spp., *Pulvinaria aethiopica*, *Quadraspidiotus* spp.,
Rhopalosiphum spp., *Saissetia* spp., *Scaphoideus* spp., *Schizaphis* spp., *Sitobion*
spp., *Trialeurodes vaporariorum*, *Trioza erytrae* and *Unaspis citri*;
- of the order *Hymenoptera*, for example *Acromyrmex*, *Atta* spp., *Cephus* spp.,
Diprion spp., *Diprionidae*, *Gilpinia polytoma*, *Hoplocampa* spp., *Lasius* spp.,
30 *Monomorium pharaonis*, *Neodiprion* spp., *Solenopsis* spp. and *Vespa* spp.;

of the order *Diptera*, for example *Aedes* spp., *Antherigona soccata*, *Bibio hortulanus*, *Calliphora erythrocephala*, *Ceratitis* spp., *Chrysomyia* spp., *Culex* spp., *Cuterebra* spp., *Dacus* spp., *Drosophila melanogaster*, *Fannia* spp., *Gastrophilus* spp., *Glossina* spp., *Hypoderma* spp., *Hyppobosca* spp., *Liriomyza* spp., *Lucilia* spp., *Melanagromyza* spp., *Musca* spp., *Oestrus* spp., *Orseolia* spp., *Oseinelia frit*, *Pegomyia hyoscyami*, *Phorbia* spp., *Rhagoletis pomonella*, *Sciara* spp., *Stomoxys* spp., *Tabanus* spp., *Tannia* spp. and *Tipula* spp.;
of the order *Siphonaptera*, for example *Ceratophyllus* spp. and *Xenopsylla cheopis*;

10 of the order *Thysanura*, for example *Lepisma saccharina* and
of the subclass *Acarina*, for example *Acarus siro*, *Aceria sheldoni*, *Aculops lycopersici*, *Aculus schlechtendali*, *Amblyomma* spp., *Argas* spp., *Boophilus* spp., *Brevipalpus* spp., *Bryobia praetiosa*, *Calipitimerus* spp., *Chlosyne lacinia saundersii*, *Choriotptes* spp., *Dermanyssus gallinae*, *Eotetranychus* spp.,
15 *carpini*, *Eriophyes* spp., *Hyalomma* spp., *Ixodes* spp., *Oligonychus ilicis*, *Oligonychus pratensis*, *Ornithodoros* spp., *Panonychus* spp., *Phyllocoptruta oleivora*, *Polyphagotarsonemus latus*, *Psoroptes* spp., *Rhipicephalus* spp., *Rhizoglyphus* spp., *Sarcoptes* spp., *Tarsenemus* spp. and *Tetranychus* spp.;
Halotydeus destructor, *Penthaleus* spp.

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Within the scope of this invention it is possible to control in particular insects

1) of the order *Lepidoptera*,
especially *Adoxophyes* spp., *Alabama argillaceae*, *Anticarsia gemmatalis*, *Brassolis sophorae*, *Clysia ambiguella*, *Clysia pomonella*, *Crocidolomia* spp.,
25 *binotalis*, *Cydia* spp., *Diaphania nitidalis*, *Earias* spp., *Ecdytolopha aurantiana*, *Heliothis* spp., *Leucoptera coffeella*, *Lobesia botrana*, *Neoleucinodes elegantis*, *Ostrinia nubilalis*, *Phthorimaea operculella*, *Phyllocnistis citrella*, *Plutella xylostella*, *Pseudaletia sequax*, *Pseudoplusia includes*, *Sparganothis* spp. and *Spodoptera* spp. *Tuta absoluta*;

30 2) of the order *Coleoptera*

in particular the family *Curculionidae*, more particularly *Anthonemus spp.*, more particularly still *A. grandis*, very particularly the family *Chrysomelidae*, most preferably *Leptinotarsa decemlineata*;

3) of the order *Hemiptera*

- 5 in particular the family *Aphididae*, more particularly the genus *Aphis* and the genus *Myzus*, most particularly *A. gossypii*, or *Myzus persicae*; in particular the family *Aleurodidae*, preferably *Aleurothrixus floccus* and *Bemisia tabaci*; in particular family *Psyllidae*, more preferably *Psylla spp.*, preferably *Frankliniella spp.*, *Thrips palmi* and *Thrips tabaci*;
- 10 of the subclass *Acarina* in particular the species *Aculops lycopersici* and the family *Eriophyidae*, *Aculus schlechtendali*, *Chlosyne lacinia saundersii*, *Oligonychus ilicis*, *Phyllocoptruta oleivora* *Polyphagotarsonemus latus* and *Tetranychus spp.*, *Halotydeus destructor*, *Penthaleus spp.*, *Bryobia praetiosa*.
- 15 With the novel arthropod pesticidal combination, it is possible to control in particular pests of the above mentioned type that occur in plants or, especially, in cultivated plants and ornamentals, in horticulture and in forestry, or in parts of such plants such as fruit, blossoms, leaves, stems, tubers or roots, while in some cases parts of plants that grow later can also be protected against these pests.
- 20 The arthropod pesticidal combination of this invention can be used with advantage for pest control in asparagus, strawberries, mushroom, ornamentals, hops, forests trees, cereals, sweet corn, maize, grasses, sorghum, rice, and tobacco; Brassicas such as broccoli, brussels sprouts, cauliflower, cabbage, cauliflower; Crucifers such as beets, radish, carrots, rape, mustard, marrows;
- 25 Cucurbitaceae such as squash, cucumber, melons; Leguminosae such as beans, lentils, peas, soybeans, groundnuts, chick peas; Pastures such as clover, grasses, alfalfa; Solanaceae such as Potatoes, tomatoes, paprika, bell pepper, chilli, aubergine; Umbelliferae such as celeriac, knob celery, celery root; Lamiaceae such as lemon mint; Alliaceae such as onion and garlic; Stone fruits such as
- 30 plums, peaches, nectarine, almonds, cherries, apricots, Pome fruit such as Apples and pears; Citrus such as oranges, lemons, grapefruit, mandarins,

kumquats; Other Orchard crops such as Persimmon, figs, nuts, olives, avocados, mango and vines; Plantation crops such as bananas, coffee, sugar cane, tea, pepper, pineapple, coconut, castor oil plants, cocoa beans, cinnamon, camphor, rubber plants; Fibrous crops such as cotton, flax, hemp and jute; Cane fruit such
 5 as raspberries, blackberries; Bush fruit such as blackcurrant, gooseberries, redcurrants, white currants; Leafy vegetables such as lettuce, spinach, rucicola, radicchio; Asteraceae such as Sunflower; Papaveraceae such as poppy.

Further utilities of the arthropod pesticidal combination of this invention are a
 10 method of controlling harmful pests on humans and animals. The method comprises administering to a human or an animal in need thereof a pharmaceutical or veterinary effective amount of the combination. Animals on which the composition can be applied includes productive animals, breeding animals, zoo animals, pets as well as laboratory and experimental animals, such
 15 as mice, rats, guinea-pigs, golden hamsters, dogs, cats, cattle, horses, sheep, pigs, goats, camels, water buffalo, donkeys, rabbits, fallow deer and reindeer, fur-bearing animals such as mink, chinchilla and raccoon, birds such as hens, geese, turkeys and ducks. The combination may also be applied to the environs for the animals which include farmyard structures, dairy sheds, stables, poultry
 20 sheds, pig sties, dog and cat kennels and houses where dogs and cats are kept. The combination is effective against animal and human pests such as fly larvae; lice; mosquitoes such as *Anopheles spp.*, *Aedes spp.*, *Culex spp.*, *Mansonia spp.*; flies such as *Musca spp.*; bedbugs such as *Cimex lectularius*, *C. hemipterus*; fleas such as *Xenopsulla spp.*, *pulex spp.*, *Ctenocephalides spp.*; coackroaches
 25 such as *Blatella spp.*, *Periplaneta spp.*; triatomine bugs such as *Triatoma spp.*, *Panstrongylus spp.*, *Rhodnius spp.*; and ticks & mites such as *Ixodes spp.*, *Dermaceutor spp.*, *Haemaphysalis spp.*, *Hyalomma spp.*, *Borreliia spp.*, *Ornithodoros spp.*

30 The invention additionally relates to the use of a combination of lufenuron and malathion for the manufacture of a medicament for the control of pests on

humans or animals or their environs, said medicament comprising a reduced amount of pesticide while maintaining a similar pesticidal effect by replacing a part of the amount of pesticide with a synergistic amount of the combination.

Additional pesticides, different from lufenuron and malathion, may also be added to the combination, preferably so selected that the additional pesticides do not interfere negatively, with the synergistic relationship between lufenuron and malathion. The optional additional pesticides, preferably insecticides and acaricides, can advantageously be included for example to widen the spectrum of action or to prevent the build-up of resistance. Suitable examples of such additional pesticides are e.g.:

abamectin, acephate, acrinathrin, alanycarb, albendazole, aldicarb, alphamethrin, amitraz, azadirachtin, azinphos, azocyclotin, *Bacillus thuringiensis*, bendiocarb, benfuracarb, bensultap, bephenium, betacyfluthrin, bifenazate, bifenthrin, bistrifluron, BPMC, brofenprox, bromophos, brotianide, bufencarb, buprofezin, butamisol, butocarboxin, butylpyridaben, cadusafos, cambendazole, carbaryl, carbofuran, carbophenothion, carbosulfan, cartap, chloethocarb, chloroethoxyfos, chlorfenapyr, chlorofenvinphos, chlorofluazuron, chloromephos, chlorpyrifos, chromafenozide, cis-resmethrin, clocythrin, clofentezine, clorsulon, closantel, cyanophos, cycloprothrin, cyfluthrin, cyhalothrin, cyhexatin, cypermethrin, cyromazine, deltamethrin, demeton, diamphenethide, dibromosalan, dichlorophen, difenthiuron, diazinon, dichlofenthion, dichlorvos, dicliphos, dicrotophos, diethion, diethylcarbamazine, diflubenzuron, dimethoate, dimethylvinphos, dioxathion, disulfoton, edifenphos, emamectin(-benzoate), epsiprantel, esfenvalerate, ethiofencarb, ethion, ethiprole, ethofenprox, ethoprophos, etoxazole, etrimphos, febantel, fenamiphos, fenbendazole, fenzaquin, fenbutatin oxide, fenitrothion, fenobucarb, fenothiocarb, fenoxycarb, fenpropathrin, fenpyrad, fenpyroximate, fenthion, fenvalerate, fipronil, flonicamid, fluazuron, flubendazole, flucycloxuron, flucythrinate, flufenoxuron, flufenprox, fluvalinate, fonophos, formothion, fosthiazate, fubfenprox, furathiocarb, gamma-cyhalothrin, haloxon, heptenophos, hexaflumuron, hexachlorophene, hexythiazox, imidacloprid,

10

indoxacarb, iprobenfos, isazophos, isofenphos, isoprocab, isoxathion, ivermectin, lambda-cyhalothrin, levamisole, mebendazole, mecarbam, mevinphos, mesulfenphos, metaldehyde, methacrifos, methamidophos, methidathion, methiocarb, methomyl, methoxyfenozide, methyridine, metolcarb, 5 milbemectin, monocrotophos, morantel, naled, netobimin, niclopholan, niclosamide, nitroxylin, omethoate, oxamyl, oxfendazole, oxibendazole, oxyclozanide, oxydemethon M, oxydeprofos, parathion A, parathion M, parbendazol, permethrin, phenothiazine, phenthoate, phorate, phosalone, phosmet, phosphamidon, phoxim, pirimicarb, pirimiphos, praziquantel, 10 profenofos, promecarb, propaphos, propoxur, prothiofos, prothoate, pymetrozin, pyrachlophos, pyrantel, pyridaphenthion, pyresmethrin, pyrethrum, pyridaben, pyrimidifen, pyriproxifen, quinalphos, rafoxanide, rynaxypyr, salithion, sebufos, silafluofen, spinosad, spinetoram, spiroadiclofen, spiromesifen, spirotriatmat, sulfotep, sulprofos, tebufenozid, tebufenpyrad, tebupirimiphos, teflubenzuron, 15 tefluthrin, temephos, terbam, terbufos, tetra-chlorvinphos, tetramisole, thenium, thiabendazole, thiafenox, thiodicarb, thiofanox, thiomethon, thionazin, thiophanate, thuringiensin, tralomethrin, triarathen, triazophos, triazuron, trichlorfon, triclabendazole, triflumuron, trimethacarb, vamidothion, XMC, xylylcarb, zetamethrin.

20

The additional pesticides may also include fungicides. The optional additional fungicides can advantageously be included for example to broaden the spectrum of action. Suitable examples of such additional fungicides are e.g.

A) azoles, in particular: bitertanol, bromuconazole, cyproconazole, 25 difenoconazole, diniconazole, enilconazole, epoxiconazole, fluquinconazole, fenbuconazole, flusilazole, flutriafol, hexaconazole, imibenconazole, ipconazole, metconazole, myclobutanil, penconazole, propiconazole, prothioconazole, simeconazole, triadimefon, triadimenol, tebuconazole, tetraconazole, triticonazole; prochloraz, pefurazoate, imazalil, triflumizole, 30 cyazofamid; benomyl, carbendazim, thiabendazole, fuberidazole, ethaboxam, etridiazole, hymexazole;

- B) strobilurins, in particular: azoxystrobin, dimoxystrobin, enestroburin, fluoxastrobin, kresoxim-methyl, metominostrobin, orysastrobin, picoxystrobin, pyraclostrobin, trifloxystrobin, or methyl (2-chloro-5-[1-(3-methylbenzyloxyimino)ethyl]benzyl)carbamate, methyl (2-chloro-5-[1-(6-methylpyridin-2-ylmethoxyimino)ethyl]benzyl)carbamate, methyl 2-(ortho-((2,5-dimethylphenyloxymethylene)phenyl)-3-methoxyacrylate;
- C) carboxamides, in particular: carboxin, benalaxyl, boscalid, fenhexamid, flutolanil, furametpyr, mepronil, metalaxyl, mefenoxam, ofurace, oxadixyl, oxycarboxin, penthiopyrad, thifluzamide, tiadinil, N-(4'-bromobiphenyl-2-yl)-4-difluoromethyl-2-methylthiazole-5-carboxamide, N-(4'-trifluoromethylbiphenyl-2-yl)-4-difluoromethyl-2-methylthiazole-5-carboxamide, N-(4'-chloro-3'-fluorobiphenyl-2-yl)-4-difluoromethyl-2-methylthiazole-5-carboxamide, N-(3',4'-dichloro-4-fluorobiphenyl-2-yl)-3-difluoromethyl-1-methylpyrazole-4-carboxamide, N-(3',4'-dichloro-5-fluorobiphenyl-2-yl)-3-difluoromethyl-1-methylpyrazole-4-carboxamide, 3,4-dichloro-N-(2-cyanophenyl)isothiazol-5-carboxamide, dimethomorph, flumorph, flumetover, fluopicolide (picobenzamid), zoxamide, carpropamid, diclocymet, mandipropamid, N-(2-{4-[3-(4-chlorophenyl)prop-2-ynyloxy]-3-methoxyphenyl}ethyl)-2-methanesulfonyl-amino-3-methylbutyramide, N-(2-{4-[3-(4-chlorophenyl)prop-2-ynyloxy]-3-methoxyphenyl}ethyl)-2-ethanesulfonylamino-3-methylbutyramide;
- D) heterocyclic compounds, in particular: fluazinam, pyrifenoxy, bupirimate, cyprodinil, fenarimol, ferimzone, mepanipyrim, nuarimol, pyrimethanil, triforine, fenpiclonil, fludioxonil, aldimorph, dodemorph, fenpropimorph, tridemorph, fenpropidin, iprodione, procymidone, vinclozolin, famoxadone, fenamidone, othilinone, probenazole, amisulbrom, anilazine, diclomezine, pyroquilon, proquinazid, tricyclazole, 5-chloro-7-(4-methylpiperidin-1-yl)-6-(2,4,6-trifluorophenyl)-[1,2,4]triazolo[1,5-a]pyrimidine, 2-butoxy-6-iodo-3-propylchromen-4-one, acibenzolar-S-methyl, captafol, captan, dazomet, folpet, fenoxanil, quinoxifen, 3-[5-(4-chlorophenyl)-2,3-dimethylisoxazolidin-3-yl]pyridine;

- E) carbamates, in particular: mancozeb, maneb, metam, metiram, ferbam, propineb, thiram, zineb, ziram, benthiavalicarb, diethofencarb, iprovalicarb, flubenthiavalicarb, propamocarb, methyl 3-(4-chlorophenyl)-3-(2-isopropoxycarbonylamino-3-methyl- butyrylamino)propanoate; and
- 5 F) other active compounds, selected from guanidines: dodine, iminoctadine, guazatine, antibiotics: kasugamycin, streptomycin, polyoxine, validamycin A; nitrophenyl derivates: binapacryl, dinocap, dinobuton; sulfur-containing heterocyclyl compounds: dithianon, isoprothiolane; organometal compounds: fentin salts, such as fentin-acetate; organophosphorus compounds: edifenphos,
- 10 iprobenfos, fosetyl, fosetyl-aluminum, phosphorous acid and its salts, pyrazophos, tolclofos-methyl; organochlorine compounds: chlorothalonil, dichlofluanid, flusulfamide, hexachlorobenzene, phthalide, pencycuron, quintozone, thiophanate-methyl, tolylfluanid; inorganic active compounds: Bordeaux mixture, copper acetate, copper hydroxide, copper oxychloride, basic
- 15 copper sulfate, sulfur; others: cyflufenamid, cymoxanil, dimethirimol, ethirimol, furalaxyl, metrafenone and spiroxamine;

Depending on the intended objectives and the prevailing circumstances, the arthropod pesticidal combination may be employed in any conventional form,

20 for example, in the form of a twin pack, or ready-to-use solutions, emulsifiable concentrates, emulsions, dilute emulsions, suspensions, wettable powders, soluble powders, dispersible powders, dusts, granules, soluble granules, dispersible granules, microemulsions, microcapsule suspensions e.g. capsules comprising both active ingredients or present within separate capsules, and

25 mixtures thereof such as a ZC, ZE or ZW formulation. Such compositions can be formulated using diluents and formulation techniques that are known in the art for individually formulating the pesticides. For example, the pesticides may be mixed together, optionally with other formulating ingredients.

30 The active ingredients are used in those compositions in pure form, lufenuron or any additional actives being typically used in a specific particle size, or

preferably together with at least one of the diluents customary in formulation technology.

The compositions may contain a diluent, which may be added during the formulation process, after the formulation process (e.g. by the user – a farmer or custom applicator), or both. The term diluent includes all liquid and solid agriculturally acceptable material-including carriers, which may be added to the pesticides to bring them in a suitable application or commercial form and include solvents, emulsifiers, and dispersants. The solid carriers typically used for dusts, granules and dispersible powders are usually natural mineral fillers such as aluminium silicate, calcined magnesia, kieselguhr, tricalcium phosphate, powdered cork, absorbent carbon black, chalk, silica, and clays such as kaolin and bentonite calcite, talcum, montmorillonite or attapulgite. To improve the physical properties, it is also possible to add highly dispersed silicic acids or highly dispersed absorbent polymers. Suitable granulated adsorptive carriers are porous types, including pumice, broken brick, sepiolite or bentonite; and suitable nonsorbent carriers are calcite or sand. In addition, innumerable granulated materials of inorganic or organic nature may be used, especially dolomite or pulverised plant residues.

Suitable solvents are typically aromatic hydrocarbons or partially hydrogenated aromatic hydrocarbons, preferably the fractions of alkylbenzenes containing 8 to 12 carbon atoms, such as xylene mixtures, alkylated naphthalenes or tetrahydronaphthalene, aliphatic or cycloaliphatic hydrocarbons such as paraffins or cyclohexane; alcohols such as ethanol, propanal or butanol; glycols and their ethers and esters such as propylene glycol, dipropylene glycol ether, diethylene glycol or 2-methoxyethanol or 2-ethoxyethanol; ketones such as cyclohexanone, isophorone or diacetone alcohol; strongly polar solvents such as N-methylpyrrolid-2-one, dimethyl sulfoxide or N,N-dimethylformamide; water; vegetable oils or epoxidised vegetable oils such as rape oil, castor oil, coconut oil, or soybean oil, and silicone oils.

The compositions may also contain surfactants, protective colloids, thickeners, penetrating agents, stabilizers, sequestering agents, anti-caking agents, coloring

agents, corrosion inhibitors, and dispersants such as liginosulfite waste liquors and methylcellulose.

Suitable surfactants compounds are nonionic, cationic and for anionic surfactants or mixtures of surfactants having good emulsifying, stability, spreading, dispersibility, wetting, or other surface-modifying properties. The surfactants listed below shall be regarded merely as exemplary; many more surfactants customarily employed in formulation technology and suitable for use in the practice of the invention are described in the relevant literature.

Nonionic surfactants are preferably polyglycol ether derivatives of aliphatic or cycloaliphatic alcohols, saturated or unsaturated fatty acids and alkylphenols, said derivatives containing 3 to 30 glycol ether groups and 8 to 20 carbon atoms in the (aliphatic) hydrocarbon moiety and 6 to 18 carbon atoms in the alkyl moiety of the alkylphenols. Further suitable nonionic surfactants are water-soluble polyadducts of polyethylene oxide with polypropylene glycol, ethylenediaminopolypropylene glycol and alkylpolypropylene glycol containing 1 to 10 carbon atoms in the alkyl chain, which adducts contain 20 to 250 ethylene glycol ether groups and 10 to 100 propylene glycol ether groups. These compounds usually contain 1 to 5 ethylene glycol units per propylene glycol unit. Representative examples of nonionic surfactants are nonylphenol polyethoxyethanols, polyethoxylated eastor oil, polyadducts of polypropylene and polyethylene oxide, tributylphenol polyethoxylate, polyethylene glycol and octylphenol polyethoxylate. Fatty acid esters of polyoxyethylene sorbitan, e.g. polyoxyethylene sorbitan trioleate, are also suitable nonionic surfactants.

Cationic surfactants are preferably quaternary ammonium salts carrying, as N-substituent, at least one C₈-C₂₂alkyl radical and, as further substituents, unsubstituted or halogenated lower alkyl, benzyl or hydroxy-lower alkyl radicals. The salts are preferably in the form of halides, methyl sulfates orethyl sulfates. Examples are stearyltrimethylammonium chloride and benzyl bis(2-chloroethyl)ethylammonium bromide.

Suitable anionic surfactants may be water-soluble soaps as well as water-soluble synthetic surface-active compounds. Suitable soaps are the alkali metal salts,

alkaline earth metal salts and unsubstituted or substituted ammonium salts of higher fatty acids (C_{10} - C_{22}), e.g. the sodium or potassium salts of oleic or stearic acid or of natural fatty acid mixtures, which can be obtained e.g. from coconut oil or tall oil. Further suitable soaps are also the fatty acid methyl taurin salts.

5 More frequently, however, synthetic surfactants are used, preferably fatty sulfonates, fatty sulfates, sulfonated benzimidazole derivatives or alkylarylsulfonates. The fatty sulfonates or sulfates are usually in the form of alkali metal salts, alkaline earth metal salts or unsubstituted or substituted ammonium salts and usually contain a C_8 - C_{22} alkyl radical, which also includes
10 the alkyl moiety of acyl radicals. Typical examples are the sodium or calcium salt of ligninsulfonic acid, of dodecyl sulfate or of a mixture of fatty alcohol sulfates obtained from natural fatty acids. These compounds also comprise the salts of sulfated and sulfonated fatty alcohol/ethylene oxide adducts. The sulfonated benzimidazole derivatives preferably contain two sulfonic acid
15 groups and one fatty acid radical containing 8 to 22 carbon atoms. Typical examples of alkylarylsulfonates are the sodium, calcium or triethanolammonium salts of dodecylbenzenesulfonic acid, dibutyl-naphthalenesulfonic acid or of a condensate of naphthalenesulfonic acid and formaldehyde.

Corresponding phosphates, e.g. salts of the phosphoric acid ester of an adduct of
20 p-nonylphenol with 4 to 14 mol of ethylene oxide, or phospholipids, are also suitable.

The composition will usually comprise 0.1 to 99%, preferably 0.1 to 95%, of a combination of lufenuron and malathion, and 1 to 99.9%, preferably 5 to 99.9%,
25 of at least one solid or liquid carrier; usually they will contain 0 to 50%, preferably 0.1 to 20%, of surfactants (in each case percentages are by weight). Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ dilute formulations having a substantially lower concentration of active ingredient. Particularly preferred formulations will be
30 made up as follows: (throughout, percentages are by weight):

Emulsifiable concentrates:	
Combination of lufenuron and malathion:	1 to 99%, preferably 60 to 90%
Surfactant:	1 to 30%, preferably 1 to 20%
Solvent:	0 to 80%, preferably 0 to 35%

Dusts:	
Combination of lufenuron and malathion:	99.9 to 90%, preferably 99.9 to 99%
Solid carrier:	0.1 to 10%, preferably 0.1 to 5%

Suspension concentrates:	
Combination of lufenuron and malathion:	5 to 75%, preferably 10 to 50%
Water:	94 to 24%, preferably 88 to 30%
Surfactant:	1 to 40%, preferably 2 to 30%

Suspo-emulsion	
Combination of lufenuron and malathion:	1 to 99%, preferably 10 to 50%
Surfactant:	1 to 30%, preferably 1 to 20%
Solvent	1 to 80%, preferably 1 to 35%

5

Wettable powders:	
Combination of lufenuron and malathion:	0.1 to 90%, preferably 1 to 80%
Surfactant:	1 to 50%, preferably 1 to 15%
Solid carrier:	1 to 95%, preferably 15 to 90%

Granulates:	
Combination of lufenuron and malathion:	0.1 to 90%, preferably 1 to 80%
Surfactant:	1 to 50%, preferably 1 to 15%
Solid carrier:	1 to 95%, preferably 15 to 90%

The compositions may additionally contain other additives known in the art of formulation chemistry, such as pigments, and thickeners. The composition may also contain further solid or liquid diluents such as stabilisers, e.g. vegetable oils or epoxidised vegetable oils (e.g. epoxidised coconut oil, rapeseed oil or soybean oil), antifoams, e.g. silicone oil, preservatives, viscosity regulators, binders and/or tackifiers, as well as fertilisers or other chemical agents for obtaining special effects, typically including bactericides, fungicides, or herbicides.

The compositions of this invention are prepared by a known process in the absence of diluents, typically by grinding, sieving and/or compressing a solid active ingredient or mixture of active ingredients, for example to a specific particle size, and in the presence of at least one diluent, for example by mixing and grinding the active ingredient or mixture of active ingredients with the diluent(s) and/or surfactant(s). The invention also relates to the preparation of the compositions.

The composition may be applied in various combinations of the two active compounds. For example, they may be applied as a single "ready-mix" form, or in a combined spray mixture composed from separate formulations of the active compounds, e.g. a "tank-mix" form. Thus, to be used in combination, it is not necessary that the two pesticides are applied in a physically combined form, or even at the same time, i.e. the components may be applied in a separately and/or sequentially application, provided that the application of the second active compound occurs within a reasonable period of time from the application of the first active compound. The combination effect results as long as the two pesticides are present at the same time, regardless of when they were applied. The order of applying the individual actives lufenuron and malathion is not essential.

It is possible to control the arthropod pests by applying an effective amount of the combination to the water, the pests food supply, habitat, breeding grounds, or their loci.

- 5 The treatment of plants and parts of plants according to the invention may be carried out directly or by action on their environment (e.g. soil application), habitat or storage area according to customary treatment methods, for example by dipping, spraying, evaporating, atomizing, broadcasting, brushing-on and, in the case of propagation material, in particular in the case of seeds, furthermore
10 by one- or multilayer coating.

The composition may also be formulated for use in a method of controlling harmful pests on animals or humans. Solutions for use on the skin are trickled on, spread on, rubbed in, sprinkled on or sprayed on. Pour-on formulations are
15 poured or sprayed onto limited areas of the skin. Gels are applied to or spread on the skin. The combination may also be administered such that lufenuron is given to the animal orally e.g. as a tablet, and malathion is applied to the skin of the animal e.g as a solution.

- 20 According to the invention, it is possible to treat and protect all plants including parts of plants against harmful pests. Plants are to be understood as all plants and plant populations such as desired and undesired wild plants or crop plants (including naturally occurring crop plants). Parts of plants are to be understood as all above-ground and below-ground parts and organs of plants, such as shoot,
25 leaf, flower and root, examples which may be mentioned are leaves, needles, stems, trunks, flowers, fruit-bodies, fruits and seeds and also roots, tubers and rhizomes. Parts of plants also include harvested plants and vegetative and generative plant propagation material, for example seedlings, tubers, rhizomes, cuttings and seeds (including stored seeds). The compounds of the invention can
30 also be applied to grains (coating), either by impregnating the grains with a liquid formulation or by coating them with a solid formulation. The composition

can also be applied to the locus of plant establishment e.g. prior to sowing, or during sowing, or prior to planting plant propagation material. The invention relates also to these methods of treating plant propagation material and to the plant propagation material so treated. The composition can also be applied to
5 water in which the plant is growing.

A preferred method of application in the field of plant protection is application to the foliage of the plants (foliar application), the number of applications and the rate of application depend on the risk of infestation by the particular arthropod pests.

10

Rates of application of the composition will vary according to prevailing conditions such as degree of infestation, weather conditions, crop species, method of application, and application timing. Compositions containing lufenuron and malathion may be applied in the manner, in which they are
15 formulated, as discussed above.

The methods of applying the composition, i.e. the methods of controlling arthropod pests of the indicated type, typically spraying, atomising, dusting, coating, dressing, scattering or pouring, selected in accordance with the intended
20 objectives and prevailing circumstances, and the use of the compositions for controlling pests of the indicated type, are further objects of the invention.

Typical rates of application, of the combination of lufenuron and malathion, are in the range from 0.1 to 100,000 ppm, preferably from 0.1 to 10,000 ppm of
25 active ingredient. The rate of application may vary over a wide range, and will depend on the nature of soil, the type of application (foliar application, seed dressing, application to the seed furrow), the cultivated plant, the pests to be controlled, the prevailing climatic conditions, and other factors governed by the type of application, time of application and target crop. The rates of application
30 per hectare will be from 1 to about 100 g/ha, preferably 5 to about 75 g/ha of lufenuron, and more preferably from about 10 to about 50 g/ha, and from about

100 to about 2500 g/ha, preferably about 300 to about 2000 g/ha of malathion, and more preferably from about 500 to about 1500 g/ha. The rates of application per hectare will preferably be from 1 to 100 g/ha of lufenuron, and from 100 to 2500 g/ha of malathion. The rates of application per hectare is more particularly
 5 from 5 to 75 g/ha of lufenuron, and from 300 to 2000 g/ha of malathion. The rates of application per hectare is even more preferably from 10 to 50 g/ha of lufenuron, and from 500 to 1500 g/ha of malathion.

Biological Examples

- 10 A synergistic effect is always obtained whenever the activity of the combination lufenuron and malathion is greater than the sum of activities of the individually applied compounds.

In the Colby method, also referred to as the Limpels method, the action to be expected (E) for a given active ingredient combination obeys the so-called

- 15 Colby formula. According to Colby, the expected (additive) action of active ingredients A+B using $p+q$ ppm of active ingredient is:

$$E = X + Y - \frac{Y \cdot X}{100}$$

where ppm=milligrams of active ingredient (=a.i.) per litre of spray mixture

- 20 X = Percentage mortality, compared with untreated controls after treatment with the active compound lufenuron at a rate of application of p kg/hectare

Y = Percentage mortality, compared with untreated controls after treatment with the active compound malathion at a rate of application of q kg/hectare.

- E = the expected pesticidal activity (percentage mortality compared with
 25 untreated controls) after treatment with lufenuron and malathion at a rate of application of $p+q$ kg a.i./ha.

If the action actually observed (O) is greater than the expected action (E), then the action of the combination is superadditive, i.e. there is a synergistic

effect. For a more detailed description of the Colby formula, see Colby, S. R. "Calculating synergistic and antagonistic responses of herbicide combination," Weeds, Vol. 15, pages 20-22; 1967; see also Limpel et al., and Proc. NEWCC 16: 48-53 (1962), all of which are herein incorporated by reference in their entirety. The synergism ratio (R) is calculated as the ratio between the theoretical values and observed values.

The synergistic effect of the combination of lufenuron and malathion is demonstrated in the following biological examples.

10

Example 1: The synergistic activity of a lufenuron:malathion mix against the Green Peach Aphid, *Myzus persicae*.

Method: EC formulations are applied to the adaxial surface of pepper leaf discs at a volume of 200L/Ha. Sprayed leaf discs are transferred to a petridish containing 0.3 wt% agar, after which 5 adult female Green Peach Aphids, *Myzus persicae*, are transferred to the adaxial leaf surface. Mortality of Green Peach Aphid nymphs is recorded after 24 and 48 hours, respectively and the Colby method is used to determine synergy.

Table 1.1 The synergistic activity of a lufenuron:malathion mix against the Green Peach Aphid, *Myzus persicae*, 24 hours after treatment.

Insect	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Myzus persicae</i>	lufenuron	11.3	0	-
	malathion	750	6.5	-
	lufenuron +	11.3 + 750	15.3	6.5
	malathion			(2.3)

20 () indicates the synergism ratio R, O/E

Table 1.2 The synergistic activity of a lufenuron:malathion mix against the Green Peach Aphid, <i>Myzus persicae</i> , 48 hours after treatment.				
Insect	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Myzus persicae</i>	lufenuron	11.3	0	-
	malathion	750	6.9	-
	lufenuron + malathion	11.3 + 750	17.7	6.9 (2.6)

() indicates the synergism ratio R, O/E

Example 2: synergistic activity of a lufenuron:malathion mix against the Red Spider Mite, *Tetranychus urticae*.

5

Method: EC formulations are applied to the abaxial surface of bean leaf discs at a volume of 200L/Ha. Sprayed leaf discs are transferred to a petridish containing 0.3 wt% agar, after which 5 adult female Red Spider Mite, *Tetranychus urticae*, are transferred to the abaxial leaf surface. Mortality of Red Spider Mites is recorded after 24 and 48 hours, respectively and the Colby method is used to determine synergy.

10

Table 2.1 The synergistic activity of a lufenuron:malathion mix against the Red Spider Mite, <i>Tetranychus urticae</i> , 24 hours after treatment.				
Mite	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Tetranychus urticae</i>	lufenuron	22.5	6.7	-
	malathion	1500	43	-
	lufenuron + malathion	1500 + 22.5	62	47 (1.3)

() indicates the synergism ratio R, O/E

Table 2.2 The synergistic activity of a lufenuron:malathion mix against the Red Spider Mite, <i>Tetranychus urticae</i> , 48 hours after treatment.				
Mite	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Tetranychus urticae</i>	lufenuron	22.5	13	-
	malathion	1500	54	-
	lufenuron + malathion	1500 + 22.5	73	60 (1.23)

() indicates the synergism ratio R, O/E

Example 3: The synergistic activity of a lufenuron:malathion mix against the Gamma Moth (*Autographa gamma*).

Method: EC formulations are applied to the adaxial surface of Oilseed Rape leaves at a volume of 200L/Ha. After drying, sprayed leaves are transferred to a petridish containing two moistened filter discs, after which five 8-10 days old Gamma Moth (*Autographa gamma*) larvae are transferred to the adaxial leaf surface. Mortality of Gamma Moth larvae is recorded after 24 and 48 hours, respectively, and the Colby method is used to determine synergy.

Table 3.1 The synergistic activity of a lufenuron:malathion mix against the Gamma Moth, <i>Autographa gamma</i> , 24 hours after treatment.				
Insect	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Autographa gamma</i>	lufenuron	11.3	3.3	-
	malathion	750	3.3	-
	lufenuron + malathion	11.3 + 750	16.7	6.6 (2.5)

() indicates the synergism ratio R, O/E

Table 3.2 The synergistic activity of a lufenuron:malathion mix against the Gamma Moth, <i>Autographa gamma</i> , 48 hours after treatment.				
Insect	Active Substance	g. AI/hectare	Control observed (O) %	Expected control (E) %
<i>Autographa gamma</i>	lufenuron	11.3	20.0	-
	malathion	750	3.3	-
	lufenuron + malathion	11.3 + 750	53.3	22.7 (2.4)

() indicates the synergism ratio R, O/E

P A T E N T C L A I M S

1. A method for controlling harmful arthropod pests comprising the exposure of said harmful pests to an effective amount of a combination of lufenuron and malathion.
5
2. The method according to claim 1, wherein the harmful pests are of the order *Hemiptera*, *Lepidoptera*, *Thysanoptera*, *Coleoptera*, or the subclass *Acarina*.
- 10 3. The method according to any of the claims 1 and 2, comprising the employment of 1 to 100 g/ha of lufenuron and from 100 to 2500 g/ha malathion.
4. A method according to any of the previous claims comprising the exposure
15 of the arthropod pests, their food supply, habitat, breeding grounds or their loci to an effective amount of lufenuron and malathion.
5. A method for protecting plants from attack or infestation by pests comprising the exposure of the plant, or the soil, or water in which the plant
20 is growing with an effective amount of lufenuron and malathion.
6. A method for controlling animal and human arthropod pests by exposing said harmful pests to an effective amount of lufenuron and malathion.
- 25 7. A composition comprising an effective amount of a combination of lufenuron, in the free form or as a salt, and malathion in a weight ratio of lufenuron:malathion ranging from about 1:10 to about 1:200.
8. A composition according to claim 7, which further comprises a combination
30 of lufenuron and malathion with one or more additional pesticidal compound.

- 9. A composition according to claim 7 and 8, wherein lufenuron and malathion is present in a form selected among ready-to-use solutions, emulsifiable concentrates, emulsions, suspensions, wettable powders, soluble powders, granules, soluble granules, dispersible granules, micro-emulsions, microcapsule suspensions and mixtures thereof.
- 10. A process for preparing a composition according to any of the claims 7 to 9, which comprise mixing lufenuron and malathion with a diluent(s) and/or surfactant(s).

A B S T R A C T

Presented are arthropod pesticidal compositions comprising lufenuron and 5 malathion. The combination of these arthropod pesticidal active compounds shows a synergistic effect in the control of harmful pests.

Traducción

(Aparece un emblema y texto en un segundo idioma)

Solicitud de Patente N°: PA 2012 00295

Fecha de presentación: 1 de mayo de 2012

Solicitante: Cheminova A/S

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Título: Combinación pesticida sinérgica de lufenurón y malatión contra
artrópodos

IPC: A 01 N 47/34, A 01 N 57/12, A 61 K 31/17, A 61 K 31/661

Se certifica que los documentos adjuntos son copias fieles de la solicitud de
patente mencionada tal como fuera presentada originalmente.

(Aparece una oblea)

(Aparece texto en un segundo idioma)

26 de marzo de 2013

(Aparece una firma debajo de la cual se lee:)

Jette Dalby

Jefe

REIVINDICACIONES

1. Un método para el control de plagas de artrópodos nocivas, que comprende la exposición de dichas plagas nocivas a una cantidad eficaz de una combinación de lufenurón y malatión.
2. El método de acuerdo con la reivindicación 1, donde las plagas nocivas son de los órdenes *Hemiptera* (hemípteros), *Lepidoptera* (lepidópteros), *Thysanoptera* (tisanópteros), *Coleoptera* (coleópteros), o de la subclase *Acarina* (ácaros).
3. El método de acuerdo con cualquiera de las reivindicaciones 1 y 2, que comprende el empleo de 1 a 100 g/ha de lufenurón. y de 100 a 2500 g/ha de malatión.
4. Un método de acuerdo con cualquiera de las reivindicaciones precedentes, que comprende la exposición de las plagas de artrópodos, su suministro de alimento, hábitat, suelos de cultivo o sus sitios, a una cantidad eficaz de lufenurón y malatión.
5. Un método de protección de plantas contra el ataque o la infestación por plagas, que comprende la exposición de la planta, el suelo, o el agua donde crece la planta, a una cantidad eficaz de lufenurón y malatión.
6. Un método para el control de plagas de artrópodos en animales y seres humanos mediante la exposición de dicha plaga nociva a una cantidad efectiva de lufenurón y malatión.
7. Una composición que comprende una cantidad eficaz de una combinación de lufenurón, en la forma libre o como una sal, y malatión, en una relación en peso de lufenurón:malatión que varía de alrededor de 1:10 a alrededor de 1:200.
8. Una composición de acuerdo con la reivindicación 7, que además comprende una combinación de lufenurón y malatión con uno o más compuestos pesticidas adicionales.
9. Una composición de acuerdo con las reivindicaciones 7 y 8, donde

lufenurón y malatión se presentan en una forma seleccionada de soluciones listas para el uso, concentrados emulsionables, emulsiones, suspensiones, polvos para la mezcla con agua, polvos solubles, gránulos, gránulos solubles, gránulos dispersables, microemulsiones, suspensiones de microcápsula y sus mezclas.

10. Un proceso para la preparación de una composición de acuerdo con cualquiera de las reivindicaciones 7 a 9, que comprende la mezcla de lufenurón y malatión con uno o más diluyentes y/o surfactantes.