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(54) Title: PESTICIDAL COMPOSITION HAVING OVICIDAL AND ADULTICIDAL ACTIVITY AND METHOD OF CONTROLLING PESTS

(57) Abstract: The invention relates to a novel use of R,S- and/or S-hydroprene for the preparation of a composition having ovicidal activity against head louse. Preferably, the composition contains also an adulticidal agent, e.g. malathion, natural pyrethrum or synthetic pyrethroid. The prepared composition and the method of controlling head lice by using the composition are also disclosed.

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Pesticidal composition having ovicidal and adulticidal activity and method of controlling pests

Field of the Invention

The present invention relates to a novel use of R,S- and/or S-hydroprene for controlling head-lice and for the preparation of a composition for treating head-lice infestation. The invention also relates to a composition having ovicidal and adulticidal properties containing R,S- and/or S-hydroprene and to a method of controlling head-lice by using said composition.

Background of the Invention

Head pediculosis poses extremely serious problems both in developed and developing countries. For example, in the U.S. and in England 2 to 3 % of children in elementary schools are infested. According to a study carried out on children in big cities in Canada and in the U.S., the rate of infestation was as high as 3 to 20 %.

In Hungary, in Békés county 1.7 to 3.6 % of children at school were infested by head-lice in 2003. Instead of the previous 0.7 % infestation, a 3.6 % rate was observed in some kindergartens. For instance, 5.5 % and 6.2 % of the pupils had head-louse infestation in the 21st and the 8th district of Budapest, respectively.

According to the data published in EPINFO (the informational publication of „Johan Béla" National Epidemiologic Centre), the number of infected persons in Hungary showed a continuous increase in the past 3 years.

The head-louse (*Pediculus humanus capitis*) is a 2.5 to 4.5 mm long insect which may change its colour according to the colour of the hair. Females lay 6 to 8 oval, small, pearl-coloured eggs (nits) daily to the root of hairs, mainly in the temporal and occipital areas. The lice stick the nits onto the root of hairs with a hard-to-remove cement-

like material. The lice hatch out of the nit in 5 to 8 days and reach maturity within 2 to 3 weeks. Adult lice live up to 30 days. Mature females start egg-laying in a couple of days. Within 1 month the size of the offspring of a female may reach about 150, while at the end of the second month it may as well increase to several thousands, thus a louse infestation may occur relatively quickly. Even so, cases are few when there are more than 5 to 10 lice on one head, unless it is very untidy. Lice only suck human blood, 6 to 10 times a day.

The infection provokes itchiness and the skin may easily become sore due to scratch and, as a result, secondary dermatitis may also occur.

The infection spreads through direct contact, from hair to hair, sometimes by means of a cap or a comb. Contrary to public belief, there is no connection between the infection and the hygiene of the person affected.

Successful control of head-lice is discouraged by the following factors:

- The eggs are located in an indusium resistant to external effects; this is why they are called nits. The cement-like material the lice use to stick the nits onto the roots of hairs is hard to remove. Most active agents having insecticidal activity are unable to penetrate the nits.

- For human treatment only those insecticides can be used that are not toxic to humans, but these usually do not have an ovicidal (egg-killing) effect.

- There are few active agents approved for human application. As a result of repeated contact with these actives and their incomplete efficiency, resistance to them may develop in lice. For instance, nowadays head lice are resistant to permethrin in most regions of the world.

- As most of the products currently used do not have or have only minimal ovicidal effect, treatment should be repeated within 6 to 10 days. Experience shows, however, that in most cases these re-

peated treatments are not carried out. As a consequence, the efficiency is far from being perfect; the persons still infected reinfect their environment what contributes to the development of resistance in lice to the active agents.

The insecticidal agents most commonly used against head lice currently are:

- organophosphoric acid esters, e.g. malathion (S-1,2-bisethoxycarbonyl-ethyl-O,O-dimethyl-phosphorodithioate),
- synthetic pyrethroid derivatives (cyclopentyl-cyclopropane-carboxylate derivatives called pyrethroids),
- natural pyrethrins (originally the word 'pyrethrum' was used for the extract obtained from chrysanthenum flower and having insect killing effect).

Several references disclose formulations for treating head-lice infestation.

RU Patent 2205626 discloses a composition containing a pyrethroid.

WO 91/15953 discloses a combination of synthetic pyrethroids and natural pyrethrins.

Compositions containing several other actives have also been proposed for killing head-lice.

NZ Patent 514229 for example discloses a composition containing a lactoperoxidase, a thiocyanate and/or a iodide and a hydrogen peroxide source.

US Patent 6,607,716 discloses a composition containing a salt, a plant extract and a pharmaceutically acceptable gelling agent.

WO 03/057231 discloses a composition for killing head lice containing Melia azadirachta extract and a surfactant.

WO 03/092583 discloses compositions for killing ectoparasites including head lice containing a fatty acid ester and a siloxane, and optionally, among others, S-methoprene.

A stable pesticidal microemulsion formulation for controlling ticks and fleas on animals containing among others methoprene and pyrethroids or permethrins is described in US Patent 5,612,047.

However none of the above formulations has a stable ovicidal activity against head lice nits. The need for a composition controlling head lice and having efficient ovicidal and adulticidal activity while not being toxic to humans persists.

It has now been found that R,S- and/or S-hydroprene totally kills head lice nits in a short time. The present invention is based on this surprising finding.

Summary of the Invention

The present invention relates to a novel use of R,S- and/or S-hydroprene for killing head lice nits. The present invention also relates to the use of R,S- and/or S-hydroprene for the preparation of a composition having ovicidal activity for controlling head lice.

The invention also relates to a composition having ovicidal activity for controlling head lice containing R,S- and/or S-hydroprene. The invention also relates to a composition for controlling head lice containing R,S- and/or S-hydroprene and one or more adulticidal active agents of natural or synthetic origin. The present invention also relates to a method of controlling head lice which comprises applying to the growth area of head lice R,S- and/or S-hydroprene and an adulticidal active agent simultaneously, together or separately, or one after the other in any order in form of a composition or compositions.

By using the composition according to the invention a hundred percent adulticidal and ovicidal effectiveness can be achieved even in ten minutes.

Detailed Description of the Invention

The present invention relates to the novel use of R,S- and/or S-hydroprene in killing head louse, especially head louse nit. The invention also relates to the use of R,S- and/or S-hydroprene for the preparation of a composition having ovicidal activity for controlling head lice.

R,S-hydroprene, chemical name ethyl- (EE)-(RS)-3,7,11-trimethyldodeca-2,4-dienoate (CAS number: 41205-09-8) and S-hydroprene, chemical name ethyl- (EE)-(S)-3,7,11-trimethyldodeca-2,4-dienoate (CAS number: 65733-18-8) are golden yellow coloured liquids, practically insoluble in water (water solubility at 20 °C 2 mg/l), stable for more than 3 years under normal storage conditions with very low toxicity (oral LD_{50} for rats > 36000 mg/kg, for dogs >10 000 mg/kg). Dermal LD_{50} for rabbits > 5100 mg/kg.

R,S- and/or S-hydroprene can be used in food industrial units as well.

Hydroprene can be applied in the form of R,S-hydroprene or S-hydroprene.

Hydroprene belongs to the agents regulating (inhibiting) the development, growth of insects (in English: insect growth regulator, abbreviation: IGR.) The insect growth regulators mimic the juvenile hormones produced by immature insects (juvenile hormone analogues), break the growth cycle of immature insects. Thus, the targeted insects cannot develop into reproductive adults.

IGRs were developed by Zoëcon Corporation, Palo Alto, California. Kinoprene and methoprene were registered for the control of whitefly, and mosquito in 1975. From 1980 methoprene was also recommended for flea control.

Hydroprene was registered by Zoëcon with the U.S. Environmental Protection Agency (EPA) in 1984.

Hydroprene is used primarily against cockroaches and recently against bedbugs (as an example, see HU Patent 0204657). Its effect against certain plant damaging moth species was also demonstrated.

Hydroprene is currently used against both the larvae and the adults.

Its ovicidal effect against head louse nits has not been described as yet.

We recognized that R,S- and/or S-hydroprene is an agent that completely destroys head louse nits in a short time, while being non-toxic to humans. R,S- and/or S-hydroprene has the further advantage of having a mode of action (as a juvenile hormone analogue, it regulates the growth of the insects) different from that of generally applied adulticidal agents. This prevents the development of resistance in lice.

Another advantage of hydroprene is that it decomposes after use under the influence of natural ultra-violet light, thus not cumulating in humans.

Methoprene juvenile hormone analogue IGR active agent does not have an ovicidal effect of the extent similar to that of R,S- and/or S-hydroprene. We shall prove this statement by a comparative test hereafter. Methoprene is currently used in combined formulations against ectoparasites such as fleas and ticks.

We remark that other IGRs, for example, kinoprene, fenoxycarb, piriproxyfen, lufenuron, buprofezin and any insect growth regulator possibly unknown at present time can also be presumably used in accordance with our invention, provided it has an ovicidal effect and is not toxic to humans.

The IGRs do not kill either developed imagoes or newly moulted head lice in 2nd larval stage at an acceptable rate. Therefore, according to the present invention, we use a well-known adulticidal agent to destroy these developmental stages.

Accordingly, the invention also concerns insecticidal formulations that have ovicidal and adulticidal effect and are suitable for head lice control. The formulation may contain only one active ingredient, R,S- and/or S-hydroprene or include, in addition to R,S- and/or S-hydroprene, one or more well-known insecticidal active ingredients, too. In these combined formulations R,S- and/or S-hydroprene

exert the ovicidal effect, while the well-known active ingredients ensure the adulticidal effect. According to the invention, those formulations in which the adulticidal active ingredient is selected from the natural pyrethrum, the various synthetic pyrethroid agents such as bioallethrin, permethrin, sumithrin, resmethrin or tetramethrin, and agents belonging to organophosphoric acid esters, e.g. malathion, are preferable.

As the adulticidal agent, other already known or to-be-known actives, for example imidaclorid, spinozad, spinozin, etc. may also be considered.

The formulation according to the present invention contains preferably from 0.1 to 1 % or, more preferably, from 0.1 to 0.5% of R,S- and/or S-hydroprene relating to the total weight of the formulation.

Preferably the adulticidal active ingredient content of the formulation according to the present invention is also approximately from 0.1 to 1 % by weight.

To improve efficacy, the formulation according to the present invention may also contain an adjuvant (called synergist), for example, piperonyl butoxide. The formulation according to the present invention contains preferably from 0.1 to 10 % by weight or, more preferably, from 0.5 to 5 % by weight of a synergist.

The formulation according to the present invention may be formulated in different ways, thus it can be in solid form, such as an ointment, or liquid form such as an aqueous or alcoholic solution, emulsion or microemulsion, especially an oil-in-water type emulsion.

The microemulsion is especially advantageous as this is a stable, translucent, attractive formulation readily accepted by users.

The head-louse control formulation according to the present invention may be formulated in the form of shampoo, lotion, ointment, hair-lotion, aerosol, gel, foam or any other form which suits the application.

For the formulation we use the usual carriers and adjuvants such as solvents, co-solvents and, optionally, surfactants, emulsifiers, stabilizers, preservatives, colourants, or any other additives commonly used in that special field.

As solvent and co-solvent we can use, for example, water or usual organic solvents such as alcohols, e.g. ethanol, glycols e.g. diethylene glycol, propylene glycol, glycerin, glycol ethers, e.g. propylene glycol monomethylether or monoethylether, or glycol esters e.g. propylene glycol monomethyl acetate, etc. Mixture of the above mentioned substances may also be used.

Preferably we use from 5 to 60 % of an organic solvent relating to the total weight of the formulation.

By choosing the appropriate quantity and ratio of these solvents we can change the appearance, the consistence of the formulation and we can produce an emulsion or a microemulsion.

As surfactant, we preferably use non-ionic surfactants. These substances are well-known; see e.g. "Handbook of Surfactants" by M.R. Porter published by Blackie & Son, Glasgow and London, pp. 116-178, (1991). For example, ethoxylated oils such as castor-oils are advantageous, Polyoxyl 35 Castor oil as per National Formulary 18 which is the ester of ethoxylated glycerin triricinoleate being particularly advantageous. Such product is marketed, for example, by BASF company under the name Cremophor EL. This product contains 35 mol ethylene oxide per 1 mol castor-oil.

The formulation according to the present invention preferably contains from 10 to 30 % by weight of a surfactant.

A translucent and stable microemulsion can be produced by using propylene glycol monomethyl ether or monomethyl acetate and glycerin, ethanol and ethoxylated castor-oil if applied in 1:0.3-0.5:1.5-

2.0:3-5 weight ratio.

As stabilizer, we can use for example antioxidants, preferably butyl-hydroxy-anisole. As an example, the formulation according to the present invention contains from 0 to 0.1 % by weight of a stabilizer.

As preservative, we can use, for example, chlorhexydine-digluconate, in an amount of from 0.05 to 0.5 % by weight, more preferably from 0.1 to 0.3 % by weight.

According to the invention, especially advantageous are the formulations which contain

from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of R,S- and/or S-hydroprene,

from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of an adulticidal active agent,

from 0.1 to 10.0 % by weight, preferably from 0.5 to 5.0 % by weight of a synergist,

from 10 to 30 % by weight, preferably from 15 to 25 % by weight of a surfactant,

from 5 to 40 % by weight of a co-solvent, preferably from 3 to 8 % by weight of a glycol ether,

from 5 to 15 % by weight of ethanol,

from 1 to 4 % by weight of glycerin,

from 0.1 to 0.3 % by weight of a preservative,

water to volume, and optionally stabilizer and colourant.

The invention also relates to a process for the preparation of the formulation according to the invention. Most advantageously, a microemulsion can be produced by mixing the R,S- and/or S-hydroprene, the insecticidal active ingredient, the synergist, the emulsifier, the organic solvents and, optionally, the stabilizer, the preservative and the colourant, then by diluting the mixture with wa-

ter.

The invention relates also to a method of controlling head lice comprising applying to the growth area of head lice an effective amount of R,S- and/or S-hydroprene and an adulticidal active agent, simultaneously, together or separately or one after the other in any order in form of a composition or compositions.

The effective amount is the quantity that kills the pests and is not toxic to humans.

In an especially advantageous embodiment, the method of head-louse control is performed with a formulation which has the preferred composition described above.

According to the foregoing, the use of R,S- and/or S-hydroprene is advantageous to the preparation of a formulation in which the adulticidal active ingredient is an organophosphoric acid ester, preferably malathion, or a synthetic pyrethroid, preferably bioallethrin, permethrin, sumithrin, resmethrin or tetramethrin, or a natural pyrethrum.

The use according to the present invention is especially advantageous for the preparation of a formulation, the composition of which corresponds to one of the advantageous compositions described above.

The following examples are provided to illustrate specific embodiments of the invention. They are not intended to limit the scope of claims of the invention.

A) Formulation Examples

In the examples % means % by weight, while the quantities are given in grams.

Examples 1-3

100 g of emulsion is produced by mixing the components below:

	Example no.		
	1	2	3
R,S-hydroprene	0.3	0.5	0.5
malathion	0.7	1.0	1.0
piperonyl-butoxide	2.0	8.0	8.0
Cremophor EL	10.0	25.0	25.0
propyleneglycol-monomethylether	1.0	8.0	8.0
butylhydroxyanisole	0.04	0.04	0.04
ethanol	5.0	20.0	25.0
glycerin	1.0	5.0	10.0
chlorhexydine-digluconate	0.2	0.2	0.2
colourant	0.06	0.06	0.06
water	volume necessary to 100 g		

Examples 4-6

We proceed as described under Examples 1-3 with the difference that permethrin is used instead of malathion. In this case again, we obtain an emulsion.

Examples 7-9

We proceed as described under Examples 1-3 with the difference that sumithrin is used instead of malathion. In this case again, we obtain an emulsion.

We proceed as described under Examples 1-3 with the difference that natural pyrethrum is used instead of malathion. (Kenya pyrethrum in the form of 50 % vegetable oil solution. The quantity given in the table applies the active ingredient.) In this case again, we obtain an emulsion.

Examples 13-15

100 g of microemulsion is produced by mixing the components below in the order of listing.

	Example no.		
	13	14	15
RS-hydroprene	0.3	0.5	0.1
malathion	0.2	0.5	1.0
piperonyl-butoxide	2.0	5.0	0.5
Cremophor EL	20.0	24.0	15.0
propyleneglycol-monomethylether	5.0	8.0	3.0
butylhydroxyanisole	0.04	0.04	0.04
ethanol	10.0	15.0	5.0
glycerin	2.5	4.0	1.0
chlorhexydine-digluconate	0.2	0.2	0.2
colourant	0.06	0.06	0.06
water	volume necessary to 100 g		

Examples 16-18

We proceed as described under Examples 13-15 with the difference that permethrin is used instead of malathion. In this case again, we obtain a microemulsion.

Examples 19-21

We proceed as described under Examples 13-15 with the difference that sumithrin is used instead of malathion. In this case again, we obtain a microemulsion.

Examples 22-24

We proceed as described under Examples 13-15 with the difference that natural pyrethrum is used instead of malathion (Kenya pyrethrum in the form of 50 % vegetable oil solution. The quantity given in the table applies the active ingredient.) In this case again, we obtain a microemulsion.

Examples 25-27

We produce a microemulsion containing only R,S- hydroprene active ingredient as described under Examples 13-15, omitting malathion.

Biological test method:

Nits were obtained from actively laying adult lice over gauze material over a period of 48 hours. The 24 hours old nits were named as "young", while the 4-5 days old nits were named as "older" eggs.

The cut gauze bearing the louse eggs were immersed in the formulation for 10 seconds and returned to a marked Petri dish. The Petri dishes were kept under 30 °C degree and 50 % $\pm$ 15 % relative humidity.

At the end of the appropriate exposure time (120, 90, 60, 30, 20, 10 minutes) the louse eggs were washed for 30 seconds, using a 1 : 9 mixture of a bland frequent shampoo in tap water, and rinsed using 35 °C tap water. The gauze sqares were then incubated again under the above described conditions.

Detailed observations were made when the control group had completed emergence, a minimum of 10 days after treatment.

B) Biological Examples

Example B1

We studied the effect of R,S-hydroprene on head-louse nits using the formulation of Example 26. A formulation with identical composition but containing methoprene instead of R,S-hydroprene was tested as control.

Trials were repeated three times, the formulation according to the present invention was applied to head-louse nits. Nits were counted at the start of the trial, then after 2 hours of exposure. The number of hatched, semi-hatched, dead and undeveloped nits was recorded after 10 days. The results are summarized in Table I.

The results show that the control formulation containing methoprene gave 64.6 % nit killing effect after 2 hours of exposure, while with the formulation according to the present invention 100 % nit killing effect was achieved.

Example B2

The trial according to Example B1 was repeated with a shorter, 1.5-hour exposure time. The results are summarized in Table II.

Table I

		Number of head louse nits						
Example no.	Experiment no.	Total	Hatched	Half hatched	Dead	Undeveloped	Mortality (%)	Undeveloped (%)
control	1	139	5	0	17	117		
	2	123	1	0	26	96		
	3	173	148	6	18	1		
	total	**435**	**154**	**6**	**61**	**214**	**64.6**	**49.2**
26	1	134	0	0	2	132		
	2	170	0	0	8	162		
	3	145	0	0		145		
	total	**449**	**0**	**0**	**10**	**439**	**100.0**	**97.8**

Table II

		Number of head louse nits						
Example no.	Experiment no.	Total	Hatched	Half hatched	Dead	Undeveloped	Mortality (%)	Undeveloped (%)
control	1	111	96	2	7	6		
	2	131	117	0	8	6		
	3	143	129	1	5	8		
	total	**385**	**342**	**3**	**20**	**20**	**11.2**	
26	1	133	0	0	17	116		
	2	96	0	0	16	80		
	3	100	0	0	7	93		
	total	**329**	**0**	**0**	**40**	**289**	**100.0**	**100.0**

The results show that with the formulation containing R,S- hydroprene according to the present invention 100 % mortality was achieved again, just as in Example B1, while the control formulation gave only 11.2 % mortality.

Example B3

The trial according to Example B2 was repeated with the combined formulation of Example 23 on young and older nits, with 1.5 hour, 1 hour, 30, 20 and 10 minute exposure times. The results are summarized in Tables III and IV.

able III

		Number of young (24 hour old) head louse nits				
Example no.	Exposure time	Total	Hatched	Half hatched	Dead	Undeveloped	Mortality (%)
23	1.5 hour	192	0	0	0	192	**100**
	1 hour	153	0	0	0	153	**100**
	30 minutes	165	0	0	0	165	**100**
	20 minutes	150	0	0	98	52	**100**
	10 minutes	163	9	31	65	58	**94**
Control	-	164	132	7	14	11	**19.5**

Table IV

		Number of older (4 day old) head louse nits					
Example no.	Exposure time	Total	Hatched	Half hatched	Dead	Undeveloped	Mortality (%)
23	1.5 hour	151	0	0	71	80	**100**
	1 hour	109	0	0	43	66	**100**
	30 minutes	109	0	2	55	52	**100**
	20 minutes	215	0	3	49	163	**100**
	10 minutes	153	0	9	44	100	**100**
Control	-	228	198	2	13	15	**13.0**

Consequently, it is evident that with a single application of the formulation according to the present invention, head lice can be totally killed during a 10 to 15 minute exposure time; repeated application of the formulation is not necessary.

While the invention has been described with respect to specific examples including presently preferred modes of carrying out the invention, those skilled in the art will appreciate that there are numerous variations and permutations of the above described systems and techniques that fall within the spirit and scope of the invention.

Claims

1. Use of R,S- and/or S-hydroprene for killing head lice nits.

2. Use of R,S- and/or S-hydroprene for the preparation of a composition having ovicidal activity for controlling head lice.

3. The use according to claim 2 for the preparation of a composition containing also an active agent having adulticidal activity.

4. The use according to claim 3 for the preparation of a composition wherein the adulticidal active agent is an organophosphoric acid ester, preferably malathion.

5. The use according to claim 3 for the preparation of a composition wherein the adulticidal active agent is a synthetic pyrethroid, preferably bioallethrin, permethrin, sumithrin, resmethrin or tetramethrin.

6. The use according to claim 3 for the preparation of a composition wherein the adulticidal active agent is the natural pyrethrum.

7. The use according to claim 3 for the preparation of a composition containing
from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of R,S- and/or S-hydroprene,
from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of an adulticidal active agent,
from 0.1 to 10.0 % by weight, preferably from 0.5 to 5.0 % by weight of a synergist,
from 10 to 30 % by weight, preferably from 15 to 25 % by weight of a surfactant,
from 5 to 40 % by weight of a co-solvent, preferably from 3 to 8 % by

weight of a glycol ether,
from 5 to 15 % by weight of ethanol,
from 1 to 4 % by weight of glycerin,
from 0.1 to 0.3 % by weight of a preservative,
water to volume, and optionally stabilizer and colourant.

8. A composition having ovicidal activity for controlling head lice containing R,S- and/or S-hydroprene.

9. An insecticidal composition having also ovicidal activity for controlling head lice containing a combination of R,S- and/or S-hydroprene and an adulticidal active agent beside carriers and optionally other additives.

10. The composition according to claim 9 wherein the adulticidal active agent is an organophosphoric acid ester, preferably malathion.

11. The composition according to claim 9 wherein the adulticidal active agent is a synthetic pyrethroid, preferably bioallethrin, permethrin, sumithrin, resmethrin or tetramethrin.

12. The composition according to claim 9 wherein the adulticidal active agent is a natural pyrethrum, preferably Kenya pyrethrum.

13. The composition according to any of claims 10 to 12 further containing a synergist, preferably piperonyl butoxide.

14. The composition according to any of claims 10 to 13 in form of a shampoo, lotion, ointment, hair-lotion, foam, gel, or an aerosol.

15. The composition according to any of claims 10 to 12 containing from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of R,S- and/or S-hydroprene,

from 0.1 to 1.0 % by weight, preferably from 0.1 to 0.5 % by weight of an adulticidal active agent,
from 0.1 to 10.0 % by weight, preferably from 0.5 to 5.0 % by weight of a synergist,
from 10 to 30 % by weight, preferably from 15 to 25 % by weight of a surfactant,
from 5 to 40 % by weight of a co-solvent, preferably from 3 to 8 % by weight of a glycol ether,
from 5 to 15 % by weight of ethanol,
from 1 to 4 % by weight of glycerin,
from 0.1 to 0.3 % by weight of a preservative,
water to volume, and optionally stabilizer and colourant.

16. A method of controlling head lice comprising applying to the growth area of head lice the R,S- and/or S-hydroprene and an adulticidal active agent, simultaneously, together or separately or one after the other in any order in form of a composition or compositions.

17. The method according to claim 16 comprising using the composition of claim 15.