ABSTRACT

A novel synergistic herbal formulation comprising of the ingredients of Annona Squamosa, Brassica Campestris, Azardica Indica, Citronella Java Oil, Lemongrass Oil and Camphor Oil or comprising of the ingredients of Annona Squamosa, Ocimum Sanctum, Adhatoda Vasica, Allium Sativum, Romarinus Officinalis and Eucalyptus, characterized in that the extraction process involves the steps of obtaining the leaf extract of Annona Squamosa, seed extract of Brassica Campestris, kernel extract of Azardica Indica, and oils of Citronella Java, Lemongrass and Camphor or the extraction process involves the steps of obtaining the leaf extract of Annona Squamosa, leaf extract of Ocimum Sanctum, leaf extract of Adhatoda Vasica, bulb of Allium Sativum, rosemary and oil of eucalyptus.

What is claimed is:

1. A novel synergistic herbal formulation comprising of the ingredients of Annona Squamosa, Brassica Campestris, Azardica Indica, Citronella Java Oil, Lemongrass Oil and Camphor Oil or comprising of the ingredients of Annona Squamosa, Ocimum Sanctum, Adhatoda Vasica, Allium Sativum, Romarinus Officinalis and Eucalyptus, characterized in that the extraction process involves the steps of obtaining the leaf extract of Annona Squamosa, seed extract of Brassica Campestris, kernel extract of Azardica Indica, and oils of Citronella Java, Lemongrass and Camphor or the extraction process involves the steps of obtaining the leaf extract of Annona Squamosa, leaf extract of Ocimum Sanctum, leaf extract of Adhatoda Vasica, bulb of Allium Sativum, rosemary and oil of eucalyptus.

2. A novel synergistic herbal formulation as contained in Claim 1, wherein various supporting ingredients are added to the formulation for synergistic action.

3. A novel synergistic herbal formulation as contained in Claim 1, wherein various aromatic oils are added for fragrance.

4. A novel synergistic herbal formulation as contained in Claim 1, wherein the formulation can be used as coils, liquid evaporator, mats, space sprays, for topical application

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FORM 2

THE PATENT ACT 1970

(39 of 1970) &

The Patents Rules, 2003

PROVISIONAL SPECIFICATION

(Section 10 and rule 13)

1. TITLE OF THE INVENTION NOVEL SYNERGISTIC HERBAL FORMULATION TO CONTROL MOSQUITOES, INSECTS AND PESTS

2. APPLICANT (S)

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE SPECIFICATION

The following specification describes the invention.

Title - Novel Synergistic Herbal Formulation to Control Mosquitoes, Insects and Pests

Field of Invention

The present invention belongs to the field of ethnopharmacology and relates to a herbal extract, more particularly to a novel herbal formulation and method to control the spread and check the growth of mosquitoes and other insects and pests.

Background of Invention

Mosquitoes are known to transmit many diseases such as malaria, dengue, yellow fever, filariasis and Japanese encephalitis. In India different forms of mosquitoes exist that is extremely aggressive and carries disease. Approximately 40 million people in India suffer from mosquito born diseases annually. A stronger and more effective repellent than existing ones is required to repel these types of mosquitoes.

Synthetic compounds though very effective in controlling the menace of mosquitoes, are highly toxic to human beings and persist in the bio-system for a long time. The use of chemical toxicants or mosquito repellents to control mosquito has proved to be one of the most controversial and emotional subjects in recent years.

The widespread use of mosquito repellents and insecticides in public health programme has caused severe environmental pollution and potential health hazards. Introduction of new more toxic and rapidly disseminating mosquito repellents/pesticides into environment has necessitated accurate identification of

their potential hazards to human health. Many of them are extremely toxic to mammals/and or other non-target organisms. The extent of hazard depends on the amount of residue and its toxicity. Many synthetic chemicals, such as DEET (N, N-diethyl toluamide), have been found to be effective in repelling mosquitoes and other insects. However, the problem with repellents utilizing these chemicals is that they can be readily absorbed through the skin when applied to the body of the user. Absorption of chemicals such as DEET can be dangerous, particularly for small children and wildlife, potentially leading to accidental poisonings and causing harm to the environment. Thus there is a need to develop safe and eco-friendly mosquito repellents based on herbage.

The specific composition and the amount and frequency of application of a repellent varies based upon the type of insect targeted as well as the risk of disease associated with that insect. For example, different mosquito repellent compositions are required to produce the desired level of repellency depending upon the type and location of mosquito encountered.

With emerging concern world over on the harmful effect of the commercially available mosquito repellent, containing synthetic pyrethroids such as allethrin and related toxic chemical compounds, the people have started looking for natural products to control mosquitoes, insects and pests.

The relevant prior art methods, which teach adaptation of diverse delivery systems for sustained release of the active, are as follows:

Chinese Patent Application No: CN1669442 discloses a pure Chinese herbal medicine mosquito killing product, wherein 1000g product contains pure Chinese herbal medicine dahurian angelica root 1-300g, camphor 1-280g, spearmint 1-200g, Chinese mugwort leaf 1-250g, liquidambar orientalis mill 1-150g, camphorwood 1-250g, sweet osmanthus flower 1-150g, A. ablus 1-300g, clove 1-

200g in the form of powdered medicament and balancing base material.

Denmark Patent Application No: DE10021560 reveals a skin care composition (I) having insect repellent action contains (in addition to cosmetic carrier(s)): (a) an extract of components of the neem tree and (b) a clove extract.

Denmark Patent Application No: DE10341342 discloses an active agent combinations (I) containing the plants agnus castus (AC) and barberry (Berberis) (BB), and homeopathic extracts (II) of AC and BB, are new. - Independent claims is included for: - (1) pharmaceutical formulations, for use as feed additives, containing (I) or (II); - (2) the production of a feed additive, by extracting AC and BB with lactose, alcohol and/or water. adding the extract to feedstuff pretreated with steam and drying; and - (3) the production of a homeopathic extract (II), by extracting the plants AC and BB, or commercially available pharmaceutical formulations of AC and BB, with lactose, alcohol and/or water.

Indian Patent Application No: IN190853 discloses a method for preparation of a herbal mosquito repellent.

Japanese Patent Application No: JP4308510 discloses an enhancer for effects of insecticide, etc., expelling insect pests, comprising a purified plant oil and/or a terpene, preferably one not having lethal activity in open space, especially alpha-pinene, limonene, benzyl alcohol, vanillin, terpirun, coumarin, terpinyl acetate and acetophenone as an active ingredient. The enhancer of effects shows extremely high synergistic effects when used with an organic phosphorous insecticide which can not be used in a large amount because of its especially high toxicity. The enhancer activates action of insect pests because of its disturbing effect by releating insect pests from plants and increases change of insect pests coming into contact with the active ingredient, thus improves controlling effects. The amount of the enhancer used is usually 1-500 times, preferably 10-400 times as

much as the insect pest controlling component.

Patent Application No: WO0021364 reveals a composition to repel or kill insects, fungi, nematodes and bacteria, comprising, as an active ingredient, an essential oil or a component thereof, wherein said essential oil or component thereof is derived from at least one plant species in the Family Labiatae and Umbellifera.

Patent Application WO0176373 reveals a formulation useful as herbal mosquito repellent, said formulation comprising an effective amount of the essential oil of Tagetes minuta, Chrysanthemum cinerariaefolium (Pyrethrum powder) and cyperus rotundus powder together with binders and fillers.

Patent Application No: WO0201959 discloses a pesticide composition comprising extracts derived from fennel.

Patent Application No: WO02087527 discloses a composition for use as an insect repellent comprising Hinoki oil and limonene.

Patent Application No: WO03079796 discloses a synergistic herbal insecticidal formulation against mosquito larvae, said formulation comprising: a) an essential oil in the range of 0.01 to 2.6 weight percent derived from plant Foeniculum vulgare, b) at least an additional essential oil in the range of 0.01 to 2.6 weight percent derived from one or more other plant sources, c) at least an emulsifier in the range of 0.01 to 3.8 weight percentand d) balance quantity water as a carrier or diluent 2. The formulation as claimed in claim 1, wherein in step (b), the essential oil of other plants is selected from plants belonging to families Apiaceae, Geraniaceae, Lamiaceae, Meliaceae, Myrtaceae, Poaceae, Zingiberaceae or mixtures thereof.

As seen from the prior art, individual actions of many herbs/plants having inherent insect repellent property, have been tested, documented & reported, but the synergistic action of herbs/plants has not been formulated, tested, documented/reported. Further many natural substances are known to repel insects, but these substances are typically effective for only a short period of time. In addition, the efficacy of many natural substances to repel certain insects may be lost during processing of the substances to form commercial products such as sprays, lotions or oils. Thus the present invention aims at combining two or more herbal ingredients to form an effective insect repellent having long lasting efficacy.

Objectives

Accordingly, it is an objective of the present invention to provide herbal formulation and method to control the spread and check the growth of mosquitoes and other insects and pests and that has sustained efficacy.

Another objective of the present invention to provide an insect repellent herbal formulation possessing maximum 'Knock-Down' effect in eradication.

Another objective of the present invention to provide a safe alternative to allethrin group of compounds, widely used in mosquito repellent.

Another objective of the present invention is to provide an insect repellent herbal formulation that is safe and non-toxic to humans and the environment.

Yet another objective of the present invention is to provide an insect repellent herbal formulation that could be used in all places in any form - coils, liquid evaporator, mats, space sprays, for topical application to give protection against mosquito and insect bites.

The aforesaid objects may be achieved individually and/or in combination, and it is not intended that the present invention be construed as requiring two or more of the objects to be combined unless expressly required by the claims attached hereto.

Summary of Invention

The key ingredients of the herbal formulation are:

1. Formula I
    a. Annona Squamosa – Sugar Apple – kernel extract - 10 ml
    b. Brassica Campestris – Turnip – seed extract – 50 ml
    c. Azardica Indica – Neem – kernel extract – 50 ml
    d. Citronella Java Oil – 10 ml
    e. Lemongrass Oil – 10 ml
    f. Camphor Oil – 20 ml

2. Formula II
    a. Annona Squamosa – Sugar Apple – kernel extract - 10 ml
    b. Ocimum Sanctum – Holy Basil – leaf extract – 50 ml
    c. Adhatoda Vasica – Vasaka – leaf extract – 50 ml
    d. Allium Sativum – Round cloved Garlic – bulb extract – 50 ml
    e. Romarinus Officinalis – Rosemary – 10 ml
    f. Eucalyptus – oil – 10 ml

In addition to the above various supporting ingredients are added to the formulation for synergistic action. The final formulation is also render fragrant by the addition of various aromatic oils.

The formulation has been tested in the form of coils made of wood powder and gaur gum. Six studies were conducted during June-August, 2006 to evaluate the efficacy of the coils containing the formulation The species of the mosquito

selected for these studies was *Culex quinquefasciatus.*

Detailed Description of the Invention

All the 6 studies were designed to assess the 'knock down' effect of the mosquito coil. The studies were carried out in a standard Peet-Grady chamber ($5.8m^3$). One hundred healthy female mosquitoes were released inside the chamber. The mosquito coil was ignited and then placed inside the chamber. Number of mosquitoes 'knocked down' was counted and recorded at 5 min intervals, until all the mosquitoes were 'knocked down'.

Cumulative number of mosquitoes 'knocked down' was subjected to probit analysis to determine KT50and KT_99. The studies showed that KT 50 of Herbal Mosquito Coil, was 11-42 min, whereas the KT 99 was 28-78 min.

From the above studies it is concluded that the synergistic herbal formulation to control mosquitoes, insects and pests possesses excellent 'knock down' effect.

EXPERIMENT

The experiments were conducted in a Peet Grady Chamber. The volume of the Peet Grady Chamber was 5.8 m^3. The Herbal Mosquito Coil was ignited and placed on the floor inside the chamber. Hundred number of mosquitoes were released inside the chamber. Number of mosquitoes 'knocked down' was counted and recorded at 5 min intervals, until all the mosquitoes were knocked down.

The experiment was repeated 6 times in different days of June-August, 2006, using different mosquito coils. Cumulative 'knock down' was calculated for each study and subjected to probit analysis to determine KT_{50} and KT_{99}.

STATISTICS

Finney's probit analysis was employed to calculate KT50and KT99 (Finney, 1977).

RESULT

'Knock down'

The six studies conducted with different mosquito coils showed that hundred percent knockdown occurred at the end 20-60 min (Table 1).

KT_{50}

$KT_5$0s calculated for studies 1,2,3,4,5 and 6 were 16 ± 0.4 (± S.E.), 12 ± 0.4, 14 ± 0.4, 11 ± 0.4, 31 ± 0.44 and 42 ± 1 and, respectively (Table 2).

KT99

KT_{99}S calculated for studies 1,2,3,4,5 and 6 were 33 ± 2 (± S.E.), 28 ± 2,41 ± 3,29 ± 2, 48 ± 1 and 78 ± 3, respectively ('{able 2).

CONCLUSION

From the above studies it is concluded that the Herbal Mosquito Coil possesses excellent 'knock-down' effect.

Table 1. 'Knock down' in mosquitoes exposed to Herbal Mosquito Coil at different time points of observations

Study No.	Observation time minute											
	5	10	15	20	25	30	35	40	45	50	55	60
1	0	3	50	75	90	100	-	-	-	-	-	-
2	1	32	67	100	-	-	-	-	-	-	-	-
3	5	25	35	85	90	100	-	-	-	-	-	-
4	0	48	72	90	100	-	-	-	-	-	-	-
5	0	0	0	0	8	60	75	85	100	-	-	-
6	0	0	0	0	5	11	22	35	50	70	85	100

Table 2. KTso (min), KT99 (min) and regression coefficients (a and b)

Statistical parameters	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6
KDso±S.E.	16 ± 0.4	12 ± 0.4	14 ± 0.4	11 ± 0.4	31 ± 0.4	42 ± 1
KD_99±S.E.	33 .± 2	28 ± 2	1 ± 3	29 ± 2	48 ± 1	78 ± 3
Y=a+b logX*	a= -3.86 b = 7.38	a = -2.17 b= 6.58	a= -0.63 b=4.92	a=-0.98 b = 5.70	a = -13.2 b = 12.2	a = -9.34 b = 8.81

*Regression equation, Y = a + b log X, where Y = Probit 'Knock down', X = Time (min), a = Intercept, b = Slope.

In this application, the terminology 'embodiment' can be used to describe any aspect, feature, process or step, any combination thereof, and/or any portion

thereof, etc. While the invention has been described in connection with specific embodiments thereof, it will be understood that it is capable of further modifications and this application is intended to cover any variations, uses or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure come within known or customary practice within the art to which the invention pertains and may be applied to the essential features hereinbefore set forth.

Dated this the 6th day of October 2006

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