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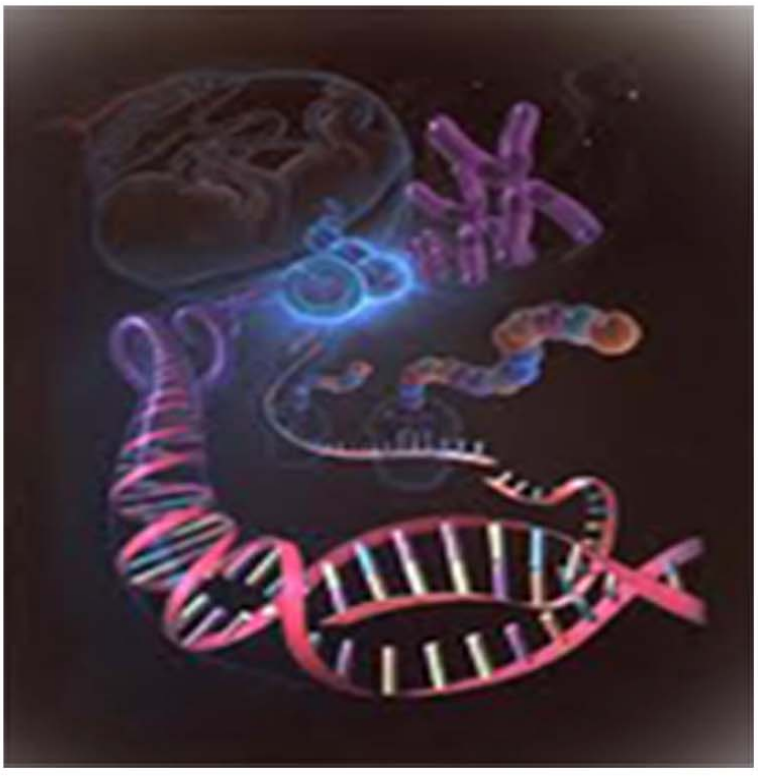

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Research Paper

NOVEL HERBAL FORMULATION WITH INSECT REPELLENT ACTIVITY

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A Novel Composition of a mixture of basil oil, Gallic acid and a plant based powder containing several chemical constituents such as alkaloids, Coumarins, Furoquinolines, lignans, Xanthyletins, etc., with significant insect repellent activity has been developed. The objective of the present study is to replace the conventionally used insect repellent containing DEET as one of the components which is reportedly having toxic effects on Central Nervous System (CNS) and causing skin allergy. Incense sticks and sprays were prepared using the natural herbal materials and the results were found to be promising.

Keywords: Herbal formulation, insect repellent, DEET

INTRODUCTION

Climate plays an important role in Vector-borne diseases transmitted by insects like mosquitoes. Controlling of insects in various forms is an important task for the researchers all over the world (Castle *et al.,* 1999; Bhoopendra Singh, 2012; Marta *et al.,* 2011; Marks, 2002; Kaliyaperumol *et al.*, 2014). In this connection there are several attempts by researchers which were published widely in Internationally reputed Journals and in the form of patents. In the present work an attempt was made to develop mosquito repellents in the form of incense sticks *(Agarbattis),* and sprays.

MATERIALS AND METHODS

One of the components of the present study is Basil oil from *Ocimum basilicum,* the nut powder of the plant *Terminalia chebula,* and another leaf powder of *Chloroxylon swietenia.* Toxicity evaluation studies were done on lab colonized larvae of the field collected mosquitoes of *Aedes*

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aegypti. All the three extracts were mixed in different proportions (0.5:1:1, 1:1:1, 1:2:1, 2:1:1, 1:1:2) along with the charcoal powder and incense sticks were prepared in the form of coils and handmade moulds were used for the preparation.

In the same way the extracts of 2 and 3 were mixed with compound 1. These were also mixed in different proportions, in order to prepare spray extracts.

The tests against mosquitoes were conducted using standard protocols for phase 1 study (Zairi and Lee, 2002). Toxicity of the oil and compounds isolated was evaluated by topical application of the sprays to larvae of Aedes aegypti. Known no of larvae (20) were taken in rectangular troughs with a length, width of 24 X 19 cm. Water was added up to 3/4th volume of the troughs initially, prior to the addition of larvae.

With the help of a sprayer the extract was added and after 30 min interval the effect of these extracts on larvae was observed. In one of the troughs filled with water, only acetone was sprayed as control. The no. of larvae which became non motile were counted manually in all the experiments. The death rate of larvae with different concentrations of the spray reagent was noted and the graph depicts the max no larvae dead at optimum concentration (Table 1).

Probit analysis was conducted to determine LD 50 and LD 90 representing the concentrations that caused 50 and 90% mortality. The required concentrations of larvicide suspension is calculated as follows

$$\text{Conc of larvicide} = \frac{\text{Dosage to be applied (g/m}^2\text{)} \times 100}{\text{Application rate (ml/m}^2\text{)}}$$

The three different components (Basil oil, Leaf powders of Chloroxylon swietenia and the nut power of the plant Terminalia chebula) were subjected to Soxhlet extraction and they were mixed in different proportions along with water

These extracts were sprayed on the larvae collected in trays and the % mortality was determined after thorough examination. Control experiments were also conducted with the tests.

In another experiment pure components were directly used without dilution, and were used for mortality studies.

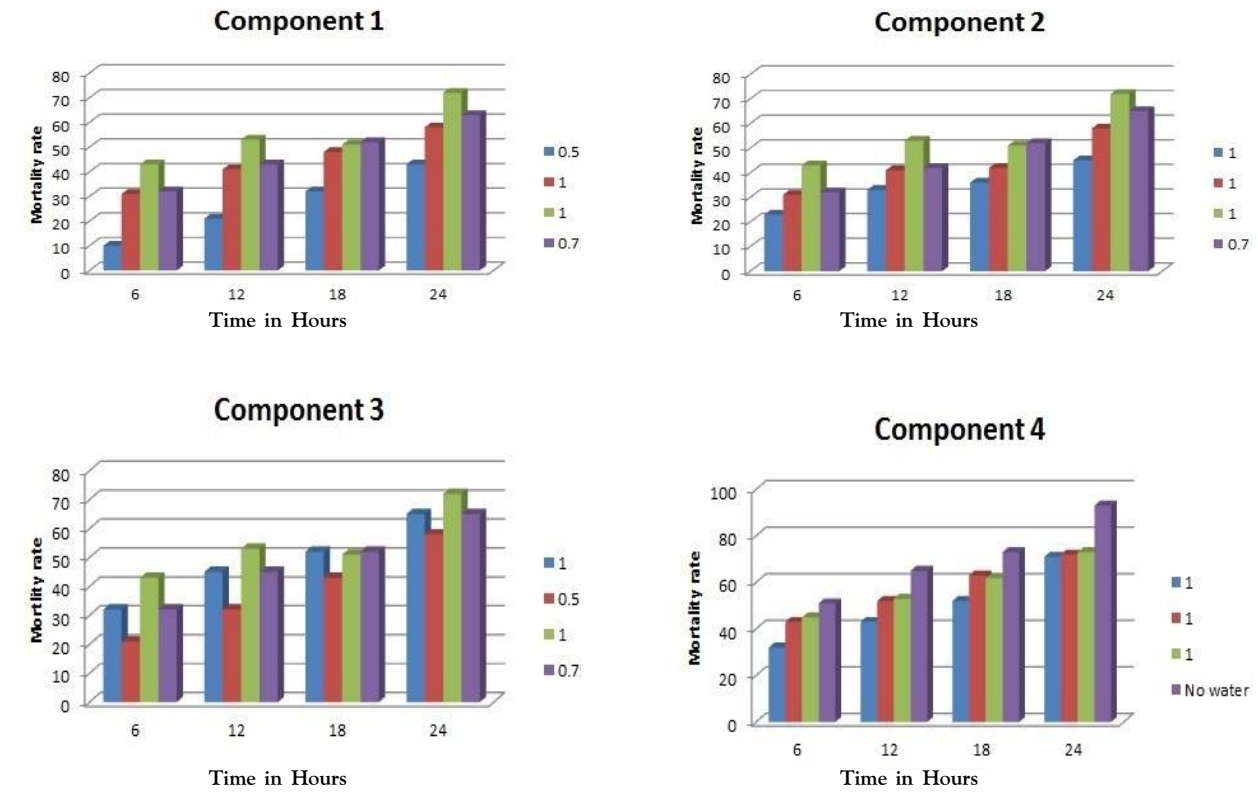
All the three components (Basil oil, plant extract, Wall nut extract, water) were subsequently analyzed by LCMS. Nearly 40-45 compounds were found in the leaf and nut extracts along with basil oil. Among all components, the concentration of Gallic acid was found to be very high, in addition to tannic, other sugar acids and few alkaloids.

RESULTS AND DISCUSSION

Although several herbal repellents were studied by different workers. The present study reveals

S.No	Name of the sample	Volume in ml			
1	Component 1 (Basil oil)	0.5	1	1	7.5
2	Component 2 (Plant extract 1%)	1	1	1	7
3	Component 3(Wall nut extract 1%)	1	0.5	1	7.5
4	Component 4(water)	1	1	1	0

Figure 1: Phytochemical activity of four components with respect to regular time intervals



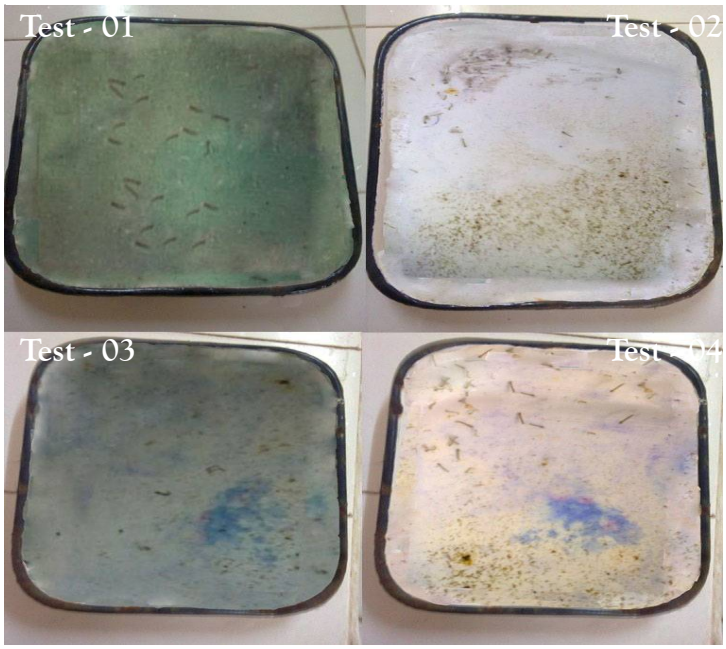
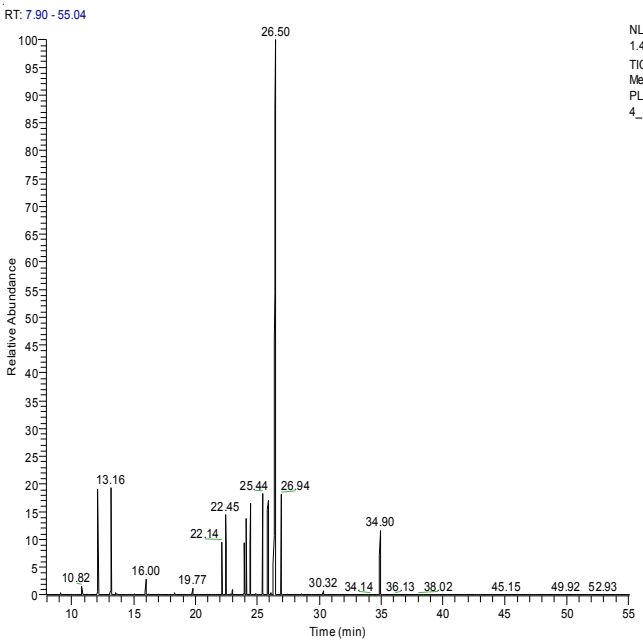


Figure 3: Chemical analysis report of Component IV



Rt	Metabolite
8.15	Lactic acid
9.09	Alanine
9.46	Glycine
11.24	Estragole
11.73	Valine
12.10	Linalool
12.58	Menthol
13.01	Leucine
13.16	Glycerol
13.14	Phosphoric acid
13.54	Proline
13.87	Succenic acid
14.3	Geraniol
14.95	Farnesol
15.65	Threonine
16.00	3-Hydroxy carpoate
18.12	Threitol
18.29	Arabinitol
18.48	4 Amino butyric acid
18.94	Erythrose
19.16	Erythro pentitol
22.14	Linalol oxide
22.44	Arabitol
22.98	β- Eudesmol
23.25	1-deoxy glucose
24.09	Fructose
24.43	Inositol
24.62	Arabiono furanose
24.87	Thio barbituric acid
25.43	Glucopyranose
25.85	Galactose
26.08	Glucitol
26.34	Trihydroxy benzoate
26.94	Mannose
27.26	Gluconic acid
27.42	Hexa decanoic acid
28.07	Glucuronic acid
28.30	Galacturonic acid
28.81	Quinoline carboxylic acid
30.01	Methyl gluco pyranoside
30.32	Octa decanoic acid
34.90	Disaccharide

that a combination of natural products is more affective, when compared to a single one. As mentioned in WHO standard methods, further efficacy studies should be carried out (ex: simulated field trials in order to effectively transfer this technology). The work with incense sticks further requires animal studies.

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