



Development of Cow Dung Based Herbal Mosquito Repellent

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ABSTRACT

Mosquitoes are the most important and abundant pest in urban, suburban and rural environment. Although, chemical control provides quick mortality, resistance of mosquito against the use of insecticides have been widely reported. Moreover, chemical mosquito repellents contain toxic synthetic pyrethroids as active ingredients whose exposure to food and water is hazardous to health. In present study, an attempt has been made to develop an eco-friendly mosquito coil containing cow dung, Neem leaves, Saw dust, loban, Tulsi, Maida and Lemon grass oil. This paper deals with selection and optimization of ingredients, their characteristics, medicinal properties and comparison with existing coil.

Key words: Cow dung, Citronella, Pallethrin, Plant extract, Neem, Tulsi.

INTRODUCTION

Mosquito borne disease are major human-health problem in all tropical and subtropical countries. The disease transmitted include malaria, filariasis, yellow fever, Japanese encephalitis and dengue fever *Culex quinquefasciatus*, the potential vector of lymphatic filariasis, is the most widely distributed tropical disease with around 120 million people infected worldwide and 44 million people having common chronic manifestation (Bernhard *et al*, 2003). Controls of such serious diseases are becoming increasingly difficult because of high rate of reproduction and development of resistance to insecticides in mosquitoes (Sukumar *et al*, 1991).

Synthetic pesticides have been extensively used for mosquito control by either killing, preventing adult mosquito to bite human beings or by killing mosquito larvae at the breeding sites of vectors. However its deleterious impact on non-target population and the development of resistance prompted for the search of alternative, simple and sustainable methods of Mosquito control. The need for development of effective insecticides should be

taken in to consideration due to toxicity problems, together with the increased incidence of insect resistance (Miro specos *et al*, 2010). In the most part of the world, synthetic chemical larvicides continue to be applied for controlling mosquitoes but many of these chemicals are toxic to human, animal and plant life and resistance can be problematic in regulating the control. Therefore, researchers are currently exploiting natural substances to be used as insecticides for controlling larval mosquitoes. These formulations are safe, eco friendly, cheap, easy to use and has maximum repellence against mosquitoes. Hence, an effort was made to prepare cow dung based herbal mosquito repellent.

MATERIALS AND METHODS

Raw material Selection

Raw material has been selected based on experience, traditional knowledge and practice by ancestors (Duke *et al*, 2002). Cow dung contains plenty of Menthol, Ammonia, Phenol, Indol, Formalin and specifically its bacteriophage eradicate the pathogens and are a recognised disinfectant

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(Mohan *et al*, 2007). Plant products are emerging as a potential source of mosquito control and among them essential oils have special interest due to their insecticidal properties (Benner, 1993).

Lemon Grass Oil (*Cymbopogon flexuosus*)

Lemongrass is an aromatic and medicinal herb. It has been used because of its disinfectant property and good smell.

Tulsi (*Ocimum Sanctum*)

Tulsi is the most sacred and generally used as medicinal plant in Indian homes. It has excellent antiviral and insecticidal property.

Neem (*Azadirachta indica*)

Azadirachta is a powerful insect anti-feedant that disrupt metamorphosis as a moth larvae at extremely low concentration. It has also been proved that besides azadirachtin, salanim, gedunin, azadinone, nimbin, nimbidine, nimbicidine, nimitinolare also important liminods which has excellent effect on insect and pest (Su and Mulla, 1998). Active ingredient of *azadirachta indica* inhibits the growth of insects by interrupting their life cycle.

Maida

It has been used as binder. Maida is found to be more convenient for use and gives excellent binding to all the ingredients and holds it together strongly.

Saw dust

Saw dust will enhance the combustion process while cow dung has large ash content, large volatile content, low carbon content and burning ratio is low.

Loban (*sambarani*)

It is a resin from a tree (*Styrax benzoin*) and is an excellent repellent of insects and mosquitoes. The fumigation of Loban is a good insect repellent. It has qualities of insecticides, as well as antiseptic. The smoke of loban create soothing atmosphere of serenity.

Method of preparation

The different herbal plants used in the study were collected from our herbal garden of panchgavya research and extension centre. The dried neem leaves (18.22%), tulsi (4.38%) were mixed with Loban (5.82%), maida (6.14%) and saw dust (6.88%), ground well to get a powdered form which was then mixed with dried cow dung (50%). After mixing, pressed in to the desired shapes with the help of a mould which was then dried with the help of drier. Lemon grass oil (8.56%) was sprayed on top of the coil by using a hand spray pump. The coil was dried in the oven at 700c for 6 hr and further kept in the room for half an hour of drying. Finally, these coils were packed in suitable air tight container and kept for 2-3 d for storage so that the essential oil could spread uniformly on the coil.

Table 1. Composition of different ingredients used in herbal mosquito coil.

Sr. No.	Ingredient	Parts (Per cent)
1.	Neem Leaves	18.22
2.	Tulsi	4.38
3.	Loban	5.82
4.	Maida	6.14
5.	Saw Dust	6.88
6.	Dried cow dung	50.0
7.	Lemon Grass Oil	8.56

Smoke toxicity test

Experiments were conducted in glass chamber measuring 140x120x60 cm and a window measuring 60x30 cm was situated at mid bottom of one side of the chamber. Three or four day's blood starved adult female mosquitoes, fed with sucrose solution, were released in the chamber. The experiment chamber was tightly closed. Smoke toxicity was tested with commercial mosquito coil and herbal mosquito repellent from 20 min to 1 hr. intervals respectively (Vineetha and Murugan, 2009).

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Table 2. Comparative efficacy of herbal mosquito repellent with commercial mosquito

Sr. No.	Time (min)	Type of repellent used	Observations recorded
1	5-7 pm	No coil used	Numerous mosquitoes
2	7-9 pm	Commercial coil	100 per cent mosquitoes reduced.
3	9-10 pm	Herbal mosquito repellentHer	85 per cent of the mosquitoes reduced.

RESULTS AND DISCUSSION

It was noticed that by 5 to 7 pm when no coil was used, the room was filled with mosquitoes and at 7 to 8 pm, a commercial coil was used to check the repellence activity in that area. It was found that up to 95 per cent of the mosquitoes were reduced. Further, when no coils were used from 7 to 9 pm again, a large number of mosquitoes were gathered. After the burning of herbal mosquito repellent from 9 to 10 pm, it was noticed that up to 85 per cent of the mosquitoes reduced. According to Palanisami *et al* (2014) the death of the mosquitoes increased with the application of the herbal mosquito repellent but as the time of using coils increased, 100 per cent of mosquito died with the application of the commercial coil.

Smoke toxicity effect of herbal mosquito repellent

The smoke toxicity effect of herbal mosquito repellent v/s commercial mosquito coil on mosquitoes was studied and found that after 20 minutes, 54 mosquitoes dropped down and 20 mosquitoes were died due to the burning herbal mosquito repellent while 74 mosquitoes died with the application of commercial coil. The death of

the mosquitoes increased with increase in time interval, 100 per cent of the mosquitoes died with the application of commercial coil. The results were in agreement with Palanisami *et al* (2014). After 20 min. commercial coil killed almost 100 per cent of mosquitoes with deleterious effect on human health while herbal mosquito coil killed mosquitoes 64 to 81 per cent between 20 to 60 minutes (Table 3).

CONCLUSION

It is not only that lemon grass oil showed good mosquito repellent activity in performed tests but it was also strong mosquitocidal agent, Hence, lemongrass, essential oil, alone or in combinations with those obtained from other mosquito repellent plant species, could be potentially used for the preparation of mosquito repellent products. The results of this investigation indicated that the lemon grass oil could be beneficial for the control of vector borne diseases. It provides an herbal repellent with long lasting protection, safe for human life, human and domestic animal skin with no side effect and no feedback of environmental ill effect, as an alternative to synthetic chemical repellents. The formulation was safe, eco-friendly, cheap, easy to use and has maximum repellence against mosquitoes.

Table 3. Smoke toxicity effect of herbal mosquito repellent and commercial mosquito coil.

Sr.No	Time of observation after burning of mosquito repellent	Herbal Mosquito Coil		Commercial Mosquito Coil
		No. of dropped down mosquito	No. of died mosquito	No. of mosquito died by commercial mosquito coil
1	After 20 min	54.00±2.35	20.00±1.45	74.00±0.35
2	After 30 min	102.00±4.65	45.00±2.05	102.00±0.00
3	After 40 min	125.00±5.76	64.00±3.24	100.00±0.00
4	After 50 min	140.00±6.23	73.00±4.50	100.00±0.00
5	After 1hr	152.00±7.85	81.00±4.85	100.00±0.00

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