

Original Research Article

COMPARITIVE STUDY OF FORMULATED MOSQUITO REPELLENT INCENSE STICKS WITH MARKETED PRODUCT

ABSTRACT

~~The mosquito~~ Mosquito repellent formulations ~~that~~ are available ~~in on~~ the market are causing ~~more~~ irritations like coughing, sneezing, and allergic reactions to humans. Some ~~persons~~ people are also ~~feeling~~ falling ill of respiratory disorders. ~~So~~ The present study was carried out to formulate mosquito repellent incense sticks ~~that cause less irritation and have germicidal activity using herbals like Vitex negundo, Neem, Holy basil, and Garlic. The herbals are having more advantages like germicidal activity and less irritation.~~ The synthetic chemical used in the marketed formulation can be replaced by ~~the~~ herbals ~~such as Vitex negundo, neem, holy basil and garlic~~ to get better effect. Poly-herbal formulations were designed and ~~the effects are~~ compared with ~~formulations on~~ the marketed ~~product~~.

Comment [MDM1]: Add techniques and methods used as well as conclusions

KEY WORDS: Mosquito repellents, Essential oil, Herbals

INTRODUCTION:

The word mosquito is called as little fly. The body of the mosquitoes are slender, segmented, one pair of wings, three pairs of long hair like legs and long mouth parts.

The mosquito crosses several stages in its life cycle like egg, larva, pupa and adult stages. The matured female mosquitoes have tube like mouth part that will pierce the skin of a human and withdraw the blood to produce the eggs and the mosquito also needed proteins and iron for the egg production.

After the bite of the mosquito the itchy feel is due to the saliva of the mosquito. Mosquito develops so many diseases in human like dengue, malaria, yellow fever etc.

Comment [MDM2]: Expand your introduction. Maybe give more details on the mosquitoes, which types transmit diseases and how.

Mosquito repellent are also called as "bug spray". The mosquito repellents are applied to surface of skin to avoid mosquito biting on the skin. Mosquito repellent are used to prevent and control the diseases like malaria, dengue and fever. Use of synthetic repellent causes many health issues like respiratory problems so natural synthetic repellents like neem, garlic, basil, camphor, castor oil, cinnamon, clove oil, D-limonene, fennel oil, marigold. Synthetic insect repellents are DEET(N,N-diethyl-m-toluamide), dimethylcarbate, picaridin, metofluthrin, permethrin. Mosquito can be repelled by also using mosquito net, using clothes that covers total body. By using fan with more air, using light coloured clothes can avoid the contact of mosquito. To control adult mosquitoes van mounted fogging machines and hand fogging machines are used.

Comment [MDM3]: Give examples of these synthetic repellents and the health issues associated with their use.

Comment [MDM4]: Give a short review of what has been done already and were your work fits into the research gap

MATERIALS AND METHODS:

INGREDIENTS:

TABLE NO: 1 Formulation table

Sample No.	INGREDIENTS	POLYHERBAL FORMULATION
1	NEEM	10gm
2	VITEX NEGUNDO	10gm
3	HOLY BASIL	10gm
4	GARLIC	5gm
5	BENZOIN	5gm
6	CHARCOAL	50gm
7	STARCH	10%
8	LEMON GRASS OIL	Q.S.
TOTAL		100gm

METHOD OF PREPARATION OF INCENSE STICKS

- All the dried herbs were finely powdered in a mixer and then passed through a sieve(no.80). The powder shall be very fine to avoid problems in the stage of binding and burning. 100g of powder premix was taken to prepare 20 incense sticks.
- The quantity of plant material taken is listed in table 1. Water was gradually added to the fine powder until it attained dough-like consistency. It should be well mixed and not too watery, otherwise it creates problems in making sticks.
- The dough was divided into portions and was rolled by hand in small quantities on plain bamboo sticks. This can be done by a machine in large scale production. The sticks were dried for 24hours under shade.
- Tray dryer can be used to dry the sticks faster. The dried incense sticks were scented with lemongrass oil. Finally sticks were packed in a suitable packing material preferably plastics

Comment [MDM5]: Do not use bullets. Either write in paragraph form or use sub-headings for different methods

Comment [MDM6]: Report your methodology in past tense. You switch from past tense to future tense

EVALUATION

BURNING ON USERS:

Test was done by simply selecting mosquitoes from areas in the evening and night period. The public remarks were noted down after allowing them to investigate mosquito repellent activity. The prepared incense sticks were checked for causal

Comment [MDM7]: How? Please explain

effects such as irritation, coughing, and tears were observed and recorded. The results are compared with the marketed formulation

SMOKE TOXICITY TEST:

Smoke toxicity test was conducted in a chamber measuring 34.5 ~~x~~ 24 ~~x~~ 0.95 cm. Then adult mosquitoes were released into the chamber and they were exposed to the smoke of burning incense sticks for 45 minutes. The mortality data were recorded after every 15 minutes. Total number of mosquitoes used was 50. The results are compared with the marketed formulation

Comment [MDM8]: Use the multiplication sign from the Insert menu

FEED BACK FROM 20 VOLUNTEERS

The feed-back of prepared mosquito repellent incense sticks were taken from 20 people ~~after requested to evaluate the formulation containing poly herbs~~. The results are compared with the marketed formulation

RESULT AND DISCUSSION

EVALUATION OF BURNING ON USERS:

Smoke from the herbal mosquito repellent sticks produce no toxic effect to humans and ~~are~~ also ~~act as~~ germicidal. Incense sticks prepared are cost effective and easily portable. The prepared ~~incense~~ sticks were given to the 10 houses, hostel and canteen for ~~getting~~ feedback about the product depending on the duration of time, illness, and allergic reactions. The results are compared with the marketed formulation

Comment [MDM9]: Was it 10 houses, 10 hostels and 10 canteens?

Table No 2 Behaviour of mosquitos repellent sticks on ignition

Sample No.	Areas	Formulation containing poly herbs	Marketed formulations
1	Houses	Less irritation and mosquitoes repelled	Coughing, sneezing and mosquito repelled
2	Hostel	No irritation and allergic reaction. Mosquitoes repelled	Eyes burning and eyes burning
3	Canteen	No irritation and coughing. Mosquitoes repelled	Vomit and dizziness and mosquito repelled

SMOKE TOXICITY TEST

Observations ~~is were~~ done regarding time taken to burn the sticks, fragrance of sticks, and duration of repellent activity. It is very safe to use and is nontoxic in nature. This mosquito repellent sticks can be used regular in houses and laboratories.

Table No 3: Smoke toxicity test for the prepared formulations

TIME(MINUTES)	POLY HERBAL FORMULATION	MARKETED FORMULATION
15	10	9
30	8	8
45	7	8
Total number of mosquito killed(Duration of repellent activity)	25	25

Feedback from 20 people

The feedback of mosquito repellent incense stick were taken from 20 people and requested to evaluate the prepared formulation containing poly herbs.

Table No 4: Feedback from 20 people

Parameters	Excellent	Good	Average	Poor
Product elegance	15	5	---	---
Mosquito repellency	17	3	---	---
Odor of the incense stick	14	6	---	---
Allergy	---	---	---	---

Product satisfaction rating of 1 to 5 score (Average)	4	---	---	---
-------------------------------------------------------	---	-----	-----	-----

CONCLUSION

The mosquito repellent incense sticks prepared using herbals show excellent mosquito repellent action and also have no side effects. The fragrance produced by the formulated sticks are good-better than the marketed formulation. The incense sticks were eco-friendly, cost effective and safe to use. It is easily portable and can be easily used by all the age groups. The herbal incense sticks give a pleasant smell and repel mosquitoes, so the herbals are highly recommended for the formulation of mosquito repellent incense sticks. The lemon grass oil used in the formulation gives pleasant odour during ignition. The marketed formulation shows some complications like irritation to the eyes, coughing, sneezing and respiratory disorders.

References

1. Fornadel CM, Norris LC, Glass GE, Norris DE. Analysis of Anopheles arabiensis blood feeding behavior in southern Zambia during the two years after introduction of insecticide-treated bed nets. *Am J Trop Med Hyg.* 2010;83(4):848–853.
2. Karunamoorthi K, Husen E. Knowledge and self-reported practice of the local inhabitants on traditional insect repellent plants in Western Hararghe Zone, Ethiopia. *J Ethnopharmacol.* 2012;141(1):212–219.
3. E.J. Mavundza, R. Maharaj, J.F. Finnie, G. Kabera, J. Van Staden An ethnobotanical survey of mosquito repellent plants in Mkhanyakude district, KwaZulu-Natal province, South Africa *J Ethnopharmacol.* 137 (2011), pp. 1516-1520
4. S. Phasomkusolsil, M. Soonwera Insect repellent activity of medicinal plant oils against *Aedes aegypti* (Linn.), *Anopheles minimus* (Theobald) and *Culex quinquefasciatus* Say based on protection time and biting rate *Southeast Asian J Trop Med Public Health*, 41 (2010), pp. 831- 840
5. A.K. Mishra, N. Singh, V.P. Sharma Use of neem oil as mosquito repellent in tribal villages of Mandla district, Madhya Pradesh *Indian J Malariol*, 32 (1995), pp. 99-103
6. N.G. Das, D.R. Nath, I. Baruah, P.K. Talukdar, S.C. Das Field evaluation of herbal mosquito repellents *J Commun Dis*, 31 (2000), pp. 241-245
7. Y. Young-Cheol, L. Eun-Hae, L. Hoi-Seon, L. Dong-Kyu, A. Young-Joon Repellency of aromatic medicinal plant extracts and a steam distillate to *Aedes aegypti* *J Am Mosq Control Assoc*, 20 (2004), pp. 146-149
8. N.G. Das, Sunil Dhiman, P.K. Talukdar Synergistic mosquito-repellent activity of *Curcuma longa*, *Pogostemon heyneanus* and *Zanthoxylum limonella* essential oils *J of Infection and Pub Health* Vol 8, Issue 4, July–August 2015, pp 323-328

Comment [MDM10]: Put in-text referencing as well

UNDER PEER REVIEW

