



DEVELOPMENT OF ALOE VERA BASED MOSQUITO REPELLENT INCENSE

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ABSTRACT

The chemical based mosquito repellents available in the market contain some harmful and several poisonous chemicals which are likely to cause threat to human health. An attempt has been made to prepare an herbal mosquito repellent incense based on Aloe vera waste products. There are seven formulation for herbal mosquito repellent incense were prepared by using Aloe vera, used tea, cow dung and wood dust. The herbal mosquito repellent incense was prepared by mixing of different material and then forming in roll shape of incense. The prepared incense was dried and evaluated for dried weight, length of burning time, burnt ash content and diffusion time. It was concluded that mosquito repellent incense should be prepared from Aloe vera skin and Jigat powder in the proportion of 50:50 for best results and prevent side effect commercial formulation of products.

KEY WORDS: Mosquito repellent incense, Aloe vera, Jigat powder, Diffusion time.

INTRODUCTION

Control of mosquitoes today has become prime requirement with rising number of mosquito borne illnesses. Mosquito is now-a-days a major problem among the human beings. With the onset of modern civilization, we are forgetting the several useful natural resources; e.g. Cow dung, *Aloe vera*, used tea, wood dust etc. During the processing of *Aloe vera*, it produce useful by-product as a leaf skin and dispose of as waste. It has insect repellent properties and used traditionally in ancient times. Researchers proved that pyrethroids used in repellents leads to hyper-excitation of nervous system and prolong uses result in corneal damage, liver damage and asthma. Highly accurate studies conducted in US show that children ranging from 1-6 years in age are eating at least 0.002157mg/kg/day of pallethrin used in liquidators due to food exposure which is affecting their health whereas its limiting quantity is 0.002152mg/kg/day (Sharma, 2001). Hallahan (2007) invented the insect repellent compounds as Dihydronepetalactone a natural constituent of the essential oil of catmints (*Nepetaspp.*) such as *Nepetacataria*, has been identified as an effective insect repellent compound. *Agarbathi* making is one of the oldest cottage industries generating 30-35 million man-days of work for the sections of the society, particularly women. The binding material in *Agarbathi* manufacture is *Jigat*. (<http://www.nrdcindia.com/pages/Jigat.htm>). (Teklay *et al.*, 2012) reported that the insects were repelled by the bitter taste of *Aloe vera* leaves. The chemical based mosquito repellents available in the market contain some harmful and even poisonous chemicals which are likely to cause threat to human health (Patel *et al.*, 2012). An attempt has been made to prepare a 100% herbal product. Thus, the present research is driven by the need to

discover new, cost effective repellents that overcomes the limitation of currently available mosquito repellents in the market, without compromising the human health.

MATERIALS & METHODS

The experiment was mainly consisting of preparation of sample, drying of sample, determination of burning characteristics and mosquito repellent behavior. Freshly harvested *Aloe vera* leaves were procured from Botany Department, College of Agriculture, JAU, Junagadh. For preparation of incense binding and burning agent as *Jigat* powder was purchased from market. Cow dung, wood dust and used tea were collected locally available source. The research investigation was carried out by taking seven different combinations in different proportions of material and compared with commercially available mosquito repellent coil. There are seven formulation used for preparation of herbal mosquito repellent incense as (a) *Aloe vera*+ *Jigat* powder, (b) *Aloe vera* skin + *Jigat* powder, (c) *Aloe vera* pulp + *Jigat* powder, (d) *Aloe vera*+ Used tea + *Jigat* powder, (e) *Aloe vera* + Cow dung + *Jigat* powder, (f) Used tea + Cow Dung + *Jigat* powder + *Aloe vera* and (g) Used tea + Cow dung + *Jigat* powder + *Aloe vera* + Wood dust. The experiments were planned using Completely Randomized Design. Plate 1 show different raw materials utilized.

Experimental Procedure

The herbal mosquito repellent incense was prepared by mixing of different material and then forming in roll shape of incense. The prepared incense was dried at 45°C in Cabinet tray dryer (Khera MAKE, New Delhi India). Simultaneously, to study the effect of incense on mortality

of mosquito and human hazards were tested by visual observation and evaluated for burning time, dried ash content, diffusion time and mortality of mosquito by keeping

in thermocol chamber and net tied in room. The cost analysis of manufacturing for *Aloe vera* based mosquito repellent incense was done.



PLATE 1: Different raw material for incense

Testing of developed mosquito repellent incense

The developed mosquito repellent incense was tested for various parameters like dried weight, length of burning time, diffusion rate, burnt ash and sensory parameters. The burning time of the mosquito repellent incense was measured by taking initial reading at the time of start and final reading after complete burning with the help of stop watch. The diffusion rate is defined as the rate at which the diffusion of flumes of mosquito repellent incense advances in a specific sized chamber and it was found out by placing the mosquito repellent incense in 10 ft. x 10 ft. size room. Same way the living room was used to measure the diffusion rate by visual observation.

Sensory evaluation

Variations in Odor, Suffocation, and Overall acceptability for mosquito repellent incense were observed during burning of it. Sensory evaluation of mosquito repellent incense was carried out by panel of ten persons for Odor, Suffocation, Overall acceptability using 9 point Hedonic scale (1-Dislike extremely, 2-Dislike very much, 3- Dislike moderately, 4-Dislike fairly, 5-Neither like nor dislike, 6- Like fairly, 7-Like moderately, 8-Like very much and 9-Like extremely) for each attribute as per BIS (1971). The least significance

difference was computed to establish difference between control and treatment.

RESULTS AND DISCUSSION

Effect of different proportion of material for mosquito repellent incense on dried weight

The mosquito repellent with low weight is one of the important requirements of the consumer. It will help in burning, packaging and also in transportation. From the Table 1, the lowest dried weight was observed in treatment T-5. The lowest dried weight of the incense was due to the minimum solid content in it, as this treatment contains two major moisture containing contents i.e. *Aloe vera* and Cow dung. The highest dried weight was observed in treatment T-3 due to the high moisture content of the *Aloe vera* pulp and high moisture absorbing property of *Jigat powder*. As it plays a role of binding agent in the incense, it absorbs most of the moisture from *Aloe vera*. Finally, leaving the maximum solid content in the incense gives the highest dried weight. This treatment was not beneficial due to its highest dried weight as it will be difficult in burning, packaging and transportation too. As the proportion of *Jigat powder* decreased, the dried weight also decreased.

TABLE 1: Effect of different proportion of material for mosquito repellent incense on dried weight

Treatments	Particulars	Proportion of component	Wt. of contents (g) at a constant volume of 15.7 cc.	Dried Wt. (g)
T-1	Aloe vera + Jigat powder	50:50	23.10	11.20
T-2	Aloe vera Skin + Jigat powder	50:50	32.44	10.91
T-3	Aloe vera Pulp + Jigat powder	50:50	22.58	11.60
T-4	Aloe vera + Used Tea + Jigat powder	40:20:40	21.86	10.35
T-5	Aloe vera + Cow dung + Jigat powder	33.33:33.33:33.33	21.58	08.50
T-6	Used Tea + Cow dung + Jigat powder + Aloe vera	20.84:20.84:37.48:20.84	22.26	09.93
T-7	Used Tea + Cow dung + Jigat powder + Aloe vera + Wood dust	20:20:26.66:26.66:6.66	21.20	09.00
T-8	Control (Commercial mosquito repellent incense)	Unknown	Unknown	10.12

TABLE 2: Effect of different proportion of material for mosquito repellent incense on length of burning time

Treatments	Particulars	Proportion of component	Wt. of contents (g) at a constant volume of 15.7 cc.	Length of burning time (min)
T-1	Aloe vera + Jigat powder	50:50	23.10	132.55
T-2	Aloe vera Skin + Jigat powder	50:50	32.44	199.45
T-3	Aloe vera Pulp + Jigat powder	50:50	22.58	099.35
T-4	Aloe vera + Used Tea + Jigat powder	40:20:40	21.86	160.10
T-5	Aloe vera + Cow dung + Jigat powder	33.33:33.33 :33.33	21.58	100.15
T-6	Used Tea + Cow dung + Jigat powder + Aloe vera	20.84:20.84 :37.48:20.84	22.26	120.12
T-7	Used Tea + Cow dung + Jigat powder + Aloe vera + Wood dust	20:20:26.66 :26.66:6.66	21.20	110.08
T-8	Control (Commercial mosquito repellent incense)	Unknown	Unknown	358.90

Effect of different proportion of material for mosquito repellent incense on length of burning time

The longest burning time was found for treatment T-2 (Table 2). This was due to the maximum amount of solid content in it. As *Aloe vera* skin contains less amount of moisture, when it was mixed with the *Jigat* powder, the paste formed had the minimum moisture content. On the other hand if the length of burning time is more, the effect on the repellence of the mosquito will also increase. Moreover, the mortality rate also indirectly depends upon the length of burning time.

Also it has been recognized that a majority of people spend much of their life inside a room, so it will be more beneficial. The people will get relief from mosquito for maximum time if the length of burning time is more. The lowest burning time was found in treatment T-3. This treatment contains *Aloe vera* pulp and *Jigat* powder, as the pulp contains the maximum moisture content, when it was mixed with the *Jigat* powder having moisture absorbing property, absorbs the moisture uniformly and led uniform drying of the incense.

TABLE 3: Effect of different proportion of material for mosquito repellent incense on burnt ash

Treatments	Particulars	Proportion of component	Wt. of contents (g) at a constant volume of 15.7 cc.	Wt. of Burnt Ash. (g)
T-1	Aloe vera + Jigat powder	50:50	23.10	2.94
T-2	Aloe vera Skin + Jigat powder	50:50	32.44	2.87
T-3	Aloe vera Pulp + Jigat powder	50:50	22.58	3.13
T-4	Aloe vera + Used Tea + Jigat powder	40:20:40	21.86	2.41
T-5	Aloe vera + Cow dung + Jigat powder	33:33:33	21.58	2.09
T-6	Used Tea + Cow dung + Jigat powder + Aloe vera	20.84:20.84:37.48 :20.84	22.26	2.25
T-7	Used Tea + Cow dung + Jigat powder + Aloe vera + Wood dust	20:20:26.66:26.66:6.66	21.20	1.95
T-8	Control (Commercial mosquito repellent incense)	Unknown	Unknown	110.08

TABLE 4: Effect of different proportion of material for mosquito repellent incense on diffusion time of smokes

Treatments	Particulars	Proportion of component	Wt. of contents (g) at a constant volume of 15.7 cc.	Diffusion time (min)
T-1	Aloe vera + Jigat powder	50:50	23.10	5.10
T-2	Aloe vera Skin + Jigat powder	50:50	32.44	6.55
T-3	Aloe vera Pulp + Jigat powder	50:50	22.58	7.17
T-4	Aloe vera + Used Tea + Jigat powder	40:20:40	21.86	4.55
T-5	Aloe vera + Cow dung + Jigat powder	33:33:33	21.58	5.53
T-6	Used Tea + Cow dung + Jigat powder + Aloe vera	20.84:20.84:37.48:20.84	22.26	5.54
T-7	Used Tea + Cow dung + Jigat powder + Aloe vera + Wood dust	20:20:26.66:26.66:6.66	21.20	3.59
T-8	Control (Commercial mosquito repellent incense)	Unknown	Unknown	4.56

Effect of different proportion of material for mosquito repellent incense on burnt ash

Burnt ash weight is the indirect measure of volatile compounds present in the incense. More burnt ash weight suggests more amount of volatile component responsible for flume causing death or repellence of mosquito. From the Table 3, it was observed that the highest weight of burnt ash was in treatment T-3. This was due to the *Aloe vera* pulp contains more volatile compounds followed by Treatment T-1 and T-2. The lowest ash content was found in treatment T-7 which comprised of used Tea, Cow dung, *Jigat* powder, *Aloe vera* and Wood dust had low amount of volatile compound. Also the moisture absorbance in treatment T-3 was uniform due to high water holding capacity of *Jigat* powder which slows down burning process and resulted in high ash content. While in case of other treatments there was a lower amount of moisture holding capacity of different materials leads rapid burning process and resulted in lower ash content.

Effect of different proportion of material for mosquito repellent incense on diffusion time of smokes

The diffusion of flumes after the burning of incense is important aspects for mosquito repellent. The diffusion of flume recorded lowest in treatment T-7 and highest for treatment T-3. It was found that the diffusion time was doubled due to the high moisture content of *Aloe vera* pulp (Table-1). From the Table 4 it was also cleared that incense without *Aloe vera* pulp recorded average 5 to 6 min diffusion time. As the proportion of *Jigat* powder decreases, the diffusion time also decreases. From the Table 5, it was observed that different panelist had given their opinion as best for treatment T-2 (*Aloe vera* skin + *Jigat* powder) formulation for mosquito repellent incense with 6.0 overall acceptability with lower sensitivity of odour and suffocation.

CONCLUSION

The mosquito repellent with low weight and more length of burning time is preferable. Moreover, the mortality rate also indirectly depends upon the length of burning time. Burnt ash weight is the indirect measure of volatile compounds present in the incense. More burnt ash weight suggests more amount of volatile component responsible for flume causing death or repellence of mosquito. A lower amount of moisture holding capacity of different materials leads rapid burning process and resulted in lower ash content. The diffusion of flumes after the burning of incense is important aspects for mosquito repellent. It was found that the diffusion time was doubled due to the high moisture content of *Aloe vera* pulp as the proportion of *Jigat* powder decreases, the diffusion time also decreases. It was concluded that mosquito repellent incense should be prepared from *Aloe vera* skin and *Jigat* powder in the proportion of 50:50 for best results and prevent side effect commercial formulation of products.

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