

Optimization and Development of Herbal Incense Cones for Air Purification and Mosquito Repellent Trash into Treasure: Novel Low Cost Environmental Friendly Polyherbal Mosquito Repellants and Air Purifier Incense Cones

Rashmi Bagri¹, P. Poornima², K. Nagaraja³, G. Tulja Rani⁴

^{1,2,3}Assistant Professor, department of Pharmaceutics, Malla Reddy Pharmacy College, Secunderabad-50010, Telangana, India

⁴Professor & Principal, department of Pharmaceutical Analysis, Malla Reddy Pharmacy College Secunderabad-50010, Telangana, India

Abstract

The atmosphere has been a foremost concern in today's era. The constant pollution all around has gathered the attention of many people. Disease causing pathogens spread from an infected person and mosquitoes also spread diseases like malaria. Microbial burden of the air causes several airborne illnesses[1]. Synthetic mosquito repellent and air purifiers used to control the vectors are causing irreversible damage to ecosystem and also chemicals are carcinogenic in nature. Poly herbal incense cones are free from cancer-causing chemicals. Incense is known to impart antimicrobial activity. The objective of the current work is to formulate low cost environmental friendly polyherbal mosquito repellants and air purifier incense cones and to evaluate its activity. Public survey was also done to study safety and efficacy of the formulation. Dried powdered leaves of Piper betle, flowers of Nyctanthes arbortristis, Artemisia pallens, Rosa rubiginosa, Tagetsarecta, Nelumbonucifera, and plant extrudes of Spyrax benzoin were mixed with Azadirechta indica oil. Linumusit atissimum and Apismellifera used as binders. Saw dust and cow dung are used for ignition. The powdered blend additional to enhance worth, it was later fragranced¹with volatile oil like Jasminum officinale and dehydrated [2]. Results shows that they have the mosquito repellent and air purifying activity. The prepared herbal mosquito incense cones are effective, safe with more duration of time and less cost.

Keywords: Herbal incense cones, Polyherbal mosquito repellants, Air purifier, Nyctanthes arbortristis and Piper betle.

Introduction

In the present era where environment is the major concerns and health-conscious living are utmost, the exploration for natural and effective solutions has led to a renewed interest in traditional practices. One such possibility is herbal incense cones, not only for their aromatic application but also for their potential as air purifiers and mosquito repellents [3].

As urbanization progresses and the challenges of air quality and sicknesses cause by mosquito bite persist, here is a growing necessity for innovative approaches that align with sustainability and well-being. Herbal incense, with its origins deeply rooted in ancient cultures, presents a captivating opportunity to address these current issues [4]. By utilizing the natural properties of specific herbs, we developed incense cones that not only elevate the ambiance of spaces but also contribute to healthier indoor environments and enhanced protection against air and mosquito-borne diseases.

Usually in the olden days dhupana was used as the media as mosquito repellent and by keeping this into consideration, an effort was made to develop an incense stick which contains various herbal drugs, acts as mosquito repellent and air purifiers. Incense stick was prepared from dried powdered leaves and plant extrudes, all the ingredients are eco-friendly, portable, cost effective and comparatively having nil untoward health effect as compared to other air purifier, repellents available in the market. Due to toxicity issues, there is increase in demand of development of herbal based air purifier, mosquito repellent in the market. Prepared formulation was evaluated for appearance, efficiency and safety [5].

The herbals are used in the preparation of mosquito repellent formulations in order to reduce the marketed product harmful effects². Herbals with mosquito repellent activity are of Piper beetle, flowers of *Nyctanthes arbortristis*, *Artemisia pallens*, *Rosa rubiginosa*, *Tagetsarecta*, *Nelumbonucifera* and *Spyrax benzoin*. Neem oil was the herbal have multiple uses like antifungal, antibacterial and antiviral agent[6]. Neem oil also gives protection against biting of the mosquitoes. Neem oil was the herbal used as a bio pesticide and have more mosquito repelling action and air purifier activity. *Jasminum officinale* oil was used in the mosquito repellent stick preparation for the flavoring action. Benzoin its gum resin. Its odor will repel the mosquitoes.

Materials and methods

Flowers (rose, lotus and marigold) were collected from temple waste, betel and dhavanum leaves were collected from the local market. Resin – loban, honey, essential oils- neem and jasmine oil were collected from Ayurveda shop in Hyderabad, saw dust collected from local saw mill.

Methodology:

Preparation of Herbal incense cones:

The collected flower petals and leaves are dried in a shaded area at ambient temperature for 7 days. Weighed the required quantities of ingredients were ground to obtain powder. All the powdered ingredients were passed through the sieve no. 80 to obtain the uniform size of the powdered ingredients. Entire 100 grams of the mixed powder were taken to formulate twenty incense cones³. The quantity of plant material taken is listed in Table 1. All the ingredients were added the motor, the binder was measured according to the formulation added above powdered ingredients. Water was gradually added to the fine powder until it attains dough like consistency. It should be well mixed and not too watery dough otherwise it creates problem in making cones. The dough was moulded into the incense into cone and cylindrical shapes using the moulds. The cones were dried for 24 hours under shade, The dried incense cones were then scented with lemon jasmine oil. Finally cones were packed in a suitable packing material preferably plastic.

Table 1: Formulation details of incense cones F₁ to F₈

INGREDIENTS (gms)	F₁	F₂	F₃	F₄	F₅	F₆	F₇	F₈
Sawdust	50	45	40	35	50	45	40	35
Rose petals	10	10	10	10	10	10	10	10
Dhavanam	5	5	5	5	5	5	5	5
Akasa malli	5	5	5	5	5	5	5	5
Loban	5	5	5	5	5	5	5	5
Betelleaves powder	5	5	5	5	5	5	5	5
Mari gold petals	10	10	10	10	10	10	10	10
Neem oil	3	3	3	3	3	3	3	3
Jasmine oil	2	2	2	2	2	2	2	2
Honey	-	-	-	-	5	10	15	20
Flaxseed gel	5	10	15	20	-	-	-	-
Vehicle(water)	q. s	q. s	q. s	q. s	q. s	q. s	q. s	q. s
Total wt.	100	100	100	100	100	100	100	100

Evaluation test for incense cones:

Test for Antimicrobial Activity:

The evaluation of the herbal incense cones for their antibacterial action was assessed in a customized chamber taking into concern the magnitude and size to produce smokes of the cones. Petri plates with nutrient agar were used for air sampler for estimation the effect of medicinal smoke from incense cones on air borne bacteria. Air sampler was placed in the smoke chamber where the smoke produced by the incense cones⁴. An agar plates were exposed to the smoke of the incense cones in the chamber for 15 min. Then it was removed and incubated for 48 hr. at 32°C. Repeat the same process for another set of petri plates with nutrient agar were used for air sampler. The petri plates were kept in the chamber for 15 min. without burning of the incense cones as a control. after 15 min the plates were removed from the chamber, incubated for 48 hrs. at 32°C. The plates were estimated for microbial count, difference in the microbial count indicated the antimicrobial activity of the incense cones. The test was performed for 6 sets of the sample.

Mosquito repellent test:

For this experiment mosquitos were trapped by plastic cover and shifted cautiously in the mosquito net with approximately 50cm X 50cm. About 30 mosquitos are shifted in the net between 5pm to 8pm since maximum mosquitos bite at that time. The two full incense stick were ignited in the room with adequate ventilation, mosquito net is placed at the middle of the room and extent of exposure is 3 hours. The actions of the mosquitos were assessed and reported[7].

Evaluation of Strength for incense cones:

The strength of cones were checked by keeping weights on cone increasing manner like 5g, 10g, 25g,..... 100g until the cone get crushed. At one moment weight on the cone get irresistible and crushed then it is recorded as maximum strength of the cones.

Ash content:

Initial weight of the cones was checked. The cones were ignited until the total product get burned and then ash content which was remained is checked by the fallowing formula

$$\text{Initial wt.} - \text{Final wt.} / \text{initial wt.} * 100$$

Feedback from volunteers for acceptance:

The fragrance and irritation incense cones tests were carried out on 30 volunteers and their statistical responses were recorded.

Result and Discussion

Ignition time: The average time for to ignite the incense cones were noted and it was found to be 26 sec as average of 6 cones.

Burning test: Total burning time for incense cones were determined and it was found to be average of 6 36.33±3.2 min

Table no: 2. Burning time of incense cones

S. No.	Total burning time (min)
1	33
2	38
3	40
4	36
5	32
6	39
Average	36.33±3.2



(A)



(B)

Fig:1 A: Burning time for incense cones

B: Ignition time for incense cones

Strength of incense cones:



Fig:2 Strength of incense cones a) Weight of 10 gms; b) Weight of 50 gms; c) Weight of 100 gms;

The six number of incense cones were tested for crushing strength got crushed totally at 100 grams weight. Showing good integrity of shape and strength up to 100gms.

Ash content:

The ash content of the incense cones were found to be 22.8% (Average of six cones).

Antimicrobial Activity:

The number of colonies present in media before and after expose of incense fumes were counted. The colonies found for control and test 28 ± 5.8 and 8 ± 1.4 respectively and shown in table no.3

Table 3 : The average number of colonies

S. No.	Number of colonies	
	Control	Test
1	35	6
2	29	8
3	34	10
4	26	9
5	24	7
6	20	8
Average	28	8
STDEV	5.8	1.4



Fig:3 customized smoke chamber

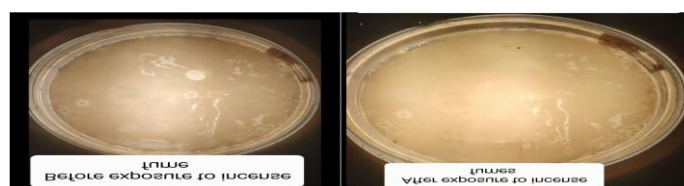


Fig:4 The number of colonies present in media a) before and b) after expose of incense fumes

Mosquito repellent activity Test:

Mosquito repellent activity was performed and result were presented in table no. 4.

Table 4: Action of the mosquitoes exposed to smoke of incense cones

Action of the mosquitos	5 pm to 6 pm	6 pm to 7 pm	7 pm to 8 pm
Mosquitos easily moving in the net	15	2	0
mosquitos associated on the net	20	13	5
Mosquitos struggling in lieu of life	16	11	5
Not at all movement and lying on flooring	10	18	25

Feedback from volunteers for acceptance:

The reponses of incense cones were taken from 30 volunteers and requested to give the feedback on cones and were given in table no.5. No single volunteers reported for eye irritation and allergic related issues.

Table 5: Volunteer’s feedback report

Parameters	Excellent	Good	Average	Poor
Product appearance	22	6	2	0
Fragrance	25	4	1	0
Product satisfaction rating	26	3	1	0

Conclusion:

Thoroughly literature review was carried out beforehand the preparation of air purifier, mosquito repellent incense cones. Plants like neem have mosquito repellent activity, leaves of Piper beetle use in treatment of numerous diseases like bad smell, wounds, injuries, irritations, cold cough, heartburn, etc, flowers of Nyctanthes arbortristis, Artemisia pallens, Rosa rubiginosa, Tagetsarecta, Nelumbonucifera, and plant extrudes of Spyrax benzoin were mixed with Azadirectha indica oil. Linumusit atissimum and Apismellifera used as binders were Powdered and incense cones were made by hand rolling method. The incense cones were for evaluated by using colony counter to count the bacterial reduction and mosquito net method for mosquito repellent activity [8]. The results were very satisfactory in reduction of bacterial burden and the mosquitos repelling activity [9] The responses of the incense cones were also satisfactory when given to 20 volunteers for their feedback and the product satisfaction rating were good. The product also tested to any allergic signs when used and there are no such allergic symptoms like uneasiness, sneezing, breathless were reported. Comprehensively, the product is harmless to use and have noteworthy air purifying and mosquito repellent activity.[10]

Acknowledgement:

The authors are thankful to Malla Reddy Pharmacy College Hyderabad for providing the laboratory facility to perform the work.

Reference

1. Kumar P., Bijauliya RK., Singh B., Yadav P., Khan WA., “Formulation and Evaluation of Essential Oil Encapsulated Mosquito Repellent Gel”, *Journal of Drug Delivery and Therapeutics*, 2022,12(1),23-29.
2. Aditi Bahadur., K S Chandrashekar., Vasudev Pai., “Formulation and Development of Polyherbal mosquito Repellent Incense Cones”, *Research J. Pharm. and Tech.* 2020,13(1),124-128.
3. 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.
4. Sana Soheilian., Fatemeh Zeraati., Iraj Khodadadi., Mahmoud Farshchian., Marzieh Mosaed., Mohamad Ali Seif Rabiei., Shabnam Pourmoslemi, “Microbiological Quality of Semi-Solid Pharmacy compounded Topical Preparations”, *Research J. Pharm. and Tech.* 2019, 12(3),983-989.
5. Krishnaveni M., Amsavalli L., Chandrasekar R., Durairaj S., Madhaiyan P. “Biochemical Changes in Medicinal Plant Leaves as a Biomarker of Pollution”, *Research J. Pharm. and Tech.* 6(5) May 2013, 537-543.
6. Yoghinni Manogaran., Dharshini Jagadeesan., Kamal Narain., Usha Kumari., Preetha Anand., Shalini Shanmugavelu., “Antibacterial Response of Cinnamomum iners Leaves Extract and Cinnamic Acid Derivative against Pathogens that Triggers Perimplantitis”, *Research Journal of Pharmacy and Technology* 2023, 16(3),1491-0.
7. Klowden MJ., “Blood, sex, and the mosquito”, *Bioscience*. 1995 May 1,45(5),326-31.
8. Abiy, E., Gebre-Michael., T., Balkew., “Repellent efficacy of DEET, MyggA, neem (*Azadirachta indica*) oil and chinaberry (*Melia azedarach*) oil against *Anopheles arabiensis*, the principal malaria vector in Ethiopia”, *Malar J* 14, 187 (2015).
9. Madhumita M., Guha P., Nag A., “Bio-actives of betel leaf (*Piper betle* L.): A comprehensive review on extraction, isolation, characterization, and biological activity”, *Phytother Res.* 2020 Oct,34(10),2609-2627.
10. Waziri M., Suleiman JS., “Physicochemical Properties and Antimicrobial Activity of Evaporated Extract of Cow Dung Against Some Pathogens”, *J Sci Res.* 2012,5 (1),135–41.