

**HERBAL COCKROACH REPELLENT INCENSE STICKS****B. Babji Naik\*, Chinnaram Renuka, Jonna Thanu Sriya, Meda Uday Kiran and Dulla Yaswanth Balaji**

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**B. Babji Naik**Department of Pharmaceutics,  
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Research -Autonomous, Kr Palli  
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515721.**ABSTRACT**

A cockroach is an insect which has the nature of transmitting various bacteria that cause several human health hazards. In this study we are interested in developing a nature-based cockroach repellent which doesn't have a negative impact on human health. Hence the present research work based on literature of cockroach repellents. This work focuses on understanding cockroach repellents, identifying the existing types and advantages of such repellents through a literature review. The synthetic cockroach repellents that are available on the market consist of boric acid, pyrethrins which cause irritations like coughing, sneezing, allergic reactions and respiratory disorders to humans. The cockroach repellents are available in various forms like sprays and glues. So, the present study was carried out to formulate cockroach repellent incense sticks using herbals like neem oil, eucalyptus oil, lavender oil, Peppermint oil, etc., The poly herbal cockroach repellents are made by hand rolling method. The solid formulation containing binders and additives are rolled in the form of incense sticks are potent. Safe with more duration of time and less cost.

**KEYWORDS:** Cockroach, Herbal incense sticks, Repellents, Fumigation.**INTRODUCTION**

Cockroaches are resilient insects belonging to the order Blattidae, existing for over 300, million years and found worldwide in diverse habitats.<sup>[1]</sup> Common species include German, American, Oriental, and brown-banded cockroaches. Cockroaches are primarily nocturnal and omnivorous, feeding on decaying matter and organic materials, posing health risks through contamination. They could contaminate food and surfaces with bacteria, pathogens, and allergens, potentially causing food poisoning, allergies, or asthma in some individuals.<sup>[2]</sup>

**Habitats**

Some of the common habitats where cockroaches were found are

- Urban area
- Residential buildings
- Restaurants and Food Service Establishments
- Sewers and drains
- Outdoor environments.<sup>[3]</sup>

**Herbal repellents**

On the other hand, herbal repellents are gaining the attraction of consumers as they were found to be safer and more abundant. These repellents include and listed the traditional practice there are Peppermint oil, eucalyptus oil, neem oil, lavender oil, which effectively keep cockroaches.<sup>[4]</sup>

**Advantages of herbal repellents**

- They are chemical-free and do not cause toxic actions on the nervous system, unlike artificial chemicals.
- Petroleum-containing repellents may cause skin inflammations and allergic reactions, whereas herbal ones are devoid of these
- The essential oils have the additional advantage of relaxing body muscles.
- Most natural pest repellents contain aromatic oils that give off a pleasant smell. (E.g., Lavender and eucalyptus).
- These are alcohol-free.
- There is no harm for children.
- These are eco-friendly.<sup>[5]</sup>

The information regarding past work done on natural repellents of cockroach were described in Table 1.

**Table 1: Past work done on cockroach repellants from nature.**

Plant name	Scientific name	Family	Plant part used	Chemical constituents	Reference
Neem	<i>Azadiracta indica</i>	Meliaceae	leaves	Azadiractin, nimbine, nibandioli, quercetin, ascorbic acid, n-hexaconazole, $\beta$ -sitosterol	[6]
Peppermint	<i>Mentha piperita</i>	Labiatae	Whole plant	Menthol, menthyl acetate, cineole, limonene, flavonoids, tannins, menthone	[7]
Eucalyptus	<i>Eucalyptus Kochi</i>	Myrtaceous	leaves	Eucalyptol, cymene, citronellal, thujene, eugenol	[8]
Lavender	<i>Lavandula angustifolia</i>	Lamiaceae	Flowers	Linalool, linalyl acetate, geraniol, Lavandula	[8]
Rosemary	<i>Salvia Rosmarinus</i>	Lamiaceae	Leaves	Rosmarinic acid, caffeic acid, urosolic acid, carnosic acid	[9]
Lemon grass	<i>Cymbopogan flexuous</i>	Poaceae	Leaves	Limonene, myrcene, neral, citral, terpinolene, geraniol, terpinol	[10]
Mari gold	<i>Calendula officinalis</i>	Asteraceae	Petals	Hydroxy coumarins, carotenoids, murulene, caryophyllene, menthone, carvone, triterpene saponin carotenoids, murulene, caryophyllene, menthone, carvone, triterpene saponin	[11]
Basil	<i>Ocimum basicilium</i>	Lamiaceae	leaves	Methyl cinnamate, linalool, eugenol, methyl chavicol, bergamottin	[12]
Chives	<i>Allium schoenoperasum</i>	Amaryllidaceae	Shoots	Quercetins, isorhamnetin, tri and di glycosides, kaempferol	[13]
Garlic	<i>Allium sativum linn</i>	Liliaceae	Ripen bulb	Allicin, albumin, leucine, methionine, diallyl disulphide, allicin	[14]

**MATERIALS AND METHODS**

The materials used in the preparation of incense sticks were mentioned in Table 2.

**Table 2: Materials used in preparation of herbal incense sticks.**

S.no	Ingredient	Quantity taken
1	Charcoal powder	60%
2	Sawdust	40%
3	Joss powder	q.s

**Fig. 1: Charcoal powder.****Fig. 2: Saw dust.**



**Fig. 3: Joss powder.**



**Fig. 4: Bamboo sticks.**

#### Herbal incense sticks formulation

Steps involved in preparation of incense sticks are

##### Mixing the ingredients

- Combine dry ingredients: In a mixing bowl, combine the charcoal powder, sawdust, and joss powder in the desired ratios.
- Mix thoroughly: Stir the dry ingredients together thoroughly to ensure an even distribution.

**Table 3: Essential oils used for dipping incense sticks.**

S.no.	Essential oils	Quantity taken
1	Neem oil	40%
2	Eucalyptus oil	30%
3	Peppermint oil	20%
4	Lavender oil	10%

##### Shade drying

- The dipped incense sticks will be removed and kept for shade drying for a period of 24 hrs.
- Sun drying will lead to loss of required repellent chemical constituents in incense sticks.

##### Adding water

- Gradually add water: Slowly add water to the dry mixture while stirring continuously. Add water gradually to avoid making the mixture too wet.
- Achieve dough-like consistency: Continue adding water and stirring until the mixture reaches a dough-like consistency. The mixture should be moist enough to hold its shape when molded but not so wet that it becomes sticky.<sup>[15]</sup>

##### Forming the incense sticks

- Forming the sticks: Take a portion of the dough mixture and roll it into a cylindrical shape around the bamboo stick. Apply gentle pressure to ensure the mixture adheres to the stick uniformly.

##### Drying

- Air drying: Place the formed incense sticks on a drying rack or a flat surface in a well-ventilated area. Allow them to air dry completely. This process may take several days, depending on the humidity levels.<sup>[16]</sup>

##### Preparation of essential oil mixture

- In a small mixing bowl, combine the essential oils: lavender, eucalyptus, peppermint, and neem according to the specific proportions.

##### Dipping the incense sticks

- Dip each prepared incense stick into the essential oil mixture, ensuring that they are fully coated.
- Dip for about 24 hours and rotate the sticks several times to ensure thorough coverage.

The essential oils used, and quantities taken are given in Table 3.

##### Storage

- Once dry, store the cockroach-repellent incense sticks in an airtight container or zip-lock bags to preserve their potency.
- Label the container or bags clearly to indicate that they are Herbal Cockroach Repellent Incense Sticks.



**Fig. 5: Prepared incense sticks.**

### EVALUATION OF INCENSE STICKS

The evaluation is performed to determine the repellence activity of incense sticks on the cockroaches. This will be performed in 2 conditions.

**Closed condition:** The cockroach is placed in a closed environment allowing sufficient air supply and ignited incense sticks are placed in the closed chamber and observed for the cockroach fatality.

The closed arrangement is prepared by using a cardboard box of measurement 65cm X 42cm X 36cm (length X width X height).

That is closed 5 sides except one side which is covered with a transparent sheet and used for introduction of cockroach and incense sticks during evaluation.

**Open condition:** the cockroaches are placed in the open area of limit and the lightened incense sticks are placed in the area and leave the cockroaches exposed to the fumigation. Note the time taken for the death of cockroaches.

For this open condition evaluation, a room of 6feet X 4feet X 10feet (length X width X height) measurement that should be without any ventilation, the cockroaches will be released after placing incense sticks. The door should be closed without any gaps to prevent roaches coming out of the room.<sup>[17]</sup>

### RESULTS AND DISCUSSION

The herbal incense sticks showed that the closed condition is more effective on cockroaches rather than the opened condition as the concentration of fumes is very high in closed condition. The fumes containing various constituents of essential oils used will enter the respiratory tract of cockroaches and causes difficulty in breathing by blocking the tract. Then also inhibits the ability of reproduction in cockroaches. As the change in formulation of incense sticks the fumigation will be

changed. In closed condition the time taken for the cockroach death was found to be 4 hours.

Whereas in open condition due to more air supply the fumes concentration will be less and it takes more time for the cockroach death. As the area increases the no. of incense sticks to be used also increases for more efficacy. The time taken for the cockroach's death in open condition was found to be 6 hours.

The essential concentration also plays a key role in this process, the greater the concentration the more the mortality rate of roaches. When used in household environments 3 incense sticks should be used for effective repellence of cockroaches.

The cockroaches were spreading various diseases towards humans and that leads to various health hazards. These cockroaches prefer to habituate in moist and dark areas. These are nocturnal so they search for food during night times and move around kitchen areas and groceries their usage leads to infections. To prevent that many synthetic repellents are being used to kill roaches. Along with repellence effect some side effects will be faced during usage. The synthetic repellents like permethrin, imiprothrin, boric acid, pyrethroids, pyrethrins etc. These shows various side effects like skin itching, redness, numbness, nausea, vomiting, nasal discharge, skin rash, headache, nervousness, eye and nose irritations. In other hand pyrethrins cause lifetime breathing problems if inhaled or entered our eyes. The ingredients used in synthetic repellents will harm children and pets too. The pyrethrins will accumulate as fat in the body and affect the central nervous system in humans. The aerosol pesticides contain poisons which will enter the body.

Herbal incense sticks are attracting consumers as these are eco-friendly, aromatic and do not show any side effects. But the rate of action is slow when compared to synthetic repellents. These natural incense sticks contain various essential oils like lavender, neem, eucalyptus, and peppermint oils which show repellency activity not

only against cockroaches but also shows on some insects and mosquitoes. Especially the aromatic properties of Lavender and Eucalyptus oils gives a pleasant odor. These herbal incense sticks would not cause any harm to children and pets.

### CONCLUSION

The conclusion about herbal cockroach repellents is multifaceted. While herbal remedies have been used for centuries and are often perceived as safe and environmentally friendly alternatives to chemical pesticides, their effectiveness in repelling cockroaches can vary.

Some herbal ingredients, such as peppermint oil, neem oil, eucalyptus oil and lavender oil have shown promise in repelling cockroaches due to their strong odors that deter these pests.

However, it's essential to note that the efficacy of herbal repellents is consistent across all situations and environments. Factors such as the concentration of active ingredients, the species of cockroach, and the severity of infestation can influence their effectiveness. Additionally, while herbal repellents may deter cockroaches, they will eliminate them entirely, especially in cases of severe infestations. These incense sticks show the same results after a storage period of 6 months, expected the same result up to 1 year.

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