

Formulation, Development and Evaluation of Mosquito and Insect Repellent Natural Fragrant Body Powder

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ABSTRACT

Aim: To develop and formulate the mosquito and insect repellent along with cosmetic purposes.**Methods:** Ingredients include Talc, Kaolin, Arrowroot powder, Calcium carbonate, Lemon grass oil, Tea tree oil, Chrysanthemum flower extract, Citrus peel extract, Flower distillate and Rosemary oil. Physical evaluation, moisture content, particle size determination, angle of repose, bulk density, tapped density, pH determination and microbial studies are the evaluation parameters included in this study.**Results:** All the evaluation parameters are conducted on the powder for assessment and the results showed that the pH of the powder is 9.1 which was within the accepted range. The particles size was in the range of 10-58 μm which creates a sooty action upon application and the angle of repose is 23⁰ which indicate the flow property was excellent. The bulk density was about 1,452 kg/m^3 and tapped density was 5gm/ml which were present within the range. The weight of powder on loss of drying was 0.5 gm which indicates that the powder was free of moisture and the anti-microbial activity of the powder showed that it is highly effective against *E. coli*, *S. aureus* and moderately effective on *P. aeruginosa*.**Conclusion:** This cosmetic formulation showed that it was found to be stable and can act as an effective mosquito and insect repellent.© 2025 Published by Universal Episteme Publications. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)

Introduction

The mosquitoes and the insects are slowly developing the resistance towards mosquito coils and liquid insect repellents etc. These creatures are developing strategies towards our solutions in order to sustain themselves and there is a need to develop the products with herbals to protect ourselves.

Fragrant powders are the only cosmetics that have been used since the 20th century and have been used by both rural and urban people. They are easily accessible to everyone because it contains readily available herbal remedies and natural ingredients, making it affordable for everyone [1]. We are all aware of the primary causes of allergies and infections where the mosquitoes and insects will play a major role. The mosquitoes act as carriers and insects release certain fluids, which creates the allergies and infections. In case of insects, the acid fly is actually called the Nairobi fly, in recent times invaded into India for the last two years, as it is native to South Africa. This releases the chemical called pederin,

which is a corrosive fluid that causes blisters and irritation when it gets in contact with skin [2].

The latest innovation includes an insect and mosquito repellent as its primary component and other useful substances for additive purposes, which will aid in preventing such complications. Upon application of the powder to the skin, it will serve as a protective barrier against mosquito and insect stings. Additionally, it contains a natural fragrance and can be used as a cosmetic [3]. Hence, we decided and aimed to develop and formulate the mosquito and insect repellent along with cosmetic purposes in this study.

Material and Methods

Lemon grass oil: It is scientifically known as "Cymbopogon citratus," is a herb from the Poaceae family that has been used as a natural mosquito repellent for millennia. It contains an essential oil, specifically citronella oil, which masks human smells that attract mosquitos, such as carbon dioxide and lactic acid.

Chrysanthemum: Chrysanthemum (Dendranthema grandiflorum) that belongs to the family of Asteraceae, and it has been recognized for its insect repellent action. It contains a natural group of compounds called pyrethrins, which are responsible for their activity. These compounds can get extracted from ethanol.

Table 1: Composition

Ingredients	Purpose
Talc	Absorbs moisture
Kaolin	Soothing agent
Arrowroot powder	Anti-inflammatory
Calcium carbonate	Opacifying agent
Lemon grass oil	Mosquito repellent
Tea tree oil	Anti-acne agent
Chrysanthemum flower extract	Insect repellent
Citrus peel extract	Detoxifying agent
Flower distillate	Fragrance
Rosemary oil	Preservative

Method of preparation

In this study, we weighed all the required ingredients and kept them aside. Sieved all the powders (with sieve no. 500) for attaining fine powder. Now, half of the amount of talc and kaolin was taken and added to the blender to mix it uniformly. Next, arrowroot powder and calcium carbonate were added to the above mixture. After uniform mixing, the essential oils were sprayed onto the mixture. Then, the chrysanthemum extract and citrus peel extract were added to the above mixture. Finally, the fragrance and preservatives were added to the mixture and allowed it to mix for 5 min. After completion of mixing, take the mixture out of the blender and allowed it to dry in a shaded and closed area. After completely drying of the mixture, again we sieved the complex mixture into a fine powder in order to reduce the formation of lumps.

Evaluation Parameters

Physical evaluation: The physical evaluation includes colour, odour and texture of the powder.

Moisture content: About 1 gm of powder was taken and placed it on a China plate. Initially, calculated the weight of the China dish and powder and placed it in a hot air oven at 1000°C for 30-45 minutes. After drying, we took out and cooled it. Then, we computed the China dish along with the powder and the weight difference was considered as the moisture loss.

Particle size determination: We determined the particle size of the powder using the sieve method, which involved sieving the powder for 10-20 minutes.

Angle of repose: A funnel was taken and positioned it at a specific height on a burette stand. A graph paper was placed beneath the funnel on the tail. The powder's angle of repose was calculated by slowly pouring it through a funnel. The circumference of the powder pile was sketched with a pencil without disturbing the pile, and the radius and angle of repose are determined using the following formula.

$$\text{Angle of repose} = \tan^{-1} (h/r)$$

Bulk density: The bulk density was calculated by taking measuring cylinder and weighed it. The empty weight of the cylinder was noted. The cylinder was filled with powder and weighed it. Then, we compared the difference and computed the bulk density using the formula provided.

$$\text{Bulk density} = \text{mass} / \text{volume}$$

Taped density: The taped density was calculated by filling a 100 ml measuring cylinder with powder and tapping it 500-1000 times and repeated the process numerous times.

pH determination: For this, we created a powder suspension by dissolving 1 gm in 100 ml of distilled water, then measured the pH of the suspension using a digital pH meter and recorded the results.

Microbial studies: The microbial research determined the powder's antibacterial properties. It is critical to investigate the antimicrobial activity since the powder was placed on the skin; if it is ineffective against germs, significant bacterial infections may develop. So, in order to assist the powder, we focused on E. coli, Staphylococcus aureus and P. aeruginosa as they are the most frequent infections.

The antibacterial activity was evaluated using nutrient agar medium. Prepared the agar media by placing it in a conical flask and added a loopful of bacteria before transferring it to a petri plate to solidify. Now, the powder solution was added and diffused in an incubator for 2-5 days. The antibacterial activity of the powder was determined by measuring the zone of inhibition in mm [4-6].



Fig.1. Weight of the Powder before Drying

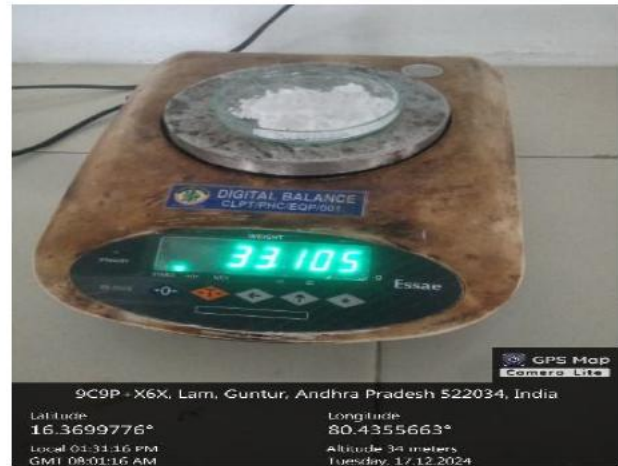


Fig.2. Weight of the Powder after Drying



Fig.3. Weight of the Empty Cylinder



Fig.4. Weight of the Cylinder + Powder

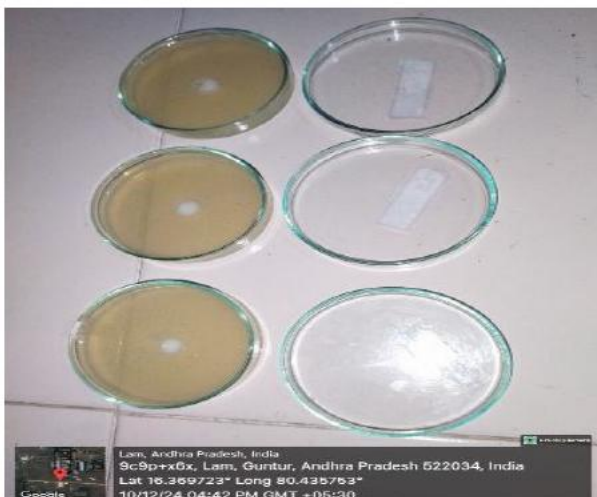


Fig.5. Preparation of Cups on Solid Bacterial Nutrient Medium for Inoculation of Sample



Fig 6. Zone of Inhibition of Bacteria against Powder Suspension

Results and Discussion

All the evaluation parameters were conducted on powder for assessment and the results showed that the pH of the powder is 9.1. which was within the accepted range. The particles size was in the range of 10-58 μm which creates a sooty action upon application and the angle of repose is 23° which indicates that the flow property was excellent. The bulk density was about $1,452 \text{ kg/m}^3$ and tapped density was 5gm/ml which were present within the range. The weight of powder on loss of drying was 0.5 gm which indicates that the powder was free of moisture and the anti-microbial activity of powder shows that it was highly effective against *E. coli*, *S. aureus* and moderately effective on *P. aeruginosa*.

Table 2: Physical Evaluation

Parameters	Observation
Colour	White
Odour	Perfumed
Texture	Smooth

Table 3: Powder Characteristics and other Evaluation

Parameters

Evaluation test	Observation
Moisture content	0.5
Particle size	10-58 μm
Angle of repose	23°
Bulk density	1.452 kg/m^3
Tapped density	5gm/ml
pH determination	9.1

Table 4: Microbial Evaluation

Organism	50 $\mu\text{g/ml}$	100 $\mu\text{g/ml}$	50 mg/ml	100 mg/gm
<i>E. coli</i>	+	++	+++	+++
<i>S. aureus</i>	++	++	++	+++
<i>P. aeruginosa</i>	++	++	++	+++

Highly active [+++]: 7-9 mm; Moderately active [++]: 4-6 mm; Slightly active [+]: 3mm; Inactive [-]: less than 3mm

Conclusion

In this study, this formulation showed that it was observed to be stable and it can act as a cosmetic, mosquito and insect repellent. The anti-microbial activity of this powder showed highly effective against *E. coli*, *S. aureus* and moderately effective on *P. Aeruginosa*.

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