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FORMULATION AND EVALUATION OF HERBAL MOSQUITO REPELLENT CREAM

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ABSTRACT

In contrast to synthetic chemicals, herbal formulations combine herbs in precise amounts to provide medicinal or cosmetic benefits with fewer adverse effects. Herbal creams are semisolid emulsions that fall into the oil-in-water (O/W) or water-in-oil (W/O) categories. They are used for a variety of applications, including skin care and mosquito repellent. Millions of people worldwide are impacted by mosquitoes, including species like Aedes and Culex, which are important carriers of diseases like dengue and malaria. Repellents, which might be synthetic or natural, are frequently used in effective mosquito control. Natural options like those using Neem, Tulsi and Lemongrass extracts, are being explored as safer, biodegradable alternatives to synthetic chemicals like DEET. Herbal mosquito repellent cream offer a promising solution to prevent mosquito bites and associated diseases, minimizing health risks compared to conventional repellents. The aim of the study was to develop an herbal mosquito repellent cream using Neem extract and essential oils from Clove, Tulsi, and Lemongrass. The plant profiles include Neem known for its antimicrobial and mosquito repellent properties. Lemongrass used for its insecticidal and antimicrobial benefits, Tulsi valued for its antibacterial and immunomodulatory effects and Clove recognized for its insecticidal properties. The extraction methods involved maceration for

Neem and Clevenger apparatus for the Essential oils. The cream was prepared using a water-in-oil emulsion method with ingredients including Beeswax, liquid paraffin, and coconut oil in the oil phase and glycerin, borax and rose water in the aqueous phase. Three formulations (F1, F2, and F3) were tested, with F1 showing the best stability, no phase separation, and no irritancy, making it suitable for further use.

KEYWORDS: Mosquito repellent, Ocimum Sanctum, formulation, cream, repellent action.

INTRODUCTION

In order to provide specific nutritional or cosmetic benefits for the diagnosis, treatment, or mitigation of human or animal sickness, herbal formulations are dosage forms that comprise one or more raw or processed herbs in preset proportions. Since herbal preparations are manufactured by extracting the active components from the biological sources of herbal plants, they are said to be more effective and to have less side effects than any other synthetic chemical treatments.[1] Numerous diseases spread by mosquitoes have been documented in our nation. Each year, mosquito-borne diseases that are mostly spread by these arthropod vectors affect millions of people worldwide. Because they are known to carry a number of viruses, bacteria, and protozoa that can cause fatal illnesses including dengue, chikungunya, malaria, yellow fever, and Japanese encephalitis, Aedes, Culex, and Anopheles mosquitoes represent a serious threat to public health.[2] Every day, more people use insect repellents due to the increasing prevalence of mosquito-borne illnesses. In the nation, repellents such vaporizing mats, sprays, mosquito coils, and liquid vaporizers are often employed. Numerous plant extracts have been shown to be highly effective in keeping mosquitoes away and to have mosquitocidal properties against mosquito vectors. Neem extract can effectively suppress mosquito populations in place of synthetic insecticides by killing Aedes pupae at very low doses. The most popular natural repellents in the world are made by Cymbopogon.[2-3] Additionally, clove oil has insecticidal and repellant properties against a wide variety of pest species. As a result, three distinct plant leaves tulsi, lemongrass, and neem leaves have been chosen for use in this study as the best environmentally friendly method of controlling mosquitoes. A chemical that is applied to skin, clothes, or other surfaces to deter mosquitoes from landing there is known as a mosquito repellent. Their active component serves as the sole means of keeping mosquitoes away by obstructing their ability to detect lactic acid and carbon dioxide, which are generated when a person perspires. The aim of present study was to formulate a herbal cream using Neem extract, Essential oils

of Clove, Tulsi & Lemongrass as active ingredients for a potent mosquito repellent property. Mosquitoes are found in tropical regions and comprise over 3500 different species. The primary mosquito species that act as vectors for numerous illnesses include Anopheles (filariasis, malaria), Culex (Japanese encephalitis, West Nile, chikungunya), and Aedes (chikungunya, dengue fever. Both during the day and at night, mosquitoes are terrible. As the weather drops, they start looking for warm spots because they live outside. The mosquito season typically begins in the summer and lasts into the fall. Mosquito bites can be more than just bothersome or uncomfortable. It does not kill mosquitoes, but it can cause illness and, in extreme situations, even death. Repellents work by making people less appealing to mosquitoes, which lessens the likelihood that they will scent humans. When used duly, natural oil painting- grounded mosquito repellents are safe for grown-ups and children over the age of two months, according to the Environmental Protection Agency. There are multitudinous repellents on the request moment that effectively shield off mosquitoes but are bad for your health since they contain the poisonous chemical.[4-10]

EXTRACTIN

To make the ethanol plant extract, 50g of the powder was put in a container, defatted with petroleum ether, and then macerated with 250ml of 95% (v/v) ethanol. After vigorous stirring, the mixture was left for a full day. After filtering the mixture, 100 milliliters of ethanol were added to the residue, which was then left for an additional day. This procedure was repeated three times to obtain the crude drug extract, after which the combined filtrate was evaporated. The obtained crude drug extract weighed five grams in total.[10]

EXTRACTION OF LEMONGRASS, TULSI AND CLOVE BY CLEVENGER APPARATUS

Weighed quantity of materials (lemongrass: 30g, clove & tulsi: 50g) was taken in a sample flask and required quantity of water was added (lemongrass & tulsi: 300ml, clove; 250ml). In order to run the flow water in a condenser, I connected the flask to the Clevenger device and turned on the tap. Heating on a heating mantle and adjusted the temperature so that extra water returned to the flask and oil with water vapors entered the graded distillate receiving tube. After eight hours of continuous heating, the assembly was cooled, the water was extracted from the distillate receiving tube, the oil was transferred into a rotary evaporator to eliminate any remaining water, and the flask was cooled in a desiccators. It was precisely weighed after cooling.[3]

FORMULATION OF HERBAL MOSQUITO REPELLENT CREAM

In a china dish, beeswax (2.8g), liquid paraffin, and all other oil phase materials, such as coconut oil, were added and melted in a water bath at a temperature of roughly 70°C. At the same time, borax was added to water phases, such as rose water and glycerin, and heated to 70 ^{0}C. Just before combining the two phases, 0.5g of neem extract and essential oils including tulsi, clove, and lemongrass were added to the oil phase. After that, the water phase is quickly stirred into the oil phase. To guarantee that the sample was evenly mixed, the mixes were thoroughly agitated. The resulting cream was then moved into an appropriate container when the temperature fell to 30 ^{o}C.

Table 1: working formula of three formulations.

INGREDIENTS			
Beeswax	3.8g	2.9g	3.7g
Liquid paraffin	12ml	9ml	9ml
Clove oil	1ml	1ml	1ml
Tulsi oil	0.5ml	1ml	1ml
Lemongrass	0.5ml	1ml	1ml
Glycerin	2ml	3ml	--
Coconut oil	2ml	2.5ml	4ml
Borax	0.2g	0.5g	0.6g
Neem extract	0.5g	0.5g	0.1g
Rose water	2.5ml	3.6ml	4.6ml

EVALUATION

PHYSICAL PROPERTIES

The color, odor, and appearance of the cream were examined.

DILUTION TEST

A small amount of cream was taken in two test tubes one of the test tubes is diluted with water and other with oily medium. Both of these test tubes were shaken for few minutes and then observed to determine the type of emulsion.

PRESENCE OF FOREIGN PARTICLES

A little amount of herbal cream is taken and spread on a glass slide and which is then observed against light.

CAGE TEST

The effectiveness of mosquito repellent cream was tested commonly by the cage test method. By performing the experiment, the effectiveness of mosquito against the repellent cream can

be found out. While conducting the experiment mosquitoes are placed inside the cage. Mosquitoes needed for the experiment are caught using net while biting the biting the humans. Repellent formulation was applied and rubbed evenly. Then arm is inserted into the cage and exposed to mosquitoes. The number of mosquitoes that land and probe is observed and recorded.

STABILITY STUDIES

PHASE SEPARTION

The cream to be tested was placed in a closed container away from sunlight and the phase separation was observed every 24 hours for 30 days.[8]

pH DETERMINATION

The pH meter was calibrated. The pH measurement of the cream was carried out by dissolving 0.5g of cream in 50ml of distilled water and the measurement was done using a digital pH meter.[8]

IRRITANCY TEST

The cream was applied to the specific area on the dorsal surface of the left hand and the time was noted. Irritancy, edema, erythema is tested at regular interval for 24 hours.

HOMOGENEITY: Homogeneity of the formulated cream was evaluated by visual appearance and touch. The consistency is determined by examining its softness, greasiness, and stickiness.[11]

SPREADABILITY

A small sample of cream was taken in a glass slide and it was compressed between two glass slides to uniform thickness. The time in which the upper glass slide moved over the lower slide is calculated as measure of spreadability.[11]

$S = d^2 \times \pi/4$

Where, S=spreading area depending on mass (mm^2)

d = spreading area diameter (mm)

RESULT AND DISCUSSION

EXTRACTION OF DRUG

Extract of herbal drugs were obtained as per their respective method. All extract were stored properly in tightly closed container.

EVALUATION PARAMETERS

1. ORGANOLEPTICEVALUATIONS

The physical properties and all formulated cream were evaluated by its color, odor, and texture. The results are tabulated below:

Table 2: Organoleptic evaluation of cream.

S. No	Formulation	Color	Odor	Texture
1	F1	Olive green	Characteristic	Smooth
2	F2	Olive green	Characteristic	Smooth
3	F3	Olive green	Characteristic	Hard

PRESENCEOFFOREIGNPARTICLE

All the prepared formulations are spread on glass slide and which is tested against light and no foreign particle was observed.

2. TYPE OF EMULSION

Tests were performed to determine the type of emulsion and were found to be water in oil emulsion.

3. CAGE TEST METHOD

The formulated cream was evaluated for mosquito repellent activity using the cage test and from the observation we can conclude that the cream shows repellent action against mosquito by not biting the forearm.

STABILITY STUDIES

1. PHASESEPARATIONANALYSISOFPREPAREDFORMULATION

Table 3: Phase separation test.

S. No	Formulation	OBSERVATION
1	F1	Nophase separation
2	F2	Phase separation
3	F3	Phase separation

From this it was concluded that F1 shows no phase separation while F2 and F3 formulation is unstable. Therefore, F1 is used for the further studies.

2. **IRRITANCYTEST**

Table 4: Irritancytest

S. No	Formulation	Observation
1	F1	No irritancy

3. HOMOGENEITY

Homogeneityofformulatedherbalcreamwasevaluatedbyvisualappearanceandtouch.Thevisual appearance and touch were good.

4. SPREADABILITY

Thepreparedherbalcreamformulationwastestedforspreadabilityandtheareacoveredbythefixeda mount of cream was found to be 9.62mm^2.

5. pH DETERMINATION

The pH of the formulated herbal cream was found to be 5.7

CONCLUSION

The most dangerous diseases that harm humans are spread by mosquitoes, which are also the most unsettling bloodsucking creatures that have an impact on people's health. Plant-based repellents are often easily biodegradable and do not pose a risk of toxicity to humans. The harmful effects of synthetic mosquito repellant on human health and the environment can be lessened by encouraging the use of more natural repellents. Azadirachtin, an active chemical found in neem extract, has the potential to function as a natural pesticide. Herbal formulations are growing demand in the world market. The formulated cream was evaluated for parameters like spread ability, stability, pH, and irritancy. The appearance of the cream was good and has a smooth texture. Irritancy test was conducted and show no sign of redness and itching which indicate that the cream was safe for topical application. The current investigation has demonstrated the strong mosquito-repelling properties of neem leaves and the oils of clove, tulsi, and lemongrass. It is true that the combination of different essential oils influences the efficacy of repellents, even if the history of DEET and other well-known repellents like dimethyl phthalate is well-established. The current study suggests that natural, non-DEET formulations can be used as insect repellents. The outcomes are encouraging and favorable. The formulation with the highest repellent efficacy was F3. Ultimately, it was found that oil extracts may be used to repel mosquitoes and could be developed into a commercial product like an insect-repelling lotion or essence stick.

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