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Formulation and Evaluation of Herbal Mosquito Cream From Grapefruit Peel Extract

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ABSTRACT

Mosquito-borne infections, such as malaria and dengue, are a profound cause of illness and death in many countries. Personal protection against mosquitoes using repellents could be a useful method to reduce or prevent transmission of mosquito-borne diseases. However, due to the objectionable side effects and toxicity associated with synthetic repellents, an urge for developing natural repellents has come forward. The peel of citrus fruits has been reported to have excellent mosquito repellent properties. Hence, we aimed to develop a non-toxic, stable, and consistent cream using the peel extract of *Citrus Paradisi*. The cream was prepared and characterized based on sensory evaluation and consistency in terms of texture, greasiness, consistency, and pH. The present study concluded that the formulated mosquito repellent cream using essential oil is natural, safe, effective, and usable for the skin to afford mosquito repellent action. This herbal cream offers a promising alternative to marketed synthetic products.

Keywords: Malaria, Toxicity, Natural Repellents, *Citrus Paradisi*.

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INTRODUCTION

Mosquitoes such as Aedes, Anopheles, and Culex are a serious threat to public health as they are known vectors for various protozoans, viruses, and bacteria, which result in many life-threatening diseases such as malaria, filariasis, yellow fever, Japanese encephalitis, chikungunya, and dengue[1]. These diseases can cause serious illness and death. These vectors are considered a major obstacle to socioeconomic development in developing countries, particularly in the tropical region. Despite considerable efforts in recent years to control vector-borne diseases, malaria alone produces 250 million cases per year and 800,000 deaths, including 85% of children under five years of age. Therefore, the prevention of mosquitoes could be better than the cure of vector-borne diseases. Hence, the use of mosquito repellents is strongly recommended[2].

Mosquito repellents are products applied to the skin or other surfaces to deter insects from landing or climbing on that surface[3]. They act as the first line of defence against epidemics of vector-borne diseases. The current market is flooded with chemical-based mosquito repellents, which have been proven to be harmful and poisonous by most researchers. Synthetic mosquito repellents used for the control of vectors cause irreversible damage to ecosystems and are non-degradable in nature[4]. The use of biologically active plant materials with anti-mosquitocidal properties has attracted attention in recent years because of their biodegradable nature and relative safety to humans and other non-target organisms in the environment. The interest in plant-based repellents has been revived because of the development of resistance, cross-resistance, and possible toxicity hazards associated with synthetic insecticides, and their cost is also increasing[5]. Hence, the present study aimed to formulate and evaluate a safe and effective herbal mosquito repellent cream from the fruit peel extract of *Citrus Paradisi* using a natural approach.

MATERIALS AND METHOD

Citrus Paradisi (Grapefruit) fruits were collected from a local market in Mangalore. Stearic Acid, Ceto stearyl alcohol, Propyl paraben, Glycerine, Propylene glycol, Potassium hydroxide and Methyl paraben were obtained from Yarrow Chem Products, Mumbai.

Method of Preparation of *Citrus Paradisi* peel extract: [6,7]

Fresh grapefruit was collected, peeled, chopped with a knife, and soaked in distilled water. Then the peels were shade dried at room temperature for 10 to 15 days and ground to powder by using electrical blender. The powdered mass was macerated with 1 L of 96% ethanol sequentially for 72 h and filtered through Whatman number 4 filter paper. The extracts were concentrated at a reduced temperature using a rotary vacuum evaporator.

Method of Preparation of Herbal Mosquito Repellent Cream: [8]

The ingredients (except the crude extract) were placed in a china dish and melted in a water bath. The contents were immediately transferred into a mortar and triturated until a homogeneous semi-solid mass was formed. The crude extract was then mixed with the melted solution and stirred vigorously. Then it was cooled. After cooling, cream was formed.

Table 1: Formulation Chart [1]

Ingredients	Weight%
Oil Phase	
Stearic Acid	9
Cetostearyl alcohol	2
Citric fruit peel Extract	10
Propyl paraben	0.05
Aqueous phase	
Glycerine	5
Propylene glycol	2.5
Potassium hydroxide	0.7
Methyl paraben	0.1
Distilled water	q.s

Evaluation of the Herbal Mosquito Repellent Cream:

1. The appearance, color, odor, irritability, consistency, and washability of the prepared cream were visually examined.
2. **pH Determination[10]**: A distinct amount of cream (100 mg) was weighed, diluted with distilled water, and mixed well. The pH of the cream was measured using a digital pH meter. The measurements were performed in triplicate.
3. **Spreadability [10]:** A total of 500 mg of the cream was sandwiched between two slides. A weight of 100 gm was placed on the upper slide. The weight was removed, and the excess formulation was removed. The lower slide was fixed on the board of the apparatus, and the upper slide was fixed with a non-flexible string to which a 20 g load was applied. The time taken by the upper slide to slip off was noted.
4. **Viscosity [9]:** It was determined using a Brookfield viscometer at room temperature.
5. **Patch Test[8]**: Approximately 1 g of the cream to be tested was applied to an area of 1sq. m. of the skin behind the ear. Control patches (known brand) was also applied. The site of the patch was inspected after 24 h.
6. **Evaluation of mosquito repellent activity[3]**: Mosquito repellent activity was assessed using a homemade test cage, as described in the American Society for Testing and Materials (ASTM) standard E951-83 Laboratory testing of non-commercial mosquito repellent formulation on the skin. The formulation to be tested was applied to the skin of the volunteers. The mosquitoes used in this experiment were caught using a net while

biting humans between 7pm and 10pm. Mosquitoes were starved for 24 h, and 20 mosquitoes were placed in each cage. The test timing was between 6 and 9pm since mosquitoes typically bite at night. The skin that had been rubbed with 1 g of the formulated herbal repellent was exposed to the cage, and the number of mosquitoes that aligned or bit the arm was recorded every minute for 5 min. Mosquitoes were given an over one-hour interval.

RESULTS AND DISCUSSION:

Organoleptic characteristics and evaluation of the formulation:

The formulated cream was evaluated using physicochemical tests to observe its properties. The prepared cream was pale yellow and exhibited good characteristics in terms of appearance, color, homogeneity, and consistency.

Table 3: Physicochemical tests of the prepared herbal mosquito repellent cream

Evaluation test	Results
Appearance	Good
Colour	Pale yellow
Odour	Fruity
Spreadability	Good
Irritability	No Irritation
Homogeneity	No lumps
Consistency	Moderately thick
Washability	Good

Table 4: Various Evaluation Parameters of the prepared cream:

Formulation	Herbal Mosquito Repellent cream
pH*	6.4±0.3
Viscosity (cps)	57000
Spreadability* (g.cm/sec)	5.5± 0.25

*Data expressed as a mean ±SD, n=3

The pH of the cream was determined using a digital pH meter. The results showed that the formulation had a desired pH that is compatible with the skin. The viscosity was determined using a Brookfield viscometer, and the value was found to be within the acceptable range. The spreadability value indicated that the prepared cream spread easily on the skin surface.

Table 5: Patch test

Formulation/Hypersensitivity	6 hours	12 hours	24 hours
Control Patches (Brand)	No reaction	No reaction	No reaction
Herbal Mosquito Repellent cream	No reaction	No reaction	No reaction

Patch test was conducted on voluntary individuals and both the branded cream and the prepared herbal cream showed no hypersensitivity reactions upto 24 hours**.**

Table 6: Mosquito repellent activity:

Number of mosquitos tested		No action seen		Mosquito migrate away		Mosquito Paralyzed		Remark
No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**High Repellency activity**
20	100	03	15	07	35	10	50	

After conducting the mosquito repellant activity of the herbal cream, it was concluded that the prepared cream was found to have high repellant activity against mosquitoes**.**

CONCLUSION:

Investigation on mosquito repellents is growing every day due to the high demand for protection against mosquito-borne diseases. Recently, there has been widespread search for a safe and environmentally friendly product to decrease transmission of diseases caused by mosquitoes. The present study investigates the repellent activity of a non-toxic citrus fruit peel extract formulation against mosquitoes. Safe and effective mosquito repellent cream formulation was successfully developed. The developed product was characterized in terms of pH, spreadability and Viscosity. The overall study substantiates the development of non-toxic topical cream formulation and has been recognized as a promising tool to strategically minimize mosquito bites and to decrease the mosquito-borne disease incidents. However, this study is not conclusive, further study on repellency testing using different strains of mosquito should be carried out. Non-target toxicity testing, stability testing or self-life assessment is essential for more conclusive results.

REFERENCES:

1. Yadav NP, Rai VK, Mishra N, Sinha P, Bawankule DU, Pal A *et al.*, A novel approach for development and characterization of effective mosquito repellent cream formulation containing citronella oil. BioMed Res Int. 2014; 1(1): 1-11.
2. Lavialle-Defaix C, Apaire-Marchais V, Legros C, Pennetier C, Mohamed A, Licznar P *et al.*, *Anopheles gambiae* mosquito isolated neurons: A new biological model for optimizing insecticide/repellent efficacy. J Neurosci Methods. 2011; 200(1): 68-73.
3. Banik B, Barman J, Dutta MP, Bhowmick N. Development and evaluation of herbal mosquito repellent Cream. Res J Pharm Technol. 2021; 14(12): 6262-68.
4. Prabasheela B, Nandhini V, Sakithya V, Ara N, Nagalakshmi R. Formulation Of Novel Herbal Cream As Mosquito Repellent. Int J Pharm Res. 2018; 10(3): 88 -96.
5. Chavare SD, Karande KM, Aloorkar NH, Kulkarni AS, Majumdar SH. Formulation of novel herbal mosquito repellent: A new approach in antimalarial management. Int J Med Pharm Res. 2015; 1(1): 78-85.

6. Murugan K, Mahesh Kumar P, Kovendan K, Amerasan D, Subrmaniam J, Hwang JS. Larvicidal, pupicidal, repellent and adulticidal activity of *Citrus sinensis* orange peel extract against *Anopheles stephensi, Aedes aegypti* and *Culex quinquefasciatus* (Diptera: Culicidae). Parasitol Res. 2012; 111(4): 1757-69.
7. Alrasheid AA, Mohamed AA, Mohieldin EG, Eldein KI, Yassin LF, Widdatallh MO *et al.*, Phytochemical investigation and assessment of antimicrobial, anti-inflammatory and antioxidant activities of Sudanese *Citrus paradisi* peel extract. J Pharmacogn Phytotherapy. 2019; 11(1): 1-8.
8. Mendhekar SY, Bodke NN, Thorat PB, Jadhav SL, Gaikwad DD. Formulation and evaluation of polyherbal mosquito repellent creams (ointment type) with extra skin nourishing impact. World J Pharm Pharm Sci. 2017; 6(12): 1731-42.
9. Gupta DK, Gupta R, Tiwari A. Novel Formulation and Evaluation of Poly Herbal Mosquito Repellent. Res Sq. 2022; 1(1): 1-20.
10. Chavan P, Kalshetti M, Navindgikar N. Formulation And Evaluation Of Polyherbal Cream. Int J Curr Pharm Res. 2020; 12(4): 75-77.
11. Arsene MM, Podoprigora IV, Davares AK, Razan M, Das MS, Senyagin AN. Antibacterial activity of grapefruit peel extracts and green-synthesized silver nanoparticles. Vet World. 2021; 14(5): 1330-41.
12. Castro VL, Alanon ME, Rodríguez-Robledo V, Pérez-Coello MS, Hermosín-Gutierrez I, Díaz-Maroto MC *et al*., Bioactive flavonoids, antioxidant behaviour, and cytoprotective effects of dried grapefruit peels (*Citrus paradisi* Macf.). Oxid Med Cell Longev. 2016; 2016: 8915729.
13. Davkhar SS, Bhandari AS, Akolkar SA. Formulation and Evaluation of Multipurpose Herbal Cream. Sys Rev Pharm 2023; 14(1): 23-28.
14. Navindgikar N, Kamalapurkar KA, Chavan PS. Formulation and evaluation of multipurpose herbal cream. Int J Curr Pharm Res. 2020; 12(3): 25-30.
15. Ranasinghe MS, Arambewela L, Samarasinghe S. Development of herbal mosquito repellent formulations. Int J Pharm Sci Res. 2016; 7(9): 3643-48.
16. Agrawal S, Haldankar N, Jadhav A. Formulation of natural mosquito repellent. Int J Adv Res Ideas and Innov Tech. 2018; 4(1): 11-7.
17. Hazarika H, Krishnatreyya H, Tyagi V, Islam J, Gogoi N, Goyary D *et al.*, The fabrication and assessment of mosquito repellent cream for outdoor protection. Sci Rep. 2022; 12(1): 2180 - 81.

18. Naseem S, Malik MF, Munir T. Mosquito management: A review. J Entomol Zool Stud. 2016; 4(5): 73-9.
19. Boanyah GY, Brenyah RC. The combined efficacy of neem (*Azardirachta indica*) seed oil and orange (*Citrus sinensis*) peel oil cream as a mosquito repellent. Adv Res Rev. 2022; 12(1): 57-67.
20. Kalita B, Bora S, Sharma AK. Plant essential oils as mosquito repellent-a review. Int. J. Res. Dev. Pharm. Life Sci. 2013; 3(1): 741-47.
21. Uppala PK, Radhadevi JB, Kumar KA. Formulation and Evaluation of Mosquito Repellent Activity of Polyherbal Formulations of Extraction of *Annona squamosa*, *Azadirachta indica*, *Eucalyptus alba*, *Citrus aurantium* and *Rosa indica* and their phytochemical analysis. Asian J Pharm Tech. 2017; 7(2): 91-02.