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Production of eco-friendly multipurpose cleaner with mosquito-repelling properties

Authors: Namratha P. M.[#], Haji Mohamed A., Mohamed Suhail S., Pavilan S. and Ramya M.

[#]Corresponding Author: Namratha P. M.

Assistant professor (Biotechnology),

Shri Shakthi Institute of Engineering and Technology, Coimbatore 62

Author affiliations

Authors name	Designations and Highest degree(s)	Email address	Affiliations
Namratha P. M.[1]	Assistant professor (Biotechnology), M. Tech Biotechnology	namrathapm@mail.com ORCID:0009-0002-9257-779X	Shri Shakthi Institute of Engineering and Technology, Coimbatore
Haji Mohamed A.	Student: B. Tech Biotechnology	hajiaathif@gmail.com	Shri Shakthi Institute of Engineering and Technology, Coimbatore
Pavilan S.	Student: B. Tech Biotechnology	pavilan143@gmail.com	Shri Shakthi Institute of Engineering and Technology, Coimbatore
Mohammed Suhail S.	Student: B. Tech Biotechnology	suhailsmart2000@gmail.com	Shri Shakthi Institute of Engineering and Technology, Coimbatore
Ramya M.	Student: B. Tech Biotechnology	ramyamanthaiyappan@gmail.com	Shri Shakthi Institute of Engineering and Technology, Coimbatore

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Abstract

Eco-friendly multipurpose cleaners are classified as safe for the environment anddo not emit any toxic fumes. The original definition of cleaning is using a plant-based product that is easily biodegradable after joining waste streams. Eco-friendly cleaners rely on non-hazardous solvents such as vinegar, lemon, baking soda, aromatic oils, and water. This makes them safe for humans, animals, and the environment. The objective of the study is to develop a multipurpose eco-friendly cleaner with mosquito-repelling properties. Soapnuts, vinegar, citronella,neem, camphor, eucalyptus oil, and peppermint oil are the ingredients used for developing the cleaner. Soap nuts are dried fruit of the Chinese Soapberry. Theyare natural surfactants used in laundry and are reusable. Vinegar and essential oils are natural disinfectants. Citronella, neem, camphor, and peppermint have mosquito-repelling properties. The work plan is to collect eco-friendly components for cleaning and components with mosquito-repelling properties. Optimization of components (Placket Burman design) and testing the efficacy of the product developed as a floor cleaner and as a mosquito repellent. Becoming more eco-friendly will allow you to preserve the planet for future generations, limit your exposure to harmful substances, and make informed decisions. Small changes in your daily life are enough to make a difference.

Introduction:

Cleaner

In our fast-paced and dynamic world, the importance of maintaining a clean and healthy environment cannot be overstated. Whether at home, in the workplace, or in public spaces, cleanliness plays a crucial role in promoting well-being, productivity, and a positive overall atmosphere. Cleaners play a pivotal role in maintaining hygienic and organized spaces, contributing not only to the well-being of individuals but also to the overall health of our planet. Cleaners nowadays contain harsh chemicals and artificial fragrances, which lead to health risks, environment impact, etc. So natural cleaner is a substitute for chemical cleaners. Natural floor cleaner is designed to break down dirt, grime, and stains without leaving behind harmful residues. The refreshing scent is derived from essential oils, providing a sensorial experience that harmonizes with nature. Natural cleaners redefine the cleaning experience, bringing together effectiveness, safety, and a commitment to the environment. Join us on a journey to discover the transformative potential of natural floor cleaners, where the pursuit of cleanliness aligns seamlessly with a greener, healthier lifestyle.

Soapnut

Soapnuts, also known as soapberries, are nature's versatile and sustainable gift for cleaning and laundry purposes. Derived from the Sapindus genus of trees, these small, round berries contain natural saponins, a type of organic detergent. The magic of soapnuts lies in their ability to produce a mild yet effective soap when in contact with water. This natural soap is gentle on fabrics, making soapnuts an excellent choice for those with sensitive skin. Moreover, their cultivation and usage contribute to sustainable practices, as they are biodegradable and have a minimal environmental impact compared to synthetic detergents. Soapnuts as a floor cleaner mark a harmonious blend of tradition and modern sustainability in the realm of household cleaning. Bid farewell to harsh chemicals and artificial fragrances. Embrace the simplicity of soapnuts as they transform your cleaning routine. From hardwood to tile, soapnut floor cleaners offer a natural touch that is safe, sustainable, and effective.

Fig 1: Soap nut

Citronella

The citronella plant is a group of aromatic herbs known for its strong citrus fragrance, which is thought to repel mosquitoes and other insects. While there are several plants with the common name "citronella," the most commonly referred to as Citronella winterianus, also known as Citronella grass. Citronella refers to a type of plant and its essential oil, both of which are commonly used for their distinct fragrance and insect-repelling properties. It is cultivated for the production of citronella oil, which is derived from the plant's leaves. The plant has tall stems and a citrus-like aroma, giving it its name.

Fig 2: Citronella

Neem

Neem is a tree that is native to India and has been used for centuries in traditional medicine. The leaves, bark, and oil of the neem tree have many medicinal properties, including anti-inflammatory, antibacterial, and antifungal properties. Neem oil is also a natural mosquito repellent. There is some scientific evidence to support the use of neem oil as a mosquito repellent. Neem floor cleaners harness the disinfecting and pest-repelling properties of neem oil. These cleaners are often safe for pets and children, though always check the label and dilute as instructed.

Fig 3: Neem

Camphor

Camphor is a white, crystalline substance with a strong aroma. It is obtained from the wood of the camphor tree (Cinnamomum camphora) or synthesized from turpentine oil. Camphor has been used for various purposes for centuries, and it has both medicinal and industrial applications. Camphor is known for its insect-repelling properties. It is sometimes used in mothballs or added to insect-repellent formulations to keep insects away. Camphor has been used in traditional medicine systems in different cultures for various purposes, including its use in rituals and religious ceremonies.

Fig 4: Camphor

Pink Salt

"Pink salt" typically refers to Himalayan salt, a type of rock salt that is mined from the Salt Range mountains in the Punjab region of Pakistan. It gets its distinctive pink color from trace minerals, such as iron and magnesium, present in the salt. Himalayan salt is primarily composed of sodium chloride, but it also contains trace amounts of minerals like potassium, magnesium, and calcium. These minerals contribute to the salt's pink color and provide some additional nutritional content. Pink salt can help absorb and neutralize odors. Place a bowl of Himalayan pink salt in areas where you want to reduce or eliminate unwanted smells.

Fig 5: Pink Salt

Mint Leaves

Mint leaves come from the mint plant, which is a popular herb known for its refreshing aroma and flavor. There are several varieties of mint, with some of the most common being peppermint (Mentha × piperita) and spearmint (Mentha spicata). Mint leaves are widely used in culinary, medicinal, and cosmetic applications. The aroma of mint is known to repel certain insects. Some people plant mint around their homes or use mint-infused sprays to keep insects away.

Fig 6: Mint Leaves

Essential Oils

Essential oils can be a great addition to homemade floor cleaners, providing a pleasant fragrance and potential additional cleaning properties. When using essential oils for a floor cleaner, it's important to choose oils with antibacterial, antiviral, or antimicrobial properties. Essential oils like neem oil, tea tree, lavender oil, etc., are known for their antibacterial, antiviral, and antifungal properties and also add a fresh, clean scent to the cleaner.

Fig 7: Lavender Oil

Fig 8: Tea Tree Oil

Mosquito Repellant

In the persistent battle against mosquitoes, a natural and effective solution emerges a mosquito repellent designed to protect without compromising your well-being or the environment. Enter the realm of

mosquito repellents crafted from natural ingredients, where the power of nature becomes the guardian of your well-being. End to harsh chemicals and introduce a formula that harnesses the potency of essential oils, and botanical extracts like neem, camphor, and other natural deterrents. Imagine a formula that blends essential oils known for their mosquito-repelling properties. Bid farewell to the sticky residues and pungent odors of conventional repellents as you embrace a more pleasant and natural solution.

Multipurpose Floor Cleaner

Cleanliness with multipurpose floor cleaner, designed to simplify your cleaning routine and elevate your living spaces. This all-in-one solution is crafted to meet the diverse needs of modern households, offering a dynamic approach to floor maintenance that goes beyond mere cleanliness. Imagine a floor cleaner that effortlessly tackles dirt, kills mosquitoes, tackles grime, and spills on various surfaces from hardwood and tiles to laminate and more. The multipurpose formula is specially formulated to adapt to different flooring materials, providing a consistent and effective cleaning every time. Multipurpose floor cleaners don't just clean; they also leave behind a refreshing scent that transforms your living spaces into a haven of freshness. Multipurpose floor cleaner also kills mosquitoes which is the main aim of a multipurpose floor cleaner. Infused with thoughtfully chosen fragrances, the afterglow of cleanliness becomes a delightful experience for everyone in your home.

Materials and Methods:

Soapnut, neem leaf, neem oil, camphor, peppermint, pink salt, lecithin, distilled water.

Methods

Selection of components:

Select components that exhibit mosquito-repellent and antimicrobial properties. Neem leaf, Neem oil, camphor, Soapnut, peppermint, and pink salt are the components selected to produce mosquito-repellent multipurpose floor cleaners. Soapnut is selected for its foaming properties. Neem oil and Neem leaves are selected for their antibacterial properties and mosquito-repellent properties. Peppermint is selected for its antibiotic properties and fragrance. Camphor is used for its fragrance and antifungal properties.

Optimizing the components using the Plackett-Burman method:

Soapnut water is prepared by boiling Soapnut in 250 mL distilled water. Then the boiled water is stirred with softened soapnut and filtered.40 mL of this soapnut water is taken into a 100 mL beaker. Components are added into these test tubes in different compositions and different combinations. Optimization of these components is done using the Plackett-Burman method.

Test mosquito repellent property:

Mosquito larvae are collected and incubated to breed mosquitoes. The mixture of components is tested against the grown mosquitos to test mosquito-repellent properties. Mosquito-repellent property is tested by observing using the eye and finding the reduction in the population of mosquitoes before and after the use of floor cleaner.

Making cleaner:

Floor cleaner is prepared by using the results of placket Burman optimization and mosquito repellent test. The floor cleaner is tested for its antimicrobial property and cleaning properties. The floor cleaner is tested whether it can be used for multiple uses.

Flowchart

Selection of components
↓
Collection of components
↓
Preparation of detergent using soapnut
↓
Optimizing the collected components Using Plackett-Burman design
↓
Testing antimicrobial resistivity
↓
Making the floor cleaner
↓
Grow the mosquito larvae
↓
Test the mosquito repellent by prepared cleaner

Results

Preparation Of Soapnut Extract

Soap nuts are soaked in distilled water and boiled until they are soft and are stirred well after boiling. The soap nuts are then filtered and the water is separated for further procedure

Fig 9: Preparation Of Soapnut Extract

Preparation of Components

In the soap nut extract, components such as Camphor, Neem extract, Pink salt, and Peppermint extract are added to the soap nut solution to the required and different compositions and mixed to form solutions. These solutions are kept in beakers, which are named A, B, C, etc.

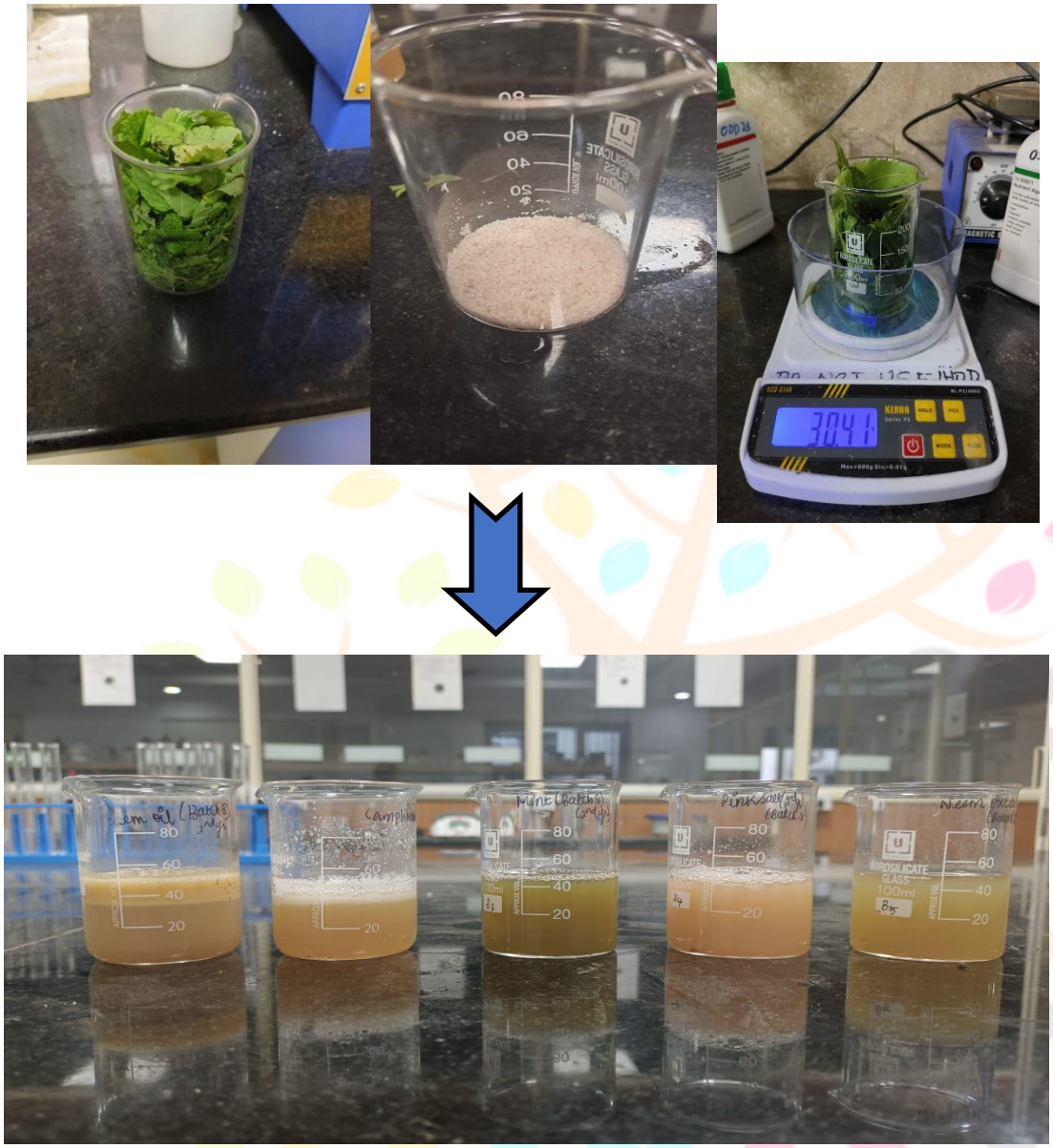
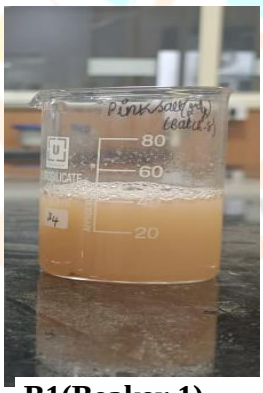


Fig 10: Preparation of Components

Optimization of components

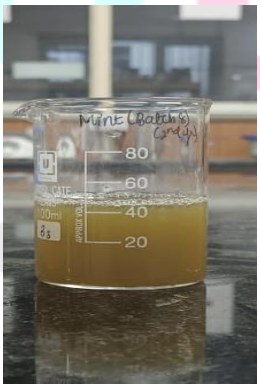
The components produced are then optimized using the Plackett-Burman design, through which we know which components have good mosquito-repellent properties as well as good cleaning properties.

PLACKETT-BURMAN DESIGN						
Components	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**
Soapnut	+	+	+	+	+	+
Citronella	+	-	+	-	+	-
Neem	+	+	-	+	-	+
Neem oil	+	-	+	-	+	-
Peppermint	+	+	-	+	-	+
Pink salt	+	-	+	-	+	-
Essential oil	+	+	+	+	+	+



B1(Beaker 1)

Fig 11: Optimization of components



After optimization, Beaker 1 and Beaker 3 had the best mosquito repelling as well as good cleaning properties. Beaker 1 had all the components (neem extract, neem oil, citronella, pink salt, and peppermint oil), and it had very good mosquito-repelling properties due to the presence of citronella and neem extract. Beaker 3 had citronella, pink salt, and neem oil in it, and it was the next best formulation that had good mosquito-repellent properties. Both soapnut and essential oils are used in both beakers.

Mosquito Repellent Test

Mosquito larvae were collected and grown into mosquitoes, and their population was noted. The floor cleaner was then used to clean a dirty floor to check its cleaning ability. After the cleaner was applied, the time taken for the cleaner to kill mosquitoes and its efficiency was noted.

Fig 12: Mosquito repelling test

Discussion

The formulation of an eco-friendly multipurpose cleaner with mosquito-repelling properties is a promising venture that combines sustainability and functionality. Firstly, incorporating natural ingredients such as citronella, neem, or lemongrass essential oils can enhance the cleaner's mosquito-repelling capabilities while maintaining an environmentally friendly profile. Discussing the eco-friendly aspect, emphasis should be placed on avoiding harmful chemicals like phthalates, parabens, and synthetic fragrances. Opting for biodegradable and non-toxic ingredients ensures that the cleaner is gentle on the environment and safe for use in various settings. Exploring the formulation process, the synergy between cleaning agents and mosquito-repelling elements should be balanced to create an effective and versatile product.

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Author Information

Sri Shakthi Institute of Engineering and Technology, Coimbatore 641062, Tamilnadu, India

Author Contributions

Namratha P M has performed the literature search, compilation, drafting, preparation or writing, and revision of the manuscript. Haji Mohamed A., Mohamed Suhail S., Pavilan S. and Ramya M. experimented.

Corresponding author

Correspondence to Namratha P. M.

Ethics declarations

Conflicts of interest

The authors declare no conflict of interest.

Ethics approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Consent to participate and consent to the publication

Not applicable

Data availability

Data availability and sharing do not apply to this article as no datasets were generated or analyzed during the study.

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