



## Study on Various Types of Organic Extracts used as Mosquito Repellent in Garments

S. Karthi Krishna<sup>1</sup>, K. Aparna Sri<sup>2</sup>

<sup>1</sup>Aditya Birla Fashion and Retail Limited, Bengaluru, Karnataka, India

<sup>2</sup>Department of Fashion Technology, Sona College of Technology, Salem, Tamilnadu, India.

### ABSTRACT:

In this article we have discussed about the mosquito repellent finishes using organic extracts. We have discussed about finish preparatory process and application procedures in detail. Finally, we concluded by discussing about advantages of using each organic finishes.

**KEYWORDS:** Mosquito, Organic extract, Essential oils, Finishing, Eco-friendly.

### 1. INTRODUCTION:

Organic mosquito repellent garments are becoming increasingly popular as people become more aware of the potential health risks associated with using chemical pesticides. Organic mosquito repellent garments use a blend of natural ingredients to repel mosquitoes, such as essential oils and botanical extracts. These garments are designed to be comfortable and lightweight, while providing long-lasting protection from mosquito-borne illnesses.

Organic mosquito repellent garments are made from materials such as cotton, polyester, and spandex, which are treated with a blend of natural ingredients such as essential oils and plant extracts. These ingredients are designed to repel mosquitoes without the use of harsh chemicals. The blend of natural ingredients is designed to create a barrier between the skin and the insect, making it difficult for mosquitoes to land and bite.



*Figure – 1* Mosquito repellent textiles

These garments are designed to be comfortable and lightweight, allowing for easy movement and breathability. They are also designed to be durable and long-lasting, providing protection against mosquito bites for up to 70 washings.

They are non-toxic, non-irritating, and will not harm the environment. In addition, these garments are designed to be comfortable and lightweight, making them ideal for everyday wear. Organic mosquito repellent garments are also an affordable alternative to chemical pesticides, providing long-lasting protection against mosquito-borne illnesses without the use of harsh chemicals.

Organic mosquito repellent garments are an effective and safe way to protect against mosquito bites. They provide long-lasting protection without the use of harsh chemicals, and they are comfortable and lightweight. These garments are becoming increasingly popular due to their effectiveness and safety, and are an affordable alternative to chemical pesticides.

---

## 2. MATERIALS AND METHODS:

### 2.1 Citronella Oil Finish:

#### 2.1.1 About Citronella Plant:

Citronella (*Cymbopogon nardus*) is a type of grass native to Asia. It is cultivated for its aromatic oil which is used in perfumes, soaps, mosquito repellents, and candles. The plant grows up to 2 meters tall and has long, thin leaves with a lemony scent. The oil is extracted from the leaves by steam distillation. It has a fresh, sweet, and citrusy aroma. Citronella has antiseptic and anti-inflammatory properties, making it a popular ingredient in natural skincare products. It is also known to be a natural insect repellent, and can be used in both candles and sprays.



*Figure – 2* Citronella plant

#### 2.1.2 Ingredients:

- 2 tablespoons of dried and powdered Citronella leaves
- 2 cups of hot water

#### 2.1.3 Dye preparatory process:

1. Place the dried point leaves in a heat-safe bowl.
2. Pour the hot water over the leaves and let steep for 5 minutes.
3. Strain the mixture and discard the leaves.
4. Pour the liquid into a pot and bring to a boil.
5. Reduce the heat to low and simmer for 15 minutes.
6. Remove the pot from the heat and let cool for 10 minutes.
7. Strain the liquid once more and discard any solids.
8. The dye is now ready to use.

#### 2.1.4 Dyeing Methodology:

1. Prepare the dye bath by soaking the fabric in a mixture of 2 tablespoons of salt and 2 cups of cold water.
2. Take the prepared dye bath and add the point extract.
3. Heat the mixture to a simmer and add the fabric.
4. Simmer the fabric in the dye bath for 1-2 hours, stirring occasionally.
5. Remove the fabric from the dye bath and rinse with cold water until the water runs clear.
6. Hang the fabric to dry.

## **2.2 Rosemary Extract Finish:**

### **2.2.1 About Rosemary Plant:**

Rosemary (*Rosmarinus officinalis*) is an aromatic evergreen shrub with needle-like leaves and a woody stem. It's an herb that's used in many cultures for a variety of purposes. Rosemary is native to the Mediterranean region, but it grows in many other places around the world, typically in warm climates.

Rosemary has a strong, pine-like scent and flavour, and it can be used to season meats, vegetables, and other dishes. It also has many medicinal properties. Rosemary contains essential oils, which are believed to have anti-inflammatory, antioxidant, and antispasmodic properties. It's also used as a natural remedy to help with digestive issues, headaches, and joint pain.

Rosemary is easy to grow and can be propagated from cuttings, divisions, and seeds. It's a drought-tolerant plant, so it doesn't require a lot of water. It prefers full sun and well-drained soil, and it's best planted in raised beds or containers.

Rosemary is a great addition to any garden, and it's an attractive plant that adds texture and color to a landscape. Its beautiful evergreen foliage and bright flowers make it a great choice for any garden. Plus, its versatile flavour and medicinal properties make it a great addition to any kitchen.



*Figure -3* Rosemary plant

### **2.2.2 Ingredients:**

- 1/4 cup of dried rosemary
- 2 tablespoons of white vinegar
- 1/4 cup of hot water

### **2.2.3 Dye preparatory process:**

1. Place the rosemary in a bowl and add the white vinegar and hot water.
2. Stir the mixture until all the ingredients are combined.
3. Allow the mixture to steep for about 20 minutes.
4. Strain the mixture and discard the rosemary.
5. Use the rosemary extract as a dye to finish the fabric.

### **2.2.4 Dyeing Methodology:**

1. Pre-treat the fabric with a mild detergent, and rinse thoroughly.
2. Mix 1 part rosemary extract with 4 parts of water in a spray bottle, and shake the bottle until the mixture is fully blended.
3. Spray the fabric with the rosemary extract and water mixture, and let it sit for 10 to 15 minutes.
4. Rinse the fabric with cold water.
5. Hang the fabric outdoors to dry, or tumble dry on low heat.
6. Once the fabric is dry, apply a light coat of fabric protector spray.

## **2.3 NEEM EXTRACT FINISH:**

### **2.3.1. About Neem:**

Neem is a tropical evergreen tree native to India and Southeast Asia. It is a large, fast-growing tree that can reach heights of up to 60 feet. The bark, leaves, and seeds of the neem tree are used in traditional medicine and in organic farming. Neem oil is extracted from the seeds of the tree and has antifungal, antibacterial, and anti-inflammatory properties. It is used to treat a variety of skin conditions, including acne, eczema, and psoriasis. Neem leaves are also used to make an herbal tea that has been used to treat fever, digestive issues, and skin conditions. Neem has many other beneficial properties, such as repelling insects, promoting healthy hair, and supporting the immune system.



*Figure – 4* Neem Tree

### **2.3.2. Ingredients:**

- Neem leaves
- Boiling water
- Natural dye material (e.g., turmeric, onion skin, cochineal, walnut husks, etc.)

### **2.3.3 Dye preparatory process:**

1. Place neem leaves in a pot with enough boiling water to cover them.
2. Simmer for 30 minutes, stirring occasionally.
3. Strain the liquid and discard the leaves.
4. Add your chosen natural dye material to the liquid and simmer for an additional 30 minutes.
5. Strain and discard the solids.
6. Use the liquid to dye your fabric.

### **2.3.4 Dyeing Methodology:**

1. Soak the fabric in a mixture of neem extract and warm water.
2. Allow the fabric to sit in the solution for 30 minutes.
3. Rinse the fabric with cold water.
4. Wring out the excess water.
5. Place the fabric in a dyeing pot with a solution of warm water and a dyeing agent.
6. Simmer the fabric in the dyeing solution over low heat for 1-2 hours.
7. Remove the fabric and rinse thoroughly with cold water.
8. Allow the fabric to air dry.

## **2.4 EUCALYPTUS EXTRACT FINISH:**

### **2.4.1 About Eucalyptus plant:**

Eucalyptus is a flowering tree native to Australia and the nearby islands, and is also found in many other parts of the world. It is a fast-growing evergreen tree that is widely used in landscaping, as a timber source, and for its medicinal properties. Eucalyptus has been used for centuries as a medicinal herb, and is believed to have natural antiseptic, antibacterial, and anti-inflammatory properties. The leaves are often used in teas, tinctures, and ointments for a variety of medical conditions. The wood of the tree is also used for construction, furniture, and fuel.



*Figure – 5 Eucalyptus Tree*

### **2.4.2 Ingredients:**

- Eucalyptus extract (2 tablespoons)
- Water (1 cup)
- White vinegar (2 tablespoons)
- Baking soda (1 teaspoon)

### **2.4.3 Dye preparatory process:**

1. In a pot, add the eucalyptus extract and 1 cup of water.
2. Bring the mixture to a boil and simmer for 10 minutes.
3. Remove the pot from heat and add the white vinegar and baking soda. Stir until combined.
4. Let the mixture cool and strain into a jar.

### **2.4.4 Dyeing Methodology:**

1. Pre-soak the fabric in warm water for 15-20 minutes.
2. Squeeze out any excess water and place the fabric in the dye bath.
3. Heat the dye bath to a simmer and add the pre-soaked fabric.
4. Simmer the fabric for 30-45 minutes, stirring occasionally.
5. Remove the fabric from the dye bath and rinse in cold water until the water runs clear.
6. Hang the fabric to dry.

## **2.5 TEA TREE EXTRACT FINISH:**

### **2.5.1 About Tea Tree:**

Tea tree (*Melaleuca alternifolia*) is a flowering plant native to Australia. It is a member of the Myrtaceae family, which includes eucalyptus, clove, and myrtle. Tea tree oil is extracted from the leaves and twigs of the plant and is known for its antiseptic and healing properties. It has been used for centuries by Indigenous Australians for its medicinal uses, and today it is widely used in skin care and aromatherapy. Tea tree oil can be used to treat and prevent a variety of skin conditions, such as acne, athlete's foot, psoriasis, and warts. It is also used to reduce inflammation and redness and can be used as an antifungal and antibacterial agent. Tea tree oil can be used to treat a variety of ailments, from colds and coughs to cuts and scrapes. It is an incredibly versatile plant and can be used in a variety of ways.



*Figure – 6* Tea Tree

### **2.5.2 Ingredients:**

- 2 tablespoons of Tea Tree Essential Oil
- 1 cup of Distilled Water
- 1 teaspoon of Witch Hazel

### **2.5.2 Dyeing Methodology:**

1. In a bowl, mix together the essential oil, distilled water, and witch hazel.
2. Stir the ingredients until they are blended together.
3. Place the mixture in a spray bottle and shake well before each use.
4. Spray the mixture onto any fabric or surface to use as a natural dye.

---

## **3. RESULTS AND DISCUSSION:**

### **3.1 Advantages of using Citronella Oil Finish:**

1. *Natural:* Citronella oil is an all-natural product derived from plants, making it a safer alternative to chemical-based repellents.
2. *Long-Lasting:* Citronella oil has a long-lasting effect, providing protection for up to several hours.
3. *Easy to Use:* Citronella oil can be applied directly to skin or clothing, making it a quick and easy way to protect yourself from mosquitoes.
4. *Non-Toxic:* Citronella oil is non-toxic and does not contain any harsh chemicals, making it safe for use around children and pets.
5. *Cost-Effective:* Citronella oil is relatively inexpensive when compared to other mosquito repellents.
6. *Environmentally-Friendly:* Citronella oil is biodegradable and does not harm the environment.
7. *Pleasant Scent:* Citronella oil has a pleasant, lemony smell that is not overpowering.
8. *Portable:* Citronella oil is available in a variety of forms, including sprays, candles, and lotions, making it easy to take with you on the go.
9. *Repels Other Insects:* Citronella oil can also be used to repel other insects, such as flies and gnats.
10. *Versatile:* Citronella oil can be used indoors or outdoors and can also be used on clothing, furniture, and other surfaces.

### **3.2 Advantages of using Rosemary Extract Finish:**

1. Rosemary Extract Finish is a natural and safe mosquito repellent. It is non-toxic and does not contain any harmful chemicals like DEET or permethrin.
2. Rosemary Extract Finish is effective at repelling mosquitoes and other insects, as well as other types of pests.
3. Rosemary Extract Finish is easy to apply and has a pleasant scent that is not overpowering.
4. Rosemary Extract Finish is affordable and can be used on a variety of surfaces, including furniture, clothing, and bedding.
5. Rosemary Extract Finish is long-lasting and can last up to two weeks, depending on the environment and frequency of application.
6. Rosemary Extract Finish is safe for use around children and pets.
7. Rosemary Extract Finish is biodegradable and does not harm the environment.

8. Rosemary Extract Finish does not stain fabrics or surfaces.
9. Rosemary Extract Finish is safe for use in organic gardens and does not harm beneficial insects.
10. Rosemary Extract Finish has been proven to be an effective mosquito repellent in numerous studies.

### **3.3 ADVANTAGES OF USING NEEM EXTRACT FINISH:**

1. *Natural and Safe:* Neem extract is a natural insect repellent, so it is safe to use around children and pets. It does not contain any harsh chemicals or synthetic ingredients that may be found in other insect repellents.
2. *Long Lasting:* Neem extract can be applied to clothing, bedding, furniture, and other fabrics to provide long-lasting protection from mosquitoes.
3. *Effective:* Neem extract has been scientifically proven to be effective against a variety of insects, including mosquitoes.
4. *Ease of Use:* Neem extract can be easily applied to fabrics with a spray bottle or brush. It also dries quickly so there is no need to wait for it to dry before wearing the treated fabrics.
5. *Cost-Effective:* Neem extract is a relatively inexpensive insect repellent compared to other chemical alternatives.
6. *Environmentally Friendly:* Neem extract is derived from a natural plant, so it does not contain any harmful chemicals that can be damaging to the environment.
7. *Versatile:* Neem extract can be used on a variety of surfaces, including clothing, furniture, bedding, and other fabrics.
8. *Non-Toxic:* Neem extract is non-toxic and does not cause any skin irritation or other health risks.
9. *Odourless:* Neem extract is odourless, so it does not have a strong smell that can be unpleasant.
10. *Sustainable:* Neem extract is derived from a renewable resource, making it a sustainable insect repellent option.

### **3.4 ADVANTAGES OF USING EUCALYPTUS EXTRACT FINISH:**

1. *Natural:* Eucalyptus extract is a natural repellent, which means it is safe for humans and the environment. It does not contain any harmful chemicals or toxins and is not known to cause any side effects.
2. *Effective:* Eucalyptus extract has been proven to be an effective mosquito repellent. Studies have shown that it can repel up to 95% of mosquitoes.
3. *Long Lasting:* Eucalyptus extract can last up to 4 hours, much longer than other natural repellents. It can be applied to the skin or clothing for maximum protection.
4. *Affordable:* Eucalyptus extract is a very affordable option compared to synthetic chemical repellents. It is also widely available in supermarkets and health stores.
5. *Odourless:* Eucalyptus extract is odourless, making it a great option for people who are sensitive to strong fragrances.
6. *Non-Staining:* Eucalyptus extract does not stain clothes or furniture, making it a great choice for indoors.
7. *Easy to Use:* Eucalyptus extract is easy to use and can be applied directly to the skin or clothing.
8. *Compatible with Sunscreen:* Eucalyptus extract is safe to combine with sunscreen, which helps to provide dual protection from both mosquitoes and UV rays.
9. *Environmentally Friendly:* Eucalyptus extract is an environmentally friendly option that does not contain any synthetic chemicals or toxins.
10. *Repels Other Insects:* Eucalyptus extract can also be used to repel other insects such as ticks, fleas, and flies.

### **3.4 ADVANTAGES OF USING TEA TREE EXTRACT FINISH:**

1. Tea tree extract finish is a natural repellent that is safe to use around children and pets and is non-toxic.
2. It has a pleasant smell and is not as strong as other repellent products.
3. Tea tree extract finish is also effective against other pests such as spiders and ants.
4. It is a cost-effective solution for mosquito repellency, since it can be reapplied as needed.
5. Tea tree extract finish is also a good option for people with sensitive skin, as it is gentle on the skin and does not cause irritation.
6. It is easy to apply and dries quickly.

7. Tea tree extract finish is long-lasting and can provide up to 8 hours of protection.
8. It is environmentally friendly and biodegradable.
9. It is not as messy as other repellents and does not leave behind an oily residue.
10. It is not as harsh on the skin as other products, so it can be used on people of all ages.

---

#### 4. CONCLUSION:

The study of organic extracts as mosquito repellents in garments has shown that many types of natural substances have the potential to act as effective repellents. These include essential oils such as citronella, eucalyptus, and tea tree, as well as plant-based extracts such as neem, garlic, and lemongrass. These natural ingredients have been proven to be effective in repelling mosquitoes, and can provide an alternative to chemical-based repellents. Furthermore, these natural extracts are safe, environmentally friendly, and often more affordable than their chemical counterparts. Overall, this study has demonstrated the potential of organic extracts as mosquito repellents in garments, and suggests that further research should be conducted to explore their efficacy and safety.

#### 5. Reference:

---

1. Anuar, Afa Adeela, and Nurain Yusof. "Methods of imparting mosquito repellent agents and the assessing mosquito repellency on textile." *Fashion and Textiles* 3.1 (2016): 1-14.
2. Xin, J. H., and X. W. Wang. "Insect-repellent textiles." *Engineering of High-Performance Textiles*. Woodhead Publishing, 2018. 335-348.
3. Specos, MM Miró, et al. "Microencapsulated citronella oil for mosquito repellent finishing of cotton textiles." *Transactions of the Royal Society of Tropical Medicine and Hygiene* 104.10 (2010): 653-658.
4. Romi, Roberto, et al. "Bioengineering of a cellulosic fabric for insecticide delivery via grafted cyclodextrin." *Biotechnology progress* 21.6 (2005): 1724-1730.
5. El-Sayed, Ahmed A., et al. "Eco-friendly fabric modification based on AgNPs@ Moringa for mosquito repellent applications." *Cellulose* 27 (2020): 8429-8442.