Filarial Repellent Finish Using Medicinal Plants

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ABSTRACT

The textile sector is facing new challenges in the modern days and every technician is giving the best to face these challenges. The world that would lead us would be astonishingly hi-tech and materialistic. To ensure our security and safety from the future hazards, we need to equally develop the technology for our protection. Protective textiles are among one such smart application of smart technology in textiles. Protective textiles refer to those textiles products which have a functionality of giving protection from something in some or the other sense. Mosquito repellent finished textiles are also a part of protective textiles which help in protection from the species that are prone to cause damage in some or the other manner. Mosquitoes are among the most common and widely distributed insects. It has earned a worldwide reputation as torturers of man and also disease carriers. Mosquitoes are classified as one of the deadliest pests known to man. The activity of mosquitoes is affected by climate, light and temperature. Mosquito repellent textiles is one of the revolutionary ways to advance the textile field by providing the much needed features of driving away mosquitoes, especially in the tropical areas. It protects the human beings from the bite of mosquitoes and there by promising safety from the mosquito borne disease, such as malaria, dengue fever, chicken guina and filaria. Taking all these into considerations the investigator decided to work on mosquito repellent using natural finishing agent on cotton and tencel cotton fabrics.

1. INTRODUCTION

Textiles are developing into interdisciplinary high tech products. It has become an integral part of everyone’s life. Textiles were considered primarily for economical and functional point of view some end users in particular demands on the safety of textiles for the health, says Saraf and Alat (2005). Cotton is a wonderfully versatile and globally important fibre that is used for a vast variety of fibre and food products, says Menezes (2007). Tencel represents the latest generation of cellulose fibres and is the most flexible in terms of where it can be used in the various textile and non-woven application; states Taylor et al. (2009). Finishing completes the fabric’s performance and gives it special functional properties including the final touch; say Schindler and Hauser (2004). According to Bernard (2000) mosquito repellents may be one of the most effective tools for protecting human from vector borne disease. Medicinal plants like Tulasi, Neem, Notchi, Lemon grass, Citronella, Keelanalli (Phyllanthus niruri), Cinnamon, Eucalyptus, Vetiver roots (Vetiveria zizanioides), Turmeric are used for production of mosquito repellent (www.biopatents.com). In order to avoid chemicals for repellent activity, effects were made to find out alternate eco-friendly sources, express Kumaravel and Kantha (2009).

2. MATERIALS AND METHODS

2.1. Selection of fabric

Based on the properties like absorbency, bio-degradable, non-toxic, high strength, non-allergic, cool and softness, 100 per cent cotton and tencel yam were obtained from the local market and were converted into 100 per cent cotton fabric and tencel cotton fabric (50 : 50) respectively.

2.2. Selection of source

Natural finishes have many advantages such as non-toxic, biodegradable, cost effective and availability. Phyllanthus niruri (Keelanalli) leaves and Vetiveria zizanioides (Vetiver roots) were selected as natural finishing agent. This natural finishing agent could not adhere into the fabric directly and require a binder. The easily available source like citric acid was selected as a binder. Extraction of herbal solution was done by ethanolic method.

2.3. Pilot study

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RESEARCH

The pilot study was conducted using two natural finishing agents to optimize the concentration, time and temperature. Several samples of bleached cotton and tencel cotton fabric were taken. The fabric was finished using a natural extract in different concentration, time and temperature. Then it was evaluated both subjectively and objectively and tested for mosquito repellency. Based on the results of the pilot study, the selected natural sources were mixed and natural extracted in 50 : 50 proportion, temperature 80°C and time 90 minutes were taken. Then the finish was applied on the fabric by using padding mangle. The treated fabric was constructed into night dress for adolescent girls. The constructed dress was given to adolescent girls for wear study. The adolescent’s girls were asked to wear the night dress from 6 pm – 6 am for a period of one week. After every wear the garments were washed.

2.4. Evaluation of samples

Evaluation of unfinished and finished sample of cotton and tencel cotton were done for comfort properties and mosquito repellency test. The results of laboratory tests were analyzed statistically.

3. RESULTS AND DISCUSSION

3.1. Drapability

The drapability of unfinished and finished samples of cotton and tencel cotton are presented in Table 1.

**Table 1 Fabric drape**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Sample</th>
<th>Mean co-efficient (%)</th>
<th>Gain / Loss over original</th>
<th>Percentage gain / loss over original</th>
<th>‘F’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>UC</td>
<td>0.4</td>
<td>0.10</td>
<td>21.40</td>
<td>30.3**</td>
</tr>
<tr>
<td>2.</td>
<td>FC</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>UTC</td>
<td>0.5</td>
<td>-0.05</td>
<td>-10.68</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>FTC</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Significant at one per cent level**

The Table 1 represents the drapability of unfinished and finished fabrics. The higher mean value suggested that the higher is the drape of fabric. The cotton finished fabric has increase in drapability when compared to unfinished bleached fabric due to the reaction of the finishing agent. But in tencel cotton finished fabric the drape have decreased due to the reaction of finishing agent. From this table it was significant difference at one per cent level. Thus it could be concluded that fabric drapability was affected by the finish applied on the fabric.

3.2. Fabric Stiffness

The fabric stiffness for the unfinished and finished samples of cotton and tencel cotton are listed below. The above fig.1 shows that the fabric stiffness of the finished cotton and tencel cotton in the wrap shows – 18.5 and – 28.8 per cent loss respectively. From this table that there was no significant difference. Thus it could be concluded that the stiffness of the finished fabric had decreased in warp both cotton and tencel cotton fabric.

**Table 2 Fabric stiffness – weft**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Sample</th>
<th>Mean (inches)</th>
<th>Gain / Loss over original</th>
<th>Percentage gain / loss over original</th>
<th>‘F’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>UC</td>
<td>2.0</td>
<td>- 0.10</td>
<td>- 4.88</td>
<td>4.26**</td>
</tr>
<tr>
<td>2.</td>
<td>FC</td>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>UTC</td>
<td>2.2</td>
<td>- 0.42</td>
<td>- 18.83</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>FTC</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS – Not Significant

The above Table 2 shows that the fabric stiffness of the finished cotton and tencel cotton in the weft shows – 4.88 and – 18.83 per cent loss respectively. From this table that there was no significant difference at both one per cent and five per cent level. Thus it could be concluded that the stiffness of the finished fabric had decreased in weft both cotton and tencel cotton fabric.

3.3. Wicking

The absorbency of unfinished and finished samples of cotton and tencel cotton by wicking test are discussed below.

**Table 3 wetting by wicking**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Sample</th>
<th>Mean Absorbency (cm)</th>
<th>Gain / Loss over original</th>
<th>Percentage gain / loss over original</th>
<th>‘F’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>UC</td>
<td>9.5</td>
<td>- 6.70</td>
<td>- 70.5</td>
<td>28.7**</td>
</tr>
<tr>
<td>2.</td>
<td>FC</td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>UTC</td>
<td>4.6</td>
<td>0.42</td>
<td>9.05</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>FTC</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Significant at one per cent level**

From the above Table 3 that the cotton finished fabric have maximum increase in absorbency of about – 70.5 when compare to untreated bleached fabric. But in tencel cotton finished fabric has less in absorbency when compared to unfinished bleached fabric. From this table that there was a significant difference at one per cent level. Thus it could be concluded that the cotton finished fabric was maximum raise in absorbency than the tencel cotton after finishing.

3.4. Mosquito repellent test

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3.4.1. Cage Test
Cage test are the quick and cost-effective way determines the mosquito-repelling qualities of treated materials. A box of 30 x 30 x 30 cm made out of transparent glasses with 25°C ± 2°C temperature and 60 to 70 per cent humidity was maintained. In the glass box the finished and unfinished fabric was placed. Release 20 mosquitoes in the box and allow it for 2 minutes. Note down the anti-mosquito effectiveness by counting the number of mosquitoes which will rest on the unfinished and finished samples during 2 minutes.

3.4.2. Cone Test
Cone tests another method of found out the mosquito repellent of an insecticide treated textiles. The cone test was conducted with transparent nylon cone shaped filter. The unfinished and finished samples were spread on the table then the filter was kept upside down on the fabric. Then 20 mosquitoes were released in the filter for 2 minutes. The investigator note down number of mosquitoes resting on the fabric and that was noted down.

3.4.3. Wash Durability
Adolescent girls night dress was used for nearly 15 times and washed after every usage. Then the washed garment was evaluated for its mosquito repellency after 5, 10 and 15 washes. After 5 wash the garment shows good mosquito repellency and its effect was reduced gradually by 10 and 15 washes. The wash durability test result revealed that the finished fabrics of cotton and tencel cotton were more effective up to five washes when compared with the unwashed samples, due to the application of finish on the fabric using padding mangle.

4. CONCLUSION
From this study it was concluded that *Phyllanthus niruri* and *Vetiveria zizanioides* were the natural and herbal finishing agent which were applied on the fabric using padding mangle which have given stability of finish on the fabric. The natural finishing agents were eco-friendly bio-degradable, non-toxic, and non-irritant to the skin. It shows good repellent property when applied on the cotton and tencel cotton fabrics were evaluated by cage test, cone test and wear study. The value of fabric weight, fabric thickness, fabric count, strength, elongation, absorbency in both cotton and tencel cotton fabrics were increased. The values of fabric stiffness, drapability, abrasion resistance were decreased due to the finish applied on the fabric. The mosquito repellent of tencel cotton finished fabric showed greater repellency than the finished cotton.

REFERENCES