

Application of organic mosquito repellents finishes on cotton fabric

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■ **ABSTRACT** : As the consumers are now increasingly aware of the hygienic life style, there is a necessity and expectation of a wide range of economical and hygienic textile products. Control of mosquitoes is something of utmost importance in the present day with rising number of mosquito borne illnesses. In this research work, Natural base mosquito repellent was formulated successfully. Natural mosquito repellents fabrics may be one of the most effective tools for protecting human from vector borne diseases. In this direction a research is mainly carried out for the development of mosquito repellent finished cotton fabric using pomegranate peel extract. A series of experiment were conducted to optimize the concentration of pomegranate peel, concentration of pomegranate peel extract, concentration of mordant and dyeing time, on the basis of optical density and mosquito repellency test. After that dyed samples with pomegranate peel were mordanted with different concentration of citric acid for different time and tested for wash durability and mosquito repellency test and it was provides 80 per cent mosquito repellency.

■ **KEY WORDS**: Cotton fabrics, Pomegranate Peel, Wash durability, Mosquito repellency

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Herbal textile forms a tremendous place as one of the most important and useful need in an eco-friendly manner. The world is gradually turning to herbal formulations which are known to be effective against a large repertoire of diseases and ailments. This trend is aimed at safeguarding human health as well as protecting and prolonging life on earth (Gohl and Vilensky, 2003).

Plants are the gift of nature to cure limitless number of diseases among human being. The abundance of plants on the earth surface has led to an increasing interest in the investigation of different extracts obtained from the traditional medicinal plants as potential sources of new

mosquito repellent agent (Raja *et al.*, 2015).

To impart this character a finish of the mosquito repelling agent is given to the textile material. Antimosquito repellent textiles with improved functionality find a variety of applications such as health and hygiene products, specially the garments worn close to the skin and several medical applications, such as infection control and barrier material (Prabha and Raaja (2012 and Satyanarayan and Chandra, 2001). To overcome all these symptomatic problems it is better to use repellants from natural sources over synthetic chemicals. Repellents ideally should have no adverse reactions. Thus, the study is a small step in developing

an eco-friendly natural antimicrobial finish from plant extracts the application.

■ RESEARCH METHODS

The investigation was carried out to optimize the process of natural mosquito repellent dyeing with pomegranate peel.

Collection of materials:

Pomegranate peel:

The peels of the pomegranate were washed in water, dried in shade at room temperature for one week to 10 days. Dried peels were grinded into fine powder form and sieved.

Textile material:

Pure white cotton fabric.

Chemicals:

Methanol for extraction of natural mosquito repellent and copper sulphate, citric acid for mordanting of cotton sample, respectively.

Optimization of variables for mosquito repellents:

Optimization of concentrations (10, 15 and 20g) of natural mosquito repellent done on optical density basis measured through spectrophotometer. Experiments were conducted with concentrations of pomegranate peel.

After optimization, extraction of the pomegranate peel was done by using methanol. This extract solution was further diluted in three concentrations *i.e.*, 40, 50, and 60 per cent and 0.5 per cent concentration copper sulphate was diluted in to one finalized extract solution.

Scoured cotton fabric immersed in different concentrations of natural mosquito repellents. The fabric was dried in the oven. Dyeing time for cotton samples with extract of pomegranate peel were 30, 60 and 90 minutes. Cotton sample were dyed by utilizing these parameters.

Mordanting of dyed mosquito repellent sample:

Dyed cotton samples were mordanted with 5, 10 and 15 per cent concentrations of citric acid and tested for mosquito repellency and wash durability.

Mosquito repellency test:

Prepared dyed samples were tested for mosquito

repellency in mosquito cage box. Cage test is the quick and cost effective way to determine the mosquito repelling qualities of treated materials. A box of 30×30×30 cm made out of transparent glasses with 25⁰ C ±2⁰ C temperature and 60 to 70 per cent humidity was maintained. In the glass box, dyed and unfinished fabrics samples were placed. Release 20 mosquitoes in the box and allow them for 2 minutes. Mosquitoes were deprived of all the nutrition and water for a minimum of 4 hours before exposure. Laboratory tests were performed during daylight hours only and each test was replicated four times. Note down the anti mosquito effectiveness by counting the number of mosquitoes which will rest on the unfinished and dyed samples during 2 minutes. Efficiency of mosquito repellency was calculated by using following formula:

$$\text{Efficiency of mosquito repellency (\%)} = \frac{\text{Number of escaped specimen} + \text{Number of specimen dead}}{\text{Number of specimen exposed}} \times 100$$

Wash durability test:

Tie and dyed sample were dipped in 5 per cent mild detergent (Ezee/Genteel etc.) solution for 30 minutes. After that samples were washed with plain water, squeezed and dried in shade. Wash durability of dyed samples mordanted with different concentration of citric acid for different time were checked upto 10 to 15 launderings.

■ RESEARCH FINDINGS AND DISCUSSION

Results reveal that 15g of pomegranate peels showed maximum optical density hence, optimized for dyeing process. Pomegranate peel extract in 50 per cent concentration for 90 minutes dyeing time produced excellent mosquito repellency.

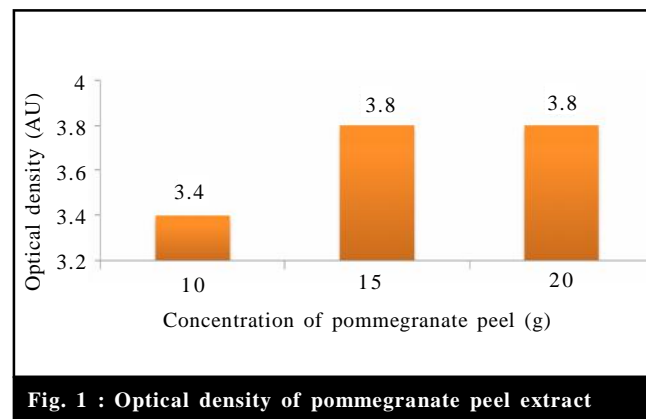


Fig. 1 : Optical density of pomegranate peel extract

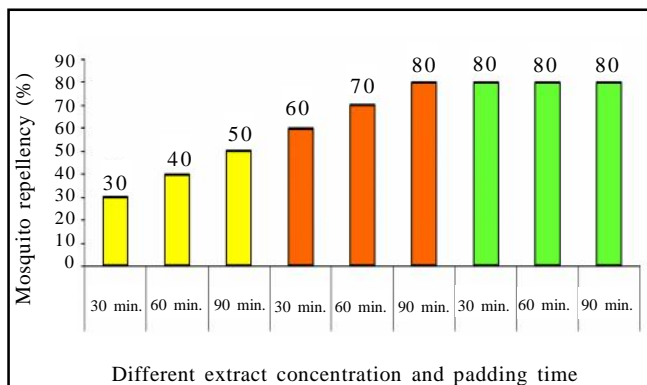


Fig. 2 : Mosquito repellency of dyed samples with pomegranate peel

Optical density of 10, 15, 20 g pomegranate peel powder in 100ml methanol gave the highest value (3.8) therefore, 15g selected as optimum.

Pomegranate peel extract was taken in 40, 50 and 60 per cent concentration. Data depicts that on increasing concentration from 35-55 per cent mosquito repellency also increases from 55-80 per cent, therefore, 50 per cent extract was standardized for dyeing of cotton fabric. Dyed cotton samples were mordanted with 10 per cent concentration of citric acid for 90 minutes, revealed good wash durability upto 5th laundering. Therefore, these finishing conditions were optimized for dyeing of cotton fabric.

Conclusion:

Cotton fabric was tie dyeing with pomegranate peel protects the human beings from the bite of mosquito and there by promising safety from mosquito vector diseases and it is eco-friendly, bio-degradable, non toxic, non irritant to the skin and low cost for vector control and can be used with minimum care. It shows good repellent property when applied on cotton fabric. It can be successfully utilized in apparel, mosquito net, window curtain and other home furnishings.

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