



## RESEARCH ARTICLE

### ECO-FRIENDLY MOSQUITO REPELLENT FINISH FOR COTTON FABRIC

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#### ABSTRACT

Clothing has always played a central role in the evolution of human culture by being at the forefront of both technological and artistic developments. A mosquito repellent helps prevent and control the outbreak of mosquito-borne diseases such as malaria, dengue fever. Most plants contain compounds that they use in preventing attack from phytophagous insects. Thus, special products like mosquito repellents for combating mosquitoes are required. The present study was an endeavor in this direction, where attempt has been made to collect, the information on natural mosquito repellent and to standardize the research is mainly carried out for the development of anti mosquito finished cotton fabric using Marigold flower petals extract. A series of experiment were conducted to optimize the of Marigold flower petals, concentration of Marigold flower (*Calendula officinalis*) petals extract, concentration of mordant and dyeing time on the basis of optical density and mosquito repellency test. After that padded and cured samples with Marigold flower petals were more methanol for different time and tested for wash durability and mosquito repellency test and its 95 percent mosquito repellency.

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#### INTRODUCTION

Cotton is the natural vegetable fiber of great economic importance as a raw material for cloth. Organic cotton is cotton that is grown using methods and materials that have a low impact on the environment. Textile finishing usually includes treatments such as scouring, bleaching and dyeing. Medicinal plants are the gift of nature to cure limitless number of diseases among human beings. 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 agents.

#### MATERIALS AND METHODS

The investigation was carried out to optimize the process of natural mosquito repellent padding with petals of Marigold flower

##### Collection of material

- **Marigold flower petals:** Marigold flower petals were separated from the whole flowers and dried in shade at room temperature for 5 to 7 days and grinded into fine powder and sieved.

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- **Textile material:** Pure white cotton fabric.
- **Chemicals:** Methanol, Ethanol for extraction of natural mosquito repellent and Mordanting of curing sample, respectively.

##### Optimization of variables for organic mosquito repellent

- Optimization of concentrations (5, 10, 15, 20 and 25 per cent) of natural mosquito repellent done on optical density basis measured through spectrophotometer. Experiments were conducted with concentrations of marigold flower petals.
- After optimization, extraction of the Marigold flower petals was done by using methanol. This extract solution was further diluted in three concentrations i.e.; 25, 50, and 75 per cent and different water solution was diluted in to one finalized extract solution.
- Scoured cotton fabric immersed in different concentrations of natural mosquito repellents. Dyeing time for cotton samples with extract of Marigold flower petals were 60, 90 and 120 minutes. Cotton sample were tie dyed by utilizing these parameters.
- **Mordanting of dyed (mosquito repellent) Sample:**
- Cured 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 pad-dry-cure 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:

$$\frac{\text{No. of escapedspecimaen+ No. of specimen} \times 100}{\text{No. of specimenexposed}}$$

**Wash durability test**

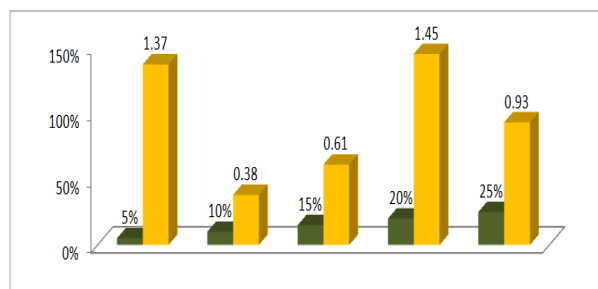
Dyed sample were dipped in 5 per cent mild detergent Ezee solution for 30 minutes. After that samples were washed with plain water, squeezed and dried in shade. Wash durability of dyed samples mordanted with different concentration of citric acid for different time were checked up to 5 to 10 launderings.

**Effect of padding and mordanting samples (mosquito repellent) Treatment on Physical Properties**

Padding and mordanting cotton sample was evaluated for fabric stiffness, tensile strength, crease recovery and drape coefficient.

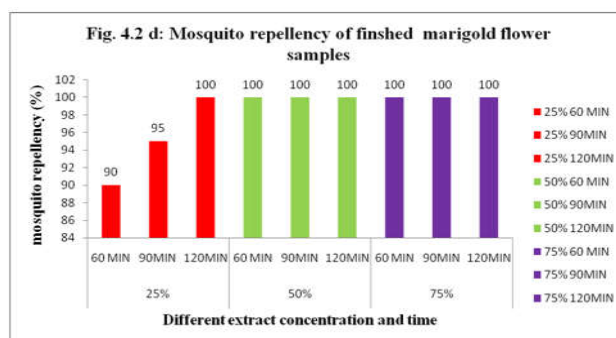
**RESULTS AND DISCUSSION**

Results reveal that 20 per cent of Marigold flower petals showed maximum optical density hence optimized for finishing process. Marigold flower petals extract in 25 percent concentration for 120 minutes dyeing time produced excellent mosquito repellency. Padded cotton samples were mordanted with 10 per cent concentration of citric acid for 30 minutes, revealed good wash durability up to 10<sup>th</sup> laundering. Therefore these finishing conditions were optimized for dyeing of cotton fabric. Thus, cotton fabric finished with Marigold flower petals protects the human beings from the bite of mosquito and there by promising safety from mosquito borne diseases like malaria, dengue fever and filariasis.



**Fig. 1. Optical density of marigold flower**

Optical density of 5, 10, 15,20 and 25g marigold flower petals powder in 100ml methanol gave the highest value (1.45) therefore, 20 g selected as optimum.



**Concentration of Marigold flower**

**Conclusion**

Cotton fabric tie dyed with marigold flower petals protects the human beings from the bite of mosquito and there by promising safety from mosquito vector diseases and it is eco freinndly, 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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