



## **USE OF SOLAR COOKER FOR TIE & DYE ON SILK FABRIC WITH FLOWERS OF FLAME OF FOREST (Natural Resources Development)**

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### **ABSTRACT**

Use of solar energy and natural sources for dyeing is simple, economical and ecofriendly. In this study an attempt has been made to optimize time for dye extraction, dyeing and temperature for dyeing of silk fabric with natural dye source i.e. flowers of flame of forest (Palas) in tie and dye using solar energy. Tying styles such as spot, circular, spider web, line, and marble were used for tying of fabric. Solar cooker was used for dyeing as well as extraction of dye from dye source. Based on color strength values, temperature and time for dyeing was optimized. Tinctometer was used to test color strength of dye solution at selected time intervals and temperatures. At optimized dyeing time and temperature using solar energy, tie and dye samples were prepared, washed thoroughly dried and evaluated visually for various criteria using 5 point scale. Samples dyed in acid dye were used as control samples. It was concluded from this study that- Utilization of solar energy for dyeing of silk fabric with flowers Palas in tie and dye was successful; optimized temperature was 55-65 °C , optimized dye extraction time was 3 hours, optimized dye quantity was 9 gms & dyeing time was 3 hours & the score of tie and dye samples dyed at optimized time and temperature was highest.

**Keywords:** Palas, tie & die, tinctometer.

### **OBJECTIVES**

- To optimize temperature and time for dyeing silk fabric by solar Cooker with natural dye source
- To develop tie & dye on silk by solar dyeing
- To evaluate the effect of print

### **INTRODUCTION**

Solar energy usage for dyeing purpose is a cost effective method. In hot countries like India, the sun shines bright for 60% of the day. Using solar energy to dye silk fabric with natural dye is cheap and environment friendly method. The use of natural



dyestuff is an endless topic of interest for surmise, wonder and admiration. Nature provided different coloring matter of plant, animal and mineral origin for dyeing textiles for ages. Vegetable dyes were obtained from various parts of plants like roots, barks, leaves, fruits, seeds and flowers sources which are renewable. Paul et al (2003) But with the introduction of synthetic dyes in the middle of nineteen century, there was a decline in the use of natural dyes. Synthetic dyes are brighter and have better fastness than natural dyes. However synthetic dyes based on some amines are carcinogenic, allergic or poisonous In dyeing with these dyes enormous chemicals are released in environment in the form of unused dye or industrial waste which has put ecology in jeopardy. Present increasing awareness about environment, pollution and ecology has revived the adoption of age old techniques of natural dyeing. Natural dyes do not create any problem in ecology as they are biodegradable, non

toxic and eco-friendly. Natural dyes are soft in color, cool to eyes and good to skin. Dyeing of textile fibers with natural dyes has been produced since long. (Bain S.2003).

Flame of Forest is also locally known as Palas in Maharashtra. Other names are tissue ,tripatrak.It is commonly found all over particularly in hilly regions of Maharashtra.It has Recemose type of inflorescences and flowers are dark yellow orange in color.Flowering season is February to April. Botanical name of plant is Here in this study an attempt has been made to develop tie and dye print on silk with optimized conditions of dye quantity, dye extraction time, dyeing time & temperature with natural dyes – Flowers of Flame of Forest using solar cooker.

### **METHODOLOGY**

Pure Silk fabric with the following characteristics was used in the study for tie and dye.

Weave	Plain
Ends/cm	90
Picks/cm	80



Weight g/m<sup>2</sup> 58.20

Selected silk fabric was boiled in neutral soap solution for 30 minutes to remove natural gum sericin.

### **Preparation of samples for tie and dye**

The samples were tied in the style of line, spot, circular, marble, cloth peg & spider web & were evaluated for various criteria such as sharpness of out line, resistance to penetration of dye, evenness in dyeing and overall appearance by ranking system. Samples dyed by normal method for dyeing of silk with acid dyes were used as control samples

### **Optimization of Quantity of Dye Material**

Various quantities of dye material viz. 1-10 gms were selected for optimization, it was heated in 100 ml water in solar cooker for 1-4 hours. Silk fabric was dyed for 30 minutes at highest temp. i.e. 40-50 °C, optical density values of the extract were noted down by spectrophotometer before & after dyeing. On the basis of this values, percent dye absorption was calculated. Dye material quantity which gave highest percent dye

absorption value was selected as optimized quantity.

### **Optimization of temperature**

Dyeing was carried out at various temperature range i.e. 15-25, 25-35, 35-45 and 45-55 & 55-65 °C keeping time for dyeing constant i.e. 30 minutes. The strength of the extract was measured with the help of tinctometer.

### **Optimization of dyeing time**

For optimization of time for dyeing, samples were dyed at various time intervals such as 1 hr. to 4 hours at optimized temperature i.e. 45-55°C. The strength of the extract was measured with the help of tinctometer.

### **Evaluation of effect of printing**

Based on visual observations, evaluation was done for criteria such as depth of shade, even spreading of dye, sharpness of outline of the design, resistance to color penetration and overall appearance by ranking system. Samples dyed in acid dye were used as control samples

### **FINDINGS**



### Optimization of Quantity of Dye Material

Table 1 indicates the dye percent absorption values for selected dye material quantity. It was noted highest with 9 gms of dye material. After this no much difference was noted in dye percentage values hence it was optimized.

**Table 1: Optimization of dye concentration**

Dye concentration	Percent dye absorption
1	10.20
2	13.10
3	18.66
4	20.80
5	30.00
6	32.30
7	32.70
8	33.20
9	<b>33.77</b>
10	33.80

The data presented in table 2 reveals that, at the temperature of 55-65 °c, the color strength of dye solution was maximum i.e. **30Y10R**. No change was observed in color strength even after temperature increased. Hence it was optimized

**Table 2: Optimization of Temperature of Dyeing for 30 minutes**

Temperature of dyeing (°c)	Color Strength
15-25	18Y 8R
25-35	20Y 9R
35-45	25Y 9R
45-55	28Y10R
55-65	<b>30Y10R</b>

Table 3 depicts, the color strength values of dye solution at various time periods and it was found maximum i.e. **40Y10R** at 3 hours. No change was observed in color strength even after dyeing time increased

**Table 3: Optimization of Time for Dyeing at Temp. 55-65°C**

Time of dyeing (hour.)	Color strength
1	20Y 8R
2	30Y5R
3	<b>40Y 6R</b>
4	40Y5R

Table -4 indicates high optical density value of extract boiled for 3 hours i.e.0.39.After 3 hours no much difference was noted in O.D. value hence it was optimized.

**Table 4: Optimization of Dye Extraction Time**

Extraction Time (hours)	Optical Density value
1	0.33
2	0.35
3	0.39
4	0.39
5	0.40
6	0.40

It is clear from the table 5 that, score was given to the samples dyed at 2 hours was highest i.e.5 hence time for solar dyeing was optimized 2 hours for tie and dye .

**CONCLUSION**

- Solar dyeing technique for tie and dye print on silk with

Flame of Forest dye was found to be successful.

- The time optimized for dyeing was 3 hours.
- Temperature optimized for dyeing was 55-65 °c.
- Visual evaluation score of tie dye samples dyed at optimized temperature and for optimized dyeing time was highest
- Solar dyeing is cheaper, economical and effective method for tie dye on silk with natural dye source –Flame of Forests Flowers .

**Table 5: Visual Evaluation of Tie and Dye Samples**

Time of dyeing (hours.)	Sharpness of line	Whiteness of background	Resistance to penetration of dye	Overall appearance	Average score obtained
1	3	4	3	2	3
2	4	4	4	5	4
3	5	5	5	5	5
4	3	4	3	3	3.3

**Tie & dye printed sample with Palas flowers and solar cooker****REFERENCES**

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