



COLOURANT POTENTIAL OF RICINUS PLANT AND CUMIN SEEDS ON SILK AND COTTON CLOTH

¹Smit R. Patel, ²Parth Trada, ³Vishrut Patel, ⁴Jay M. Pandya

¹M.SC Student, ²M.SC Student, ³M.SC Student, ⁴M.SC Student

Department of Chemistry

¹Parul Institute Of Applied Science, Parul University, Ahmedabad, India

Abstract: A castor bean plant *Ricinus communis* L., a member of family Euphorbiaceae is a well known oil yielding plant. India is the world leader in Castor bean production. Whole plant body is utilised in Ayurvedic field, Present investigation is an effort to yield a Natural dye from different parts of *Ricinus* plant. Aerial parts of plant (Fruit coat, Leaf) were found to be good source of natural dye for cotton as well as silk Cloth. With different mordant Green, brown and yellow shades were on cloth. Excellent fastness property of dye was observed. A smart green shade was observed on Cotton cloth with mordant CuSO_4 . The dye extraction method is non hazardous and economically viable. The synthetic dyes created pollution in environment which can be avoided by using Natural dye. But still Natural Dye is unpopular in the market because of the higher price tag and lack of dye resource knowledge, being a dominant and widely spread species, a dye from *Ricinus* may be useful to solve the above problem. In the present study an attempt has been made to dye the silk fabric with *Cuminum Cyminum* L, commonly known as cumin seeds, as a source of natural dye which has not been exploited as natural dye by far. Optimization of natural dye extraction from cumin seeds. Dyeings obtained without mordants were compared with those obtained by pre-mordanting with Potassium aluminium sulphate, Ferrous sulphate, Copper sulphate.

- **Key Words** - Natural Dyes, *Ricinus* leaf, cumin seeds, Pollution, Applications

1. Introduction:

A member of family Euphorbiaceae *Ricinus communis* L. is a highly prolific and precocious producer of toxic seeds, very adaptable to different environments and has been widely distributed by man. It is reported invasive or weedy in many countries particularly in the tropics and since dense thickets shade out native flora it is able to have negative impacts on biodiversity. The castor bean plant a fuel crop is an erect, tropical shrub or small tree, grows up to 30 feet tall. As an annual in the cooler zones, it grows up to 15' tall. It is a very fast growing plant. The joints of the hollow stem, stalks and leaves are reddish to purple. The leaves are 6 - 11 lobed, palmate with uneven serrated edge (Singh et al., 2001). The plant has various medicinal properties and uses like purgative, galactagogue, emmenagogue and emetic. It is also used for the treatment of scrofulous sores, boils and rheumatic swellings, skin diseases and leprosy (Kota Chaitanya Sravanthi et al., 2011; ayurvedicmedicinal plants.com). Aqueous leaf extract reported excellent insecticidal activity against *Callosobruchus chinensis* L. (Upasani Shripad et al., 2003) With such medicinal property of *Ricinus* plant, an additional potential of this plant as a Natural dye has been investigated. Aerial parts of plant (Fruit coat, Leaf) were found to be good source of natural dye for cotton as well as silk Cloth. In recent years much concern is expressed for saving the environment by avoiding pollution at various levels. Chemical dyes were found a tremendous source of pollution to environment;

Natural dyes being eco-friendly and biodegradable are much preferred as the dyes of the current millennium. During present investigation the fresh / dried plant materials were used for dyeing cotton and silk cloth. The dyeing was carried out in optimizing dyeing conditions namely dye material, extraction time and using various combinations of mordant. Cotton, a natural cellulose fiber is mostly used in the textile world because of its comfortable soft touch, good absorbency and easy to handle and sew quality. Silk is yet another word for elegance and is the strongest natural protein [Fibroin] fiber which has its own luster. Silk absorbs moisture, which makes it cool in the summer and warm in the winter. Because of its high absorbency, it is easily dyed in many deep colours. People have relied on insects, leaves and roots of plants for thousands of years to impart colour onto textiles. Today, natural dyes have almost no economical importance and are used in limited quantities by craftsmen. However, with the consumer's growing appetite for eco-friendly apparel, it might be prudent to check-out natural dyes. With the plethora of chemical dyes available and recognition of the harmful effects of these substances, natural dyes are being looked at with renewed interest. Natural dyes are seen

as more ecofriendly, unlike their synthetic counterparts, as they are all derived from nature. Natural dyes, have the ability to produce wide range of tints and shades, with the same dye material, but with the invention of synthetic dyes in 1856, the prominence of natural dyes slacked because the synthetic dyes had some advantages over natural dyes like colour fastness, good reproducibility of shades, brilliance of colour and easy to use⁴. Natural dyes may have a wide range of shades, and can be obtained from various parts of plants including roots, bark, leaves, flowers, and fruit Recently, a number of commercial dyers and small textile export houses have started looking at the possibilities of using natural dyes for regular basis dyeing and printing of textiles to overcome environmental pollution caused by the synthetic dyes⁶. Ravindra V. Adivarekar et al /Int.J.ChemTech Res.2013,5(2) 700 The use of vegetable materials in textile colouration is a well known way of utilizing renewable raw materials according to the technical, economical, and ecological requirements of the 21st Century⁷. With this background, in this study, cumin seeds (*Cuminum Cyminum* L) had been taken as a source of natural dye for dyeing of silk fabric which has been hitherto unexplored. *Cuminum Cyminum* L is an annual plant of the family Apiaceae. Fruits of *Cuminum Cyminum* L, commonly known as jeera in India are consumed as condiment across the globe. The fruits are rich in estrogenic, iso-flavonoids, luteolin and apigenin. Cumin is known to have been cultivated since antiquity, and is now mainly cultivated in North Africa, Iran, India, Indonesia and China. The fruit has also been used for medicinal purposes. Moreover, cumin oil shows high antifungal activity against various pathogenic fungi and effective antibacterial activity. The yellow- coloured fresh oil contains cuminaldehyde and two p-menthadienals as its chief components¹⁰. The present research aims at optimizing extraction conditions of colouring component from the cumin seeds with environmental friendly extraction procedures and its application on silk fabric. The research work reports dyeing of silk fabric with *Cuminum Cyminum* L as a source of natural dye in presence of natural mordant like tannic acid and different metal salts like potassium aluminium sulphate, ferrous sulphate, copper sulphate, stannous chloride and potassium dichromate. The colour strength values were studied and colourfastness properties of the dyed fabrics were evaluated.

2. Materials and Methods

Selection and preparation of plant material and fibers: Fresh plant parts like leaf, fruit coat were collected from village farm and local market and dried in shade. Dried materials were grounded well to finely powder which is used in extraction of dye. Cotton and Silk cloth was purchased from local markets and washed with detergent soap and rinsed thoroughly with hot water to remove traces of detergent and starch.

3. Extraction of dye:

5 gm powder was boiled in 500ml water for one hour to extract dye. Filter the solution by muslin cloth. Collect residue and again boil in 200ml water for one hour and filter again. Mix above two filtrate dye solution.

4. Dyeing of fabrics:

The dyeing process was started initially at 40°C and the temperature was gradually raised up to 85°C and put constant up to 45 minutes. After dyeing, cloths were taken out and wash thoroughly with tap water.

5. Mordating Technique:

Various mordant were used in present investigation like Copper sulphate, ferrous sulphate, Potassium Chromate. Pre-mordant method is used for dyeing (Agarwal et al., 2007, Shrivastava, 2006, Debasish Das et al., 2008). Different combination of mordant was used during present study. viz., Copper sulphate + potassium chromate, Copper sulphate + Ferrous sulphate.

6. Result and Discussion:

In present investigation good result was found in Simultaneous mordant method. With the use of mordant various shades were obtained on silk as well as Cotton cloth. The shade ranges from green, brown to yellow colours. Intensity of the shade was depending upon the nature of fibre. Green dye was extracted from leaf of plant, which gave cream, yellow, light brown muddy brown, black brown and dull black colour on cotton and silk cloth with mordant (Table 1 The shades from Ricinus leaf). Brown dye was extracted from cumin seeds which gives, Golden Brown, Khaki, Coffee Brown, Dull Brown, Dark Yellow ochre. (Table 2 The shades from cumin seeds). The dye required minimum time (1 hr.) to dye cloths with effective colour. As natures of fibres are different from each other same mordant and dye combination gives two different shades on both fibres (Photographs in Table 1 and Table 2). Mordating technology improved the development of shade and to provide a link to colouring substance to fix on cloth. Mordating should also improve the fastness property against light, temperature and washing. (Devi et al., 2006, Agarwal Radhika et al., 2007, Shrivastava A. et al., 2006). Likewise during present investigation pale yellow to grey green to dark green shades were obtained on silk and cotton cloth. Washing and light fastness property of Ricinus dye was also found be good. The dye extracted from leaf also showed variety of shades on cloth as above. Though the Ricinus seeds are useful in oil extraction the fruit carp is waste material in this case, by using this waste material for dyeing purpose we again add a value to Ricinus plant. Various Microorganisms which are present in our surrounding deposited and multiply on our body and textile material contact with our skin have a chance to cause some skin disease; as per the reported work the Ricinus leaf is effective against Skin Disease (Mossa et al., 1987). The concentrated extract of the Ricinus communis leaves showed a better antibacterial activity in comparison with the standard and Bacterial/ fungal species such as Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhimurium, Proteus vulgaris, Bacillus subtilis, Candida albicans and Aspergillus niger (Kota Chaitanya Sravanthi et al., 2011). Ricinus plant has a huge medicinal as well as economical uses, with such uses, Ricinus can also use as a Natural Dye for Silk and Cotton cloth. Author investigated a potential character of Ricinus communis L. as a Natural textile dye, with the help different mordant various shades were produced. Used mordant are not harmful for skin and biodegradable in nature. As the plant widely distributed, ample amount of material is available throughout year. Extraction method is economically viable and fastness property of dye is good. The uninterrupted availability of different shades from a single source were tried successfully to utilized plant as a potential source of a natural dye, this will help mankind to get such ecofriendly shades from a single source.

Various shades obtained with Ricinus plant leaf dye



Sr. No.	Treatment	Samples	
		Silk	Cotton
1	Fabric dyed with 70% Ricinus leaf extract (without mordanting)		
2	Fabric treated with 10% CuSO ₄ followed by Dyeing with leaf Dye		
3	Fabric treated with 2% FeSO ₄ followed by Dyeing with leaf Dye		
4	Fabric treated with 7% K ₂ CrO ₄ followed by Dyeing with leaf Dye		
5	Fabric treated with 10% CuSO ₄ + 2% FeSO ₄ followed by Dyeing with leaf Dye		
6	Fabric treated with 10% CuSO ₄ + 7% K ₂ CrO ₄ followed by Dyeing with leaf Dye		

7. Conclusion

The concentrated extract of the *Ricinus communis* leaves showed a better antibacterial activity in comparison with the standard and Bacterial/ fungal species such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Proteus vulgaris*, *Bacillus subtilis*, *Candida albicans* and *Aspergillus niger* (Kota Chaitanya Sravanthi et al., 2011). *Ricinus* plant has a huge medicinal as well as economical uses, with such uses, *Ricinus* can also use as a Natural Dye for Silk and Cotton cloth. Author investigated a potential character of *Ricinus communis* L. as a Natural textile dye, with the help different mordant various shades were produced (except Sodium Hydroxide). Used mordant are not harmful for skin and biodegradable in nature. As the plant widely distributed, sample amount of material is available throughout year. Extraction method is economically viable and fastness property of dye is good. The uninterrupted availability of different shades from a single source were tried successfully to utilized plant as a potential source of a natural dye, this will help mankind to get such ecofriendly shades from a single source. From the above discussion it is concluded that instead of using harmful chemical dyes any one can use *Ricinus communis* L. as a Natural Dye for soothing shades. Present investigation is a try to make such kind of textile dye which is useful to make Ayurvedic Vastram which fight against Skin Disease.

In order to satisfy the demand of green minded consumers, the present study was planned, to be look out for safer alternative for dyeing with natural dyes. It was found from the study that cumin dye can be successfully used for dyeing of silk fabric to obtain wide range of soft and pastel shades with natural and synthetic mordants. The process of extraction is simple and environmental friendly. The overall fastness properties of printed fabrics ranged from good to very good to excellent. The results have shown the potential of cumin seeds as a source for dyeing of silk in yellow shades. Various shades of yellow and good fastness properties exhibited by the dyed clothes are because of the mordants used. There is a tremendous scope to use cumin dye for obtaining various color shades using safe mordants under eco-friendly textile dyeing.

8. Future scope

- *Ricinus* leaf use as a Natural textile Dye for Silk and Cotton cloth.
- *Ricinus communis* leaves showed a better antibacterial activity in comparison with the standard and Bacterial/ fungal species such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Proteus vulgaris*, *Bacillus subtilis*, *Candida albicans* and *Aspergillus niger*.
- *Ricinus communis* leaves textile dye which is useful to make Ayurvedic Vastram which fight against Skin Disease.
- Cumin dye use as a Natural textile Dye for Silk and Cotton cloth.
- Cumin dye can be successfully used for dyeing of silk fabric to obtain wide range of soft and pastel shades with natural and synthetic mordants.
- There is a tremendous scope to use cumin dye for obtaining various color shades using safe mordants under eco-friendly textile dyeing.

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