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Dyeing of *Calotropis procera* fibre with natural dyes and judging its colour fastness

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Abstract
Eco-friendly dyeing of *Calotropis procera* fibre /yarn with *Butea monosperma* flower extract was carried using simultaneous Mordanting methods. Testing of colour fastness to light, crocking, perspiration and washing was carried out. Colour produced was soft, lustrous golden yellow colour, which were earth friendly and soothing in appearance. The light, wash and perspiration fastness with standardized test was found fair to good. It is recommended that proper utilization of available indigenous plant resources can provide a good opportunity of employment to unemployed youths because it is labour intensive process. Commercial exploitation of these agro based plants with proper technology may enhance the opportunities to the unemployed youths and will make our cosmos safe.

Keywords: *Calotropis procera* fibre, natural dyes, colour fastness

Introduction
The emerging "green" economy is based on energy efficiency, renewable feed stocks in polymer products, industrial processes that reduce carbon emissions and recyclable materials. Natural fibres are a renewable resource and are sustainable at every stage of their life cycle, from production to disposal. They are carbon neutral so they are not creating any pollution load to the environment. Natural fibres possesses desirable qualities like biodegradability, reusability, good dye ability, resists mildew and blocks ultraviolet light. Availability of natural fibres is less, so new unconventional fibres are needed to be explored and /or new avenues of already established fibres to be found out. These superior essences of natural fibres can be utilized to produce conventional as well as technical textiles. *Calotropis procera* plant is a wild plant does not require any chemical for its production.

The plants afford a seed fibre which is often called ‘vegetable fibre’ but is more properly called *Calotropis procera* floss. The fibre to which the seed is attached, is tightly packed into cylindrical green seed pods that burst open when ripe, scattered the tiny seeds over a wide area because of the parachute like propulsion of the attached seed. In present investigation an attempt is made to study the dyeing behavior of *Calotropis procera* fibre with *Butea monosperma* flower extract and to study the colour fatness properties of dyes fibres towards light, crocking, perspiration and washing.

Methodology
Dyeing of extracted underutilized fibre
Butea Monosperma is commonly known as Kesula, Khakra and palas. The flowers of Kesula have ‘butin’ which is the main colouring component in dyeing. In the present research work *Calotropis procera* Fibre is dyed with *Butea monosperma* flower dye.

Optimization of dye extraction

Pre treatment		Conc. of dye	MLR	Dyeing time	Temp.	Mordanting		
Agent used	Conc.					Mordant used	Mordant Conc.	Mordanting method
Myrobolan	2%	5%	1:30	90 min	60-80	Alum	.5%	Simultaneous
Myrobolan	2%	5%	1:30	90 min	60-80	Copper Sulphate	2%	Simultaneous

Pretreatment of fiber and fabric: The fibre was pretreated with 20 percent of *myrobalan* (*Terminalia chebula*), solution for 24 hours maintaining the 1:20 MLR (material to liquor ratio) the Fibrewas squeezed and sun dried.

Dyes: Flowers of *Butea monosperma* were collected from nearby forest and dried in shade and pulverized to powder form. Aqueous method was used for dye extraction. The natural colourants are considered as non carcinogenic, easily biodegradable and non toxic for human health (Ghoulia *et al.*, 2012) [6].

Mordants used: Metal salts were used to provide exhaustion and fixation for dyeing to textile materials. Metal ions are collected on fiber surface in an aqueous media and supported dyeing textile materials creating natural dye and metal ion. In the research work Copper Sulphate (2.0%) &Alum (.5%) are used as mordants.

Dyeing method used: Simultaneous dyeing

After treatment of dyed fabric: After dyeing the samples were post treated with 5 percent solution of common salt as fixing agents for improving colorfastness of natural dye on *Calotropis procera* fiber.

Fastness properties of printed samples: Fastness properties of printed samples against washing, sunlight, rubbing (dry and wet) and perspiration (acidic & alkaline) were tested as per standard test methods of IS: 3361-1979, IS:686-1957, IS:767-1956 and IS:971-1956 methods respectively. Light fastness ratings were given as per blue wool standards and samples of washing, rubbing and perspiration fastness were assigned ratings for change in colour and degree of staining on standard fabric with the help of grey scales.

Results and Discussions

Results of colour fastness of *Calotropis procera* fibre with *Butea monosperma* flower extract with different mordent are summarized below according to fastness properties

Table 1: Sunlight Fastness, Wash Fastness, Dry Crock Fastness & Wet Crock Fastness, Acidic Perspiration& Alkaline Perspiration Fastness of natural dyed *Calotropis procera* fiber

Treatments	Colour fastness grades													
	Sun light	Washing			Rubbing				Perspiration					
		CC	CS		Dry		Wet		Acidic			Alkaline		
			c	s	cc	cs	cc	cs	cc	cs		cc	Cs	
										c	s		c	S
Without myrobolan	3	3	2	2	3	2	2	2	2	2	2	3	3	2
With myrobolan	4	4	3/4	4/5	4	3-4	4-5		3	4	4	4/5	4	4/5
Myrobolan + alum	3-4	4	4/5	4/5	3	3-4	4-5	4	3	4/5	5	5	5	4/5
Myrobolan +Copper Sulphate	4	4	3/4	4/5	3-4	4	5	4	3	4	4	4/5	4	4/5

Rating sunlight (Rating 1-poor, 2-fair, 3-moderate, 4-good, 5-better, 6-very good, 7- best & 8-excellent)
CC=Colour Change, CS+ Colour staining, W=wool, C=cotton, (Rating1-poor, 2-fair, 3-good, 4-very good & 5-excellent)

The Light Fastness: It is fundamental requirement that coloured material should with stand the conditions encountered during their subsequent useful life. When the coloured textile material is subjected to light there may be an alteration in their hue, value or intensity. This level of change must be tested. In the present study Fedometer was used. The data clearly indicate that the fastness rating vary from 3-4 for both the mordants. This may be due to photo chemical changes in dye molecule which leads to change of hue or tone variation. Light fastness of dyed fabric is influenced by chemical, physical state and concentration of dye, nature of the fibers and mordant type. Cristea and Vilarem (2006) [5].

Washing fastness: It can be seen quite clearly that wash fastness rating for the sample in general ranged from good to very good. There was slight change in hue of these dyed samples after subjected to wash fastness test. Data explicit the second aspect of wash fastness test the testing of colour bleed i.e. staining of dyed sample on the adjacent cotton and woollen material. The rating ranged from good to very good

Rubbing Fastness: Dyed samples were evaluated for rubbing fastness. The extent of rubbing may be influenced by the moisture, as many textiles transfers more colour when wet, the dry rubbing fastness was slightly better than wet rubbing fastness. Data in table related dry and wet rub show significant difference. This shows that majority of dye is fixed well on fibers and surface residual dye is minimal.

Fastness to perspiration: It can be observed that both the mordants dyed samples showed good to very good fastness in acidic and alkaline medium of perspiration test for all the dyed samples. It is clear from the data that negligible (4) or slight staining (3) on adjacent fabrics i.e. wool and cotton. The good colour fastness properties might be attributed to benzene ring and conjugated system present in dye which make firm bonding with modified fabric upon exposure to agencies heat, light and rubbing resistance Popoola 2000 [4].

Table 2: Colour strength (L a b) of dyed fibres / yarn

Treatments	L	A	B
Without myrobolan	82.347	3.330	13.903
With myrobolan	73.847	-1.6	29.414
Myrobolan + alum	75.283	1.996	24.482
Myrobolan + Copper Sulphate	65.240	3.170	35.529

The color values of the dyed fibre / yarn using different mordent are summarized in table. L* values of the sample relates to brightness. Since the L* values of alum mordant dyed sample is less than copper sulphate mordant sample. The L* value is less which shows darkness of dyed sample. The a* value indicates redness or greenness and b* value indicates yellowness and blueness. Negative a* value indicates greenness in the dyed samples. While positive b* value indicates yellowness in the dyed samples.

Greater L* values may be due to more extent of dye mordant complex formation. The extent this dye transfer from the dye solution to interior of the fabric which contain dye and type of mechanism involved in formation of dye mordant complex. Different type of mordant and dye resulted in different shades and tones of dyed *Calotropis procera* fabric. It is indicated by CIE colour coordinate results.

Conclusion

Dyeing of *Calotropis procera* fibre was carried out with natural dye and their colour fastness against light, washing, perspiration and crocking were checked. Light fastness ranged between 6 and 5 indicate excellent, very good and good fastness. Wash fastness of *Calotropis procera* was rated as no change/slightly change in colour of dyed yarns and no staining/ slight staining of adjacent fabrics. Crocking fastness of *Calotropis procera* was excellent with no change in colour of dyed yarns and no staining of adjacent fabrics during dry crocking but showed slight staining during wet crocking Colour fastness to perspiration of yarn in acidic and alkaline medium showed change in colour and slight staining of adjacent fabrics whereas in alkaline medium colour fastness to perspiration of was excellent with no change in colour and no staining in adjacent fabrics.

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References

1. Anonymous. Indian Standard method for determination of colour fastness, Indian standard institute, New Delhi, 1979.
2. Anonymous. Indian Standard method for determination of colour fastness, IS: 2454-1985, Indian standard institute, New Delhi, 1985.
3. Anonymous. Indian Standard method for determination of colour fastness, IS: 766-1988, Indian standard institute, New Delhi, 1988.
4. Popoola VA. Comparative fastness assessment performance of cellulosic fibers dyed using natural colourants J Appl. Polym. Sci. 2000; 77:752-755.
5. Cristea D, Vilarem G. Improving light fastness of natural dyes on cotton Dyes and pigments. 2006. 70:238-245
6. Ghoulia M, Howell RD, Sholas M. Cadmium and lead residues in field-collected red swamp crayfish (*Procambarus-clarkii*) and uptake by alligator weed, *Alternanthera philoxeroids*. J Environ. Sci. Health 2012; 28:473-485.