

Awareness, Consumption and Value Chain Analysis of Eco-Holi Colours in Hyderabad and Rangareddy Districts of Telangana State

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ABSTRACT

The present paper was taken from the project Value Chain in Natural Dyes, implemented under National Agricultural Innovation Project, Indian Council of Agricultural Research standardised the processing technology for eco holi colours, established value chains and increased consumer awareness regarding environmental and health hazards due to use of synthetic colours for holi. The established value chains in eco holi colours increased the employment and income of the producers and marketing agencies involved in the value chain. The technology was found sustainable with the increase in use of eco holi colours by the respondents in Hyderabad and Rangareddy districts from 8 per cent in 2008 to 33 per cent in 2018. The eco holi colours are analysed for heavy metals, channels of value chains are identified and producers share in consumer s rupee is calculated. The study concluded that to increase the production and use of eco holi colours for the environmental safety, large-scale public awareness programmes on environmental and health hazards due to synthetic colours, establishing enterprises for the manufacture of eco holi colours and market linkages for supply at affordable prices in larger quantities at local outlets are important. Research should be concentrated on development of brighter holi colours with required stickiness for satisfying more customers.

Key words: Eco-friendly, Heavy metals, Holi, Natural, Price spread

Holi is a religious festival celebrated throughout India. 'Holi' is also known as festival of colours. Traditionally colours from nature are used for Holi. These coloured powders used for playing are made from natural extracts of flowers, roots and herbs that are good for skin. With the advent of synthetic dyes, the natural dyes have disappeared and fully replaced by synthetic ones. A study conducted under the National Biodiversity Strategy and Action Plan revealed that chemical colors have all but wiped-out India's wonderful vegetable dyes [1]. In fact most of these synthetic dyes are meant for industrial use like dyeing textiles and are not for application on humans.

Holi pastes contain harmful chemicals such as Lead oxide (common in black colour), copper sulphate (found in green colour), aluminium bromide (in silver colour), prussian blue (blue colour) and mercury sulphite (a major component

in red colour). These can cause renal failure, eye allergy, puffiness, temporary blindness, cancer etc. [2]. In India, these colors are prepared on a small scale and lack any quality checks. Use of such toxic colors should be discouraged, and all doctors should caution people against using synthetic dyes. There is an urgent need to put manufacturing of 'Holi' colors under guidelines of the Food and Drug Cosmetic Act and the Bureau of Indian Standards [3]. The chemical colours have become popular because they are easily available and cost less than natural colors. However, manufacturers mix harmful chemicals in colours, putting the consumers' health at risk like skin rashes, asthma, bronchial problems. These are toxic and can result in anything from skin allergies to cancer and more. The festival of 'Holi' is proving to be an environmental risk due to the toxic colors used during the celebrations. Unlimited and uncontrolled use of such dyes can lead to grave consequences in terms of human health and ecological balance. These colors are highly structured polymers and are very difficult to decompose biologically [4]. With the growing awareness of dangers of using synthetic holi colours the market is now growing for natural colours. By using these safe, natural colours we are not only saving our skins but are also helping to save our environment to conserve our biodiversity. By this we can bring back in large quantities the diverse plants and trees that give us these colours. These colours are highly safe even to children. It replaces the present synthetic dye powder market by providing safe eco powders to the humans. It will solve the associated problems of health to the humans, aqua bodies and avoid the toxicity of soil and water due to natural dyes. There is concern about the large-scale wastage of water and water-pollution due to synthetic

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colors during 'Holi' celebration. Their presence in water, even at very low concentrations, is highly visible and undesirable. When these colored effluents enter rivers or any surface water system, they upset biological activity. Ground water systems are also affected by these pollutants because of leaching from the soil [5]. Conservation of water is also a key factor as synthetic dyes take 5 to 6 times more water than natural dyes for washing after playing holi. When washed, they need more water and also enter into water and soil and cause even more pollution.

Natural dyes are in the forefront today due to the ban imposed on the use of synthetic dyes throughout the globe. The ban imposed on the usage of synthetic dyes by Germany in 1995 has led to the reinvention of natural dyes throughout the world. In Indian scenario the natural dye industry was nearly vanished towards the middle of 19th century and since then it is practiced in few pockets of the selected states in the country. Convenience is one factor that pushed natural dyeing industry to the edge of extinction. The traditional method was too laborious and time consuming to cope up with the increasing demands of user industries. In fact, natural dyes can provide the much-required alternative to the complex world of chemical dyes. These dyes are environmentally sound and can be grown by organic methods. They are inherently carbon neutral. Vibrant colors can be produced from natural dyes [6]

There are many advantages for natural dyes as they are good for mankind and environment, but replacing the synthetic dyes with natural dyes is a herculean task. Stakeholders in the natural dye field play a very important role and their efforts are appreciable.

Under National Agricultural Innovation Project, a Value Chain in Natural Dyes was implemented, Indian Council of Agricultural Research. The project standardised the processing technologies such as dyeing cotton, silk and banana fibre with natural dyes. The project also yielded eco-powders/holi colours and eco-paints for idols to provide safe colours which control environmental pollution. A natural dye incubation centre was established at college of Home Science, Hyderabad. The natural dyed textiles, eco-powders and eco-paints would play a dominant role in the years to come in view of increasing awareness for environmental protection and health safeguards. The project has established value chains in natural dyed textiles, eco paints for idols and eco holi colours. The success of the project paves the way for establishing agri enterprises and value chains for natural dye products in the state as well as in the country. The present paper tried to understand the awareness and consumption of Eco-holi colours in Hyderabad and Rangareddy districts of Telangana State.

MATERIALS AND METHODS

Eco holi colours are developed under the project through standardization of the technology. The developed colours are brought into value chain by integrating the producers, marketing agencies and the consumers. An attempt was made to describe the value chain developed and see the sustainability of the value chain. For assessing the sustainability Hyderabad and Rangareddy districts are selected purposively as the value chains of eco holi colours are established in these districts. The primary data on the awareness and use of the natural dyes are collected in two spells. In the year 2008 the survey was conducted to know the benchmark on the use of eco holi colours and again in 2018 the survey was conducted to know the status of the eco holi

colours after intervention of the project. Later the value chains are identified and profit margins, producers share in consumers rupee are calculated. The sampling design involved cluster sampling in offices, colonies, colleges and schools. The primary data has been collected through a simple structured schedule and door to door survey from a sample of 90 civilians.

RESULTS AND DISCUSSION

The results of the base line survey in Hyderabad and Rangareddy districts regarding the awareness levels of natural/eco holi colours which was done in the year 2008 is presented in (Table 1), indicated that 83 per cent respondents are playing holi and only 20 per cent are aware about the natural/eco holi colors. Among the people who are playing holi, only 8 per cent of the persons playing holi informed that they are using natural colours. They are making colours on their own from the sources like turmeric, beetroot, green vegetables and flowers to have safe holi but not purchasing natural colours. The remaining 92 per cent of the respondents are using readily available synthetic colours. Among the respondents who play holi 85 per cent of them expressed that they are using synthetic colours. However, they complained about irritation in eyes, rashes on skin and acidic taste in the mouth when they play holi with synthetic colours. But still, they are using synthetic colours as they are readily and easily available at local markets at lower prices. It is surprising to know that only 18 per cent of the respondents are aware of the long-term effects of synthetic colours.

Table 1 Awareness levels of natural/eco holi colours (in 2008)

Particulars	Frequency	Percentage
Are you playing holi		
Yes	75	83.33
No	15	16.67
Are you aware of eco/natural holi colours		
Yes	18	20.00
No	72	80.00
If Yes, are you using of eco/natural holi colours		
Yes	6	8.00
No	69	92.00
Are you facing problem in washing synthetic colours		
Yes	64	85.33
No	11	14.67
Are you facing health/irritation problem with synthetic colours		
Yes	56	74.67
No	19	25.33
If yes what are the problems faced (multiple responses)		
Irritation in eyes	22	39.29
Rashes on skin	17	30.36
Acidic taste in the mouth	41	73.21
Do you know the long-term effects of synthetic colours		
Yes	16	17.78
No	74	82.22

To know the market potential, the respondents are enquired about the willingness to purchase natural holi colours. All the respondents are willing to purchase the colours but complained of the non-availability in required quantities and in required time, they also said that the colours should be available throughout the year and they are willing to purchase even if the cost is high as they give the children

health and happiness utmost priority. However, they have expressed the problems for natural holi colours to overcome like natural colors not being as bright as the synthetic colours and non-availability of all the colors.

Table 2 Perception of the respondents towards Eco-holi colours

Particulars	Frequency (multiple responses)	Percentage
Natural colors are not bright	60	66.67
All the colors are not available	75	83.33
Not available in required quantities and in required time	90	100.00

Under the NAIP, ICAR project technology there are 6 eco holi powders standardized. They are Orange, Yellow, Blue, Green, Maroon and Pink. These Eco-holi powders are standardized in terms of brightness of the colour, sticking quality (on skin), fineness of the powder, easily removable nature and free from heavy metal content.

Analysis of eco-colour for heavy metals

It was found that most of the heavy metal contents in the developed eco-colours are below detectable levels. The others are almost within the safe range. As these colours are developed in the context of the health hazards caused by synthetic dyes, the eco-colours are very safe to the humans especially children. After standardizing the colours, value chains are established.

Table 3 Heavy metal content in eco-colours

Name	S.ID. no	Cd (mg/kg)	Cr (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)
Maroon colour	QC-S-2749	BDL	2.2	1.105	0.00111	0.0036
Green colour	QC-S-2750	BDL	BDL	BDL	BDL	BDL
Orange colour	QC-S-2751	BDL	BDL	BDL	BDL	BDL
Yellow colour	QC-S-2753	BDL	BDL	1.04	BDL	BDL
Blue colour	QC-S-2754	BDL	2.17	1.08	BDL	BDL
Pink colour	QC-S-2755	BDL	BDL	BDL	BDL	BDL

It was found that most of the heavy metal contents in the developed eco-colours are below detectable levels. Cadmium (Cd), Mercury (Hg), Arsenic (As) are found to be under Below Detectable Levels (BDL) in all the colours. Chromium (Cr) and Lead (Pb) are at BDL in green, orange and pink colours. They are almost within the safe range in yellow, blue and maroon colours. As these colours are developed in the context of the health hazards caused by synthetic dyes, the eco-colours are very safe to the humans especially children.

Value chain and profit margins in the production of eco holi colours (Yellow colour) (Rs/kg)

For establishing the value chain first the existing value chain was analyzed and the gaps are identified. Accordingly, the Self-Help Groups and other small enterprises, collectors of the natural colour sources in Hyderabad, Rangareddy and Nalgonda districts are trained. The SHG groups are linked with the Marketing Agencies like Hyderabad Goes Green, Hariohm enterprises and Priyanka enterprises. These marketing agencies sold the eco holi colours in the twin cities of Hyderabad and Secunderabad through different outlets and office sales. Hyderabad Goes Green has sold the powders in Mumbai also. The consortium leader of the project, College of Home science also established natural dye unit, produced

eco powders and disposed through direct sales through different outlets like sweet shops, NGOs, office sales in twin cities.

The channels identified in the given study are Channel-1: Producer/SHG-Marketing Agency-Consumer and Channel-2: Producer/SHG- Consumer.

The profit level in the technology of production of eco-powders was found to be high in both the channels. The average cost per one kilogram of eco powers was worked out at Rs 150 at producer level. The selling price in the established value chain was Rs. 250. If one tonne is produced and sold, the producer would get Rs. 1.0 lakh net profit. The marketing agency can earn profit of Rs. 100 per kilogram. In channel 1 i.e., Producer/SHG to marketing agency and to end consumer, the producer's share in the consumer's rupee worked out Rs. 62.50. Thus, there is a return of 0.62 for every 1 rupee invested. Though the profit margin is same for both the producer and the marketing agency the investment is less for marketing agency. So, the middlemen are benefitted more in the value chain whereas in channel 2 where the SHG s themselves go for marketing the eco holi colour there can be a 100 per cent return for their investment. Thus, in value chains the producers share in consumers rupee can be enhanced as well the end users can also be benefitted [7].

Table 4 Profits in the production of eco holi colours (Yellow colour) (Rs/kg)

Particulars	Channel-1 (Rs./Kg)	Per cent	Channel-2 (Rs./Kg)	Per cent
Net price received by the producer	100.00	25.00	200	50.00
Purchase price	90.00	22.50	90	22.50
Production cost/ processing cost	60.00	15.00	110	27.50
Sale price of farmer/ Marketing agency purchase price	250.00	62.50	-	-
packaging and transport by the marketing agency	50.00	12.50	-	-
Marketing Agency s margin	100.00	25.00	-	-
Consumer purchase price	400.00	100.00	400	100
Producer s share in consumer rupee	62.50	-	100	-

Before the project intervention, two firms namely Eco-Exist, Pune and Green and Good store, Jaipur are producing eco-friendly colours and supplying in limited quantities to

twin cities of Hyderabad and Secunderabad. With the established value chain new agencies came into picture to supply eco holi powders. The technology was scaled up and

disseminated through trainings to SHG groups for direct sales to consumers. The awareness levels with regard to problems associated with these synthetic colours was low before the intervention in this project. The consumer awareness programmes are conducted independently and in association with pollution control board and reached more than 10,000 consumers. The feedback of the consumers was taken up and accordingly scaled up the technology by producing 3 tonnes of highly preferred 5 colours namely Orange, pink, yellow, blue and green [8].

Table 5 Awareness levels of natural/eco holi colours (2018)

Particulars	Frequency	Percentage
Are you playing holi		
Yes	84	93.33
No	6	6.67
Are you aware of eco/natural holi colours		
Yes	62	68.89
No	28	31.11
Are you using of eco/natural holi colours		
Yes	28	33.33
No	56	66.67
Are you facing problem in washing synthetic colours		
Yes	71	84.52
No	13	15.48
Are you facing health/irritation problem with synthetic colours		
Yes	76	90.48
No	8	9.52
If yes, the problems faced		
Irritation in eyes	19	25.00
Rashes on skin	29	38.16
Acidic taste in the mouth	52	68.42
Do you know the long-term effects of synthetic colours		
Yes	53	58.89
No	37	41.11

The success of the project paved the way for promoting the successful agri entrepreneurs in the production and marketing of the eco holi powders by replicating the value

chains in selected areas as these eco colours are going to play a dominant role in future. The eco holi colours would also help in reducing the environmental hazards.

An attempt was made to notice the changes in the awareness levels about eco holi colours and its usage in Hyderabad and Rangareddy districts in 2018. Door to door survey was conducted to collect the responses from 90 sample respondents. The sampling design involved cluster sampling in offices, colonies, colleges and schools [9]. The results are presented below in (Table 5).

It was observed that 93 per cent respondents are playing holi and 69 per cent are aware about the eco holi colors. This is mainly due to the publicity given by the NAIP project, Government non-Government organizations. About 33 per cent said they are using natural colours. It is heartening to note that many of them are purchasing natural colours from different sources [10]. Many of the respondents are using both natural and synthetic colours as natural colours are not available in sufficient quantities. They also expressed that the colours are not bright and are not having proper sticky character, not available at local outlets. Almost all of them are willing purchase if the natural colours are readily available at local outlets at affordable prices.

CONCLUSIONS

Large-scale public awareness programmes are important to explain about health and environmental hazards due to synthetic colours and safe practices of holi with natural colours to save the environment. Establishing enterprises for manufacture of natural colours at affordable prices, establishing value chains and market linkages, widespread publicity regarding availability of natural/eco holi colours and supply in larger quantities at local outlets are the need of the hour to increase the production and availability of eco holi colours. Research should be concentrated on development of brighter holi colours with required stickiness for satisfying more customers .

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LITERATURE CITED

1. Chaube PH, Indurkar, Moghe S. 2010. Biodegradation and decolorization of dye by mix consortia of bacteria and study of toxicity on *Phaseolus mungo* and *Triticum aestivum*. *Asiatic Journal of Biotechnology Resources* 1: 45-56.
2. Toxics Link Fact Sheet. 2019. Herbal Holi-This Holi be green and clean- Toxics alert. *An Environmental News bulletin*, Issue, 11, March.
3. Sharma H. 2012. Skin allergies caused due to Holi colors, <http://www.onlymyhealth.com>.
4. Gardner JJ, Lal D. 2012. Impact of 'Holi' on the environment: A scientific study. *Archives of Applied Science Research* 3: 1403-1410.
5. Alau KK, Gimba CE, Kagbu JA. 2010. Removal of dyes from aqueous solution using neem (*Azadirachta indica*) husk as activated carbon. *Archives of Applied Science Research* 5: 456-461.
6. Barhanpurkar S, Kumar A. 2014. Natural dyes –An over view. TEXTILE VALUE CHAIN (TVC) is an Indian Trade Media with Monthly Print Magazine, E-Magazine, E-Newsletter.
7. Devi S, Suhasini K. 2014. Consumption of maize in poultry feed industry - A value chain study in Mahbubnagar district of Andhra Pradesh. *Indian Journal of Poultry Science* 49(1): 101-105.
8. Sharada DA. 2014. Final report of A value chain in Natural Dyes.
9. Devi IS, Suhasini K, Prabhakar BN. 2017. Value chain of groundnut-An analysis of constraints and opportunities ahead. *Indian Journal of Economics and Development* 13(2a): 341-346.
10. Sharma A, Saxena R. 2013. Moderation of eco-friendly trends in Indian festival; Holi. *Archives of Applied Science Research* 5(3): 129-133.