

EXTRACTION OF NATURAL DYE AND PREPARATION OF GULAL FROM *BUTEA MONOSPERMA* AND ASSESSMENT OF DYEING PROPERTIES

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ABSTRACT

The present work was planned to extract a new colouring component with keeping the environment friendly extraction procedure excluding the extensive application of organic solvents. We have chosen the *Butea Monosperma* (palash flower) for extraction of natural dye and making the herbal gulal. Aqueous technique is used for the extraction of natural dye from palash. Author has analyzed the extracted natural dye such as percentage yield, absorbance maxima and wavelength etc. Also studied were the dyeing properties in two types of cloths namely cotton and polyester by using solvents such as potassium dichromate. The herbal gulal has also made by using palash extract with wheat and rice flour.

KEY WORDS: Bio-fertilizer, Kitchen waste, Biomass, crops

INTRODUCTION

Palash is commonly known as the Flame of the forest or the Flame tree and various parts of the plant like flowers, bark, leaf and seed gum are used for medicinal purposes. Palash is mainly used to get rid of worms from the stomach due to its anthelmintic activity. It can be used to manage diarrhoea as it has antimicrobial and astringent properties. To prepare the particular natural color dye on the gathered trial, one extraction technique has been followed. This technique is aqueous technique. The palash flower petals was collected, then soaked overnight with water and then boiled. The liquid material or dyes were used for the experiments. And to prepare natural gulal or abeer we use wheat flour and rice flour. These flours are added with different concentrations of palash juice prepared by aqueous technique. Then this solution is mixed it properly and makes small balls of this flour. These balls are sun dried for 2-3 days and then balls are crushed and fine grind by grind. Kannanmarikani *et al.* (2015) studied that according to dye yield and fastness properties the plant was

chosen for fabric dyeing. Amlepatil *et al.* (2015) studied that to extract natural color from various novel techniques of extraction especially ultrasonication and microwave assisted extraction techniques and their efficiency and suitability. Jha *et al.* (2015) studied that in this study, natural colorants mainly flavonoids and carotenoids present in the Marigold flower (*Tagetes erecta* L.). Daberao *et al.* (2016) studied that there are huge numbers of process to do coloration. Natural and man-made colors are also used. Tiwari (2020) studied that the purpose of this research is to study and develop smart packaging by addition of natural dyes of beet (*B. vulgaris L. var cicla* L.) as well as finding the best drying techniques for label producing. Suman *et al.* (2020) developed an eco-friendly wood stained extracted from beetroot (*Beta vulgaris*) and determined the color stability of stain to UV light irradiation. Gupta *et al.* (2015) studied that in India, there are more than 450 plants that can yield dyes, Ding *et al.* (2017) studied that cotton fibres can be dyed through the formation of coordinate bonds involving cellulose chains, mordants such as alum, and natural dyes such as alizarin, Bhatnagar *et al.*

(2018) studied about festival called Holi and its hazardous ocular effects at tertiary care ophthalmic center in north India, Ghosh *et al.* (2016) studied that Holi is a festival of colors, traditionally celebrated by mutual application of colors in different forms on a particular day of the year,

MATERIALS AND METHODS

We have used different type of materials, instruments, glassware and chemicals in this research work are listed below. All materials used in extraction of natural dye and preparation of herbal gual from palash flower were purchased from the local market Mungeli

Table 1. Materials used in extraction of natural dye and preparation of herbal gual from palash

Material used	Quantity	Cost (Rs.)
Palash flower	2kg	Free and cost
Distilled Water	7 litre	20 Rs. Per litre
gram Flour	100 gm	90 Rs. Per kg
Rice Flour	100 gm	45 Rs. Per kg
Cotton Cloth	0.5 meter	60 Rs. Per m
Polyester Cloth	0.5 meter	40 Rs. Per m

All the above materials used in extraction of natural dye and preparation of herbal gual from beetroot were purchased from the local market Mungeli. The instruments used in extraction of natural dye and herbal gual such as induction, weighing machine, steel container. We have analyzed the extracted natural dye sample by using the UV/VIS digital spectrophotometer model 371, which is available in Engineering Chemistry Laboratory, BRSM CAET and RS, Mungeli.

Method of extraction of natural dye

In his project we have used aqueous technique or extraction of natural dye from palash.

Aqueous technique

Firstly palash extract was prepared by boiling the palash flowers. We have to gather 1 kg of fresh palash flower, 1000 ml of distilled water and separate the flower petals then this palash petals soaked overnight. Now this 1000 ml of distilled water is boiled with palash for 1 hour. After preparation it filters and collected in fresh beaker. After this, soak cotton and polyester cloths in the extraction. Then after 5 minutes, remove the cloths



Fig. 1. Photographs of separated flower petals and different operations during extraction of natural dye from Palash with distilled water

and dry it for 24 hours. These cloths are analyzed that the changes occurred in colour of fabric in 1 hour interval.

Preparation of herbal gual

Preparation of herbal gual by using wheat flour

Firstly palash extract was prepared by boiling the palash flower. We have to gather 1 kg of fresh palash flower, 1000 ml of distilled water and separate flower petals then this flower petals soaked overnight. Now this 1000 ml of distilled water is boiled with palash flower for 1 hour. After preparation it filters and collected in fresh beaker. Then mix 50 g of wheat flour with 35 ml of pure Palash extraction. Now divide the prepared dough into small pieces. Then dry it for 24 hours in sun. After drying grind it in a powder form. Finally we obtained herbal Gual by using wheat flour.

Preparation of herbal Gual by using rice flour

Firstly Palash extract was prepared by boiling the Palash flower. We have to gather 1 kg of fresh Palash flower, 1000 ml of distilled water and separate flower petals then this flower petals soaked

overnight. Now this 1000 ml of distilled water is boiled with Palash for 1 hour. After preparation it filters and collected in fresh beaker. Then mix 50 g of rice flour with 35 ml of pure Palash extraction. Now divide the prepared dough into small pieces. Then dry it for 24 hours in sun. After drying grind it in a powder form. Finally we obtained herbal Gulal by using rice flour.

Assessment of dying properties of extracted natural dye

Assessment of dying properties of natural dye have been done with the help of chemical that is potassium dichromate, which is described below:

With potassium dichromate ($K_2Cr_2O_7$)

Firstly Palash extract was prepared by boiling the Palash flowers. We have to gather 1 kg of fresh Palash flowers, 1000 ml of distilled water and separate flower petals then this flower petals soaked overnight. Now this 1000 ml of distilled water is boiled with Palash flower for 1 hour. After preparation it filters and collected in fresh beaker. Now 2 g of $K_2Cr_2O_7$ added with 10 ml of Palash extraction. 4 gm of $K_2Cr_2O_7$ added with 10 ml of palash extraction. 6 g of $K_2Cr_2O_7$ added with 10 ml of Palash extraction. 8 g of $K_2Cr_2O_7$ added with 10 ml of palash extraction. After this, soak cotton and polyester cloths in the extraction. Then after 5 minutes remove the cloths and dry it for 24 hours. These cloths are analyzed that the changes occurred in colour of fabric in 1 hour interval.

RESULTS AND DISCUSSION

Different sample prepared by Palash flower extract

By using Palash petals extract we have prepared one samples. For extraction of the sample we have aqueous technique. The extracted sample is denoted which showed in Table 2.

Analysis of prepared natural dyes

Percentage of yield

After extraction of natural dye we have determined the percentage of yield of the sample which shown in Table 2. We find that in case of natural dye

Table 2. Percentage of yield of the extracted natural dye from palash petals

S. No.	Name of Samples	Yield	% Yield
1	SN1	520	52

extracted by distilled water we get 520 yield, i.e. 52%.

Study the Absorbance maxima

Absorbance maxima of natural dye extracted by distilled water

The extracted natural dye has characterized by UV/VIS spectrophotometer. We checked wavelength (nm) and absorbance maxima of all prepared samples which shown in Table 3 and Figure 3. We find that in case of natural dye extracted by distilled water sample is 1.6 absorbance in 400 nm wavelength, 1.0 absorbance in 420 nm wavelength, 1.2 absorbance in 440 nm wavelength, 1.8 absorbance in 460 nm wavelength, 1.1 absorbance in 480 nm wavelength, 1.7 absorbance in 500 nm wavelength, 1.9 absorbance in 520 nm wavelength, 2.0 absorbance in 540 nm wavelength, 2.2 absorbance in 560 nm wavelength, 2.6 absorbance in 580 nm wavelength, 2.3 absorbance in 600 nm wavelength, 0.9 absorbance in 620 nm wavelength, 0.8 absorbance in 640 nm wavelength, 0.5 absorbance in 660 nm wavelength. And we have observed that the maximum absorbance 2.6 in 580 nm wavelength and minimum absorbance 0.8 in 640 nm wavelength of natural dye extracted by distilled water sample.

Table 3. Absorbance maxima of natural dye extracted by distilled water

S. No.	Wavelength (nm)	Absorbance
1	400	1.6
2	420	1.0
3	440	1.2
4	460	1.8
5	480	1.1
6	500	1.7
7	520	1.9
8	540	2.0
9	560	2.2
10	580	2.6
11	600	2.3
12	620	0.9
13	640	0.8

Preparation of herbal Gulal

We have also prepared two types of gulal by using natural dye of Palash petals extract.

Preparation of herbal Gulal by using wheat flour and natural dye

We have prepared herbal Gulal by mixing Palash

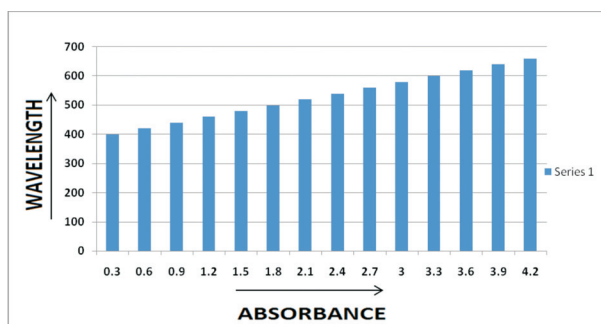


Fig. 3. Shows the graph between different wavelengths of distilled water sample verses absorbance.

petals extract and wheat flour. This Palash petals extract is prepared by using 500g of fresh Palash petals with 1000 ml of distilled water. We use 50 g of wheat flour with 50 ml of pure prepared Palash petals extract. After sun drying and grinding the small pieces of mixture we obtain fine powdered form of Gulal and we observed that the colour of the herbal Gulal is yellow colour which shown in Figure 4.13.

Preparation of herbal Gulal by using rice flour and natural dye

We have also prepared herbal Gulal by mixing Palash petals extract and rice flour. This Palash petals extract is prepared by 500g of fresh Palash petals with 1000 ml of distilled water. We use 50 g of rice flour with 50 ml of pure beetroot extraction. After sun drying and grinding the small pieces of mixture we obtain fine powdered form of Gulal and we observed that the colour of the herbal gulal is dark red colour as shown in Figure 2 and 3.

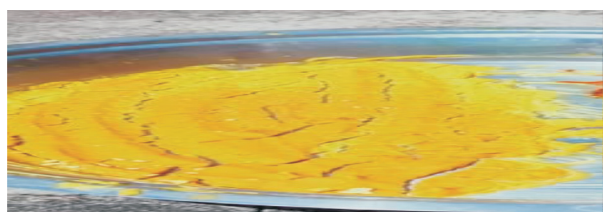


Fig. 2. Photograph showing Herbal gulal made by natural dye added with rice flour.

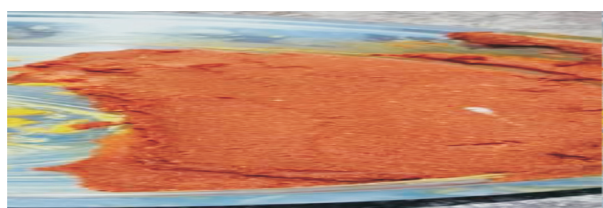


Fig. 3. Photograph of herbal gulal made by natural dye added with wheat flour

Study the assessment of dyeing properties

After the extraction of natural dye we have studied their dyeing properties in presence of sun light with reagent and two different cloths such as cotton and polyester.

Assessment of dyeing properties of natural dye in cotton cloth

We have studied dyeing properties of cotton cloth in sun light and observed that after applied the dye on clothes then we get maroon colour shows in Figure 4. In 0 minute, it showed maroon colour for natural dye but after the time interval such as 1, 3 and till the 6 hours we got dark maroon colour but after 6 hours it gets faded and after 24 hours we get constant light maroon colour.

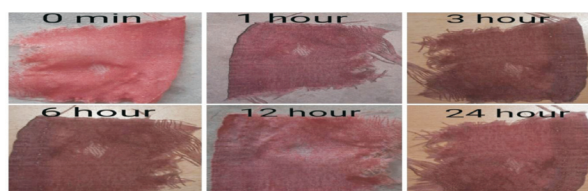


Fig. 4. Direct dyeing of cotton cloth color by natural palash petals dye at different time intervals

Assessment of dyeing properties of natural dye in polyester cloth

We have studied dyeing properties of polyester cloth in sun light and observed that after applied the dye on clothes then we get maroon colour shows in Figure 5. In 0 minute, it shows light maroon colour for natural dye but after the time interval such as 1, 3 and 6 hours we got dark maroon colour but after 6 hours it gets faded and after 24 hours we get constant light maroon colour

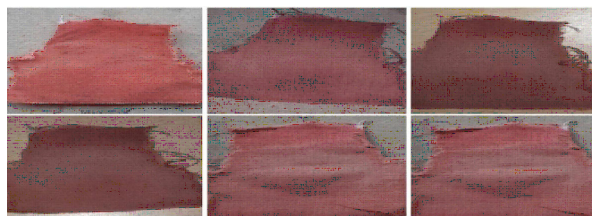


Fig. 5. Direct dyeing of polyester cloth color by natural palash petals dye at different time intervals

CONCLUSION

In this research work I have extracted natural dye and prepared the herbal gulal. The natural dye extraction by the palash was made by aqueous technique. We have also studied the assessment of

dyeing properties of extracted natural dye from palash. Assessments of dyeing properties of natural dye have been done by using reagents, i.e. potassium dichromate. The herbal colour (gulal) has been also prepared by the palash by using wheat flour and rice flour. After extraction of natural dye we have analyzed all the samples and find that:

- In case of natural dye extracted by distilled water give 52% yield.
- We find that in case of natural dye extracted by distilled water sample is 1.6 absorbance in 400 nm wavelength, 1.0 absorbance in 420 nm wavelength, 1.2 absorbance in 440 nm wavelength, 1.8 absorbance in 460 nm wavelength, 1.1 absorbance in 480 nm wavelength, 1.7 absorbance in 500 nm wavelength, 1.9 absorbance in 520 nm wavelength, 2.0 absorbance in 540 nm wavelength, 2.2 absorbance in 560 nm wavelength, 2.6 absorbance in 580 nm wavelength, 2.3 absorbance in 600 nm wavelength, 0.9 absorbance in 620 nm wavelength, 0.8 absorbance in 640 nm wavelength, 0.5 absorbance in 660 nm wavelength.
- We also observed that the maximum absorbance 2.6 in 580 nm wavelength and minimum absorbance 0.5 in 660 nm wavelength of natural dye extracted by distilled water sample
- We also observed that on applied the natural dye on cotton and polyester clothes then we get maroon colour. Initially, it is light maroon colour but after the time interval such as 1, 3 and 6 hours we got dark maroon colour but after 6 hours it gets faded and after 24 hours we get constant light maroon colour
- We have also prepared herbal gulal by mixing palash extract and wheat and rice flour. We observed that with wheat flour get brown colour & with rice flour get pink colour.

The extraction of natural dye from the palash is completely eco friendly because they come from the natural sources and natural dyes are not harmful to the environment. This process is also green synthesis. Prepared natural dyes and herbal gulal are not harmful for skin and human health while

other colour and gulal which is available in market are very dangerous for human health as well as the skin. The cost of the extracted natural dyes and prepared herbal gulal is very low and they can easily make.

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