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Colour Extraction from *Butea monosperma* (palash) Flowers

PS Pandit[1], Sunila Kumari[2] and JJ Pastagia[3]

[1]Center of Excellence on Post Harvest Technology,
[2]Subject Mater Specialist,[3]Program Coordinator, Krishi Vigyan Kendra, Surat;
Navsari Agricultural University, Navsari
E-mail: postharvesttechnology@nau.in

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ABSTRACT

Butea monosperma belongs to the plant family *Fabaceae* and also called "*the flame of the forest*" due to the bright orange and scarlet colours of its flowers. The compounds like; lanceoletin, butein, monospermoside and sulfurein have been isolated from petals of *Butea monosperma*flower which could be utilized as cosmetic treatment and so, it has got immense potential for use as herbal colour, which shall also create an additional income to tribe in the forest. The time of colour extraction using water was found to be long with less recoveryand poor quality extract. An experiment was conducted using steeping method of solvent extraction at ambient conditions with six treatments; T_1: Normal tap water, T_2: RO water, T_3: Methanol (100%), T_4: Methanol (50%), T_5: Ethanol (100%) and T_6: Ethanol (50%) to extract the colour from *Butea monosperma*flower. The time of extraction, dry dye recovery and dry dye colour content was measured for each treatment after extraction.The results of dry dye recovery, dye colour content and extraction time, indicated that the 50% v/v methanol solvent (Treatment-T_4) has recovered highest dry dye of 0.310g per 100g flower and dye colour content of 179.25ppm compared to other treatments consistently with considerable extraction time of 22h 45 min.

Keywords:

Butea monosperma, flower colour, Colour extraction from flower, Steeping solvent extraction method.

INTRODUCTION

Butea monosperma belongs to the plant family *Fabaceae,* commonly known as '*Palash*' in 'Hindi'and '*Kesudo*' in 'Gujarati'. It is also called "*the flame of the forest*" due to the bright orange and scarlet colour flowers. It follows the trade name "Butea" which has been taken from its scientific name *Butea monosperma*.This tree is native to India and can be found growing all over the country but it is most easily spotted in the mixed and/ or dry deciduous forests of central and western India. It is an underutilized species found abundantly in forest of Gujarat districts. The bright orange flowers, appears in month of February-April, have been used for through ages throughout India for playing '*Holi*' the festival of colours. As playing '*Holi*' with synthetic colours is considered unhealthy, hence there is huge demand

for herbal colours. *B. monosperma*has got immense potential for use as herbal colour, which may create an additional income to local people particularly tribal population (Anon. 2009). Its flowers contain seven flavonoid glucosides, butrin, isobutrin, three glucosides (coreopsin, isocoreopsin and sulphurein), monospermoside and isomonospermoside (Anupama 2013; Hazare et al. 2013; Rana and Mazumdar 2012). The compounds like; lanceoletin, butein, monospermoside and sulfurein have been isolated from petals (Oberoi and Ledwani 2010).

Extraction of colour using water as solvent is well-known technique, as the colour substance of '*Plash*' has very good solubility in water. The extracted colour could be utilized as food colour, dye for cloth printing as well as making herbal *gulal* (red colour). The time of colour extraction was found to be long up to 48-72 hours with less recovery and slight fermentation smell in this method. The process has number of disadvantages as far as quality of colour concern. Many a time it ferments and resulted in to entire batch loss. The limited technical information are available regarding; colour extraction process from *B. monosperma* using various combination of solvents, effect of temperature and time on recovery and concentration, etc. This article discuses the results of experiment related to generated data about effect of solvent on extraction time, dry dye recovery and strength of colour dye content in dry dye.

MATERIALS AND METHODS

B. monosperma flowers were collected from Navsari Agricultural University (NAU) campus, Navsari as well as from tribal area of Antroli and Amchuni village of Mandavi of Surat District of Gujarat State, India. The experiment was conducted at Centre of Excellence on Post Harvest Technology, NAU, Navsari during the year 2014-15 using the solvent extraction process shown in figure1 with six treatments and four replications with Completely Randomized Design(CRD). The flower were cleaned, sorted and placed in the solvent as per the treatments- T_1: normal tap water, T_2: reverse osmosis (RO) water, T_3: methanol (100%), T_4: methanol (50%), T_5: ethanol (100%) and T_6: ethanol (50%). The ratio of whole fresh flower to solvent was kept 100g to 100 ml (Oberoi and Ledwani 2010).

B. monosperma Flower
↓
Washing with tap water
↓
Dipping in Solvent as per treatments
↓
Agitation after every 2 hours
↓
Filter colour water solution
↓
Drying of colour solution
↓
Dry colour dye
↓
Analysis for strength of colour

Fig. 1 Process of colour extraction from *B. monosperma* flower

During process of extraction, the solvent started converting from colourless to orange colour and flower petal turned to colourless or purple. This duration of time was noted as extraction time. After extraction for the time of 21 to 35 hours, the solution was dried into powder at 50°C for 37 hours in controlled conditioned tray dryer. The dry dye recovery measured with respect to flower weight taken using equation 1.

$$\text{Dry dye recovery (\%)} = (W_1 / W_2) \times 100 \ldots \text{Eq. 1.}$$

Where, W_1 = Weight of dry dye matter, g

W_2 = Weight of flower, g

The solution of dry dye was prepared in water at 1 per cent concentration (0.1g dry dye in 10ml of water) to measure the colour strength with respect to standard food grade colourdye 'tartrezine'. The various dilute solution of tatrezine was prepared and standard curve generated between concentration (ppm) vs transmittance value. The sample was placed in cuate and read at 590nm wavelength of spectrophotometer (Make:ThermoSpectronic, UK;Model: GENESYS10 VIS) and compared with graph slope. The strength of the colour converted into

equivalent solution of tatrezine solution (ppm).

RESULTS AND DISCUSSION

The results of pooled analysis of two trials are presented in Table1.Time of extraction is concern; the 100% methanol (T_3) has taken lowest time of 21h 38min for extraction of colour. It was found significantly lesser compared to other treatments. 50%methanol treatments found at par with 100% methanol (T_3).The 50%methanol (T_4) has taken second lowest time of 22h 45min for extraction of colour, which was 5.16% higher than T_3. The difference in the extraction time between 100% methanol (T_3) and 50%methanol (T_4) was 67min. The result of extraction time reveled that, the solvent methanol took less time for extraction of colour from *B. monosperma* flower compared to ethanol and water. The time of extraction was higher for ethanol compared to methanol.

Table 1. Effect of various solvents on colour extraction of *B. monosperma* flower.

Treatment	Extraction Time (h)	Dry Dye Recovery (%)	Dye content (ppm)
T1	35.13	0.279	110.135
T2	34.75	0.273	119.625
T3	21.63	0.284	139.475
T4	22.75	0.310	179.25
T5	23.75	0.278	125.363
T6	25.38	0.279	163.95
Mean	27.23	0.284	139.633
S. Em ±	0.84	0.012	1.688
CD at 5%	NS	NS	NS
CV %	6.16	7.19	2.41

The dry dye recovery was measured with respect to flower weight taken. Significantly highest dry dye of 0.310% (0.310g/100g flower) was recovered with 50%methanol (T_4) compared to all the treatments. As far as dye recovery concern, the 50% methanol solvent was found useful compared to other solvent. Similar results were reported by Saxena et al. (2012) regarding extraction process time concern.

The result related to strength of the colour as equivalent solution of tatrezine indicated that, the dye content was found significantly higher with value 179.25ppm in 50%methanol (T_4) compared to all the treatments.50% ethanol Treatments (T_6)was found at par with 50%methanol (T_4).It was observed that, the 50% methanol solvent could extract higher colour dye content from flower compared to other treatments.

The results of dry dye recovery, dye colour content and extraction time, indicated that the 50% v/v methanol solvent (T_4) has recovered highest dry dye of 0.310g per 100g flower and dye colour content of 179.25ppm compared to other treatments consistently with considerable extraction time of 22h 45 min. Oberoi and Ledwani (2010) have also reported best performance of methanol solution with the yield of 9.6% in hot percolation method for *Butea monosperma* flower petal on dry basis. Similar results were observed by Bhuyan and Saikia (2005). They expressed the reason for higher colour content that the aqueous solution of methanol increase the colour expression compared to pure methanol as it helps the pigment to turn brown.

During the experiments, the maximum temperature, minimum temperature and average relative humidity was observed to be 38±2°C, 19.5±1°C and 65±5% respectively as per meteorological data.

CONCLUSION

It was concluded that, for colour extraction from *Butea monosperma* flower at ambient conditions, 50% methanol water based v/v solution perform better with solvent extraction steeping method.

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