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Standardization of *Butea monosperma* Flowers and Its Use as a Paper Colorant

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ABSTRACT

Due to the harmful effects of synthetic dye, dying has been forced to substitute preparation of dye using natural sources like flowers, leaves, stem, bark etc. In this study we made a natural paper colorant which obtained from flowers of plant Butea monosperma. These natural dyes are eco-friendly having no side-effects on skin and no disposal problems. Natural dyes find use in the colouring of textiles, drugs, cosmetics, etc. Owing to their non-toxic effects, they are also used for colouring various food products. In India, there are more than 450 plants that can yield dyes. In addition to their dye yielding characteristics, some of these plants also possess medicinal value. Though there is a large plant resource base, little has been exploited so far. Due to lack of availability of precise technical knowledge on the extracting and dyeing technique, it has not commercially succeeded like the synthetic dyes. For prevention of our health, we prepared natural paper colorant, which may be used as packaging paper for many pharmaceutical preparations, food items etc.

Keywords: *Colorant, Butea monosperma , Dyes , Natural Dyes, Modrant.*

INTRODUCTION

Introduction About Colorant

In present years there has been a revival of the use of dyes and color from natural sources like stem, bark, leaves, roots and flowers for colouring in food industry, cosmetic and textile industry. Until the unexpected invention of widely available and cheaper synthetic dye of mauveine by English chemist Sir William Henry Perkin in Germany in 1856. People are using natural sources to get different colors-yellow, orange, blue, red, green, brown, grey, etc. for dyeing purpose. This growing demand of natural origin is because synthetic dyes are harmful due to their negative eco toxicological effects associated with hazards on human health viz. creating skin diseases, lungs problems and environmental problems. Due to these drawbacks, natural dyes are becoming widely recognized throughout the world. Natural colorants are dyes and pigmentary molecules that are obtained from plant, animal or mineral sources with or without any chemical processing. The advantages of natural dyes are that they are cost effective, no disposal problems renewable, eco-friendly i.e., they do not create any environmental problems at the stage of production or use, maintains ecological balance and has no allergic reaction on skin. The use of natural dyes replaces and reduces significantly the amount of toxic effluent resulting from the dyeing process. In recent years, more than 100,000 dyes are available in market. Worldwide, nearly 1 million tonnes of synthetic dyes are produced annually. Nowadays, the global demand for natural dyes is increased nearly 10,000 tonnes which is approximately 1% of the synthetic dyes consumed worldwide. This need is predicted to grow rapidly in the coming future. It is the need of the day to identify the various resources for the extraction of these dyes. In India huge amount of flowers and herbal materials are being wasted daily. In many cases these highly colored waste plant residues contain considerable amounts of natural dyes. So these wasted flowers can be used for extraction of dye in Textile Industry in place of synthetic dye. Besides application in textile industry, the dyes can also be used in the coloration of food industry for preparing herbal gulal and making different colourful candles. For the purpose of the work, Flame of Forest (orange-red colour) has been chosen as a natural source for dye extraction [1,2].

Introduction about Medicinal Plant: *Butea monosperma*

Vernacular Name: (Roshan Sunil pharmatutor). Flame of the forest, Palas, Dhak, Tesu, Palash, Bastard teak, Khakharo, Parasa

Biological Source: It is obtaining from the plant of *Butea monosperma* (Lam.) Kuntze belonging to the family-Leguminoceae and sub family-Papilionaceae.

Geographical Source

It is medium size tree found in greater part of India, topical and sub topical part of India [west Bengal, Kolkata, Faizabad, Ranchi, Jharkhand, Kerala, Etha etc]. Sub-continent and Southeast Asia ranging across India, Bangladesh, Nepal, Srilanka, Myanmar, Thailand, Cambodia, Vietnam, Malaysia and Western Indonesia.

Cultivation and Collection

Flowering: February-April
Fruiting: May-July
Flower and leaves are shed during the dry season.

Biophysical Limits

Altitude: Up to 1500 m
Mean annual temperature: -4 -49°C
Mean annual rainfall: 450-4500 mm.
Soil type: It grows on a wide variety of soils including shallow, gravelly sites, black cotton soil, clay loams, and even saline or waterlogged soils. Seedlings

thrive best on a rich loamy soil with pH 6-7 under high temperature and relative humidity. At the beginning of the rainy season, the leafless tree flowers abundantly and is very conspicuous in the forest. At the end of the flowering period, new leaves develop, which are initially a pale bronze-tinged green. Birds are the chief pollinators.

Macroscopic Character (A.P.I)

Butea Monosperma is a small to medium-sized deciduous tree, 5-15 m (max. 20 m) tall, up to 43 cm, trunk usually crooked and tortuous, with rough Greyish-brown, fibrous bark showing a reddish exudates; branch lets densely pubescent.

Fig.1. Butea monosperma Plant

Leaves – Trifoliate; petiole 10-15 cm long petioles and stipules liner lanceolate, all obtuse, glabrous, finely, silky and petioles 6mm long, broadly ovate leaflets from a cuneate base [3].

Fig. 2. Butea monosperma Leaves

Flowers: The calyx of flower is13mm long, dark rachis, pedicles about twice as long as the calyx, densely brown bracts and flower are large, in rigid racemes 15cm long. 2 upper connate, 3 lower equal, with silky, silvery hairs at outside. Orange or salmon colored, standard 2.5 cm broad, pods stalked are 12.5-20 by 2.5-5 cm and thickened at the reticulate veined.

Fig.3. Butea monosperma Flower

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Fruit an pod: (min. 9) 17-24 x (min. 3) 4-6 cm, stalked, covered with short brown hairs, pale yellowish-brown or grey when ripe, in the lower part flat, with a single seed near the apex. Seed ellipsoid, flattened, about 3 cm long [4].

MICROSCOPIC CHARACTER (A.P.I)

Pedicel: Shows more or less wavy outline, single layered epidermis covered with thick cuticle, unicellular, 2 or 3 celled trichomes, followed by ground tissue consisting of 6 to 8 celled, thin-walled, oval to polygonal parenchymatous cells; endodermis single layered; vascular bundle radially arranged, collateral, consisting of usual elements.\

Sepal: Shows single layered epidermal cells, uniseriate, multicellular trichomes and club shaped secretory ducts present on lower surface, epidermis followed by 3 or 4layered, thin-walled, loosely arranged parenchymatous cells on both surfaces, thin walled, wavy epidermal cells showing on the surface view

.**Petal:** Shows single layered, thin-walled, epidermal cells, covered with numerous, unicellular, pointed trichomes and a few glandular hairs; thin-walled, capitate or cone shaped papillae present on both surface; mesophyll consisting of thin-walled, loosely arranged, parenchymatous cells; a large number of larger and smaller vein found scattered in this region, some of the cells contain a few of oil globules.

Powder: Yellowish-brown; shows fragments of parenchyma, epidermis with stomatal cells; numerous, pointed, multicellular trichomes and a few oil globules.

TAXANOMICAL CLASSIFICATION [5]

Kingdom - Plantae
Division - Magnoliophyta
Class - Magnoliopsida
Order - Fabalea
Family - Fabaceae
Genus - Butea
Species - Monosperma

Chemical Constituent [6]

Parts Used: Seeds, gum, leaves, flower and bark. The gum obtained from tree known as Gum Kino.

Palash Root Bark: Contains beta-sitosterol, leucoanthocyanidin, amyrin, betulinic acid, stigma sterol and en active principal palasonin.

Gum and Bark: Tannins, mucilaginous material, pyrocatechin [7].

Palash Flowers: Contain seven flavonoid glucosides, butrin, isobutrin, three glucosides (coreopsin, isocoreopsin and sulphurein), mono spermoside and iso monospermoside.

Palash Leaves: Contain glucosides. Seeds contain proteolytic and lypolytic enzymes, Palasonin, monospermoside and somonospermoside.

Seeds: Anthelmintic activity.

Fig.4. Butea monosperma Seed

MEDICINAL USES [8]

The flowers are useful in the treatment of liver disorders and seeds act as an anthelmintic.

Erosion Control: In India, farmers frequently use *B. monosperma* to stabilize field bunds

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Ornamental: *B. monosperma* is planted as an ornamental because it flowers with a profusion of bright orange, rarely sulphur-coloured flower. *Butea monosperma* is extensible used in Ayurveda, Unani and Homeopathic medicine and has become a cynosure of modern medicine.

The plants of this genus are well-known for their colouring matters. Commonly *Butea monosperma* is used asntonic, astringent, aphrodisiac and diuretics.

Roots: Root is useful in filariasis, night blindness, helminthiasis, piles, ulcer and tumours. It is reported to possess antifertility, aphrodisiac and analgesic activities.

Fig.5. Butea monosperma Root

Flowers

Fig.6. Butea monosperma Flower

Flower are useful in diarrhoea, astringent, diuretic, depurative, tonic, leprosy, skin diseases, gout, thirst, burning sensation.

Stem: The stem bark is useful in indigenous medicine for the treatment of dyspepsia, diarrhoea, dysentery, ulcer, sore throat and snake bite. Besides medicinal uses it is also having the economic use such as leaves are used for making platters, cups and bowls.

Bark fibres: Bark fibres are used for making cordage.

Wood: Wood is used for well curbs and water scoop. It is a cheap board wood .Wood pulp is suitable for newsprint manufacturing. *Butea* is also apostate the Lac insect, which produces natural lacquer, liver disorders, gonorrhoea, wound infection, Root is used in night blindness, elephantiasis, impotency and in snake bite. It also causes temporary sterility in women and is applied in sprue, piles, ulcers, tumors.

Seeds: Seed of *B. monosperma* is used in inflammation, skin and eye diseases, bleeding piles, urinary stones, abdominal troubles, intestinal worms and tumour. When seeds are pounded with lemon juice and applied to the skin, they act as a rubefacient.

Fodder: In India, young leaves are good fodder, eaten mainly by buffaloes. Though the leaves are fairly rich in nutrients, digestibility values are low, comparable only to those of straws.

Fuel: Wood makes a fuel of moderate quality. Leaves are sometimes used as a fuel. The wood is burnt for gunpowder.

Fibre: A coarse fibrous material obtained from the inner bark is used for cordage, caulking the seams of boats and making paper.

Timber:
The soft and not durable wood is light, about 570 kg/m^3 air dry, white or yellowish-brown when fresh, but often turning greyish because of susceptibility to sap stain. It is not of great value but is sometimes used for utensils.

Gum or Resin: A red exudate is obtained from the bark, hardening into a gum

known as 'butea gum' or 'Bengal kino'. It can be used as a dye and as tannin.

Tannin or Dye Stuff: A bright yellow to deep orange-red dye, known as butein, prepared from the flowers is used especially for dyeing silk and sometimes for cotton. This dye is used by Hindus to mark the forehead. The bark is used for tanning.

Lipids: The seeds yield clear oil

Poison: Seeds show bactericidal and fungicidal activities.

STANDARDIZATION PARAMETER

This involves adjusting the herbal drug preparation to defined contents of a constituents or a group of substances with known therapeutic activity by adding excipient or by mixing herbal drugs or herbal drug preparations. Botanical extracts made directly from crude plant material show substantial variation in composition, quality, and therapeutic effects. Standardized extracts are high quality extract containing consistent levels of specified compound, and they are subjected to rigorous quality controls during all phase of the growing, harvesting, and manufacturing processes. The term "standardization'' may mean many different things. Some manufacturers use the term standardization incorrectly to refer to uniform manufacturing practices, but following a recipe is not sufficient for a product to be called standardised. There are two types standardization. In the first category, true standardization, a definite phytochemicals or group of constituents is known to have activity. The other type of standardization is based on the guarantee of the manufacturers for the presence of certain percentage of marker compounds which are not indicators of therapeutic activity or quality of the plants.

WHO Guidelines for Herbal Drug Standardization and Evaluation [9]

The WHO guidelines for herbal drugs can be summarized as follows:- Identity of the drug: Botanical evaluation –sensory characters, foreign organic matter, microscopical, histological, quantitative measurements *etc*.

Physicochemical character of the drug:- Physical and Chemical identity, chromatography, ash value, extractive value, moisture contents, loss on drying. Pharmacological parameter, biological activity profiles, bitterness value. Toxicity details:-pesticide residue, heavy metals, microbial contamination.

Table no 1: The Various Parameters for Identification, Evaluation and Standardization

Methods	Evaluation parameter
1. Authentication	• Parts of plants collect like leaf • Regional status • Family • Biological source • Chemical constituents
2. Morphology or Organoleptic evaluation	• Shape • Size • Colour • Odour • Taste
3.Microscopy evaluation	• Leaf contents

	• Trichomes • Stomata • Quantitative microscopy
4.Chemical evaluation	• Chemical Test • Phytochemical screen Chemical evaluation ring
5.Physical evaluation	• Moisture content • Viscosity • Melting point • Solubility • Ash value • Alcohol soluble extractive value • Water soluble extractive value • Acid insoluble value • Loss on drying
6.Biological evaluation	• Microbial contamination • Pesticide contamination

The need for standardization-Producers' and consumer' perspective in the global perspective, there is a shift towards the use of medicine of herbal origin, as the dangers and the shortcoming of modern medicine are getting more apparent. It is the cardinal responsibility of the regulatory authorities to ensure that consumers get the medication, which guarantees purity, safety, potency, and efficacy. The regulatory authorities rigidly follow various standard of quality prescribed for raw material and finished products in pharmacopoeias, formularies and manufacturing operation through statutory imposed good manufacturing practices. These procedures logically wound apply to all type of medication whether includes in modern system in medication or one of the traditional system. Though herbal product have become increasingly popular throughout the world ,one of impediments it is acceptance is the lack of standard quality control profile, the quality of herbal medicine that is, the profile of the constituents in the final product has implication in the efficacy and safety. However, due to the complex nature and inherent variability of the constituents of plant-based drug, it is difficult to stabilize quality control parameter though modern analytical technique are expected to help in circumventing this problem. Hence for herbal drug and products, standardization should encompass the entire field to study from cultivation of medicinal plant to its clinical application.

Standardization and Quality Control of Herbal Crude Drug-Process and Procedure: According to WHO (1996), Standardization and quality control of herbal in the process involved in the physicochemical evaluation of crude drug covering aspects, such as selection and handling of crude material, safety, efficacy, and stability, assessment, of finished product, documentation of safety and risk based on experience, provision of product information to consumer and product promotion. Attention is normally paid to such quality indices such as:

Standardization of Parameters of Plant Material [8,9]

- Foreign matter
- Identification test
- Chromatographic profile
- Heavy metals
- Botanical description

- Phytochemical test
- Volatile oil
- Extractive value
- Micro-organism present
- Ash value
- Spectroscopic profile
- Loss on drying

Macroscopic evaluation: In this methods, description, general condition of the drug size, shape outer surface inner surface are referred. A sensory or organoleptic character describes colour, odour taste, and consistency.

Microscopic Evaluation: The inner pseudo parenchyma cells are oval or rounded, the contain fixed oil & protein the whole tissue is devoid of cellulose and lignin. Various parameters include in microscopy

1) Leaf content
2) Trichome
3) Stomata

Physical Evaluation

A. Determination of Total Ash –

The residue remaining after incineration is the ash content of drugs, which simply represents inorganic salts, naturally occurring in drugs or adhering added to it as form adulteration.

Two types ash determine-

1) Acid insoluble ash value.
2) Determination of water soluble ash

B. Determination of Extractive Value

1) Determination of alcohol soluble extractive.
2) Determination of water soluble extractive.

C. Determination of moisture content: Weighed 10 gm. of drug and taken in a taken evaporating dish. Then it is dried 105°C for 3 hours and again weighed. Drying and weighing was continued at one hour interval until difference two successive weighing corresponds to not more than 0.25 %. The reading is taken after a constant weight is reached and the moisture content is determined.

D. Determination of pH: The pH value of an aqueous liquid may be defined as the common-logarithm of the hydrogen ion concentration expressed in grams. Potentiometrically pH value determine by a glass electrode and a suitable pH meter.

Introduction about Different Types of Paper Dyes

Fig.7. Different Types of Dyes Colors

DYES [10]
A dye is a colored substance that has an affinity to the substrate to which it is being applied. The dye is generally applied in an aqueous solution, and may require a mordant to improve the fastness of the dye on the fibre.

Both dyes and pigments are colored because they absorb some wavelengths of light more than others. The dyes were obtained from animal, vegetable or mineral origin.

Natural Dyes
One can get coloring matter from almost all-vegetable matter. However, only a few of these sources yield colorants which can be extracted and work out to be commercially viable. Similar is the case of colorants obtained from animal origin. Basically, three primary colors are required to get any given hue (or color).

This type of approach has been worked out for synthetic dyes. However in the case of natural dyes, the dyeing procedures are different for different dyes and they cannot be blended to get required color easily.

Blue Dyes
The only viable choice among the blue natural dyes is Indigo. Natural indigo is obtained by fermenting the leaves of various species of Indigofera, running off the liquor and oxidizing it to precipitate the dye. Woad is another important source of indigo.

The plant is grown mostly in North Europe and British Isles. With the synthesis of indigo in 1880 and its successful commercial exploitation in 1897 by BASF, the production of natural Indigo decreased. The king of natural dyes went into oblivion. There are some signs of its revival. The main ingredients of natural indigo are indigotin and indirubin.

Red Dyes
The color index lists 32 red natural dyes. The prominent among them are madder *(Rubiatincorum L.)*, Manjistha *(Rubiacordifolia L.)*, Brazil Wood/Sappan wood *(Caesalpinasappan L.)*, Morinda *(Morindacitrifolia* L.) Cochineal *(Coccuscacti L.) and* Lacdye *(Coccuslaccae).* Manjisthaor Indian madder is anthraquinones based red dye.

The most important colorants in madder are the anthraquinones, alizarin (purpuro xanthin, rubiadin manjistin, purpurin and pseudopurpurin)

Red Dye-Lac Dye
Lac is perhaps one of the oldest of all known red dyes. However, cochineal and kermes were widely used in the western world for the production of bright purple and red colors. The lac-dye is extracted from lac, the resinous protective secretion of tiny insect, *Luccifera lacca*, which is a pest on a number of plants both wild and cultivated. It secretes a thick resinous fluid which envelopes their bodies and secretion from a hard continuous encrustation over the twigs.

They contain only 1-2 % dye. There are four coloring compounds in lac, designated as laccaic acid A, B, C and E. Laccaic acid being the most abundant. Laccaic acid is also called Xantho kermesicacid, and it closely resembles Kermesicacid in structure.

Lac dye being an acid dye can be directly dyed on protein fiber such as wool and silk. It also produces very dark shades on nylon. The hues can be modified by post mordanting treatment with metal salts. The dye has very good light and washing fastness.

Yellow Dyes: Yellow is the most common color in the natural dyes. However most of the yellow colorants are fugitive [11].

The color index lists 28 yellow dyes. Some of the important yellow dyes are obtained from berberry *(Berberisaristata),* tessu flowers *(Butea frondosa, monosperma)* and kamala *(Mallotus philippensis).* Other sources of yellow dye are black oak *(Quercusvelutina),* turmeric *(Curcuma longa),* weld *(Reseda luteola)*and Himalayan rhubarb *(Rheum emodi).* Some coloring matters are berberine , its derivatives, chrysophanic acid and luteolin.

Triaryl Methane Dyes-Synthetic Dyes: Triarylmethane dyes. These include the quininoidarrangement as the actual chromophore. The quininoidring but since all three benzene rings are equivalent there can be rearrangement of the bonds and any of the benzene rings could take up this arrangement.

There are a large number of dyes used in histology that fall into this category; a few examples are fuchsins, methyl violet, methyl blue and aniline blue.

Other Synthetic Dyes: Anthraquinone. Here the quininoidring is seen as the middle of the three fused rings. Examples are alizarin and carmine. Xanthene.

Basic Dyes: Basic dyes are cationic and will stain/ color anionic or acidic materials such as carboxylates, sulphates (many complex carbohydrates are sulphated) and phosphates (particularly the phosphates in nucleic acids). Most are used as nuclear stains and staining of cytoplasmiccarboxyl groups is deliberately suppressed by using a slightly acid pH. Acidic substances that stain with basic dyes are termed basophilic.

Acidic and Neutral dyes: Acidic dyes are anionic and will color cationic or basic groups such as amino groups. Most are used to stain proteins in the cytoplasm and connective tissues. Substances stains with acid dyes are called acidophilic. Neutral dyes are simply compounds of basic and acid dyes. In this case, both ions are coloured.

Such dye complexes will stain both nucleus and cytoplasm from a single dye bath. Romanowskystains are neutral dyes made from more complex mixtures. These are the commonest dyes used in haematology. They are less common in histology but still very useful and include Giemsa, Leishmanand Wright's stains.

Amphotericdyes: Amphoteric dyes also have both anionic and cationic groups, but these are on the sameion

Amphotericdyes have both positively chargeable groups and negatively chargeable groups present on the molecule.

Depending on the charge actually present, these dyes may interact as either positively charged ions basic dyesor negatively charged ions acid dye .

Introduction about different types of paper on which dye can be applied

1) Kraft paper.
2) Uncoated paper
3) White wood free paper
4) Vegetable parchment paper

Fig.8 Kraft Paper

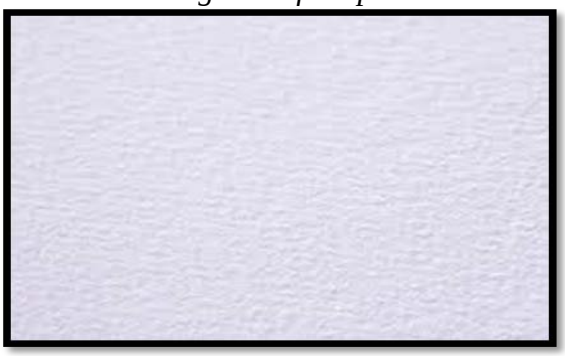


Fig.9 Uncoated Paper

Fig.10. White Wood Free Paper

Fig. 11. Vegetable Parchment Paper

Kraft Paper: It is used as outer facing far corrugated, spirally wound kegs and fiber board drums.

Uncoated Paper: Usually from highly grade chemical pulp source, used in the callipers far small labels and leaflets. One side coated are used for the heavier weighted labelling material. Two side coated lighted paper are pores between the fibers achieved by the beating the fibers far very long time.

White Wood Free Paper: It is used for laminates is usually one side coated paper that has been super–calendared to make the outside (coated) surface less permeable.

Vegetable Parchment Paper: It is made by a process of treating the absorbant paper with sulphuric acid, which enhance the wet strength of the paper .this is the most water –resistance paper of all .it is usually used for ‘dressing’ packs.

REVIEW OF LITREATURE

Fig.12 Butea monosperma Tree

We have got the references of use of ‘Palash’ since vedic period. The use of Palash was common in vedic period not only to treat the ailments but also in routine life and in holy rituals. In vedic era leaves, stem and flowers were more used but there are references regarding use of the seed. In vedic kala Palash tree was known as Shant Vruskha and 'Bramha Varchass'. Samidha of this plant were used at the time of different Homa and Yadgnyas. (Kulkarni Dr. Manjiri, 2007-08).

In Rigveda ' Kinshuk' was the synonym given for Palash. 'Kinshuk' means who shines brightly. This synonym is given because of its bright attractive colour of the flower. In Rigveda kala, Palash leaves were used with Ashwath and we get the referenes of uses of Palash leaves with Nyagrodha in Atharvaveda.

In Upanayan samskar 'Dand' (Stick) which is used by 'Brahmachari' was also made from Palash wood. Palash was used frequently because it had a power to destroy the 'Rakshasas' so also its stem was being used in Yadgnyas and patras were used to prepare 'Abhishek paatra. 'In Atharaveda “Parnamani” of Palash patra was used to gain Bala, Aayu, Samruddhi

and fame. According to 'Shrout sutra' 'patra valkala' of Palash was used in preparation of curds.

The tree is considered sacred both by Hindus and Buddhist. Hindus consider it, as holy because of the trifoliate formation of leaves which represents the Holy trinity of Brahma (the creator) on the left, Vishnu (the preserver) in the middle and Shiva (the destroyer) on the right. The flower of this plant are offered especially to Goddess Kali. In Krishnasthami Vratam, wood of Palash is also being used. Because of curse of Goddess Parvati, Bramha was converted into the tree of Palash. In Navagraha Stotra written by Vyasa the character of Ketu has been compared with Palash flower. [12,13].

Table1 : List of Dye Yielding Plants in India [14,15]

Botanical Name & Family	Common Name	Part Used	Coloring Components	Uses and Color with Mordant
Acacia catechu wild var sundra train (Leguminose)	Black catechu	Wood	Catechin, catechin red	Dyeing cotton, silk and in calico printing (reddish brown)
Aegle marmelos Correa ex Roxb. (Rutaceae)	Bael	Rind of the fruit	Marmalosin	In calico printing (Reddish)
Butea Monosperma (lam.) Kuntze (Fabaceae)	Palas	flower	Butin,Butein,Butrin,Isobuterin Palasitrin	Colouring saree (brilliant yellow
Curcuma longa linn.(Zingiberacae)	Haldi	rhizome	Curcumimioids, curcumin	Dyeing
Cassia fistula linn (Caesalpiniaceae)	Golden shower	Bark	Leucoanthoocyanidins	(Red)
Cassia tora linn (Caesalpiniaceae)	Charota	Bark	Leucoanthoocyanidins	(Red)
Haematoxylon campechianum linn. (Caesalpiniaceae)	Long wood	heartwood	Haematoxylin	Manufacturing of ink & dyeing woollen & silk goods
Impatiens balsamina linn. (Balsaminaceae)	Mirame lindo	Flower	Monoglycosidic anthocyanin based on pelogonidin	(Brown) Alum, (Orange) Tin
Lawsonia alba linn. (Lythraceae)	Heena	Leaves	Lawsone	Deep black, Dark blue
Mangifera indica linn. (Anacardiaceae)	Aam	Bark & leaves	Mangiferin	Mordant & dyeing silk (Yellow)
Nymphaea alba linn. (Nymphaceae)	Wgite water lilly	Rhizome	Tannins & Myricetin flavonoids glycosides	Blue
Pterocarpus marsupium Roxb.	Benga, paisal	Bark	Epicatechin	Dyeing silk (brownish red)

(Fabaceae)				
Rubia cardifolia linn. (Rubiaceae)	Manjistha	Stem, Root	Manijistin, Purpurin	Dyeing coarse cotton fabrics (reddish brown), (Light pink) Alum
Rubus fructicosus linn.(Rosaceae)	Blackberry	**Berries**	Carotene	(brown) Iron
Terminalia arjuna (Roxb). (Combretaceae)	Arjun, arjan	Bark	Arjunic acid	Light brown
Terminalia chebula Retz (Cobretaceae)	Harade	Fruits	Chebulinic acid	(yellow) Alum, (Camel yellow) Copper sulphate
Urtica dioica linn. (Urticaceae)	Burn weed, buen hazel	Root and bark	Ventilagin	Colouring cotton & tassar silk (Chocolate)
Woodfordia fructiocosa Kurz (Lythraceae)	Red bull bush, dhawai, dowari	Leaves & seeds		

MATERIAL & METHODOLOGY

Chemical used for standardization of *Butea monosperma*.

Table2: Chemical used for standardization of *Butea monosperma*

Sr.no.	Chemical Name	Quantity	Company Name
1.	Fehling A	2ml	Fisher scientific
2.	Fehling B	2ml	Fisher scientific
3.	Mg turning	Few	Fisher scientific
4.	Conc..HCl	1ml	MERCK
5.	Ethanol	2ml	MERCK
6.	Acetic anhydride	2ml	Fisher scientific
7.	Sodium picrate	1ml	Fisher scientific
8.	Molish reagent	1ml	Central.Drug.House
9.	Conc. H_2SO_4	2ml	Fisher scientific
10.	Bendict's reagent	Few drops	Central.Drug.House
11.	Mayer's reagent	Few drops	Fisher scientific
12.	Zinc dust	Few gm	Fisher scientific
13.	Million reagent	3ml	Fisher scientific
14.	Conc.HNO_3	2ml	Fisher scientific

15.	NaoH	4ml	Qualigens Fine Chemical
16.	Dilute $CuSo_4$	2ml	MERCK
17.	Alum	1g	Fisher scientific

Glassware & Equipment Table

Table 3: Glassware used for this Activity

Sr. no.	**Glassware**	**Manufacture company**
1.	Beaker	Borosil
2.	Conical flask	Borosil
3.	Glass rod	Borosil
4.	Measuring cylinder	Borosil
5.	Funnel	Borosil
6.	Spatula	Borosil
7.	Pipette	Borosil
8.	Petri-dish	Borosil

Table 4: Equipment used for this Activity

Sr.no	**Equipment**	**Manufacture company name**
1.	Heating mantle	Rolex
2.	Hot plate	Rolex
3.	PH meter	Rolex
4.	Muffle furnance	Insif india
5.	Weighing balance	AND Gulf

Collection: Plant flower were collected from the market of local area (Shahaganj).

1) 1.5kgs of 'Palash' flower were collected and dried in shade and stored in moisture free container
2) Then as required it is used.

Pharmacognostic Study

(i) Organoleptic Characters (Aptae Madhavi, 2014)

Table 5: Organoleptic Character

Sr.No.	**Parameters**	**As per Literature**	**Observation**
1	Colour	Bright orange	Yellowish orange
2	Taste	Bitter	Bitter
3	Odour	Odourless	Odourless
4	Corolla	1 to 2 inches	1 inch
5	Size	3-7 cm long,	5cm

Physio-chemical study [16]

(a) Ash Value

1) Use to determine quality and purity of drug.
2) Ash contains in organic radical like phosphates, carbonates and silicates of Sodium, Potassium, Magnesium and Calcium etc.
3) Sometimes inorganic variables like calcium oxalate, silica, carbonate content of the crude drug effects, total Ash value. Such variables are then by treated with acid and acid insoluble Ash value is determined.

Determination of Total Ash Value

Fig.13 Muffle farnance appratus

Fig.14 Dried flower of Butea monosperma

Procedure

1) Weigh the silica crucible
2) Powdered drug is weighed and put in to the crucible.
3) Then it is placed in the Muffle furnace at 4500c for about 1/2 - 1 hour. (i.e.: untill all carbon particles get burnt off.)
4) Cool it in dessicator
5) Then weigh the ash and calcutale the percentage of total ash with reference to the air dried sample of the crude drug. (Standard ash value of "Palash" flower is not more than 7%).

Calculation of Total Ash Value

Weigh of the empty dish= 16.98gm
Weigh of the drug taken=3gm
Weigh of the dish+ Ash (after complete incineration) =19.98gm
Weigh of Ash=0.21gm
Therefore,100g the crude drug gives= 0.21/3×100
Total Ash value = 7%

Determination of Extractive Values

1) Useful for the evaluation of crude drug.

2) Give idea about the nature of chemical constituent present in a crude drug.
3) Useful for the estimation of specific constituent soluble in that particular solvent used for extraction.

Determination of water soluble extractive value [17]

About 5gm of air dried sample transferred into a 250ml conical flask

↓

The flask was well shaken and allowed to stand for 10 min.

↓

Filtered was transferred to china dish, the solvent was evaporated on [;/lo,water bath

↓

Allowed to dry for 30 min. then dried in an hot air oven

↓

Residue was weighed

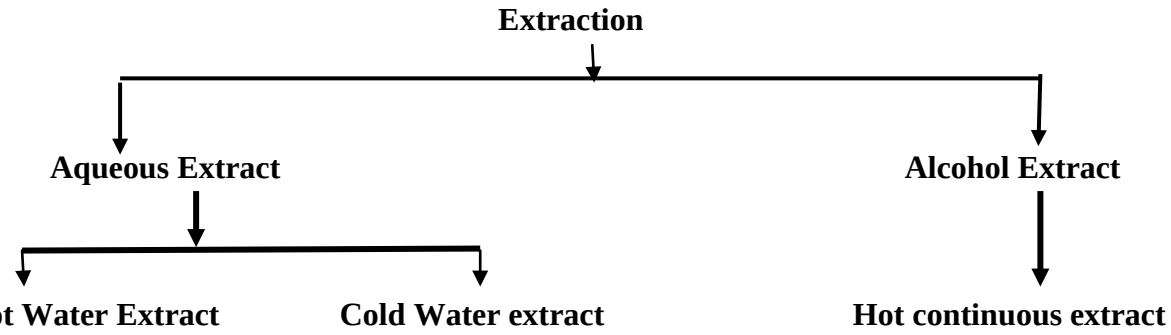
↓

Percentage of water-soluble extractives was calculated with reference to the air dried drug.

Calculation of Water Soluble Extractive Value

Weigh of empty china dish = 51.86
Weigh of residue =5gm
Weigh of china dish + weigh of residue=52.2z9gm
Weigh of residue = 52.29 - 51.86 = 0.43gm
25ml 0f water extract gives = 0.43gm
100ml of water extract gives= 4 x .43gm
5gm of air dried drug give = 1.1gm
Therefore, 100gm of air dried gives=1.1/5x100 =22%

Extraction (Schematic Presentation) (Kulkarni Dr. Manjiri, 2007-08**)**



Procedure

Extraction Method

1) Required amount of the drug powder is taken in a conical flask.
2) Pour some water (required amount of water) in a certain ratio.
3) Close the mouth of the conical flask with a filter paper and silver foil.
4) Shake it vigorously with frequently intervals.
5) Then place the conical flask in a warm place for 7 days with frequent vigorous shakings.
6) After filter the content and the filtrate is dried and the liquid part is kept on a water bath and evaporated.
7) It is evaporated till the required concentrate is achieved.
8) And stored in a dry containers.

Chemical Test: (Kulkarni Dr. Manjiri, 2007-08, Khandelwal.Dr.K.R,2004, Kokate.C.K,.Purohit at.el.2004)

Test for Triterpenoids

a) **Salkowski test:** Few drops of concentrated sulphuric acid was added to the test solution of the extract, shaken and on standing lower layer turns golden yellow.

b) **Liebermann Burchard Test :** To the test solution of the extract, few drops of acetic anhydride was added and mixed well. Then 1 ml of concentrated sulphuric acid was added from the sides of the test tube, a red colour is produced in the lower layer indicate Triterpenes.

Tests for Glycosides

a) **Baljet's test:** The test solution treated with sodium picrate gives yellow to orange colour.

Tests for Saponins

Foam test: Test solution and shaken shows the formation of foam, which is stable an least for 15 mins.

Tests for Carbohydrates

a) **Molisch's test:** Test solution with few drops of Molisch's reagent and 2ml of concentration H2SO4 added slowly from the sides of the test tube shows a purple ring at the junction of 2 liquids.
b) **Benedict's test:** The test solution treated with Benedict's reagent and boiling on water bath shows reddish brown precipitate.
c) **Fehling's test:** The test solution when heated with equal volume Fehling's A and B solutions, gives orange red precipitate presence of reducing suga

Tests for Alkaloids

(a) **Mayer's test:** Test solution with Mayer's reagent (Potassium Mercuric iodide) gives cream coloured precipitate.

Tests for Flavonoids

(a) **Shinoda test :** Test solution with few fragments of magnesium ribbon and conc. HCL shows pink to magenta red colour.
(b) **Zn/HCL reducing test :** Test solution with Zinc dust and few drops HCL shows magenta red colour.

Tests for Proteins

a) **Millon's test:** Test solution when treated with Millon's reagent and heated on a water bath, Protein is stained red on warming.

b) **Xanthoproteic test:** Test solution treated with conc. HNO3 and boiled gives yellow precipitate.

c) **Biuret test:** Test solution treated with 40% NaOH and dilutes CuSO4 solution gives blue colour.

Paper Dipping Method

Take a dye solvent (Butea monosperma flower Aq. solution) in a tray.

↓

Pour the aq. solvent through the cloth to separate the elements from the dye to cool until it is comfortable to touch.

↓

The dyes are mixed, strained and cooled; next step is to dip the paper.

↓

The tray of dye outside, or lay a tarp down on the indoor floor to prevent the dye from staining the rest.

RESULT

The extracted dye from the ***Butea monosperma flowers*** petals especially has been used as a natural paper colorant for used in pharmaceutical industry and food industry. It may be effected an economy and attractive result show.

Table 6. List of Chemical Test

Chemical Tests	Extra Aqueous Extract
1.Test for Triterpenoids	
(a) Salkowski test	+
(b) Liebermann burchard test	+
2. Tests for glycosides	
(a) Baljet's test	+
3.Tests for saponins :	
(a)Foam test :	+
4.Tests for carbohydrates :	
(a)Molisch's test	+
(b) Benedict's test	+
(c) Fehling's test	+
5. Tests for alkaloids	
(a) Mayer's test	+
6.Tests for flavonoids	
(a) Shinoda test	+
(b) Zn/HCL reducing test	+
7. Tests for proteins	
(a) Millon's test	+
(b) Xanthoproteic test	+
(c) Biuret test	+

1) *P^H -7.6 (2) Total Ash value-7 (3) Water Soluble Extractive Value -22% (4) Paper dipping – result*

Fig.15 Dye vegetable Pachement Paper

Fig.16 Dye Uncoated Paper

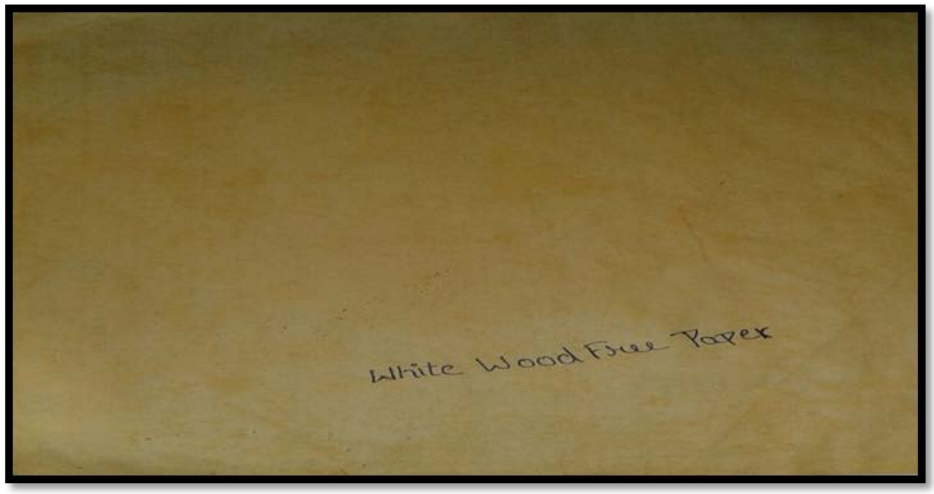


Fig.17. White Wood Free Paper

DISCUSSION

1) Dyes are two types, synthetic &natural dyes synthetic dyes are more expansive in buying or handling.
2) Synthetic dyes shows many side effect such as skin reaction, carcinogens etc.
3) These may react with the products and change the products quality & effect.
4) Synthetic dyes not suitable economically, therefore we use natural dye (*Butea monosperma* flowers)
5) 7g of *Butea monosperma* flowers gives 250 ml of aq. extract of *Butea monosperma*. The alum act as a mordant in producing colour to the paper.
6) The aq. Extract of *Butea monosperma* flower gives orange yellowish colour to the different paper such as vegetable parchment paper, uncoated paper or white wood paper.
7) The colouring capacity of Butea monosperma flowers aq. extract is to colour 30 paper with 250ml extract.
8) The colouring capacity of *Butea monosperma* flowers aq. extract is greater than alcoholic extract therefore we have used *Butea monosperma* flowers aq. extract as paper colorant.
9) The dying solution as very easily available and dye the paper easily. Dipping method is so easy to dyeing a paper in aq. extract. It takes little time.

after dying a paper stand for dry few minutes .

10) The colour retains up to long time.

CONCLUSION

Nowadays fortunately, there is increasing awareness among people toward natural products. Due to their non toxic properties, low pollution and less side effect, natural dyes are used in day to day for food products. Although the Indian subcontinent posses large plant availability of natural dye-yielding resources, and for propagation of species great in demand on commercial scale. Here, we have used *Butea monosperma* flowers as natural paper colorant, which we can use for preparation of covering papers and packaging papers for food and pharmaceutical industries.

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