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Review on Evaluation of Butea Monosperma (Lam.) Taub. Flowers

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Abstract: *Review of literature was carried out on 'Google Scholar' and in the library of Maharashtra Institute of Pharmacy, Betala, Tal. Bramhapuri, Dist. Chandrapur, Maharashtra (India). The review was carried out with objective to collect information about parameters, methods and findings published by different researchers on analysis of B. monosperma flowers. It was seen that researchers have carried out studies on organoleptic properties, morphology, microscopy, physicochemical parameters, phytochemical evaluation, thin layer chromatography, HPTLC and HPLC analysis of B. monosperma flowers. This article provides details of methods and findings of studies carried out by different researchers on evaluation of B. monosperma flowers. It was noted that very limited number of studies have been published and most of them are based on single sample hence there is scope to carry out more studies on more number of samples of B. monosperma flowers so that it can be helpful to establish standardization parameters for B. monosperma flowers.*

Keywords: Butea monosperma flower, standardization

I. INTRODUCTION

Butea monosperma (Lam.) Taub.Syn. *Butea frondosa* Koening ex Roxb. belonging to Family, Fabaceae is a flowering tree. It is known as 'Flame of Forest' in English and '*Palas*' in Hindi language [1,2]. The flowers possess red colour hence they are called as *Raktapuspa*[3].It is extensively found throughout India, Sri Lanka, Myanmar and in North West Himalayas, up to 1500 m altitude, grow at mean annual temperature -4 to 49^{O}C, mean annual rainfall 45 to 450 cm. on wide variety of soil including shallow, gravelly, black, clay loam, saline and waterlogged soil [4]. Flame of forest (*Palas*) flowers start appearing in February and hold up to end of April [5]. The flowers contain flavonoids butein,butrin and isobutrin [6]. Amino acids isolated from *B. monosperma* flowers include histidine, aspartic acid, alanine and phenylalanine. Other constituents include pyrocatechin, gum, tannins and mucilage [7]. Glycosides isolated from *B. monosperma*flowers include monospermoside and isomonospermoside [8]. The flowers possess antiestrogenic activity, they are astringent to bowls, useful in liver disorder, burning sensation, thirst, gout, skin diseases, tonic, aphrodisiac and diuretic [9]. Various studies have been published that provide findings on various pharmacognostic parameters that can be used for standardization of *Palas* flowers, findings of the published studies are given in this review article.

II. ORGANOLEPTIC PROPERTIES

Colour of *B. monosperma* flowers has been described as scarlet, red and orange-red. Scarlet coloured flowers of *B. monosperma* are most commonly available. Yellow and white flowering trees of *B. monosperma* are rarely reported. White flowers of *B. monosperma* with yellowish central portion were found in Madhya Pradesh, India. Six colour variants of *B. monosperma* flowers that include, yellow, golden yellow, mustard, chrome yellow, white and scarlet were identified in different regions of Jharkhand, India [10]. Flowers are reported to be odourless, have bitter taste [11].

III. MORPHOLOGY

The flowers are receme. Length of corolla 3.8-5cm. Colour of calyx of fresh flower and dried flower is noted as olive green to brown and velvety from outside [12]. Calyx 13mm. long, length of pedicles about twice to that of calyx, petals 15 cm. long, upper two petals are connate and lower three petals are equal, petals possess silvery hairs at outside [13].

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IV. MICROSCOPY

Pedicel show single layered epidermis covered with thick cuticle, unicellular or two or three celled trichomes, ground tissue consisting of thin-walled, oval to polygonal parenchyma cells, single layered endodermis and radially arranged collateral vascular bundles. Sepal showsingle layer of thin walled wavy epidermal cells followed by two to four layers of thin-walled loosely arranged parenchyma cells, club shaped secretory ducts and uniseriate multicellular trichomes on lower surface. Petal show single layered thin-walled epidermal cells covered with numerous unicellular pointed trichomes, few glandular hairs, thin-walled capitate or cone shaped papillae on both surfaces, mesophyll made of thin walled loosely arranged parenchyma cells, some parenchyma cells containing oil globules, scattered veins [13]. Pollen grains were found to be trizonocolporate, prolate, spheroidal and have polar diameter 4.5µm., equatorial diameter 3.24µm. and length of colpus 3.24µm., pollen wall shown presence of aperture [14]. Powder of flower was soaked in chloral hydrate solution, mounted on a glass slide in glycerin and observed under a photographic microscope with magnification of 400X. The powder showed presence of unbranched and unicellular trichomes having a narrow lumen, single layer of epidermal cells and cuticle were also observed [15].

V. PHYSICOCHEMICAL PARAMETERS

Flowers of *B. monosperma* were collected from forest of Narsapur, Telangana (India) and taxonomically identified at Telangana State Level Drug Testing Laboratory. Air dried flowers were evaluated for physicochemical parameters including loss on drying (4.39% w/w), total ash (5.82% w/w), acid insoluble ash (1.07% w/w), water insoluble ash (078% w/w), water soluble extractive (22 % w/w) and alcohol soluble extractive (14.21 % w/w) [16].

VI. PRELIMINARY PHYTOCHEMICAL EVALUATION

Researchers have carried out preliminary phytochemical analysis of *B. monosperma* flower extract by performing chemical tests to detect different phytochemicals. Findings reported by different researchers are summarized in Table I.

TABLE I: PRELIMINARY PHYTOCHEMICAL EVALUATION OF *B. MONOSPERMA* FLOWER EXTRACTS

Phytochemical	**Methanol extract**	**Ethanol extract**			**Aqueous extract**	
	Malik *et al.* 2014	Babu *et al.* 2016	Pandey *et al.* 2016	Jangid *et al.* 2021	Babu *et al.* 2016	Chouhan *et al.* 2021
Alkaloid	Negative	Positive	Positive	Positive	Positive	Positive
Glycoside	Positive	Negative	---	---	Negative	Positive
Sterols	Positive	Positive	Positive	---	Negative	Positive
Saponins	Positive	Positive	Positive	Positive	Positive	Positive
Phenolics	---	Positive	---	Positive	Positive	---
Tannins	Positive	Negative	Positive	---	Positive	---
Flavonoids	Positive	Positive	Positive	Positive	Positive	Positive
Proteins	---	Positive	---	---	Positive	Positive
Amino acids	---	Positive	---	---	Positive	---
Anthocyanin	---	---	---	Negative	---	---
Anthraquinone	---	---	Negative	Negative	---	---
Xanthophyll	---	---	---	Positive	---	---
β-carotene	---	---	---	Positive	---	---
Lycopene	---	---	---	Positive	---	---

VII. HIGH PRESSURE LIQUID CHROMATOGRAPHY (HPLC)

Butea monosperma dried flowers were extracted with methanol in a soxhlet extractor for 20 h., solvent was evaporated under reduced pressure, concentrated extract was partitioned between water and ethyl acetate, water layer was separated and treated with n-butanol. The n-butanol fraction was dried over sodium sulphate, n-butanol was removed under

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reduced pressure to yield yellow powder. Detection of butrin and isobutrin was carried out by HPLC using Perkin-Elmer Series 3 B manual injector, Schoeffel SF 770 spectral photometer detector, Bondapak C18, 300 x 7.9mm ID column and methanol: water 40:60 as mobile phase. Retention time of butrin and isobutrin was 6 to 9 min. and 21 to 28 min. respectively [17].

VIII. THIN LAYER CHROMATOGRAPHY

Butrin and isobutrin were detected in n-butanol fraction of methanol extract of *B. monosperma* flower at Rf value 0.32 and 0.45 respectively. Silica gel was used as stationary phase and ethyl acetate: formic acid: acetic acid: water (100: 11: 11: 26 v/v) was used as mobile phase [17]. A method is given to detect butrin and isobutrin in *B. monosperma* flower extract. In the method, test solution was prepared by using ethanol extract of *B. monosperma* flowers, silica gel - G plate was used as stationary phase, toluene : ethyl acetate (9:1 v/v) was used as mobile phase, vanillin-sulphuric acid reagent was used for detection of spots, spots of butrin and isobutrin were observed at Rf 0.31 and 0.65 respectively [18].

IX. HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHY (HPTLC)

Flowers of B. monosperma were dried, grinded and extracted in 70% w/w ethanol at 50 OC for 1 h, solvent was evaporated under vacuum at 50 OC and dry extract was obtained. Test solution was prepared and amino acids were determined by HPTLC using silica gel 60 F254 plates as stationary phase and acetonitrile : water (75:25 v/v) as mobile phase, ethanolic solution of ninhydrin (0.1% w/v) was sprayed and the plate was heated at 120 OC for 5 min to detect characteristic bands of amino acids. Terpenoids, phytosterols and fatty acids were separated on silica gel 60 F254 using chloroform:methanol : water (90:20:1.5 v/v) as mobile phase. Free fatty acids bands were detected by using 0.05% w/v ethanolic solution of primulin. Characteristic bands of terpenoids and sterols were identified by spraying Liebermann–Burchard (LB) reagent and heating the plate at 120 OC for 5 to 10 min. The plate was observed under visible light and 366 nm. ultra violet light. Polyphenols were detected by using HPTLC Lichrospher RP18 WF254s plates as stationary phase and acetonitrile : water : formic acid (50:50:5 v/v) as mobile phase, fluorescence of polyphenols was observed after spraying NEU reagent (1 % w/v methanolic solution of diphenyl boric acid ethyl amino ester) followed by 5% w/v ethanolic solution of polyethylene glycol 4000. The plate was studied under 366 nm ultra violet light [19].

X. CONCLUSION

Researchers have carried out studies on organoleptic properties, morphology, microscopy, physicochemical parameters, phytochemical evaluation, thin layer chromatography, HPTLC and HPLC analysis of B. monosperma flowers. Very limited number of studies have been published and most of them are based on single sample hence there is scope to carry out more studies on more number of samples of B. monosperma flowers so that it can be helpful to establish standardization parameters for B. monosperma flowers.

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