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Phytochemical screening of *Butea monosperma* (Lam.) Taub. Flowers and chlorophyll content in leaves of South-eastern Rajasthan, India

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Abstract
The present study was undertaken to determine the presence of phytochemicals in the flowers and chlorophyll content in the leaves of *Butea monosperma* in South-eastern Rajasthan, India. *Butea monosperma* is a large deciduous tree popularly known as Flame of the Forest, belongs to family Fabaceae. Almost all the parts of the plant namely root, leaves, fruit, stem bark, flowers, gum are used as medicine, food, fibre and for other miscellaneous purposes such as fish poison, dye, fodder, utensils, etc. Samples of flowers and leaves were collected from 4 different locations (Kota, Bundi, Baran and Jhalawar district) from south-eastern Rajasthan, and 12 different individuals of *Butea monosperma* trees (3 individuals from each site). Methanol and ethanol were used to extract and screening of phytochemicals present in flowers and leaves. The present results revealed that flowers of *Butea monosperma* indicate the presence of phenol, alkaloid, flavonoid, anthocyanin, xanthophyll, saponins, β-carotene, lycopene, total carotenoid in the methanol extract whereas the flowers subjected to extract with ethanol indicate the presence of phenol, alkaloid, flavonoid, xanthophyll, saponins, β-carotene, lycopene and total carotenoid. Chlorophyll content analysis showed that leaf of *Butea monosperma* had chlorophyll-a (1.91±0.02), chlorophyll-b (1.26±0.03) and total chlorophyll (3.18±0.03). The presence of phytochemical in the flower might find application for medicinal purpose and presence of chlorophyll pigment suggest the photosynthetic efficacy of plant.

Keywords: *Butea monosperma*, flowers, leaves, phytochemical, chlorophyll

Introduction
Butea monosperma (Lam.) Taub. (Palash), a deciduous tree known by different names in different places in South-eastern Rajasthan (Hadoti) such as Chulli/Chhola in Baran, Chulla/Churada/Kesula in Bundi, Khankara in Jhalawar and Cholla in Kota district, is commonly known as Palash and is also knows as the "Flame of the Forest". It belongs to the family Fabaceae. This tree is believed to be a form of Agnidev, who is the God of Fire [4]. People say that it was a punishment given to him by goddess Parvati for disturbing her and Lord Shiva's privacy [8]. It is native to India and also distributed in South Asia and other countries like Indonesia, Nepal, Thailand, Cambodia, Japan, Laos, Myanmar, Sri Lanka, Vietnam and China [14].

The flower contains triterpenes flavonoids like butei, butin, is obutrin, is obutrin, coreospin, isocoreospin, sulphuretin, monospermoside and is ospermo side, dihydromonospermoside, chalcones, aurones, isobutyine [2, 10]. The major glycoside of the flower is butrin. The bright color of the flower is due to the presence of chalcones and aurones [3]. It also contains palsitrin, histidine, aspartic acid, alanine of phenyl-1-alanine, myricyl alcohol, stearic, palmitic, arachidic and lignoceric acids, fructose, glucose, aspartic acid, alanine and phenylalanine and a new bioactive flavones glycoside (5,7-dihydroxy-3,6,4'-trimethoxyflavone-7-Oalpha-L-xylopyranosyl-(1-->3)-O-alpha-L-arabinopyranosyl-(1-->4)-O-beta-D-galactopyranoside) [5, 12, 3].

Phytochemicals are the bioactive non-nutrient chemicals and have protective or disease preventive properties, there are more than a thousand phytochemicals are known. It is well known that plant produces these chemicals to protect itself but recent research demonstrates that they can also protect humans against diseases. Same of the well-known phytochemicals are lycopene in tomatoes, isoflavones in soy and flavonoids in fruits.

Material and Methods

Study Area

South-East Rajasthan or Hadoti plateau is situated at the edge of Malwa plateau at 23º45' to 25º53' North Latitudes and 75º9' to 77º26' East Longitude in South Eastern corner of the state. The total area is 24156.6 sq km and includes Kota, Bundi, Baran, Jhalawar district. The study sites include 4 districts *viz.* Alaniya forest area is situated on Kota district, Tancha village is situated on Baran district, Rameshwaram forest area is situated on Bundi district, Jhalrapatan area situated on Jhalawar district and 3 individual trees were selected from each district with replication and overall, 12 individuals were sampled from the study area (Table 1 & Fig.1).

Table 1: List of twelve locations of *Butea monosperma* (Lam.) Taub. Tree in the study

S. No.	Districts	Locations	Sampling Sites
1	Bundi	BU-1	Silyor Road
		BU-2	Rameshwaram
		BU-3	Satur
2	Kota	KO-1	Jamuniya Bawadi
		KO-2	Pachaikala
		KO-3	Alaniya
3	Jhalawar	JH-1	Jhalrapatan
		JH-2	Asnawar
		JH-3	Jhirniya
4	Baran	BA-1	Maou
		BA-2	Kotari
		BA-3	Tancha

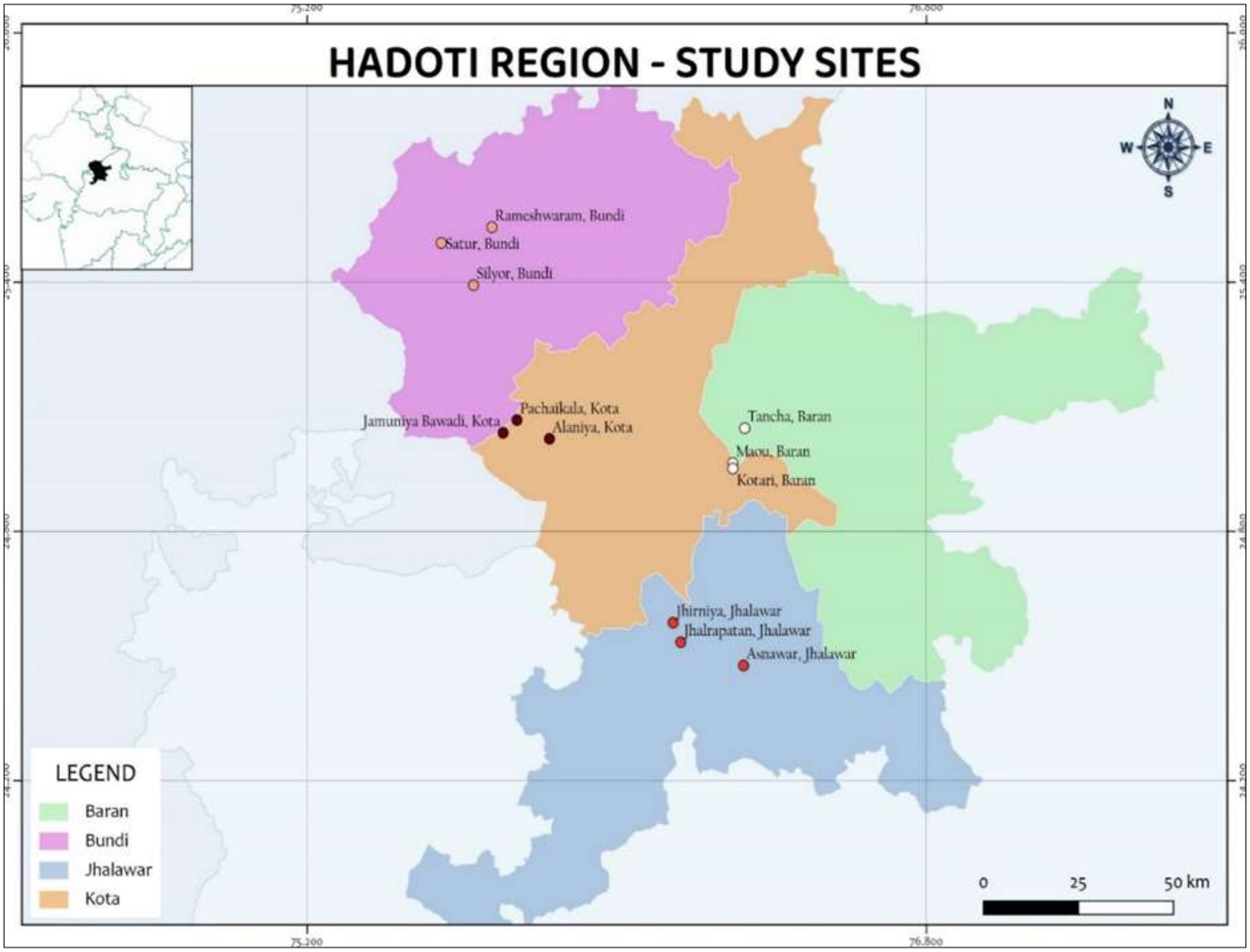

Fig.1 Map of the study area – South-eastern Rajasthan

Methodology

Extraction

Crude plant extract was made ready by means of Soxhlet extraction techniques. About 20 gm of powdered plant material was equally packed into a thimble and extracted with 250 ml of various solvents one by one. Solvents used were methanol and ethanol as per increasing polarity. The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor emerges as colourless. After that the extract was taken in a beaker and kept on a hot plate and heated at 30- 40ºC till all the solvent got evaporated. Dried extract was kept in the refrigerator at 4ºC for their future use in phytochemical evaluation.

Phytochemical screening

The phytochemical analysis for flower of *Butea monosperma* (Lam.) Taub., was carried out using standard methods [16, 18, 9, 7]. Phenols screened using ferric chloride test, alkaloids using wagner's reagent, flavonoids using shinoda test, anthraquinone using borntrager's test, anthocyanin using hydrochloric acid test. saponins using foam test, lycopene using shinoda's test, fat and oil using spot test, xanthophylls and β-Carotene by HPLC and carotenoids as per [1].

Chlorophyll content estimation

Chlorophyll content was estimated using standard method given by Sadasivam and Manickam [11].

Results and Discussion

Preliminary phytochemical screening

The presently, eleven phytochemicals were qualitatively screened in the flowers of *Butea monosperma* (Lam.) Taub. but results found that, only nine phytochemicals were present in various solvent extracts. They are phenol, alkaloid, flavonoid, anthocyanin, xanthophyll, saponins, β-carotene, lycopene and total carotenoids. The methanolic flower extract showed presence of phenols, alkaloids, flavonoids, anthocyanin, xanthophyll, saponin, β-carotene, lycopene and total carotenoid, whereas, ethanolic extract showed presence of phenol, alkaloid, flavonoid, xanthophyll, saponins, β-carotene, lycopene and total carotenoids. This shows that the plant part offers a much broader array of phytochemicals (Table 2).

Phytochemical analysis of plant was need to discover and extend to novel therapeutically agents with improved efficiency. The medicinal value of flowers lies in some chemical substances that have a certain physiological activity on the human. Different phytochemicals had been established to have an extensive variety of activities, which may also help in protection against persistent sicknesses. Alkaloids defend against prolonged ailments. Saponins protect in opposition to hypercholesterolemia and antibiotic things [6]. Phytochemicals in greenery food had great deals of attraction. Mainly on their role in preventing diseases caused and the result of oxidative stress, and release reactive oxygen species has single oxygen of various radicals as a damaging side effect of aerobic metabolism [17].

Table 2: Phytochemical screening of *Butea monosperma* (Lam.) Taub. Flower in South-eastern Rajasthan

S. No.	Phytochemical	Ethanol	Methanol
1.	Phenol	+	+
2.	Alkaloid	+	+
3.	Flavonoid	+	+
4.	Anthocyanin	−	+
5.	Anthraquinone	−	−
6.	Xanthophyll	+	+
7.	Saponins	+	+
8.	β-carotene	+	+
9.	Lycopene	+	+
10.	Total carotenoid	+	+
11.	Fat & Oil	−	−

Note: + = Indicates presence of the phytochemical,
- = Indicates absence of the phytochemical.

Chlorophyll content estimation in leaves

Perusal data of chlorophyll traits under study exhibited highly significant differences for chlorophyll-a, chlorophyll-b and total chlorophyll in different locations studied. The chlorophyll data revealed that the maximum chlorophyll-a content of leaves was noted in BU-3 (2.05 mg/100gm) while the minimum chlorophyll-a content (1.77 mg/100gm) in BA-3. The maximum chlorophyll-b content of leaves (1.56 mg/100gm) was produced by BU-3 while the minimum chlorophyll-b (1.01 mg/100gm) was produced by BA-3. The highest total chlorophyll of leaves (3.62 mg/100gm) was recorded by BU-3 while the minimum total chlorophyll (2.78 mg/100gm) was recorded by BA-3 (Table 3). The differences in biochemical characters of different DBH groups could be attributed to the vigour of trees as well varied genotypic responses due to their possible differential endogenous hormonal levels leading to varied cell division and cell sizes [13]. The difference could be influenced by several factors such as amount of sunlight available, total phosphorus (TP), water flow, light, catchment area, water depth, weather, and other physical factors [15].

Table 3: Chlorophyll content estimation in leaves of *Butea monosperma* (Lam.) Taub. in South-eastern Rajasthan

Type	Chlorophyll content
Chlorophyll-a	1.91±0.02
Chlorophyll-b	1.26±0.03
Total chlorophyll	3.18±0.03

Conclusion

The screening of available phytoconstituents of flower of *Butea monosperma*. These phytoconstituents seemed to have the potential to act as a source of useful drugs in the various indigenous medicines and formulations of Ayurveda like cancer, diabetes, diarrhoea etc. The result of present study showed chlorophyll content of leaf sample of *Butea monosperma* collected from the 4 different location of Jhalawar (Rajasthan). The study of chlorophyll is useful to understand the efficiency of the photosynthesis that directly or indirectly affects the growth functions and formation of phytoconstituents of plant.

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