Phytochemicals and Antioxidant Activity Investigation of *Butea monosperma* Lam. Leaves Ethanol Extract

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Abstract

The aim of this study was to investigate phytochemicals and antioxidant activity of plant *Butea monosperma* Lam. leaves ethanol extract. The different extracts of this plant were reported the rich source contents of bioactive phytochemicals in the leaves and afford for various pharmacological activities. The ethanol extract of leaves was subjected to investigate phytochemicals and antioxidant activity by using DPPH in vitro system. The provided evidence of results concluded that the ethanol extract of *Butea monosperma* Lam. leaves are potential sources of natural bioactive phytochemicals and showed potent in vitro antioxidant activity with their IC_{50} value of 44.16 µg/ml. Therefore phytochemical investigation of plant leaves ethanol extract was noted various bioactive phytochemicals, which may serve as a potent source of natural antioxidants.

Keywords: *Butea monosperma* Lam., phytochemical, pharmacological, antioxidant.

Introduction

The antioxidant activity has been reported to prevent oxidative damage caused by free radicals generated due to metabolic action of body and it is used in curing various human diseases related to disorders of oxidative stress. The potent antioxidant activities exhibited by traditionally used medicinal plants due to the presence of phenolic compounds and flavonoids. This type of medicinal plants can act as effective source of natural scavengers in preventing oxidative damages caused by the free radicals [1].

Widely distributed phenolic compounds in medicinal plants [2] have been gained much attention, due to their radical scavenging activity. The presence of bioactive phytochemicals in the ethanolic extract of *Butea monosperma* Lam. plant showed potential antioxidant activity [3]. The broad information about bioactive phytoconstituents, ethnopharmacology along with the traditionally claimed medicinal use different parts of *Butea monosperma* Lam. plant [4] has been widely used as curative agents for variety of ailments [5]. Physicochemical analysis of leaves has been reported presence of sterols, triterpenes, glycosides, flavonoids and proteins [6]. Hence this plant shows various types of pharmacological activities, which may be due to the presence of the investigated active chemical constituents [7].

When antioxidant agents added in foods, it reduces rancidity, retard the formation rate of toxic oxidation products and increases life of patients. These antioxidants may help to relieve from oxidative stress. The antioxidant activity of *Butea monosperma* Lam. medicinal plants extracts has been extensively studied by researchers and reported significantly. This plant might be helpful in preventing and slowing the process of diseases involved as result of oxidative stress related disorders [8].

Therefore, traditional uses and medicinal importance of medicinal plant system, the present study was carried out to investigate phytochemicals and the antioxidant activity of leaves ethanol extracts of *Butea monosperma* Lam.

Material and Methods

Collection of plant material

The leaves of *Butea monosperma* Lam. plant were collected from local area.

Extraction of plant material

Butea monosperma Lam. plant leaves were dried under shade and then powdered. In 100 ml of ethanol 10 gm of powdered material of leaves was dissolved and kept on a magnetic stirrer for 2 hrs. Thereafter, it was extracted using a soxhlet apparatus sequentially with ethanol solvent. The extract was collected and the solvent evaporated out to dryness. The obtained material was stored in airtight bottle for further studies.

Investigation of antioxidant activity

In vitro antioxidant activity was investigated by using stable free radical DPPH (2, 2-diphenyl-1-picrylhydrazyl) method with the help of UV-spectrophotometer [9-11]. A stock solution of 0.1mM DPPH was prepared in ethanol. 1ml of this solution was added to 1ml of extract solution in water at different concentrations (5-50 μg/ml) and final volume was adjusted to 3 ml by adding distilled water. After 15 minutes, the absorbance of each concentration was measured at 517 nm. Ascorbic acid was used as standard reference. The decrease in absorbance of the reaction mixture indicates presence of free radical scavengers. Percentage scavenges of DPPH radical by test sample were determined as

$$\% \text{ Scavenged Activity} = (A_{\text{Reference}} - A_{\text{Test}} / A_{\text{Reference}}) \times 100$$

IC_{50} value was calculated by using graphical method.

Phytochemical investigation

The extract was preliminary qualitatively investigated for the active phytochemicals according to the standard protocols [12].

GC-MS investigation

GC-MS investigation were carried out on Shimadzu GC-MS model number QP 2010S.The column Rxi-5Sil MS, 30 meter length, 0.25 mm ID, 0.25 μm thickness was used. The chemical components were identified by comparisons of mass spectra with the help of inbuilt libraries NIST-11 and WILEY-8.

Results and Discussion

In the present study, ethanol extract of *Butea monosperma* Lam. plant leaves were investigated for their preliminary phytochemical analysis and antioxidant activity using DPPH assay method, standard protocols and GC-MS analysis technique.

Investigation of antioxidant activity

In vitro antioxidant activity of *Butea monosperma* Lam. leaves ethanol extract was investigated by using DPPH assay method. The dose response curve of DPPH for ethanol extract of *Butea monosperma* Lam. leaves was correlated with reference ascorbic acid as a standard (Fig.1). The antioxidant activity of the ethanol extract increased in a concentration dependent manner [13]. In DPPH radical scavenging assay, the IC_{50} value of the extract was 44.16μg/ml. The ascorbic acid was used as a standard reference compound; it shows IC_{50} value at 16.05μg/ml in DPPH assay (Table.-1). This indicates that ethanol extract of *Butea monosperma* Lam. leaves has good potential as a source for natural antioxidants.

Table 1. % DPPH Free Radical Scavenging Activity of *Butea monosperma* Lam. leaves extract

Sr. No.	Concentration (µg/ml)	% Scavenged Ascorbic Acid	% Scavenged Extract
1	5	43.02	13.82
2	10	45.81	23.88
3	20	53.07	31.42
4	30	55.45	43.15
5	40	59.78	48.46
6	50	62.71	52.79
IC_{50} Value (µg/ml)		16.05	44.16

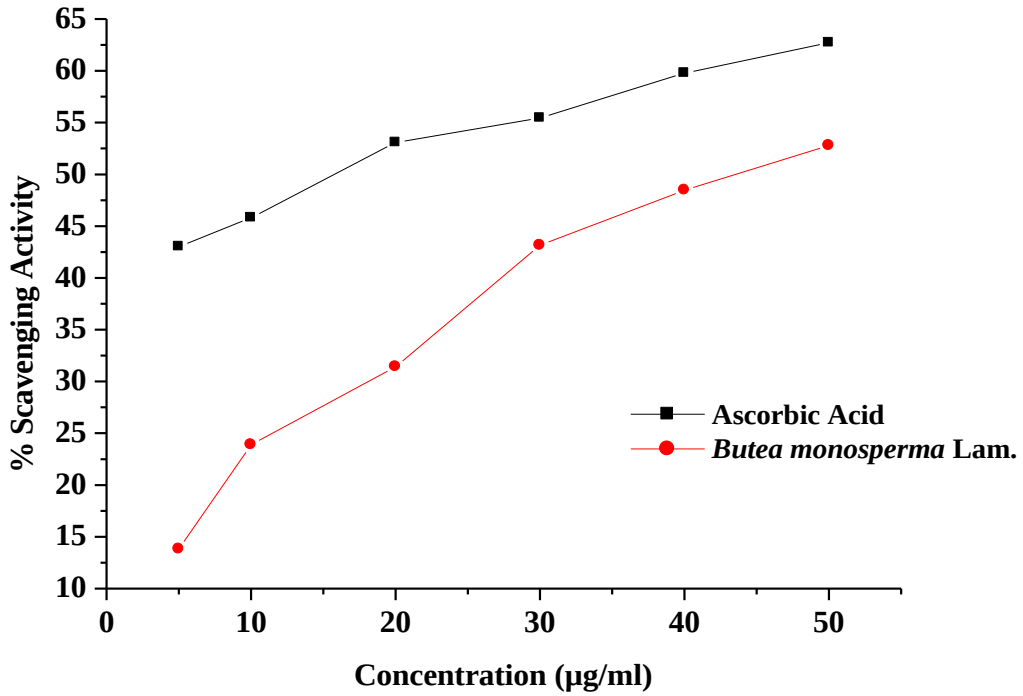


Figure 1. DPPH Free Radical Scavenging Activity of *Butea monosperma Lam.* leaves

Phytochemical investigation

The extract was preliminary investigated for the active phytochemicals using standard methods. The preliminary phytochemical tests are helpful in finding phytoconstituents in the plant material that may lead to their quantitative estimation and also in locating the source of pharmacologically active chemical compounds. The analysis study reported that leaves extract showed the presence of carbohydrates, protein, amino acids, glycosides, tannins, saponin, flavonoids, steroids and phenolic compounds [14] (Table-2).

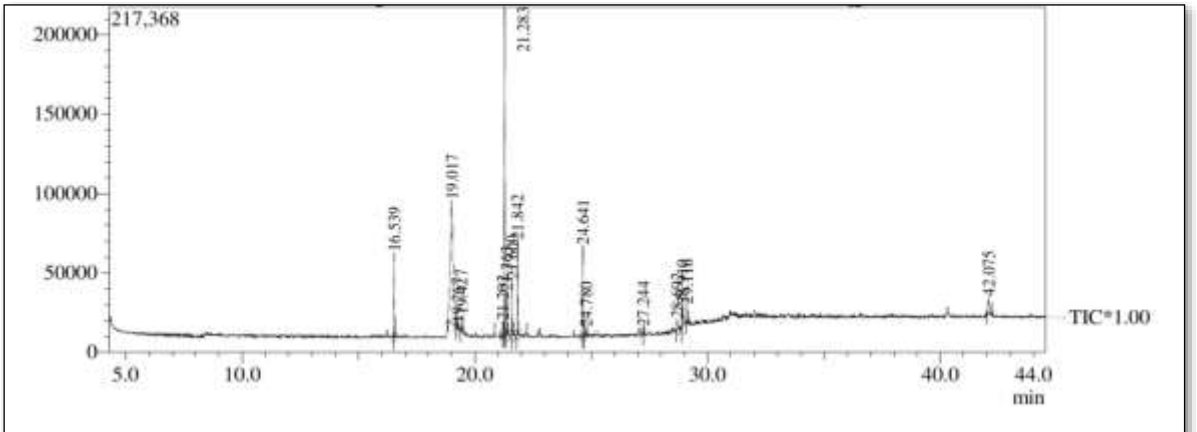
Table 2. Phytochemical analysis of *Butea monosperma* Lam. leaves extract.

Phytochemicals	**Result**
1. Alkaloid	-
2. Carbohydrate	+
3. Protein and amino acids	+
4. Glycoside	+
5. Tannin	+
6. Saponin	+
7. Flavonoids	+
8. Steroids	+
9. Triterpenoids	-
10. Phenolic compound	+

(+ for present and – for absent)

GC-MS analysis

GC-MS analysis of *Butea monosperma* Lam. leaves extract were reported the presence of different chemical constituents such as Phenol,2,4-Bis(1,1-Dimethylethyl)-, Mome Inositol, Formic Acid, 1-Methylethyl Ester, 4-Heptanone, 2-Methyl-, 2-Butenal, Neophytadiene, 5-Undecene, 3-Methyl-, (E)-, 16-Heptadecenal, 3,7,11,15-Tetramethyl-2-Hexadecen-1-ol, Tetradecanal, Undecane, 5-Methyl-, Propane, 2-Azido-2-Methyl, 2-Isopropyl-3-Amino-4-Methyl-1-Thia-3-Aza-Cyclopentane, Dieicosyl Thiodipropionate, 2-Undecen-1-ol and 1-Undecyne (Fig. 2).



Peak Report TIC

Peak#	R.Time	Area	Area%	Height	Height%	Name	Base m/z
1	16.539	91896	5.31	53364	9.10	PHENOL, 2,4-BIS(1,1-DIMETHYLETHYL)-	191.05
2	19.017	678877	39.26	77483	13.21	MOME INOSITOL	87.00
3	19.267	17665	1.02	3190	0.54	FORMIC ACID, 1-METHYLETHYL ESTER	45.00
4	19.427	16583	0.96	9510	1.62	4-Heptanone, 2-methyl-	57.00
5	21.202	11892	0.69	8519	1.45	2-BUTENAL	70.05
6	21.283	425303	24.59	206307	35.18	Neophytadiene	68.05
7	21.363	66131	3.82	27028	4.61	5-UNDECENE, 3-METHYL-, (E)-	70.05
8	21.600	64276	3.72	34967	5.96	16-Heptadecenal	82.05
9	21.842	114021	6.59	60095	10.25	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	81.05
10	24.641	113954	6.59	56707	9.67	TETRADECANAL	71.05
11	24.780	12838	0.74	5593	0.95	UNDECANE, 5-METHYL-	43.00
12	27.244	5861	0.34	3872	0.66	PROPANE, 2-AZIDO-2-METHYL-	57.05
13	28.692	21231	1.23	6384	1.09	2-ISOPROPYL-3-AMINO-4-METHYL-1-THIA-3-AZA-CYCLOPENTANE	117.05
14	28.910	28051	1.62	12628	2.15	DIEICOSYL THIODIPROPIONATE	57.10
15	29.116	12266	0.71	10626	1.81	2-UNDECEN-1-OL	82.05
16	42.075	48540	2.81	10190	1.74	1-UNDECYNE	81.00
		1729385	100.00	586463	100.00		

Figure 2. GC-MS Chromatogram of *Butea monosperma* Lam. leaves ethanol extract.

Phytochemical analysis and GC-MS analysis of *Butea monosperma* Lam. leaves extract showed the presence of different chemical constituents [15,16]. That has important pharmacological characteristics [17-18]. Phenolic compounds are responsible for antioxidant activity, because they are effective hydrogen donors, which make them antioxidant. The investigation of plant *Butea monosperma* Lam. leaves ethanol extract has significantly reported antioxidant activity. This activity is due to the higher polyphenolic contents and the interesting major bioactive compounds present. DPPH free radical scavenging activity was carried out with the leaves ethanol extracts of *Butea monosperma* Lam. The influence of antioxidants on scavenging of DPPH free radical was supposed to be owed to their hydrogen donating capacity. In the presence of oxygen radicals formed are extremely reactive species vary in their lifespan and reactive properties. The free radical scavenging ability probably is one of the mechanisms by which herbal medicines exhibit higher antioxidant activity. The phenolic compounds from *Butea monosperma* Lam. leaves possessed the potent antioxidant activity. The observed antioxidant activity of this plant leaves extract could be as a result of the presence of bioactive phytochemical constituents.

Conclusion

The present investigations were indicated that ethanol extract of *Butea monosperma* Lam. plant leaves scavenges free radicals significantly. The overall antioxidant activity depends on different phytochemicals present in the leaves. That could be a rich source of natural antioxidants and have greater importance as therapeutic agent in preventing or slowing oxidative stress related degenerative disease disorders. Therefore, it was concluded that ethanol extract of *Butea monosperma* Lam. plant leaves showed potent in vitro antioxidant activity.

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Conflicts of Interest

Authors declare that no conflict of interest

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