Phytochemical and Antioxidant Activity of *Sesbania grandiflora* (L.) Poir. Leaves

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Abstract

Plants have an almost endless variety of metabolites which is very useful to human beings. *Sesbania grandiflora* (L.) Poir., family Fabaceae, commonly known as Agati is a widely available, fast growing plant, generally popular for its animal fodder use. It was collected from East Dagon Township, Yangon Region. This plant was distributed widely through Tropical Asia including India, Indonesia, Myanmar, Phillipines and Thailand. Phytochemical investigations of *Sesbania grandiflora* (L.) Poir. leaves revealed the presence of alkaloid, glycoside, reducing sugar, α-aminoacid, phenolic compound, saponin, carbohydrate, steroid tannin, flavonoid and starch. In this study of antioxidant activity, the aqueous extract of *Sesbania grandiflora* (L.) Poir. is higher than the ethanol extract.

Key words: Phytochemical, Antioxidant

INTRODUCTION

Herbs or plants are the good source of antioxidants and they play a vital role in generated free radicals. Free radicals have been played an important role in affecting human health by causing several diseases including cancer, hypertension, heart attack and diabetes. These free radicals are generated during body metabolism. Flavonoids and phenolics are the bioactive phytoconstituents having an important role in control and prevention of tissue damage. Nowadays food scientist and nutrition specialists agree that food antioxidants, consumed daily contribute to the conservation of good health (Chen *et al.*, 1996).

Sesbania grandiflora (L.) Poir. is a soft wooded tree belonging to the family Fabaceae. Pharmacological activities of *Sesbania grandiflora* (L.) Poir. leaves are anthelmintic for children, cough medicine and anti - inflammation in rheumatic. Besides the leaves are used as aperient, diuretic, and tonic in form of poultice and they are applied to bruises. Leaves are chewed to disinfect the mouth and throat (Dhiman, 2003). Phytochemical study of *Sesbania grandiflora* (L.) Poir. exposed the presence of polyphenols, saponins, flavonoids, cyanidin, glucoside (Kale *et al*., 2015). Radical scavengers may protect tissues from free radicals, thereby preventing disease such as cancer. Active constituents in plant extracts from *Sesbania grandiflora* (L.) Poir. leaf are active against free radicals after being absorbed and metabolized cells in the body (Nakayama *et al*., 1998).

Hence, the medicinally and nutritionally important were used for the antioxidant activities in the present study. The main objective of present study is to study the morphological characters, to investigate the phytochemical properties and to study antioxidant activities from *S. grandiflora* (L.) Poir. leaves.

MATERIALS AND METHODS

The specimens used in this research were collected from East Dagon Township, Yangon Region. The leaves were dried in shade for several days when completely dried, these were pulverized by grinding machine to get the powder and stored in an airtight container for the chemical study. The morphological and phytochemical tests were conducted at the Department of Botany, Dagon University. Phytochemical investigations of *Sesbania grandiflora* (L.) Poir. leaves were determined by the methods of Central for research in Unani Medicine (1987) and Trease and Evans (1987). The extraction of compounds, antioxidant activity, total phenolic content and

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total falvonoid content were carried out at the Department of Oriental Herb Science, Chonbuk University, Iksan in Korea.

Extraction of *Sesbania grandiflora* (L.) Poir. leaves

Each powder sample 100 g of *Sesbania grandiflora* (L.) Poir. leaves were extracted using different solvents including 99% of ethanol and distilled water. The samples were soaked in ethanol for 12 hours and distilled water that was boiled in water bath (60˚C) for one hour. The two extracts were filtered through a sheet of filter paper (Whatman No. 1) and the filtrates were re-filtered through a 0.45 μm nylon membrane filter (GE Healthcare UK). The collected filtrated were dried in different processes. The ethanol extract was concentrated using a rotary evaporator with water bath at (60˚C) and the aqueous extract was concentrated using a rotary evaporator with water bath at (80˚-90˚C). And then, the two extracts were dried by freeze drier at (-60˚ C).

Test for Antioxidant Activity

Preparation of DPPH (1, 1-diphenyl - 2-picrylhydrazyl)

DPPH stock solution (0.002 g of DPPH in 50 mL of methanol) was freshly prepared and stored in falcon tube wrapped with silver foil.

Preparation of Test sample solution

0.2g of test sample and 2 mL of methanol were thoroughly mixed by vortex mixer. Then, the mixture solutions were placed in centrifuge. After 10 minutes, the stock solutions were obtained.

Measurement of DPPH Radical Scavenging Activity by Spectrophotometeric method

The control solution was prepared by mixing 200 μL of methanol and 1.8 μL of DPPH. Similarly, the blank solution was prepared 2 μL of methanol only. The sample solution was prepared by mixing 40 μL of test sample solution, 160 μL of methanol and 1.8 μL of DPPH solution. All solutions were kept in the dark for 30 minutes. Then the absorbance of the solution was measured at 517 nm using a UV-1601 Shimadzu Spectrophotometer. Methanol was used as standard and control. These were done in triplicate. The percentage inhibition was calculated by using the following equation:

$$\% \text{ inhibition} = (1 - S/C) \times 100$$

S = Absorbance of sample, C= Absorbance of control

The results were shown in table (2).

Total phenolic content

Total phenolic content of each extract was determined by Folin-Ciocalteu's reagent. The sample 100 μL was prepared by mixing 2 mL of 2% Na_2CO_3. The mixture was left at room temperature for 3 minutes. Then, 100 μL of 50% Folin-Ciocalteu's reagent was added to the mixture and left for 30 minutes. The absorbance of the solution was determined at 700 nm using a UV-1601 Shimadzu Spectrophotometer. These were done in triplicate. The equivalent values of the extract were calculated by using the following equation:

$$\text{Sample (Abs)} - 0.1523/0.8965$$

The results were shown in Table (2).

Total Flavonoid Content

Total Flavonoid content of each extract was determined by 10% $AlCl_3.6\ H_2O$. The sample 250 μL, 1mL of distilled water and 75 μL of 5% $NaNO_2$ were mixed and incubated for 5 mins. Then, 150 μL of 10% $AlCl_3$.6 H2O was added into the mixture. After 6 minutes of incubation, 500 μL of 1M NaOH was added into the mixture and left for 11 minutes. The absorbance of the solution was determined at 500 nm using a

UV-1601 Shimadzu Spectrophotometer. These were done in triplicate. The equivalent values of the extract were calculated by using the following equation:

Sample (Abs) - 0.0848 / 0.0002

The results were shown in Table (2).

Extraction of *Sesbania grandiflora* (L.) Poir. leaves

RESULTS

Morphlogical characteristics

Scientific Name - *Sesbania grandiflora* (L.) Poir.
English Name - Agati
Myanmar Name - Pauk-pan-phyu
Family - Fabaceae
Sub-family - Papilionoideae

Small tree, perennial. Leaves alternate, pinnately compound. Inflorescences axillary raceme. Flower complete, bisexual, irregular, zygomorphic, pentamerous, cyclic and hypogynous. Calyx (5), synsepalous, campanulate, ascending imbricate, sepaloid, bilabiate (the two upper and three lower united). Corolla 1+2+(2), apopetalous, papilionaceous, consisting of a large posterior petal, standard 1, 2 lateral petals wings and 2 posterior petals fused to form the keel, descending imbricate, petaloid (white). Stamen 5+5, dithecous, introse, dorsifixed, filaments 5 long and 5 short, longitudinal dehiscence. Gynoecium (1), monocapellary, unilocular, style long, stigma globose, ovary superior, marginal placentation. Fruits are legume. Seed endospermic.

Habit Leaves Inflorescence Flowers Fruits

Preliminary phytochemical investigation of *Sesbania grandiflora* (L.) Poir.

Phytochemical investigation of *Sesbania grandiflora* (L.) Poir. revealed the presence of alkaloids, glycoside, reducing sugars, α- amino acids, phenolic compounds, saponins, carbohydrates, steroids, tannins, flavonoids and starch. The results were shown in table (1).

Table (1). Preliminary Phytochemical tests of *Sesbania grandiflora* (L.) Poir.

No.	**Test**	**Extract**	**Test Reagent**	**Observation**	**Results**
1	Alkaloids	1% HCL	(1) Wagner's reagent (2) Dragendroff's reagent	Cream ppt. Organe ppt.	- -
2	α-amino acids	H_2O	Ninhydrin reagent	Deep pink	+
3	Glycosides	H_2O	10% lead acetate	White ppt	+
4	Carbohydrates	H_2O	10% α-napthol + conc : H_2SO_4	Red ring	+
5	Reducing sugars	H_2O	Benedict's solution	Yellow ppt.	+
6	Starch	H_2O	Iodine solution	Blue black	+
7	Saponins	H_2O	Distilled waters	Forthing	+
8	Phenolic compounds	H_2O	Ferric chloride solution	Deep blue	+
9	Flavonoids	95% ethanol	Conc : HCL and Mg burning	Pink	+
10	Steroids	Petroleum ether	Acetic anhydride+ Conc : H_2SO_4	Pink	+
11	Tannins	H2O	1% ferric chloride solution	Brown	+

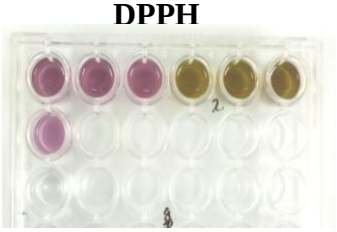
Absent = (-) Present = (+) ppt = precipitate

Antioxidant activity of *Sesbania grandiflora* (L.) Poir. leaves

DPPH – radical scavenging assay

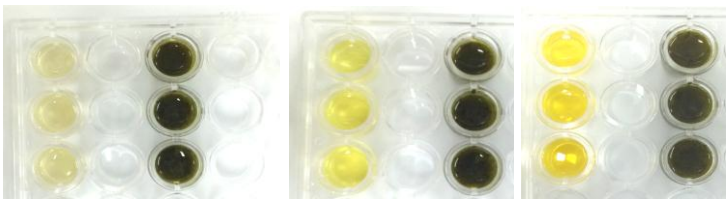
99% of ethanolic and aqueous extracts were used for screening of radical scavenging activity by DPPH method. Absorbance decreases as a result of a colour change from **purple to yellow greenish** as the radical was scavenged by antioxidant through donation of hydrogen to form the stable DPPH-H. The data showed that DPPH solution was bleached with all the sample tested. The results were shown in Table (2).

DPPH



Total Phenolic content

Total Flavonoid



Table(2). Antioxidant Activity of *Sesbania grandiflora* (L.) Poir.

No.	Tests	Aqueous extract			Ethanol extract		
		1	2	3	1	2	3
1.	DPPH Antioxidant activity	36.8%	33.7%	34.1%	59.9 %	63.3%	63.8%
2.	Total Phenolic Compound	0.9924	1.1039	1.2166	1.4664	2.7202	2.6979
3.	Total Flavonoid Content	456	536	567	868	798	878

DISCUSSION AND CONCLUSION

The samples of *Sesbania grandiflora* (L.) Poir. belonging to the family Fabaceae, were collected from East Dagon Township, Yangon Region. The morphological and phytochemical tests were conducted at the Department of Botany, Dagon University. The extraction of compounds, antioxidant activity, total phenolic content and total falvonoid content were carried out at the Department of Oriental Herb Science, Chonbuk University, Iksan in Korea.

The preliminary phytochemical investigation was carried out on the species of *Sesbania grandiflora* (L.) Poir. leaves. The main constituents of the leaves were found to be alkaloids, glycoside, reducing sugars, α- amino acids, phenolic compounds, saponins, carbohydrates, steroids, tannins, flavonoids and starch. *Sesbania grandiflora* (L.) Poir. leaves were also studied for the free radical scavenging activity by DPPH assay.

Aqueous and ethanolic extracts were prepared and their free radical scavenging activities were evaluated. According to this result, aqueous extracts of fruits showed better scavenging activity than ethanolic extracts. *Sesbania grandiflora* (L.) Poir. leaves were possessed considerable amount of phenolic and flavonoid. Therefore, the active compounds of the extracts may be quite polar or hydrophilic.

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