

Antioxidant Activity of Different Varieties of Plantain Stems by DPPH Method

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Abstract:

Plantain stems are a common source of bioactive compounds and have been traditionally used in various medicinal preparations. The antioxidant activity of different varieties of plantain stems is conducted due to their potential health benefits. This study aimed to assess the antioxidant activity of different varieties of plantain stems using 2,2 diphenyl-1-picrylhydrazyl (DPPH) method. Three different plantain stems were selected for the study. The plantain stems were further authenticated at the department of Botany, Korambayil Ahamed Haji Memorial Unity Women's College, Manjeri. All the three varieties of plantain stems showed positive result to alkaloid test. Tannin is present in Nendra and Mysore and absent in Poovan varieties. Flavonoid is present in all the three varieties of plantain stems. Phenolic compounds are present in Mysore and Poovan varieties and absent in Nendra variety. Comparison of radical scavenging activity of Poovan plantain stem in aqueous and methanolic extract shows that the Poovan plantain stem shows maximum antioxidant activity in aqueous extract. The mysore plantain stem shows maximum antioxidant activity in aqueous extract. The Nendra plantain stem shows maximum antioxidant activity in aqueous extract. Incorporating the above plantain stems in daily diets have to be popularized for its many health benefits.

Keywords: Antioxidant, DPPH, radical scavenging, Plantain stems, Health benefits

1. Introduction

Banana is the common name for herbaceous plants of the genus *Musa*. Bananas come in a variety of sizes and colors when ripe, including yellow, purple, and red. The banana plant is the largest herbaceous flowering plant. Banana central core is rich in fibre and aids in weight loss. It helps to relieve constipation. It is also found to be rich in potassium and vitamin B6. It helps to detoxify the body being a diuretic. It is used in the treatment of kidney stones. Banana pseudo stem flour (BPF) has good amount of several important macro minerals potassium (K), sodium

(Na), calcium (Ca), magnesium (Mg) and phosphorus (P) which is important to maintain body health. Antioxidants play an important role to protect damage caused by oxidative stress. There is still lack of knowledge regarding antioxidant properties of plantain stems.

Banana central core is rich in fibre and aids in weight loss. It helps to relieve constipation. It is also found to be rich in potassium and vitamin B6. It helps to detoxify the body being a diuretic. It is used in the treatment of kidney stones (Lekhshmi et al., 2010). The surface of the banana pseudo-stem is easily subjected to browning after harvest, which will affect the sensory evaluation and economic value of the banana pseudo-stem made products. In order to utilize banana Pseudostem it has to be processed to be incorporated into food products to increase its value, including both nutritional and sensory characteristics. The effects of various treatments (microwave drying, ultrasonication and irradiation) on physical and chemical properties of banana (Jun et al., 2016).

Pseudo-stem of Banana normally goes as waste though it could be used in pulp and paper industries due to its cellulosic content. It is also consumed as juice in fresh form. The banana central core finds use in south Indian cuisine. Banana stem is a rich source of fibre and helps to control obesity. It also aids to detoxify the body. In southern India, it is consumed as fresh juice to prevent kidney stones (Dikson et al., 2010).

The surface of the banana pseudo-stem is easily subjected to browning after harvest, which will affect the sensory evaluation and economic value of the banana pseudo-stem made products. In order to utilize banana pseudostem it has to be processed to be incorporated into food products to increase its value, including both nutritional and sensory characteristics. Antioxidants play an important role to protect damage caused by oxidative stress. There is still lack of knowledge regarding antioxidant properties of plantain stems.

The relevance of the study is to popularize the nutritional importance of the plantain stems and to include the plantain stems in our diet. All the aqueous, methanolic and ethanolic extracts of pseudo stem have been found to contain good number of antioxidants along with different phytochemical compounds like carbohydrate, protein and phenolic compounds. The phytochemical screening and analysis of pseudo stem sap indicated the presence of these carbohydrate, protein and phenolic compounds. By keeping in mind above aspects, the study entitled **“Antioxidant Activity of Different Varieties of Plantain Stems by DPPH Method”** has been undertaken with the main objective to find out the total antioxidant properties of selected plantain stems.

2. Experimental procedure

2.1 Selection of plantain stems

Three different plantain stems were selected for the study. The plantain stems were further authenticated at the department of Botany, Korambayil Ahamed Haji Memorial Unity Women's College, Manjeri. The stems were washed, dried and powdered for screening phytochemicals and testing total antioxidant activity by DPPH method. The selected samples were as follows:

Table 1: Information of the selected plantain stems.

Sl.No	Scientific Name	Common Name	Malayalam Name
1	<i>Musa nendra</i>	Nendra	Nendra Pazham
2	<i>Musa acuminata</i>	Poovan	Poovan Pazham
3	<i>Musa sapientum</i>	Mysore	Mysore Pazham

2.2 Preparation of the Extract for Phytochemical Analysis

Methanolic extracts were used for the determination of alkaloid, tannin, flavonoid and total phenol content. Fresh plantain stems were collected, washed and homogenized using methanol for the preparation of methanolic extracts. Total antioxidant activities were determined using both aqueous and methanolic extracts. Samples were ground in a mortar and pestle and 2gm of grounded samples were homogenized by using 20 ml of methanol. These extracts were then centrifuged at 2000 rpm for 10 minutes and the supernatant was collected in 100 ml volumetric flask and that extract was used for further study.

2.3 Phytochemical screening of the selected plantain stems

The study of antioxidant activity of the samples was done in the Biochemistry laboratory of KAHM Unity women's college, Manjeri. Standard procedures were used to assess the alkaloid, tannin, flavonoid and phenol compounds and total antioxidant activity.

2.3.1 Determination of alkaloids

Two grams of the extract were extracted by warming it for 2 minutes with 20ml of 1% sulphuric acid in a 50ml conical flask on a water bath, with intermittent shaking. It was then centrifuged and the supernatant pipetted off into a small conical flask. One drop of Meyer's reagent was

added to 0.1ml supernatant in a semi-micro tube. A cream precipitate indicated the presence of alkaloids.

2.3.2 Determination of Tannin

To the diluted extracts, 2ml of 10% lead acetate was added. White color precipitation indicated the presence of tannins. Crude extracts were mixed with 2ml of 2% solution of FeCl_3 . A blue green or black coloration indicated the presence of tannins

2.3.3 Determination of flavonoids

Five milliliters of dilute ammonia solution were added to a portion of the aqueous filtrate of the extract followed by addition of concentrated H_2SO_4 . A yellow coloration observed indicated the presence of flavonoids. The yellow coloration disappeared on standing.

Alkaline reagent test: crude extract was mixed with 2ml of 2% solution of NaOH . An intense yellow color was formed which turned color less on addition of few drops of diluted acid which indicated the presence of flavonoids

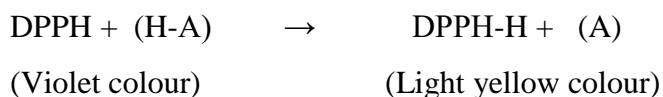
2.3.4 Determination of phenolic compounds

Ferric chloride test was carried out where the extract was diluted to 5ml with distilled water. To this, a few drops of neutral 5% Ferric chloride solution were added. A dark green or a blue-black color indicated the presence of phenolic compounds

2.4 Total antioxidant activity of plantain stems (DPPH method)

DPPH method was used to find out the total antioxidant activity. The radical-scavenging activity was determined using Diphenyl Picryl Hydrazyl (DPPH) which is a rapid, simple, inexpensive method to measure antioxidant capacity. The antioxidant activity of methanolic and aqueous extracts of samples was measured using DPPH radical scavenging assay (Ayoola, 2008). DPPH radical scavenging assays are electron transfer-based assays. Vitamin C was used as standard in DPPH assay for comparing the antioxidant activity of plantain stems.

The plant extract for free radical scavenging activity was determined by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) method by applying the modified protocol of Lim et al, (2006). The reaction involved has



The antioxidant component in plant extract undergoes a reaction with DPPH by donating free electron, and the stable free radical (DPPH) undergone the process of reduction and forms DPPH-H. This in turn, reduces the absorption from the DPPH radical to the reduced form. The strength of discoloration from violet to light yellow color describes the scavenging ability of entire antioxidant compounds in the form of its hydrogen donating capacity (Oktay, 2003).

The radical-scavenging activity was determined using Diphenyl Picryl Hydrazyl (DPPH) radical. This provides information on the reactivity of the test compounds with a stable free radical and gives a strong absorption band at 517nm in the visible region. The absorbance of the mixture was measured spectrophotometrically at 517nm using vitamin C as reference.

3. RESULT AND DISCUSSION

3.1 Phytochemical screening of the selected plantain stems

Table 2: Phytochemical screening of the selected plantain stems

Sl. No	Common Name of the Plantain Stem	Presence of Alkaloid		Presence of Tannin	Presence of Flavonoid	Presence of Phenol
		Mayer's Reagent	Wagner's Reagent			
1.	Mysore	Present	Present	Present	Present	Present
2.	Nendra	Present	Present	Absent	Present	Present
3.	Poovan	Present	Present	Present	Present	Absent

All the three varieties of plantain stems showed positive result to alkaloid test. Tannin is present in Nendra and Mysore and absent in Poovan varieties. Flavonoid is present in all the three varieties of plantain stems. Phenolic compounds are present in Mysore and Poovan varieties and absent in Nendra variety.

3.2 Determination of Total Antioxidant Activity of selected plantain stems

Total antioxidant capacity is the cumulative capacity of food components to scavenge free radicals. DPPH radical scavenging activity is one of the most widely used method for testing the total antioxidant activity of plant extract.

Table 3: DPPH radical scavenging activity of Poovan Plantain Stem

Blank	Concentration of the sample mg/ml	Methanolic extract			Aqueous extract		
		Control	Absorbance	(% Inhibition)	Control	absorbance	(Inhibition)
0.00		0.819			0.598		
	100		0.779	4.88		0.581	2.84
	200		0.775	5.37		0.576	3.68
	400		0.769	6.1		0.552	7.69
	800		0.746	8.91		0.487	18.59

Table 4: DPPH radical scavenging activity of Mysore Plantain Stem

Blank	Concentration of the sample mg/ml	Methanolic extract			Aqueous extract		
		Control	Absorbance	(% Inhibition)	Control	absorbance	(Inhibition)
0.00		0.819			0.921		
	50		0.705	4.83		0.554	0.18
	100		0.779	4.88		0.542	2.34
	200		0.775	5.37		0.518	6.66
	400		0.769	6.3		0.474	14.05
	800		0.746	8.91		0.398	28.29

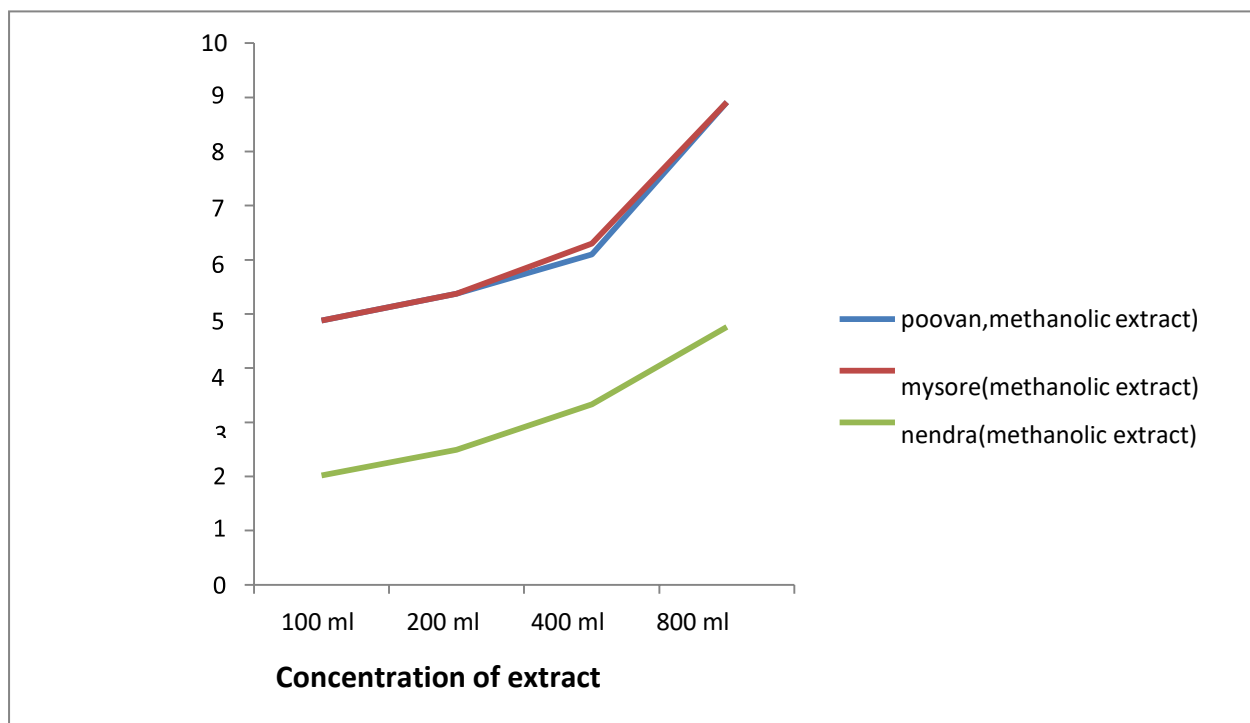
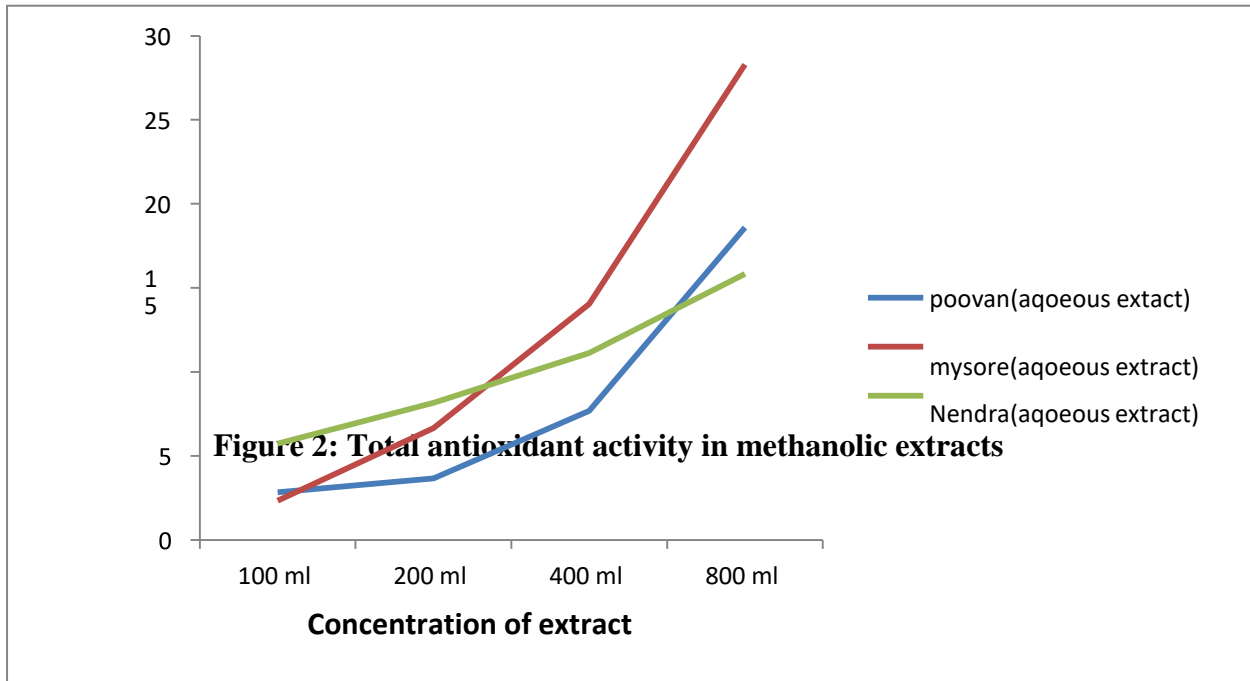
Table 5: DPPH radical scavenging activity of Nendra plantain stem

Blank	Concentration of the sample mg/ml	Methanolic extract			Aqueous extract		
		Control	Absorbance	(% Inhibition)	Control	absorbance	(Inhibition)
0.00		0.841			0.575		
	100		0.824	2.02		0.542	5.74
	200		0.820	2.49		0.528	8.17
	400		0.813	3.33		0.511	11.13
	800		0.801	4.76		0.484	15.83

Table 3,4 and 5 shows the antioxidant activities of the methanol and aqueous extracts of three plantain stems assessed using DPPH radical scavenging. Comparison of radical scavenging activity of Poovan plantain stem in aqueous and methanolic extract shows that the Poovan plantain stem shows maximum antioxidant activity in aqueous extract. The mysore plantain stem shows maximum antioxidant activity in aqueous extract. The Nendra plantain stem shows maximum antioxidant activity in aqueous extract.

3.3 Comparison of total antioxidant activity in plantain stems

Figure 1: Total antioxidant activity in aqueous extracts



Mysore plantain stems shows maximum antioxidant properties in aqueous extract, then Poovan and nendra varieties. Mysore and Poovan varieties of plantain stems shows maximum antioxidant properties and nendra variety of plantain stem shows least antioxidant property in methanolic extract.

CONCLUSION:

Alkaloids were found to be present in all three plantain stems. That is in Mysore, Poovan and Nendra. The presence of tannins was found only in two selected plantain stems- Mysore and Nendra. Flavonoid is also present in all the three selected plantain stem varieties. Phenolic compounds are present in only two varieties, in Mysore and Poovan. All the three varieties, that is Poovan, Mysore and Nendra shows maximum antioxidant properties at aqueous extract. The Mysore and Poovan varieties of plantain stems shows maximum antioxidant properties and Nendra variety of plantain stem shows least antioxidant property in methanolic extract. Thus, it may be concluded that among the three selected plantain stems, Mysore is found to be containing more amount of antioxidant properties, then Poovan and Nendra varieties. Incorporating the above plantain stems in daily diets have to be popularized for its many health benefits.

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