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Antioxidant Effect of Gmelina Arborea Stem Bark

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ABSTRACT *Plants are a rich source of Antioxidants. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their uses in traditional medicine. Free radicals can be generated in biological systems in the form of reactive oxygen species which are harmful and these are removed by the antioxidant system in the body. Antioxidants play an important role in defending the body against free radicals damage. In the present study, Gmelina arborea, commonly called Melina or Yemani was chosen as the candidate plant to determine the antioxidant potentials. The enzymic and non-enzymic levels of the stem bark was determined and proving the plant to be a potent source of antioxidants.*

INTRODUCTION

Free radicals are highly reactive species that have been implicated in the pathogenesis of many diseases (Shukula, 2010). A free radical can be defined as any molecular species capable of independent existence that contains an unpaired electron in an atomic orbital. Current lifestyle is causing the overproduction of free radicals and reactive oxygen species in the body and decreasing physiological antioxidant capacity (Orrell et al., 2008).

MATERIALS AND METHODS

Plant Material and Sample Preparation:

Gmelina arborea noted for its medicinal property was maintained in medicinal plant garden of our University and Stem Bark was taken as the sample for the present study. The Stem Bark were collected and washed in running tap water to remove the surface contaminants and shade dried, and then ground it using a mixer. An aqueous extract of the dried powdered stem bark 1g/10ml was prepared and used for all the assays. Both Enzymic and Non-Enzymic antioxidant components were analyzed in the dried stem bark of Gmelina arborea.

Enzymic Antioxidants:

The enzymic antioxidants analysed in the stem bark were superoxide dismutase, catalase, peroxidase, glutathione S-transferase, glutathione reductase and polyphenol oxidase. Activity of superoxide dismutase (SOD) was determined by the method of Misra and Fridovich (1972). Catalase (CAT) activity was assayed spectrophotometrically following the method of Luck (1974). Assay of Peroxidase (POD) as proposed by Reddy et al., (1995) was adopted for evaluating the activity of peroxidase. The method of Habig et al. (1974) was employed for the assessment of glutathione S-transferase (GST). Glutathione reducase (GR) activity was determined by the method proposed by David and Richard (1983). Polyphenol oxidase activity was determined by the method of Esterbauer et al., (1977).

Non-Enzymic Anitoxidants:

The non-enzymic antioxidants analysed in Gmelina arborea stem bark were ascorbic acid, α-tocopherol, total phenols, chlorophyll and flavonoid. Estimation of ascorbic acid content in the stem bark was carried out by the method of Roe and Keuther (1943). The level of tocopherol was determined spectrophotometrically by the method of Rosenberg (1992). Estimation of total carotenoids and lycopene was done as described by Zakaria et al. (1979). The method proposed by Moron et al (1979) was used for the estimation of reduced glutathione. Total phenols were assayed by the method proposed by Mallick and Singh (1980). The chlorophyll content of the stem bark was determined using the procedure described by Witham et al., (1971). The flavonoid content of the stem bark was determined using the procedure described by Zhishen et al., (1999).

RESULT AND DISCUSSION

The main ROS scavenging enzymes in plants include SOD, CAT, POD, GR, PPO, GST and Glutathione peroxidase (Apel and Hirt, 2004). Many plants contain substantial amounts of antioxidants such as ascorbic acid, α-Tocopherol, Carotenoids and Flavonoids that can be utilized to scavenge excess free radicals from the human body (Ranjbar et al., 2009). The activities of various antioxidative enzymes and non-enzymic antioxidants in the stem bark of Gmelina arborea were determined and presented in Table 1 and 2. From the enzymic antioxidant activities presented Table 1, it can be deduced that the dried stem bark of Gmelina arborea are an excellent source of antioxidants. Table 2, depicts good levels of non-enzymic antioxidant levels in the above stem bark in all the assays performed.

Medicinal plants are considered to be an important source of antioxidant compounds and the therapeutic benefit of many medicinal plants is often attributed to their antioxidant properties (Hansan et al., 2007). The alcoholic and aqueous extract of Plagiochasma appendiculatum, found to contain high levels of enzymic antioxidant SOD and CAT and thereby possesses potent antioxidant activity (Singh at el., 2006). Srikumar et al., (2006) concludes that the supplementation with Triphala prevents the noise-stress induced changes which may be due to its enzymic antioxidant properties such as CAT, SOD and GR. Rajathi et al., (2011) stated that the Andrographis paniculata leaves was found to possess a maximum antioxidant activity.

Total antioxidant capacity of Ficus glomerata was found to be 0.32 ±0.02 mg/g of ascorbic acid in the root extract (Channbasavaraj et al., 2008). The leaves of Dioscorea bulbifera showed higher activity of α-tocopherol 83.33±0.08 µm/mg (Suriyavathana and Indupriya, 2011).

The antioxidant potential of Majorana hortensis leaves was analyzed by Palaniswamy and Padma (2011) by assessing enzymic and non-enzymic antioxidants. The Bark powder of Terminalia arjuna has also been found to improve antioxidant status in the patients of coronary heart disease and there beneficial effects may be related to its high flavonoid content (Chander et al., 2004). Kundu et al., (2008) demonstrated that the methanol-aqueous fraction of Cajanus cajan leaf extract

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could prevent the chronically treated alcohol induced rat liver damage by augmenting the antioxidant enzymes activities.

Thus the findings of enzymic and non-enzymic antioxidants revealed that, the selected plant for the study Gmelina arborea stem bark will be a promising source of all antioxidant which could render good antioxidant activities.

CONCLUSION

Thus, the outcome of the present studty shows that the stem bark of Gmelina arborea contains potent antioxidant properties. These findings can form the basis for further studies.

Table:1 Enzymic Antioxidant activity of Gmelina arborea Stem Bark

S.No.	Enzymic Antioxidants (U/g Stem Bark)	Activity of Gmelina arborea Stem Bark
1.	SOD	46.27±0.35
2.	CAT	115.59±0.72
3.	POD	10.52±0.06
4.	GST	0.48±0.08
5.	GR	5.81±0.41
6.	PPO	0.659±0.30

The values are Mean ± SD of triplicates

1. 1 unit of enzyme is the amount that causes 50% reduction in NBT oxidation
2. 1 unit = Amount of enzyme required to decrease the absorbance at 240 nm by 0.05 units
3. 1 unit = changes in absorbance at 430 nm/minutes
4. 1 unit = µmol of NADPH oxidized/minutes
5. 1 unit = nmoles of CDNB conjugated/minutes
6. 1 unit = Amount of enzymes that transforms 1 µmole of dihydrophenol to 1 mole of quinines/minute

Table: 2 Non-Enzymic Antioxidant levels of Gmelina arborea Stem Bark

S.No.	Non-Enzymic Antioxidants	Activity of Gmelina arborea Stem Bark
1.	Ascorbic acid (mg/g)	3.62±0.05
2.	α-Tocopherol (µg/g)	2.48±0.28
3.	Reduced Glutathione (nmoles/g)	231.21±12.15
4.	Polyphenols (mg/g)	7.41±0.33
5.	Total Carotenoids (mg/g)	18.45±0.36
6.	Lycopene (mg/g)	3.29±0.05
7.	Flavonoids (mg/g)	4.67±0.94
8.	Chlorophylls (mg/g)	3.76±0.29

The values are Mean ± SD of triplicates

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