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Research Article

Comparative Antioxidant Activity Evaluation of *Tamarindus indica* Seed Coat and Cotyledon

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ABSTRACT

Tamarindus indica L.(Leguminosae) is a well-known tree for its edible fruit pulp used for its sour taste. The seeds are used in traditional medicine for the management of various ailments in India. The aim of this study was to determine and compare the antioxidant activity of seed coat and cotyledon of tamarind seeds. DPPH scavenging of methanolic extract of both seed coat and cotyledon were attempted for free radical scavenging activity. Both the samples possessed antioxidant activity however the seed coat extract possessed very minimal activity (38.57±0.08) when compared to cotyledon extract which showed prominent activity (85.24±0.08). This experimental findings suggest that the decoated cotyledon as a potential source for antioxidant property.

Keywords: Seed coat, Cotyledon, DPPH, Free radical scavenging activity.

1. INTRODUCTION

Plants have been intricately associated with the effective functioning of human system. *Tamarindus indica L.* is one of the essential ingredients in every household. The seeds of tamarind are known to contain phenolic substances. *Tamarindus indica* L. is a tropical fruit tree which grows in dry/monsoonal climates. It belongs to the family Leguminosae. Tamarind is a multi-use tree. It is a source of timber, fruit, seeds, fodder and contains medicinal extracts and potential industrial components (Gupta *et al* 2010)[1].

The ripe fruit, on an average comprises about: tamarind pulp 55 %, seeds 33 %, fibre 12 %; generally, the chemical constituents of the fresh tamarind varieties were 20.15-24.50 %moisture, 18-48º Brix TSS, 65-77 % total solids, 15.84-20.16% tartaric acid and 0.68-2.00 % ascorbic acid. Tamarind pulp concentrate is an acceptable product in many countries, since it is easily dispensable and gives a good exotic flavour to certain sources and has higher shelf life than tamarind pulp. A total of16 volatile flavour components have been identified in this product through gas chromatograph (Jhadav *et al* 2010)[2].

Plant materials have been used traditionally as medicine for treating ailments and maintaining health *Tamarindus indica* L. is one of the reported ancient herbal medicine plants (Soemardji, 2007)[3]. The healing power of tamarind is first mentioned in the traditional Sanskrit literatures. In Europe, the medical properties of tamarind were well known after it has been introduced by the Arab traders. *Tamarindus indica* L. fruit is useful as an agent of antihelmintic, antidiarrheal and anti-emetic (Khan et al., 2005)[4]. Tamarind seeds inhibit activities of snake envenomation enzymes which are responsible for local tissue damage, inflammation and hypotension (Ushanandini et al., 2006)[5]. Polysaccharide isolated from tamarind seeds has biological applications. It has immunomodulatory effect and lacks carcinogenic and cytotoxic activities (Sreelekha et al., 1993; Sano et al., 1996; Iida et al., 1978)[6,7,8]. Water extract of tamarind seed was found to reduce blood sugar level in Streptozotocin-induced diabetic male rats (Maiti et al., 2004)[9].

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Tamarind seed coat, a by product of the tamarind gum industry, could be used s a safe and low-cost source of antioxidant , although other herbals may be more effective (Ramos *et al* 2003)[10].Tamarind seed flavonoids may be involved in stabilizing highly reactive, potential harmful free radicals and protect cells from oxidative damage. The ability of antioxidants to destroy highly reactive free radicals serves to protect the structural integrity of immune cells and prevent the loss of essential functions (Sudjaroen *et al* 2005)[11].

The aim of the present work is to study the antioxidant activity of the seed coat and cotyledons of the tamarind seed.

2. MATERIALS AND METHODS

Healthy tamarind seeds were collected and decoated using mortar and pestle. The seed coat and the cotyledons were separately powered and the methanolic extract of the samples were prepared. To 1 g of the samples 20 ml of methanol was added and mixed well using a mortar and pestle the mixture was then placed in waterbath and incubated at 40^{o} C for 4-5 minutes. The extracts were cooled to room temperature and refrigerated overnight later filtered with Whatman's Filter paper. The filtrate was used for the antioxidant study.

2.1 Quantitative analysis of free radical scavenging activity

The antioxidant activities were determined using DPPH (Sigma-Aldrich) as a free radical. 100µl of sample extract was mixed with 2.7ml of methanol and then 200µl of 0.1 % methanolic DPPH was added. The suspension was incubated for 30 minutes in dark condition. Initially, absorption of blank sample containing the same amount of methanol and DPPH solution was prepared and measured as a control (Lee *et al.,* 2003)[12]. Subsequently, at every 5 min interval, the absorption maxima of the solutions were measured using a UV double beam spectra scan (Chemito, India) at 517nm. The antioxidant activity of the sample was compared with known synthetic standardof0.16% Butylated Hydroxy Toluene (BHT). Free radical scavenging activity was calculated by the following formula.

$$\% \text{ DPPH radical scavenging} = \frac{\text{Absorbance of control - Absorbance of test Sample}}{\text{Absorbance of control activity}} \times 100$$

3. RESULTS AND DISCUSSION

Plant derived substances are becoming increasingly known for their antioxidant activity (Mark Percival,1998)[13].Antioxidants are capable of stabilizing or deactivating free radicals before they attack cells and are absolutely critical for maintaining optimal cellular and systemic health. The involvement of free radicals in biological systems suggests that oxidative stress plays a cardinal role in the pathogenesis of many diseases as well as in the ageing process (Valko *et al*,2007)[14].

The results of this study indicate that the seed coat showed less antioxidant activity when compared to the cotyledon extract which exhibit higher antioxidant activity. The percentage values of antioxidant activity of seed coat ranged from 8.57 ± 0.02 to 38.57 ± 0.08 at 30 minutes interval duration. The cotyledon showed highly significant percentage ranging from 81.2± 0.05 to 85.24 ± 0.02 at 30 minutes interval duration which is in concomitant to the BHT standard (98.2 ± 0.35). The mean values of the triplicates are summarized in the table 1.

Table 1: Determination of antioxidant activity (%) by DPPH scavenging

	DPPH scavenging at different time interval (min)						
	0	**5**	**10**	**15**	**20**	**25**	**30**
BHT (control)	84.2 ± 0.05	92.8 ± 0.9	97.4 ± 0.3	97.4 ± 0.28	98.2 ± 0.15	98.2 ± 0.2	98.2 ± 0.35
Seed coat	8.57 ± 0.02	31.42 ± 0.09	32.85 ± 0.1	34.29 ± 0.1	35.73 ± 0.16	37.15 ± 0.12	38.57 ± 0.08
Cotyledon	81.97 ± 0.05	83.6 ± 0.1	84.43 ± 0.3	84.43 ± 0.1	84.23 ± 0.39	85.24 ± 0.29	85.24 ± 0.02

Values are mean ± Standard deviation

Research on *Tamarindus indicus* seeds has been carried out to explore its biochemical potential including its antioxidant property. Osawa*et al* (1994) and Luengthanophol *et al* (2004) have reported that the ethanolic extract prepared from the seed coat exhibited anti-oxidative activity as measured by the thiocyanate and thiobarbituric (TBA) method and Ethyl acetate extracts prepared from the seed coat also possessed a strong anti-oxidative activity[15,16].

Soong *et al* 2004 reported that the seed kernels of tamarind possess relatively high antioxidant activity and phenolic content[17]. So far four antioxidative compounds were isolated and identified from the seed coats of tamarind which includes

2-hydroxy-3',4'-dihydroxyacetophenone, methyl 3,4-dihydroxybenzoate, 3,4-dihydroxyphenyl acetate and epicatechin (T suda *et al* 2004)[18]. Sudjaroen *et al* (2005) suggested that the seed and pericarp of *T. indica* contain phenolic antioxidant compound. In addition to seed coat and cotyledon even the fruit pulp extract of *T. indica* showed free radical scavenging capacity when assessed in vitro by using DPPH, superoxide radicals assays and the thiobarbituric acid reactive substances assay(TBARS). It also increased the efficiency of *in vivo* antioxidant system when assessed by the superoxide dismutase, catalase and glutathione peroxidise activities (Martinello *et al* 2006)[19]. Vyas *et al* (2009) recently reported the antioxidant activity of ethanolic seed extract of seed coat of *T. indica* by DPPH free radical scavenging method whereas the results here showed less antioxidant activity in the seed coat compared to the activity of the cotyledons, indicating that the antioxidant potential of the cotyledons is very significant[20].

4. CONCLUSION

In this study there is linear increase in the percentage of antioxidant activity for both seed coat and cotyledon. The seed coat extract showed a lower percentage when compared to the control and cotyledon extract. The cotyledon extract showed a significantly higher percentage of antioxidant activity slightly lower to the control. Most of the studies share evidences to the antioxidant activity of the entire seed.

A comparative analysis for the antioxidant activity of cotyledon and seed coat indicate that the activity is very high in the decoated seeds. Hence it can be concluded that cotyledon of tamarind seeds are potential antioxidants whose significance has to be explored. Decoated Tamarind seeds need to be properly utilized as an active natural, inexpensive detoxifying agent.

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