

## Short Communication

# Antioxidant activity in some selected Indian medicinal plants

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Accepted 11 April, 2008

The study was carried out to determine the antioxidant activity of selected medicinal plants namely *Albizia amara*, *Achyranthes aspera*, *Cassia fistula*, *Cassia auriculata* and *Datura stramonium* by inhibition of lipid peroxidation technique. The highest inhibition of lipid peroxidation activity was observed in *A. amara* (96%) followed by *C. fistula* (89%) and *C. auriculata* (89%). The potency of protective effect of *A. amara* was about 4 times greater than the synthetic antioxidant butylated hydroxy toluene (BHT). The total alkaloid content varied from  $24.6 \pm 0.18$  to  $72.6 \pm 2$  mg g<sup>-1</sup> in the extracts. Flavanoid contents were between  $23.15 \pm 0.2$  and  $63.3 \pm 0.6$  mg g<sup>-1</sup> in the methanolic extracts of these plants. Our study indicates that the antioxidant activity of *A. amara* could be harnessed as a drug formulation.

**Key words:** Antioxidant, lipid peroxidation, alkaloids, flavonoids, butylatedhydroxy toluene.

## INTRODUCTION

Recently there has been an upsurge of interest in the therapeutic potential of medicinal plants as antioxidants in reducing such free radical-induced tissue injury (Pourmorad et al., 2006). Besides, well known and traditionally used natural antioxidants from teas, wines, fruits, vegetables and spices, some natural antioxidants (e.g. rosemary and sage) are already exploited commercially either as antioxidant additives or as nutritional supplements (Schuler 1990). The major constituents of biological membranes are lipids and proteins. The number of functions of membranes increases as the protein amount increases. Reactive oxygen species can easily initiate the lipids causing damage of the cell membrane constituent i.e. phospholipids, lipoproteins by propagating a reaction cycle (Raja Sudarajan et al., 2006). It has been mentioned that antioxidant activity of plants might be due to their phenolic compounds (Duh et al., 1999). Flavonoids are a group of polyphenolic compounds with known properties which include free radical scavenging, inhibition of hydrolytic oxidative enzymes and anti-inflammatory

action (Frankel, 1995). In the present study, the relative lipid peroxidation inhibition activity was carried out with selected medicinal plants; *Albizia amara* (Mimosaceae), *Achyranthes aspera* (Amaranthaceae), *Cassia fistula* (Caesalpiniaceae), *Cassia auriculata* (Cae-salpiniaceae) and *Datura stramonium* (Solonaceae). The total alkaloid and flavonoid contents with antioxidant activity were also determined. In longer term, plant species identified as having high levels of antioxidant activity *in vitro* may be of value in the design of further studies to unravel novel treatment strategies for disorders associated with free radicals-induced tissue damage.

## MATERIALS AND METHODS

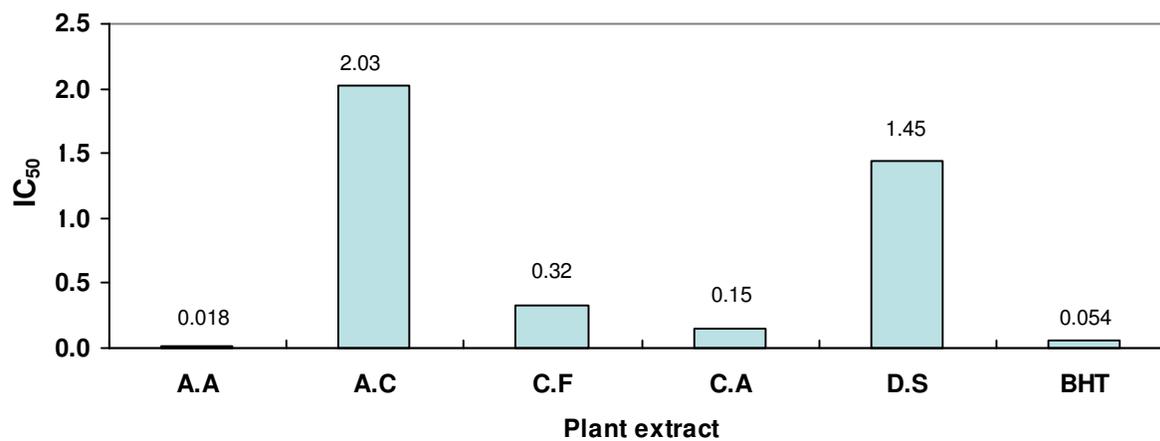
The Plants were collected from Kodaikanal (South India) and identified by BSI (Botanical Survey of India, Coimbatore, Tamil Nadu, India). The leaves collected, were shade-dried at room temperature and ground in a mortar. Fifty grams of each leaf powder was extracted (48 h). The solvent was removed under the vacuum at temperature below 50°C and the extracts were freeze-dried. The phytochemical analysis was performed according to Chu (2000) (alkaloid) and Pourmorad et al. (2006) (flavonoid). The lipid peroxidation was estimated according to the method described by Venkatarangana et al. (2001) with butylated hydroxy toluene (BHT). The experiments were conducted thrice and each value was ex-

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**Table 1.** Phytochemical Analysis and Lipid peroxidation activity.

Plant	Concentration (mg-g <sup>-1</sup> )	Alkaloid (mg-g <sup>-1</sup> )	Flavonoid (mg-g <sup>-1</sup> )	Lipid peroxidation (%)
<i>Albizia amara</i>	0.1	72.6 ± 0.12	63.3 ± 0.6	96.3 ± 0.6
<i>Achyranthes aspera</i>	4	61.1 ± 4	58.3 ± 0.18	44 ± 1
<i>Cassia fistula</i>	0.8	24.6 ± 0.18	36.2 ± 1.2	89.3 ± 1.5
<i>Cassia auriculata</i>	0.8	22.3 ± 3	25.15 ± 0.2	89.6 ± 0.6
<i>Datura stramonium</i>	4	31 ± 4	23.06 ± 1.5	70.8 ± 1
BHT (Butylated hydroxyl toluene)	0.4			93.6 ± 0.4



**Figure 1.** IC<sub>50</sub> (mg/ml<sup>-1</sup>) values of plant extracts for free lipid peroxidation activity. Lower IC<sub>50</sub> value indicates higher antioxidant activity. A.A = *Albizia amara*, A.C = *Achyranthes aspera*, C.F = *Cassia fistula*, C.A = *Cassia auriculata*, D.S = *Datura stramonium*, and BHT = butylated hydroxy toluene (synthetic antioxidant).

pressed in mean ± standard error of mean.

## RESULTS AND DISCUSSION

### Phytochemical analysis and antioxidant activity

It has been recognized that alkaloids and flavonoids show antioxidant activity and their effects on human nutrition and health care are considerable (Kumpulainen and Salonen, 1999). Mechanisms of action of alkaloids are through inhibition of peroxidation (Kessler et al., 2003, Cook and Samman, 1996). The total alkaloid content varied from 24.6 ± 0.18 to 72.6 ± 2 mg g<sup>-1</sup>. The alkaloid content in the extracts of *A. amara* (72.6 ± 2 mg g<sup>-1</sup>) and *A. aspera* (61.1 ± 4 mg g<sup>-1</sup>) were higher than that in the extracts of *C. fistula*, *C. auriculata* and *D. stramonium* (Table 1). The total flavonoid content varied from 63.3 ± 0.6 to 23.6 ± 5 mg g<sup>-1</sup>. *A. amara* with total flavonoid content 63.3 ± 0.6 mg g<sup>-1</sup> had the highest amount among the plants studied (Table 1). Compounds such as flavonoids are responsible for the inhibition of lipid peroxidation effect in the plants (Das and Pereira, 1990). According to our study, the high contents of these

phytochemicals in *A. amara* (first report) can explain its high lipid preoxidation inhibition activity.

Malonaldehyde produced during peroxidation reacts with thiobarbituric acid (TBA) reagent to form a pink colored product which has an absorption maximum at 535 nm (Riemersma et al., 2000). Extracts from all of these plants studied exhibited different extent of antioxidant activity. The amount of each extract needed for (IC<sub>50</sub>) 50% inhibition is shown in Figure 1. IC<sub>50</sub> of the standard compound, BHT was 0.054 mg ml<sup>-1</sup>. The highest lipid peroxidation inhibition activity in the plant extracts decreased in the following order *A. amara* > *C. auriculata* > *C. fistula* > *D. stramonium* > *A. aspera*. Different concentrations of extracts of all the plants tested exhibited more than 70% lipid peroxidation inhibition activity (Table 1). The methanolic leaf extract of *A. amara* showed a higher potency than BHT in lipid peroxidation inhibition activity. The lipid peroxidation inhibition effect of *A. amara* at 0.1 mg ml<sup>-1</sup> was similar to BHT at 0.4 mg ml<sup>-1</sup> indicating that the antioxidant effect of *A. amara* was four times greater than that of the synthetic antioxidant, BHT.

In conclusion, the results of the present study show that the extract of *A. amara* contains the highest amount of flavonoids and alkaloids, which corresponds to higher

lipid peroxidation activity in rats. Therefore the plant can be further harnessed for novel antioxidant/bioactive compounds which is very well evidenced by the present work.

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