

Antioxidant Activity of Some Selected Medicinal Plants in Western Region of India

Vinay R. Patel, Prakash R. Patel and Sushil S. Kajal

Department of Biosciences, Sardar Patel University, Vallabh Vidyanagar Gujarat-388 120, India

Abstract: The present study was undertaken to find the antioxidant value of certain medicinal plants in Gujarat region. Antioxidants have been reported to prevent oxidative damage caused by free radical and can be used in cardiovascular and anti-inflammatory diseases. The amount of total phenols, flavanoids and radical scavenging activity has been studied. Major amount of phenols were determined in *Gemelia* leaf followed by stem of *Kigella* and *Hibiscus*. Moreover, maximum flavonoid content was found to be present in the leaf of *Hibiscus* followed by *Gemelia* and *Parthenium*. However, high radical scavenging activity was observed in the stem of *Kigella* followed by leaf of *Hibiscus*, *Gemelia* and *Kigella*.

Key words: Antioxidant • Flavanoid • Medicinal plant • Phenol • Radical scavenger

INTRODUCTION

Since ancient times, the medicinal properties of plants have been investigated in the recent scientific developments throughout the world, due to their potent antioxidant activities. As antioxidants have been reported to prevent oxidative damage caused by free radical, it can interfere with the oxidation process by reacting with free radicals, chelating, catalytic metals and also by acting as oxygen scavengers [1, 2]. The potentially reactive derivatives of oxygen, attributed as reactive oxygen species (ROS), are continuously generated inside the human body. The generated ROS are detoxified by the antioxidants present in the body. However, overproduction of ROS and/or inadequate antioxidant defense can easily affect and persuade oxidative damage to various biomolecules including proteins, lipids, lipoproteins and DNA [3]. This oxidative damage is a critical etiological factor implicated in several chronic human diseases such as diabetes mellitus, cancer, atherosclerosis, arthritis and neurodegenerative diseases and also in the ageing process.

Besides, phenolic compounds and flavonoids are also widely distributed in plants which have been reported to exert multiple biological effects, including antioxidant, free radical scavenging abilities, anti-inflammatory, anticarcinogenic etc. [4]. As crude extracts of herbs and spices and other plant materials, rich in

phenolics are of increasing interest in the food industry because they retard oxidative degradation of lipids and thereby improve the quality and nutritional value of food. While, flavonoids are a group of polyphenolic compounds with known properties, which include free radical scavenging, inhibition of hydrolytic and oxidative enzymes and anti-inflammatory action [5].

Recently there has been an upsurge of interest in the therapeutic potentials of plants, as antioxidants in reducing free radical induced tissue injury. Although several synthetic antioxidants, such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), are commercially available, but are quite unsafe and their toxicity is a problem of concern. Hence, strong restrictions have been placed on their application and there is a trend to substitute them with naturally occurring antioxidants. Natural antioxidants especially phenolics and flavonoids from tea, wine, fruits, vegetables and spices are already exploited commercially either as antioxidant additives or as nutritional supplements [6]. Also many other plant species have been investigated in the search for novel antioxidants [7-10], but generally there is still a demand to find more information concerning the antioxidant potential of plant species as they are safe and also bioactive. Therefore, in recent years, considerable attention has been directed towards the identification of plants with antioxidant ability.

MATERIALS AND METHODS

The stem and leaf parts of *Calotropis procera* Linn., *Hibiscus cannabinus* L., *Parthenium hysterophorus* L., *Gmelina arborea* Roxb. and *Kigelia pinnata* (Jacq.) DC plants were collected from the vicinity of Vallabh Vidyanagar, Gujarat. The samples were dried at room temperature and further ground in a mortar. About 10 grams of each plant powder was extracted in 100 ml of methanol by maceration (48 h). The solvent was concentrated at temperature below 40°C and the resulting extracts were used for determination of flavonoids, phenols and free radical scavenging activity.

Flavonoids were determined using Aluminum chloride colorimetric method [11]. The calibration curve was made by preparing quercetin solutions at different concentrations in methanol. Total phenols were determined by Folin Ciocalteu reagent [12]. The phenol values are expressed in terms of gallic acid equivalent. Free radical scavenging activity was determined using the stable 1, 1-diphenyl-2-picryl hydrazyl radical (DPPH) [8]. BHT was used as standard controls.

The statistical significance between antioxidant activity values of the extracts was evaluated with a Duncan's multiple range test (DMRT) at 5 % were considered to be statistically significant [13].

RESULTS

The beneficial effects derived from phenolic compounds have been attributed to their antioxidant activity [14]. The total phenol content in the tissues varied from 47.28 to 4.88 mg/gm (Fig. 1). The screening of five plants revealed that the amount of phenols were higher in the stem tissues when compared to leaf tissues of all the plants studied. Maximum amount of phenols were found in the *Gmelina* plant followed by *Kigelia*, *Hibiscus*, *Calotropis* and *Parthenium*. Major amount of phenols were determined in *Gmelina* leaf followed by *Kigelia* stem and *Hibiscus* stem. While lower amounts was observed in other tissues of the selected plants.

Flavonoids are regarded as one of the most widespread groups of natural constituents found in plants. The values of flavanoid content varied from 1.27 mg/gm to 82.11 mg/gm (Fig. 2). High amount of

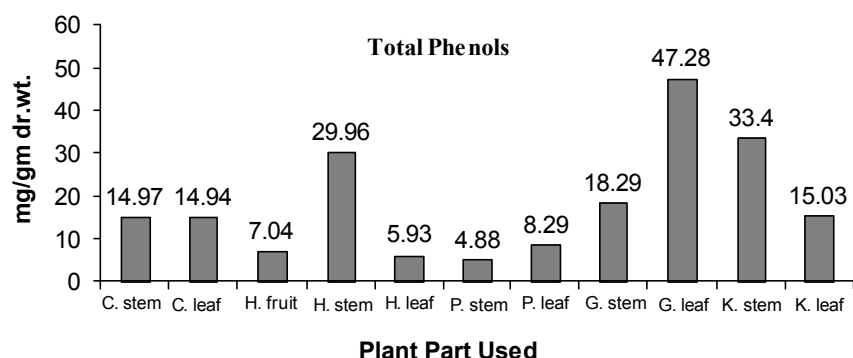


Fig. 1: The amount of Total Phenols in some selected medicinal plants

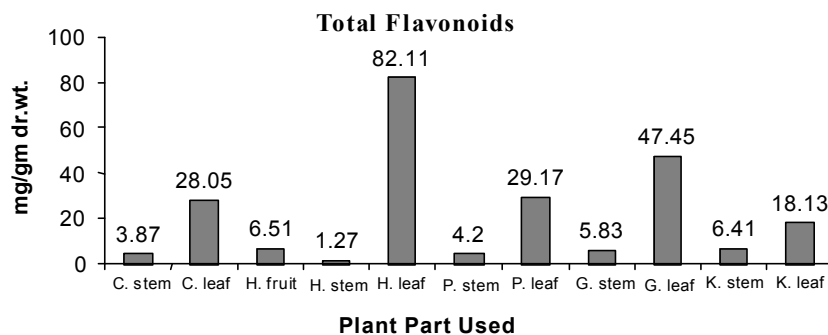


Fig. 2: The amount of Total Flavonoids in some selected medicinal plants.

C. stem - *Calotropis* stem C. leaf - *Calotropis* leaf H. fruit - *Hibiscus* fruit H. stem - *Hibiscus* stem
H. leaf - *Hibiscus* leaf P. stem - *Parthenium* stem P. leaf - *Parthenium* leaf G. stem - *Gmelina* stem
G. leaf - *Gmelina* leaf K. stem - *Kigelia* stem K. leaf - *Kigelia* leaf

Table 1: DPPH radical scavenging activity of some selected medicinal plants

Plant Species	Plant part	Extract used (ml)	Total Antioxidant Activity (%)
<i>Calotropis procera</i>	Stem	1.3 ± 0.2	93 ± 3
	Leaf	1.5 ± 0.2	88 ± 4
<i>Hibiscus cannabinus</i>	Fruit	4.4 ± 0.4	65 ± 13
	Stem	5.2 ± 0.8	75 ± 11
	Leaf	0.6 ± 0.1	84 ± 5
<i>Parthenium hysterophorus</i>	Stem	5.2 ± 1.1	71 ± 8
	Leaf	5.5 ± 1.0	78 ± 6
<i>Gmelina arborea</i>	Stem	1.1 ± 0.2	84 ± 7
	Leaf	0.8 ± 0.2	92 ± 3
<i>Kigellia pinnata</i>	Stem	0.6 ± 0.1	91 ± 4
	Leaf	0.9 ± 0.1	82 ± 8

Mean Value ± Standard Deviation of three replicates

flavonoid content was observed in the leaf tissues when compared to that of the stem tissues. High amount of flavonoid content was observed in the *Hibiscus* followed by *Gemellia*, *Parthenium*, *Calotropis* and *Kigelia*. Moreover, maximum flavonoid content was determined in the *Hibiscus* leaf followed by *Gemelia* leaf and *Parthenium* leaf.

The antioxidants are known to mediate their effect by directly reacting with ROS, quenching them and/or chelating the catalytic metal ions [15]. The radical scavenging activity was found to be high in the stem of *Kigelia* followed by leaf of *Hibiscus*, *Gemelia* and *Kigelia* (Table 1).

DISCUSSION

The screening of the leaf and stem of the five selected medicinal plants indicates that the presence of high phenolic compounds may be due to the presence of tannins and flavonoids [16] which are known to possess antioxidant activities [17-19].

It has been shown that the scavenging effects on the DPPH radical increases sharply with the increasing concentration of the samples and standards to a certain extent [19] and hence are said to be strongly dependent on the extract concentration. A strong correlation has been observed between the phenols and antioxidant activity. Also strong relationship between total phenolic content and antioxidant activity has been reported by [20-22] do not find any such kind of correlation between antioxidant activity and phenolic content in plant extracts.

In contrast, relationship was not observed between the flavonoids content and antioxidant activity. The results of the present study are in agreement with that of Miliauskas *et al.* [23] and Garcia-Alonso *et al.* [24].

CONCLUSION

High radical scavenging activity was observed in the stem of *Kigelia* followed by leaf of *Hibiscus*, *Gemelia* and *Kigelia*. The radical scavenging activities of the selected plants extracts are still less affective than the commercial available synthetic like BHT. As the plant extracts are quite safe and their toxicity is a not a problem of concern unlike those of BHT, they could be exploited as antioxidant additives or as nutritional supplements.

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