



Research Article

SCREENING OF SELECTED MEDICINAL PLANT EXTRACTS FOR ANTHELMINTIC AND ANTIOXIDANT ACTIVITY

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ABSTRACT

The present work evaluates invitro antioxidant and anthelmintic activity of hot water extracts of selected plants, namely seeds of *Coriandrum sativum*, bark of *Acacia catechu*, leaves of *Ocimum sanctum*, dried rhizome of *Zingiber officinale*, seeds of *Cuminum cyminum*, dried heart wood of *Caesalpinia sappan*, the parts being used for preparing herbal drinking water. The antioxidant activity was determined by 2,2-diphenyl-picrylhydrazyl (DPPH) assay; the anthelmintic activity was tested against the Indian earthworm (*Pheretima posthuma*). A marked dose dependent antioxidant and anthelmintic activity was observed in the trials. Antioxidant activity was higher in *Acacia catechu* bark extract and *Ocimum sanctum* leaves showed maximum anthelmintic activity.

Keywords: Anthelmintic activity, Antioxidant activity, Herbal drinking water, Medicinal Plants

INTRODUCTION

Herbal medicines for therapeutic purposes have been explicitly used since the dawn of human civilization to maintain health and to treat diseases¹. Antioxidants are compounds that inhibit oxidation. Oxidation is a chemical reaction that can produce free radicals, thereby leading to chain reactions that may damage the cells of organisms. Many plants are reported to be good antioxidants. These natural antioxidants either in the form of raw extracts or their chemical constituents are very effective to prevent the destructive processes caused by oxidative stress². The toxicity profile of most medicinal plants has not been thoroughly evaluated, it is generally accepted that medicines derived from plant products are safer than their synthetic counterparts³.

Helminthic infections are among the most common infection in humans and animals. It affects a large proportion of the world population especially in the developing countries⁴. Conventional treatment of helminthic infection is done by using synthetic drugs or “designer drugs”⁵. They are highly effective against gastrointestinal nematode infection. Although synthetic drugs are effective in the treatment of helminthic infection, they suffer from limitations of side effects or toxicity⁶.

Kerala is well known for the use of medicated drinking water popularly known as ‘Chukkuvellam’. They come in attractive colours. The original ‘chukkuvellam’ which is made by boiling water with ‘chukku’ has a turbid appearance and is slightly hot. Most other types of ‘chukkuvellam’ are clear water, with characteristic mild flavours. ‘Jeera’ gives a golden yellow colour, the herb ‘Pathimukham’ gives an attractive pink colour, and ‘Karingali’ gives a brownish colour. Keralites also use Coriander seeds, Tulsi leaves for preparing herbal drinks⁷.

In the present study an attempt is made to evaluate the anthelmintic and antioxidant activity of hot water extract prepared from parts of selected medicinal plants namely *Coriandrum sativum* L.(seeds), *Cuminum cyminum* L. (seeds),

Caesalpinia sappan L. (heart wood), *Acacia catechu* Willd, *Ocimum sanctum* Linn (leaves), and *Zingiber officinale* (L.) Rosc (dried rhizome), the plants used for preparing medicated drinking water or herbal drinks.

MATERIALS AND METHODS

Preparation of crude plant extract

Test plant parts were obtained from the local market. Plant materials collected were dried seeds of *Coriandrum sativum*, bark of *Acacia catechu*, leaves of *Ocimum sanctum*, dried rhizome of *Zingiber officinale*, seeds of *Cuminum cyminum*, dried heart wood *Caesalpinia sappan*. About 2gm of dried ground plant materials were soaked in hot water (100ml) for 1 week separately. The soaked material was stirred and heated to boiling point and stirred using sterilized glass rod. The final extracts were passed through Whatman filter paper No.1 (Whatman Ltd., England). The filtrates obtained were concentrated by keeping in the hot water bath. The extraction yield is expressed (W/W) as the percentage of total mass of extracts (*Mext*) with respect to the mass material used (*Mo*) and calculated as yield percentage, $Y\% = (Mext / Mo) \times 100$. The extracts were dissolved in the distilled water to make a concentration of 1mg/ml. The working solution of the extracts was prepared by using suitable dilutions.

Antioxidant Activity

The ability of the plant extracts to scavenge 2,2-diphenyl-1-picrylhydrazyl (DPPH)-free radical activity by modified method of Braca *et al*⁸. The stock solution of extracts was prepared in water to achieve the concentration of 1 mg/ml. Dilutions were made to obtain concentrations of 5, 2.5, 1µg/ml. Diluted solutions (1 ml each) were mixed with 1 ml of methanolic solution of 0.002% DPPH. After 30 min incubation in darkness at room temperature (23°C), the absorbance was recorded at 517 nm using Labtronics NT 290 Spectrophotometer. Control sample contained

all the reagents except the extract. The optical density was recorded and % inhibition was calculated using the formula⁹,

$$\text{Percentage inhibition of DPPH activity} = \frac{(A-B)}{A} \times 100$$

Where, A = optical density of the Control and B = optical density of the sample.

Anthelmintic Activity

The anthelmintic assay was carried out as per the method of Ajaiyeoba¹⁰. Adult earthworms (*Pheretima posthuma*), were used to evaluate anthelmintic activity in vitro. Earthworms of 3-5 cm in length and 0.1-0.2 cm in width (same type) were collected

from Kerala Agricultural University, Mannuthy. Test samples of the extract was prepared at the concentrations, 25,50,75 mg/ml in distilled water. Six earthworms of equal size were placed in nine cm diameter Petri dish with 25 ml of the test samples of plant extracts. Albendazole (25 mg/ml and 50mg/l) was used as reference standard. All the test samples and standard drug solution were prepared fresh before starting the experiments. Observations were made for the time taken for paralysis which is noted when no movement of any sort could be observed except when the worms were shaken vigorously. Time for death of worms was recorded after ascertaining that worms neither moved when shaken vigorously.

Table 1: Yield of plant extracts

Plant	% Yield w/w
<i>Coriandrum sativum</i> (Dried seeds)	17
<i>Cuminum cyminum</i> (Dried seeds)	20
<i>Caesalpinia sappan</i> (dried heart wood)	5.5
<i>Acacia catechu</i> (Dried Bark)	11
<i>Ocimum sanctum</i> (Leaves)	14.5
<i>Zingiber officinale</i> (Dried Rhizome)	65

Table 2: In vitro anthelmintic activity of selected plant extracts against Indian earthworms (*Pheretima posthuma*)

Treatment Groups	Concentration mg/ml	Time Taken (min)	
		Paralysis	Death
Albendazole	25	4	13
	50	1	4
<i>Coriandrum sativum</i> (Dried seeds)	25	21	23
	50	10	15
	75	6	8
<i>Cuminum cyminum</i> (Dried seeds)	25	76	120
	50	40	68
	75	26	48
<i>Caesalpinia sappan</i> (dried heart wood)	25	72	110
	50	42	73
	75	22	57
<i>Acacia catechu</i> (Dried Bark)	25	35	70
	50	14	60
	75	4	33
<i>Ocimum sanctum</i> (leaves)	25	33	65
	50	18	39
	75	3	7
<i>Zingiber officinale</i> (Dried Rhizome)	25	28	75
	50	14	54
	75	4	11

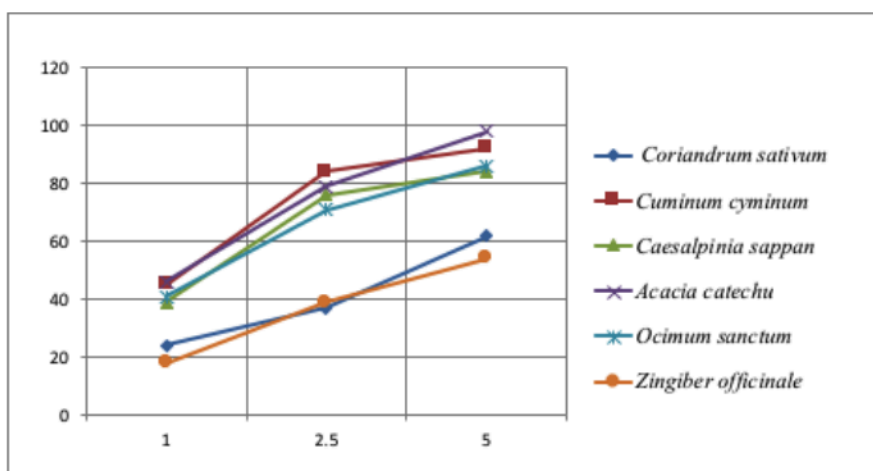


Figure 1: DPPH radical scavenging activity of selected medicinal plant extracts

RESULT AND DISCUSSIONS

Extraction Efficiency

The extraction yield is expressed as the percentage of total mass of extracts (Mext) with respect to the mass of material loaded onto the apparatus. The extraction yield can be ranked as *Zingiber officinale* > *Cuminum cyminum* > *Coriander sativum* > *Ocimum sanctum* > *Acacia catechu* > *Caesalpinia sappan* (Table 1). In the present study plant extracts were prepared using solvent water. Successful determination of biologically active compounds from plant material is largely dependent on the type of solvent used in the extraction procedure¹¹.

DPPH Antioxidant Assay

Antioxidant activity of extracts was determined using DPPH assay. All the extracts showed antioxidant activity. DPPH stable free radical method is a sensitive way to determine the antioxidant activity of plant extracts¹². The radical scavenging potential of the plant parts used here is dose dependent that increased on increasing the concentration of extracts from 1-5 µg in all the extracts studied. Percentage inhibition of plant extracts is shown in Figure 1.

The *Acacia catechu* extract showed maximum activity and minimum by *Zingiber officinale* extract. DPPH antioxidant assay is based on the ability of DPPH, a stable free radical, to decolorize in the presence of antioxidants. The DPPH radical contains an odd electron, which is responsible for the absorbance at 515 nm and also for a visible deep purple color. When DPPH accepts an electron donated by an antioxidant compound, the DPPH is decolorized, which can be quantitatively measured from the changes in absorbance. Various assays are used to test antioxidant activity but the most widely used methods are those that involve the generation of free radical species which are then neutralized by antioxidant compounds¹³.

Anthelmintic Activity

From the observations made, a dose dependent paralytic effect and the time of death was observed (Table 2). The experiment is done with Indian earthworms (*Pheretima posthuma*) adult type due to their anatomical resemblance with the intestinal roundworm parasites of humans¹⁴.

All the plants extract showed anthelmintic activity in a dose-dependent manner. Evaluation of anthelmintic activity was compared with reference standard albendazole. From the observations made, higher concentration of extract produced paralytic effect much earlier and the time to death was shorter for all worms in all the plant extracts studied. *Ocimum sanctum* showed maximum activity and least by *Cuminum cyminum*.

Development of resistance in helminthes against conventional anthelmintics is the foremost problem in treatment of helminthes diseases. Some serious side effects of drug like albendazole is that it causes giddiness, decreased urination, fever, chills, or sore throat tiredness etc.

Henceforth it is important to look for alternative strategies against gastrointestinal nematodes, which have led to the proposal of screening medicinal plants for their anthelmintic activity¹⁵

CONCLUSION

The results of the present study clearly indicate that the hot water extracts of selected parts of six medicinal plants studied had antioxidant and anthelmintic activity. The present data would certainly help to ascertain the potency of the tested plants for

medicinal use, functional food and nutraceuticals applications. Therefore, further investigations are needed for the isolation and identification of the active components and to elucidate its mechanisms of action, as well as their potential role in the biological activity, and antioxidant activities as well.

Therefore, there is no doubt that these plants are a reservoir of potentially useful chemical compounds, which serve as drugs, provide newer leads and clues for modern drug design. Habit of drinking herbal water is good for health.

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