Research Paper

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Detailed Analysis on Phytochemicals, Antioxidants, Antimicrobial Activity of Eichhornia Crassipes

Biotechnology

KEYWORDS : Eichhorniacrassipes, phytochemicals, antimicrobial activity

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ABSTRACT

Eichhornia crassipes is considered as the world's worst aquatic plant but a highly productive aquatic weed that causes a serious hindrance to nation's developmental activities. The present investigation was planned to explore the potential of Eichhornia crassipes in a way that, its positive attributes outweigh the negative ones. The present paper deals with the phytochemical screening of any therapeutic importance from Eichhornia crassipes. Qualitative analysis of the plant parts have revealed the presence of various components of importance including tannins, phoblatannin, steroid, terpenoid, alkaloid, flavonoid, phenolic contents, quinones, antraquinones and cardiac glycosides. Because of the rich diversity of this aquatic plant it is expected that screening and scientific evaluation of plant extracts may prove beneficial for the mankind along with the management of the weed. The result obtained indicates that though the plant is an aquatic weed is good services of phytochemicals needed for maintenance of good health and can also be exploited in the manufacture of drugs. The antimicrobial activity of the plant extracts and phytochemicals was evaluated with antibiotic susceptible and resistant microorganisms. Recently much attention has been paid to extracts and biologically active compounds isolated from plants species.

INTRODUCTION

For a long period of time, plants have been a variable source of natural products for maintaining human health. Many plants have chemical components and biological activities that produce definite physiological actions in the body and therefore could be used to treat various ailments. Most important of these bioactive constituents of plants are alkaloid, tannins, flavonoids and phenolic compounds. The water hyacinth, Eichhornia crassipes is a tropical species belonging to the pickerelweed family (Ponte-deriaceae). It is a free floating aquatic macrophyte plant well known for its production abilities and removal of pollutants from water.(4) Water hyacinth is listed as one of the most productive plant on earth and is considered the world's worst aquatic weed. Here in this paper we are focusing on the antioxidant, antimicrobial and phytochemical properties of Eicchornia crassipes.

MATERIALS AND METHODS

Fresh water hyacinths were collected from different marshy lands of Kayamkulam, Mavelikkara, Allepy, and Kerala. The root portion was cut off and the plant was washed thoroughly to free from debris. The leaves and shoot portion were shade dried for 20 days. The dried plant material was sliced, ground coarsely and stored for further use. Fresh samples were also taken for analysis.Different extracts of dried samples were prepared-aqueous extract, ethanolic extract, HCl extract, acetone extract, ethyl acetate extract, methanolic extract, petroleum ether extract. The plant portions were dissolved in different solvents for 6 hrs and extract is obtained by filtering using muslin cloth.

PHYTOCHEMICAL ANALYSIS OF THE PLANT EXTRACT

The extracts were subjected to phytochemical tests for plant secondary metabolites like tannins, saponins, steroid, alkaloids,flavonoids,terpenoids and glycosides. (2)

ANTIOXIDANT ACTIVITY

DPPH(1,1-DIPHENYL-2-PICRYLHYDRAZY)RADICAL SCAVENGING ACTIVITY:

0.1 mM solution of DPPH (4.33 g in 100 ml distilled water) in ethanol was prepared and 2.3 ml of this solution was added to 6.9ml of extract solution in ethanol at different concentrations. Thirty minutes later, the absorbance was measured at 517 nm.A blank was prepared without adding extract. The blue colour formed was measured at 517 nm. Ascorbic acid was used as standard. Lower the absorbance of the reaction mixture indicates higher free radical scavenging activity. The capability to scavenge the DPPH radical was calculated using the following equation.

DPPH Scavenged (%) = (Acontrol -Atest / Acontrol) ×100

Where Acontrol is the absorbance of the control reaction and Atest is the absorbance in the presence of the sample of the extracts. The antioxidant activity of the extracts were expressed as IC50 and compared with standard. The IC50 value was defined as the concentration (in µg/ml) of extracts that scavenges the DPPH radicals by 50%. The IC50 is a parameter widely used to measure antiradical efficiency. The lower the IC50 indicates the higher the antioxidant power. The same procedure was carried out for methanol extract. (6)

REDUCING POWER ASSAY:

Various concentrations of the plant extracts in corresponding solvents were mixed with phosphate buffer (2.5 ml) and potassium ferricyanide (2.5 ml). This mixture was kept at 50ºC in water bath for 20 minutes. After cooling, 2.5 ml of 10% trichloroaceticacid was added and centrifuged at 3000 rpm for 10 min whenever necessary. The upper layer of solution (2.5 ml) was mixed with distilled water (2.5 ml) and a freshly prepared ferric chloride solution (0.5 ml). The absorbance was measured at 700 nm. Control was prepared in similar manner excluding samples. Ascorbic acid at various concentrations was used as standard. Increased absorbance of the reaction mixture indicates increase in reducing power. Reducing power was measured by varying the concentration of the extract and the contact time.(11)

ANTIMICROBIAL ACTIVITY

The antibacterial activity of the two different extracts wasdetermined in accordance with the disc diffusion method. The bacterial isolates of Bacillus subtilis, Staphylococcus aureus, Escherichia coli Salmonella typhimureium were first grown in a nutrient broth for 24 h before use. 500 µl of the sub-cultured broth was transferred to the sterile petri plates. 1ml of Mueller Hinton Agar (MHA) was poured over it and allowed to settle for 30 minutes. Filter papers soaked with 150 µl of crude extracts were placed in plates and were kept in incubator for 24 hours.

Antibiotic discs of ampicillin and tetracycline were used as control. Antibacterial activity was obtained by determining the zoneof inhibition around the well. (7)

RESULT AND DISCUSSION

In the qualitative phytochemical analysis, the tested plants showed the presence of varioustested groups as shown in table1.It shows that the plant is a rich source of many phytochemicals. Lataet al.(2) demonstrated the presence of few secondary metabolites in Eichhornia crassipes except saponins in aqueous extract .Kandukuriet al. (12)reported the presence of alkaloids, phenols, steroids, tannins and triterpenoids in the methanol extract whereas the authors have reported the absence of flavonoids in waterhyacinth.

Table 1: Preliminary phytochemical screening of different extracts of Eichhornia crassipes

Key: L-leaf, S-shoot, R-rhizome, + indicates presence, - sign indicates absence

	TESTS	EXTRACTS																	
		Aqueous			Ethanol			Acetone			Ethyl acetate			Petroleum ether			Fresh		
		L	R	S	L	R	S	L	R	S	L	R	S	L	R	S	L	R	S
1	Tannin	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
2	Phlobotannin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
3	Saponin	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Steroid	-	-	-	-	+	+	-	+	+	-	+	+	-	-	-	-	+	+
5	Terpenoid	-	+	+	-	-	+	-	-	-	+	+	-	-	-	+	-	-	-
6	Alkaloid a)Mayer's test b)Wagner's c)Hager's	- - -	- - -	- - -	- - -	- - -	+ - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
7	Flavonoid	-	+	+	-	+	+	-	-	-	-	-	-	-	+	+	-	-	-
8	Quinone	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
9	Anthraquinone	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-
10	Cardiac glycosides	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11	Sterols	-	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
12	Anthocyanin	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
13	Ninhydrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Phenol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Carbohydrate	-	+	+		-	-	-	-	-	-	-	-	-	-	-	-	+	+
16	Fehling's	-	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Table 2: Antimicrobial activity of Eichhornia crassipes

Test organism	Diameter of zone of inhibition(mm)	
	Acetone extract	Ethanol extract
Escherichia coli	-	-
Bacillus sp.	12	12
Salmonella typhimurium	-	-
Staphylococcus aureus	-	-

In free radical scavenging activity, the reduction capability of DPPH radical was determined by the decrease in its absorbance at 517nm, which induced by different antioxidants.

DPPH assay

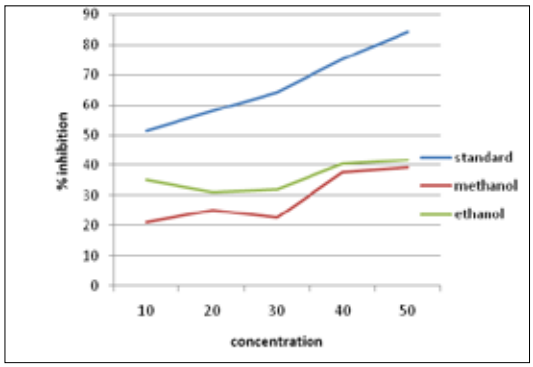

Figure 1: Percentage inhibition of standard, ethanol and methanol extracts at various concentrations (µg/ml) in DPPH radical scavenging assay

The reducing power of all the extracts increased with increase in concentration.Higher absorbance of the reaction mixture indicated higherreducing power. The reducing power of ethanol, ethyl acetate, acetone and methanolic extract of Eichhornia crassipes(Mart.) Solms, as a function of their concentration is shown in figure 2. According to the findings of Natarajet al. (13) phenol contents contributes significantly to the total antioxidant activity of plants.Humaaliet al.(11) reported Eichhornia crassipesas a safe cancer medicine and revealed its tumor inhibition potential.

Reducing power assay

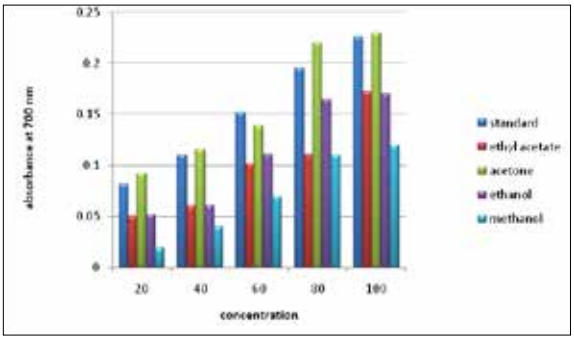

Fig 2: The reducing power of ethanol, ethyl acetate, acetone and methanolic extract of Eichhornia crassipes (Mart.) Solms, as a function of their concentration (µg/ml) is shown in figure.

In antibacterial activity assay, the ability of acetone and ethanol extracts of the plant to inhibit the activity of four different bacteria was determined by disc diffusion method. In this study,

the extracts, though very low show a mild inhibitory effect on Bacillus species.

CONCLUSION

The present study is conducted to evaluate the phytochemical, antioxidant, antimicrobial activities of Eichhornia crassipes. From this study, we came to the conclusion that the plant is endowed with many potent phytochemicals like flavonoids, tannins, terpenoids, saponins, cardiac glycosides, quionones and many others. Therefore, we have to exploit the potent possibilities of this plant which possess high therapeutic value and many other uses.The results obtained in the present investigation show the presence of phytochemicals which take part in defense mechanism of the plant. Hence, a complete study conducted with the purpose of finding these chemicals in water hyacinth plant is worthwhile as the output is "Best out of waste".

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