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Studies on the Antibacterial Potential of Two Common Weeds of Asteraceae from Paschim Medinipur District of West Bengal, India

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ABSTRACT

In this present investigation extracts of leaf, stem and root of *Parthenium hysterophorus* L. and *Ageratum conyzoides* L. occurring at Paschim Medinipur District of West Bengal were screened for phytochemicals and antibacterial properties. The antibacterial activity of the plant extracts were evaluated against *Bacillus cereus*, *Vibrio parahaemolyticus* and methicillin resistant *Staphylococcus aureus* using agar disc diffusion method. Different phytochemicals like alkaloids, tannins, phenols, flavonoids, terpenoids were present in the plant extracts. Leaf extract of *Parthenium hysterophorus* showed highest antibacterial activity against *Vibrio parahaemolyticus*. Both plant failed to show antibacterial activity against methicillin resistant *Staphylococcus aureus*.

INTRODUCTION

From ancient times, plants are used to produce medicines to cure serious diseases. About 80% of World's population depends on plants for their primary health care (Duraipandiyan et al.

2006). In modern days World, Bacterial infection is considered as one of the major human health issues. Due to the failure of antibiotics against drug resistant bacteria, the demand for new antibacterial herbal drugs has increased. Herbal drugs also has many advantages over chemical (synthetic) drugs like less side effects, more productivity, effectiveness with chronic conditions. A weed is commonly defined as a plant that is growing where it is not wanted. They produce some amount of chemical substances to inhibit the growth of the plants growing in their territory. They also show better resistance against the microbial diseases than cultivated crops (Udayaprakash et al. 2011). The resistance nature of the weeds against microbial diseases made many researchers to have an interest to know about their antibacterial potential and studies on antimicrobial potential of different weeds has been done by many researchers (Udayaprakash et al. 2012; Patel et al. 2007; Sharma et al. 2009). Asteraceae is an exceedingly large and widespread family of phanerogams. The members of this family have the ability to adapt in different ecological niche. In this study two weeds of Asteraceae were selected for screening of phytochemical and antibacterial properties. Selected weeds are – *Parthenium hysterophorus* L., and *Ageratum conyzoides* L.

***Parthenium hysterophorus* L.**

Parthenium hysterophorus is an annual herb that grows up to 30-90 cm in height . The plant body is light green in colour. Finely lobed leaves are present which are covered by soft, fine hairs. Use of *P. hysterophorus* to treat inflammation, eczema, skin rashes, herpes, rheumatic pain, cold heart trouble, skin diseases, ulcerated sores. Dysentery, fever is previously reported (Surib-Fakim et al. 1996; Maishi et al. 1998; Venkataiah et al. 2003).

***Ageratum conyzoides* L.**

It is erect, annual herb that grows up to 1 meter in height. Fine white hairs are found all over the stem. The leaves are ovate, long petiolate; pubescent, with glandular trichomes. This plant is commonly used to cure wounds and burns (Durodola 1977). In India it is used as a bacteriocide, antilithic, antidysenteric by traditional communities (Borthakur & Baruah 1987).

MATERIALS AND METHOD

Sample collection

Plant samples were collected from their natural habitats at Paschim Medinipur. Plants were cleaned with water and they

were shade dried for 4-5 days. Shade dried plant samples were grinded into fine powder using electrical grinder. Grinded plant powder was stored at room temperature for future usage.

Preparation of plant extract

Twenty five gram of grinded powder was soaked in 250 ml methanol and it was placed on a rotary shaker for 24 hours. The suspension was filtered using Whatmann no.1 filter paper and filtrate was centrifuged at 6000 rpm for 10 minutes. The supernatant was used for phytochemical tests and antibacterial screening.

Phytochemical Screening

Phytochemical screening of the plant extract was carried out according to standard methods described by Harborne et al. 1998 (**Table 1**).

Bacterial Strains and Culture conditions:

The bacterial strains were provided by the Microbiology laboratory of Department of Botany and Forestry of Vidyasagar University. Three Pathogenic bacteria like *Bacillus cereus*, *Vibrio parahaemolyticus*, Methicilin resistant *Staphylococcus aureus* were taken. They were cultured in nutrient broth media in aerobic condition in BOD incubator, Shaker at 37.9 ^{o}C.

Antibacterial Activity Assay:

Antibacterial assay was done by agar disc diffusion method (Bauer et al. 1966). 100 µl of fresh microbial culture was spread on the Muller Hillton Agar plate by a sterile cotton swab in aseptic condition. Autoclave sterilized discs of filter paper(6 mm in diameter) were impregnated with different plant extracts and they were placed on different Agar plates by a sterilized forceps. The plates were then placed on an incubator at 37^{o}C for 24 hours. The antibacterial screening was done by measuring the diameter of zone of inhibition. Inhibition zones more than 8 mm in diameter was considered as strong antibacterial activity of the plants.

RESULTS AND DISCUSSIONS

In this present study, phytochemical analysis revealed the presence of phytochemicals like alkaloids, carbohydrates, phenols, tannins, saponins, flavonoids, terpenoids in the methanolic extract of different plants parts (**Table 2**). In case of antibacterial activity assay, the leaf exract of *Parthenium hysterophorus* showed highest activity against *Vibrio parahaemolyticus* (10.5 mm). This study strongly suggests that phytochemicals present on the different plant extracts were responsible for their antibacterial activity. Leaf extract of *Parthenium hysterophorus*

contained high amount of tannins which indicates that tannins may be responsible for the antibacterial activity of the extract. From this investigation it can be concluded that different types of phytochemicals present on the different types of plant extract has the potential to become a source for producing medicines against disease causing bacteria. This study also revealed the importance of using particular parts of the plant against disease causing bacteria. So, Leaf of *Parthenium hysterophorus* can be used as a novel source of antimicrobial agent against *Vibrio parahaemolyticus*. To use these plant extract as a herbal drug, further toxicity and pharmacological studies are required.

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Table 1 showing the methods of phytochemical analysis

Phytochemicals	Name of the Test	Experiment	Observation	Inference
Alkaloids	1. Mayer's Test 2.Dragendorff's Test	1. About 2ml of plant extract was taken on a test tube and few drops of Mayer's reagent were added to it. 2. Few drops of Dragendorff's reagent was added to 2 ml of plant extract in a test tube.	1. Yellow or white precipitation formed. 2. Formation of orange or red precipitation.	Alkaloid is present.
Carbohydrates	Molisch's Test	About 1-2 ml of plant extract was taken in a test tube and 2-3 drops of Molisch's reagent was added into it. Conc. Sulphuric acid is added into it by the side of the test tube.	Purple or violet ring forms at the junction of two layers	Carbohydrate is present.
Phenols	Ferric Chloride Test	2ml of plant extract was taken on a test tube and few drops of aqueous 5% Ferric Chloride were added into it.	Solution turns deep blue or black in colour.	Phenols are present.
Tannins	Ferric Chloride Test	About 2ml of plant extract was taken in a test tube and few drops of 10% Alcoholic Ferric Chloride was added into it.	Green or bluish colour develops.	Tannins are present.
Flavonoids	Alkaline reagent Test	About 2ml of plant extract was taken in a test tube and few drops of 20% sodium hydroxide soln. were added	Yellow colour develops. Yellow colour	Flavonoids are present.

		into it. Addition of diluted hydrochloric acid to the solution.	disappears.	
Terpenoids	Salkowski's Test	1ml of chloroform was added to 2ml of plant extract in a test tube. After that few drops of conc. H_2SO_4 were added into it. Conc. H_2SO_4 was poured down into the mixture by side of the test tube.	Reddish brown precipitation forms.	Terpenoids are present.
Saponins	Foam Test	About 6ml of water was added with 2ml of plant extract in a test tube. After that the mixture was shaken vigorously and left for 3min.	Formation of persistent foam of 1 cm layer.	Saponins are present.

Table 2: Result of phytochemical analysis of methanolic extract of different plant parts

Phytochemicals	*Parthenium hysterophorus*			*Ageratum conyzoides*		
	Leaf	Stem	Root	Leaf	Stem	Root
Alkaloids	+	+	+	+	+	+
Phenols	+	+	-	+	-	-
Tannins	+	-	+	-	+	+
Saponins	+	-	-	+	+	-
Carbohydrates	-	+	+	+	+	+
Terpenoids	+	+	+	+	+	+
Flavonoids	+	-	-	-	+	+

Table 3: Antibacterial potential of methanolic extracts of different plant parts expressed in diameter of inhibition zone (in mm)

Name of the Bacteria	***Parthenium hysterophorus***			***Ageratum conyzoides***		
	Leaf	Stem	Root	Leaf	Stem	Root
Vibrio parahaemolyticus	10.5	2	7.5	4.5	_	4.5
Bacillus cereus	5.5	1.5	_	4	3	_
Methicillin Resistant *Staphylococcus aureus*	_	_	_	_	_	_

Figure 1: Result of Phytochemical analysis

Figure 2: Antibacterial activity