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PHYTOCHEMICAL CONSTITUENTS OF WEEDS: BASELINE STUDY IN MIXED CROP ZONE AGROECOSYSTEM

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ABSTRACT

The qualitative phytochemical analysis is significantly important to identify the chemical compounds present in the medicinal plants. The root, stem and leaves of seventeen weed species viz., Chenopodium murale, Convolvulus arvensis, Rumex dentatus, Parthenium hysterophorus, Euphorbia helioscopia, Coronopus didymus, Brassica compastris, Solanum nigrum, Sonchus oleraceus, Poa annua, Ricinus communis, Anthem graveolens, Cynodon dactylon, Melilotus indicus and Malvastrum coromandelianum collected from peripheral cultivation belt of Faisalabad district were analyzed for their phytochemical constituents. The results revealed the presence of phytochemicals viz., alkaloids, saponins, tannins, steroids, phlobatannin, terpenoids, flavinoids and cardiac glycosides in different parts of weeds. The root and stem of these weed species were found rich in phytochemicals, which are used to manufacture medicines and drugs for various ailments.

Key words: Agriculture, allelochemicals, extracts, pharmaceutical, Unani medicine

INTRODUCTION

The medicinal importance of plants (weeds) and vegetables are described by their phytochemical components and other chemical constituents (Fallah *et al*., 2005). In Pakistan, numerous herbaceous plants and vegetables are used as source of food and medicine. These herbaceous plants have been traditionally used not only for medicinal properties but also for nutritional and trace elements since a long time ago, many researchers discovered the medicinal activities and explore phytochemical constituents of plants in Pakistan (Atta-ur-Rahman and Choudhary, 1998; Wazir *et al*., 2004; Shah and Khan, 2006**;** Shinwari, 2010). Phytochemical constituents of plants play a significant role in decreasing the risk of various diseases such as cardiovascular diseases

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and some forms of cancer and many other diseases prevailing in the society (Javanmardi *et al*., 2003; Zafar *et al*., 2010). The knowledge of the chemical components of plants has much more importance not only for the discovery of therapeutic agents, but also exploration of economically important materials like tannins, saponins, flavnoids, oils and gums, that are the precursors for the manufacturing of complex chemical substances for curing various diseases. In addition, the knowledge based on the chemical components of plants would further be precious in determining the actual value of folkloric remedies (Farnsworth, 1966).

Previously, Abbas *et al.* (2012) evaluated phytochemical constituents of seeds of some selected weeds occurring in wheat agro-ecosystem in the mixed crop zone. Whereas in the present study different parts of weeds such as root, stem and leaves of *Chenopodium murale, Convolvulus arvensis, Rumex dentatus, Parthenium hysterophorus, Euphorbia helioscopia, Cronopus didymus, Brassica compastris, Solanum nigrum, Sonchus oleraceus, Poa annua, Ricinus communis, Anthem graveolens, Cynodon dactylon, Melilotus indicus* and *Malvastrum coromandelianum* were assessed for their phytochemicals potential. Khan et al. (2012) reported phytotoxic inhibition of the *Parthenium hysterophorus* L. plant parts against the seedlings growth of wheat (*Triticum aestivum* L.). The traditional medicinal use of these weeds reviewed in Table-1. The main purpose of the present study to evaluate the fundamental scientific data base for the use of some weeds occurring in mixed crop zone agro-ecosystem by determining the phytochemical components present in these weeds.

MATERIALS AND METHODS

Seventeen weeds species that are *Chenopodium murale, Convolvulus arvensis, Rumex dentatus, Parthenium hysterophorus, Euphorbia helioscopia, Coronopus didymus, Brassica compastris, Malva neglecta, Solanum nigrum, Sonchus oleraceus, Eclipta alba, Poa annua, Ricinus communis, Anthem graveolens, Cynodon dactylon, Melilotus indica* and *Malvastrum coromandelianum* were collected from agro-ecosystem of Faisalabad district. All the weed species were identified by taxonomists from the Department of botany, University of Agriculture, Faisalabad.

The weeds collected from agro-ecosystem were brought to laboratory, cleaned and dried in air under shade. The roots, stems and leaves of each weed were carefully chopped with knife so that mixing of each part is avoided. The respective parts of weeds were grinded with the help of electric grinder and preserved in airtight glass bottles for further use for chemical analysis.

Phytochemical screening

Chemical tests were carried out both on the ethanolic extract and on the powdered specimens using standard procedures to identify the constituents as described by Harborne (1973), Trease and Evans (1989) and Sofowara (1993). The specific procedure involved for the evaulation of a particular group of chemicals is mention below.

Tannins

One ml of water and 1-2 drops of ferric chloride solution were added in 0.5 ml of extracted solution. Blue colour was observed for gallic tannins and green black for catecholic tannins (Iyengar, 1995).

Saponins

Foam test: Small amount of extract was shaken with little quantity of water. If foam produced persists for ten minutes it indicates the presence of saponins (Roopashree, *et al.,* 2008).

Flavonoids (Alkaline Reagent Test)

Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute acid, indicates the presence of flavonoids (Roopashree *et al.,* 2008).

Steriods

Two ml of acetic anhydride was added to 0.5 g ethanolic extract of each sample with 2 ml H2S04. The color changed from violet to blue or green in some samples indicating the presence of steroids.

Terpenoids (Salkowski test)

Five ml of each extract was mixed in 2 ml of chloroform, and concentrated H2SO4 (3 ml) was carefully added to form a layer. A reddish brown colouration of the interface was formed to show the presence of terpenoids.

Cardiac glycosides (Keller-Killani test)

Five ml of each extracts was treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. This was underlayed with 1 ml of concentrated sulphuric acid. A brown ring of the interface indicates a deoxysugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout thin layer.

Alkaloids

Alkaloids are basic nitrogenous compounds with definite physiological and
pharmacological activity. Alkaloid solution produces white yellowish precipitate when a few drops of Mayer's reagents are added (Siddiqui and Ali, 1997).

Anthraquinones

Borntrager's test was used for detecting the presence of anthraquinones. In this case 0.5 g of the plant extract was shaken

with benzene layer separated and half of its own volume of 10% ammonia solution added. A pink, red or violet colouration in the ammoniacal phase indicated the presence of anthraquinone.

RESULTS AND DISCUSSION

In the present study root, stem and leaves of seventeen weed species belonging to twelve families were investigated for their phytochemical potential. Phytochemical evaluation of medicinal plants is very imperative in recognizing new sources of therapeutically and industrially important chemical compounds (Kamboj, 2000). Farmers eradicate these weed species from their fields whereas they are a rich source of naturally occurring chemicals, pharmaceutical companies use these chemicals to manufacture various medicines and drugs to treat numerous ailments (Králová and Masarovièová, 2006; Dhole *et al.*, 2009; Immanuel and Elizabeth, 2009). The preliminary results of phytochemical constituents of studied weed species are summarized in Table-2. Alkaloids, cardiac glycosides, flavonoids, steroids, saponins, terpenoids and tannins were present in all the plant parts (Nathiya and Dorcus, 2012). Phytochemical constituents exhibit various pharmacological and biochemical actions in the body of human and other animals on ingestion (Evans, 2002).

Alkaloids, saponins, terpenoids and cardiac glycosides were the most frequently found phytochemical contstituents from root, stem and leaves (Sofowara, 1993). Patwardhan *et al.* (2004) stated that about 30% of medicines and drugs based on natural products are sold throughout the world.

Saponins, terpenoids and cardiac glycosides were present in most species and have wide range of distribution (Abbas *et al*., 2012) and are known to have various medicinal and dietary impacts on human life such as saponins has dietary as well as nutriceuticals effects (Asl and Hosseinzadeh, 2008) terpenoids is an imperative pharmaceutical agents e.g. the anticancer agents like taxol. The root, stem and leaves of *Chenopodium murale, Brassica compastris, Anthem graveolens* and *Malvastrum coromandelianum* contain saponins whereas *Cronopus didymus, Sonchus olearaceus, Anthem graveolens,* and *Malvastrum coromandelianumin* constituted terpenoids whereas cardiac glycosides was present in all parts of *Rumex dentatus, Euphorbia helioscopia, Cronopus didymus, Solanum nigrum, Anthem graveolens.*

Phlobatannin was recorded least distribution in the root, stem and leaves of the studied weed species. The present work exhibits that the stems and roots of studied plants serve as good source of pharmacologically active phytochemicals may also be useful as supplements in human and animal nutrition. In conclusion, weeds

growing in the agricultural fields are very important and cheap source of phytochemicals, which are the chief constituents of medicines.

CONCLUSION

In light of the results, the phytochemicals like alkaloids, saponins, tannins, steroids, Phlobatannin, terpenoids, flavinoids and cardiac glycosides were detected in different parts of the tested weeds. These weed species were found rich in phytochemicals discovered in their roots and stems. The detected phytochemicals are used in manufacturing of medicines and drugs for various diseases.

Table-1. Brief Review of the various selected weeds used for the present study of mixed crop agro-ecosystem Faisalabad.

Weed Plants	Family	Traditional uses
Chenopodium murale	Chenopodiaceae	The leaves are used in salads.
Convolvulus arvensis	Convulvulaceae	Fodder, antidandruff and for skin diseases
Rumex dentatus	Polygonaceae	Pneumonia, cough, abscesses, stomach-ache, smallpox and also anti-tumor, astringent and anti dermatitis
Parthenium hysterophorus	Asteraceae	Fever, diarrhoea, neurologic disorders, urinary infections, dysentery, malaria and as emmenagogue
Euphorbia heliscopia	Euphorbiaceae	Antiarthritic, antiamoebic, spasmolytic, antiviral, Hepatoprotective, and antitumor activity
Coronopus didymus	Brassicaceae	It is used in rheumatism. Plant extract is used for bone disorders, used to open locks among joints.
Brassica compastris	Brassicaceae	
Malva neglecta	Malvaceae	cough, respiratory system and digestive system, also have Anti-ulcerogenic, and antioxidant properties.
Solanum nigrum	Solanaceae	Digestive system, antiulcerogenic and ulcer healing properties
Sonchus oleroceous	Asteraceae	Anticancer, antidiarrheal, anti-inflammatory,calms the nerves, cathartic, clears infections, cure for opium addiction, digestive purgative, diuretic
Eclipta alba	Asteraceae	Several diseases of liver, skin and stomach.
Poa annua	Poaceae	
Ricinus communis	Euphorbiaceae	Human laxative-cathartic agent
Anthem graveolens	Apiaceae	Antimycobacterial, antioxidant, cancer chemo-preventive, stomachic, diuretic
Cynodon dactylon	Poaceae	Laxative, brain and heart tonic, aphrodisiac, alexipharmic, emetic, emmenagogue, expectorant, carminative and useful against grippe in children, and for pains, inflammations, and toothache
Melilotus indica	Fabaceae	Astringent, aphrodisiac, heart diseases, burning sensation, skin diseases and eye diseases.
Malvastrum coromandelianum	Malvaceae	Antibacterial and antifungal activities

Table-2. Phytochemical analysis of the root, stem and leaves of some weeds occurring from the mixed crop zone.

Weed	Plant part	Alkaloids	Tannin	Saponin	Steroid (extract)	Phlobatannin	Flavonoid	Terpenoid (extract)	Cardic lycoside (extract)
Chenopodium murale	Root	-	-	+	+	-	-	+	+
	Stem	+	-	+	-	-	+	+	+
	Leaves	-	+	+	+	-	+	-	-
Convolvulus arvensis	Root	+	+	+	-	-	-	+	+
	Stem	-	-	+	+	-	-	-	-
	Leaves	-	+	-	+	-	-	-	-
Rumex dentatus	Root	-	+	+	-	-	-	-	+
	Stem	-	-	-	-	-	-	+	+
	Leaves	+	-	+	-	-	-	+	+
Parthenium hysterophorus	Root	-	-	-	+	-	-	-	+
	Stem	+	+	+	-	+	-	+	-
	Leaves	-	+	-	+	+	-	-	-
Euphorbia helioscopia	Root	-	+	+	-	-	+	+	+
	Stem	+	+	+	-	-	-	+	+
	Leaves	-	+	-	+	-	-	-	+
Cronopus didymus	Root	-	-	-	-	-	-	+	+
	Stem	+	-	-	-	-	+	+	+
	Leaves	-	-	+	+	-	-	+	+
Brassica compastris	Root	-	-	+	-	-	+	-	-
	Stem	-	-	+	-	-	-	+	+
	Leaves	-	+	+	+	-	-	+	+
Malva neglecta	Root								
	Stem	+	-	+	+	-	-	+	-
	Leaves	-	+	+	+	-	-	-	-
Solanum nigrum	Root	-	-	+	-	-	-	+	+
	Stem	+	-	-	-	-	+	+	+
	Leaves	+	+	+	-	+	+	-	+
Sonchus olearaceus	Root	+	+	-	-	-	+	+	-
	Stem	+	+	-	-	+	-	+	-
	Leaves	+	+	-	+	-	+	+	+
Eclipta alba	Root	-	+	+	+	-	-	+	-
	Stem	-	+	+	+	-	-	+	+
	Leaves	-	-	+	+	-	-	+	-
Poa annua	Root	-	+	-	-	+	-	-	-
	Stem	-	+	+	+	-	-	+	-
	Leaves	+	-	-	-	-	-	+	-
Ricinus communis	Root								
	Stem								
	Leaves	+	+	-	-	-	+	-	-

Anthem graveolens	Root	-	+	+	+	-	-	+	+
	Stem	+	+	+	+	-	+	+	+
	Leaves	-	+	+	+	-	+	+	+
Cynodon dactylon	Root		-	-	-	-	-	-	-
	Stem		-	-	-	-	-	-	-
	Leaves		-	-	+	-	-	+	-
Melilotus indicus	Root	-	+	-	-	-	-	-	-
	Stem	-	-	-	+	-	-	-	+
	Leaves	-	-	+	-	+	-	+	-
Malvastrum coromandelianum	Root	-	-	+	-	-	+	+	+
	Stem	-	-	+	-	-	+	+	+
	Leaves	-	-	+	-	+	+	+	-

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