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Weeds: A Treasure House of Bioactive Compounds.

Shaikh Farah T
Department of Botany,
Bapumiya Sirajoddin Patel Arts, Commerce and Science College, Pimpalgaon kale,
Buldhana-443403. India.

Abstract:

Parthenium hysterophorus L., Euphorbia hirta and *Cyperus rotundus* plants were screened for their phytochemical constituents. Phytochemical screening revealed the presence of Alkaloids, Carbohydrates, Cardiac Glycosides, Flavonoids, Glycosides, Phenols, Proteins, Saponins, Terpenoids, Tannins and Steroids. *P. hysterophorus* and *E. hirta* showed the large number of bioactive compounds in methanol and hexane solvent extracts whereas *Cyperus rotundus* contains least. The results support that the extracts of weeds exhibit a wide spectrum of pharmacological activities and promisingly used as traditional medicine, novel fungicides against devastating fungi and bears antimicrobial activity. The present study will be helpful to standardize the drugs.

Keywords: Weeds, Phytochemicals, Methanol, Hexane.

I. Introduction:

In India, weeds pose a significant challenge to agriculture, impacting crop yield and quality. Weeds are unwanted plants that grow in cultivated areas, competing with crops for resources such as sunlight, water, and nutrients. These invasive plants have the potential to cause economic losses and hinder agricultural productivity.

India hosts a diverse range of weed species, both indigenous and introduced. Common weed species include grasses like *Parthenium hysterophorus, Euphorbia hirta, Cyperus rotundus*. These weeds vary in their growth habits, adaptability and reproductive strategies, making them resilient and challenging to manage. Plants produce a varied range of bioactive molecules these are called phytochemicals. Phytochemicals are bioactive chemicals of plant origin. They are regarded as secondary metabolites because the plants that make them may have little need for them (Suresh et al., 2012, Afroz et al., 2012).

Phytochemical analysis of weed is essential to unveil its bioactive compounds, like steroids, terpenoids, and flavonoids, elucidating its medicinal potential. This analysis guides medical research, enabling the development of therapeutic applications for conditions like chronic pain and epilepsy. It also aids in optimizing cultivation for specific phytochemical profiles, ensuring consistent product quality. Regulatory frameworks benefit from this analysis, promoting safe and standardized use. Moreover, understanding the weed's chemical composition informs sustainable utilization in various industries, advancing knowledge and fostering responsible practices in agriculture, medicine, and beyond. Development of new drugs from natural sources is highly influenced by its ethnobotanical uses.

P. hysterophorus (L.) belongs to the family Asteraceae. The Parthenium word is derived from the Latin word 'parthenice' (Meena et al., 2017). The word hysterophorus was taken from the Greek words hysteria and phoros mean womb and bearing, respectively (Kaur et al., 2014). *Euphorbia hirta* Linn. (Family- Euphorbiaceae) an annual medicinal weed and it is commonly known as Asthma plant. Euphorbia hirta Linn. has a wide range of potentiality for morphological, phytochemical, pharmacological, pharmaceutical, therapeutic and nutritional properties. *Cyperus rotundus* is a traditional medicinal herb belongs to *Cyperaceae* family and is widespread in India.

II. Material and Methods:

The weed plants viz., *Parthenium hysterophorus, Euphorbia hirta, Cyperus rotundus* which is present in abundant amount were collected from college campus. The extract was prepared through the method described by Khan et al. (2018) with slight modifications. Briefly, the plants were washed, shed dried and grounded following soaking (1:10; w/v) into three different solvents namely Water, Methanol and Hexane. The mixture was kept for 48 h and then filtered using Whatmann's filter paper (No.1) following centrifugation for 5 min at 10,000 rpm. The filtrate was evaporated, and the crude extract was collected followed by storage at -20°C until further use. The percentage yield was calculated by the formula, weight of the extract × 100 / weight of the dry sample. The qualitative chemical analysis of plant molecules present in the extracts was carried out using the standard procedures (Harborne J. B., 1993, Srivastava et al., 2012). The different solvent extracts were used for the following metabolites tests.

Test for Alkaloids:

5 mg extract was dissolved in 1 ml double distilled water. Into this, 5 drops of 1% HCl were added and steam was passed through it. To the 1 ml of this solution, 6 drops of Wagner's reagent were added. The appearance of brownish-red precipitate indicated the presence of alkaloid.

Test for Carbohydrates:

5 mg extract was dissolved in 1 ml solvent (respective solvent). To it, 5 drops of Molisch reagent were added. The mixture was allowed to stand for 2-3 min. The formation of red or dull violet color indicated the presence of carbohydrates.

Test for Cardiac Glycosides:

5 mg extract was dissolved in 2.5 ml solvent (respective solvent). To it, 2 mL of glacial acetic acid was added containing 5 drops of $FeCl_3$ (5% *w/v*). Then, 500 μl of concentrated H_2SO_4 was added. The formation of a brown ring indicated the presence of cardiac glycosides.

Test for Flavonoids:

In 1 ml of extract containing its 5 mg, a few drops of sodium hydroxide were added. Formation of yellow color took place, which disappeared upon the addition of a few drops of 70% HCl.

Test for Phenols:

5 mg extract was dissolved in 2 ml DDW. Upon addition of 10% $FeCl_3$ (10 drops) to it, the blue-green color appeared which indicated the presence of phenols.

Test for Steroids:

5 mg extract was dissolved in 2 ml of chloroform. To it, 2 ml H_2So_4 was added. The topmost layer of sulphuric acid turned red. Further, it turned into yellow color with green fluorescence showing the presence of steroids (Harborne J. B., 1967).

Test for Saponins:

5 mg of extract was dissolved in 1 ml of DDW. Upon shaking the test tube, formation of persistent foam took place indicating the presence of saponins.

Test for Tanins:

5 mg of extract was dissolved in 1 ml of DDW. It was added with 5% $FeCl_3$. The appearance of black-blue precipitate indicated the presence of tannins.

Test for Terpenoids:

In 1 ml chloroform, 5 mg of extract was dissolved followed by the addition of 10 drops of concentrated sulphuric acid. The formation of reddish-brown precipitate at the interface indicated the presence of terpenoids.

Test for Quinones:

5 mg extract was dissolved in 1 mL solvent (respective solvent). To it, 1 ml concentrated H_2SO_4 was added. The formation of the red-colored complex indicated the presence of quinones.

III. Results:

Qualitative analysis showed that *Parthenium hysterophrous* showed highest reaction for tannins and saponins in distilled water while terpenoids and phenol in methanol extract and hexane extract shows the presence of steroids and quinones. Moderate and weak reactions were shown in distilled water in plant extract. *Euphorbia hirta* showed the presence of number of bioactive compounds in methanol and aqueous exracts. Phenols and Alkaloids is present in all the three plants. *E. hirta* showed the large number of bioactive compounds whereas *Cyperus rotundus* contains least as compared to others as shown in Table.1.

Table 1: Preliminary phytochemical constituents of aqueous, methanol and hexane extracts of three weed plants.

Plants	Solvents	Phytochemicals									
		Falvonoids	Saponins	Tannins	Terpenoids	Streoids	Phenols	Quinones	Cardiac Glycoside	Carbohydrates	Alkaloids
P. hysterophorus	Aqueous	++	+++	++	+++	-	++	++	-	++	++
	Methanol	-	++	-	+++	-	+++	-	++	++	++
	Hexane	-	-	-	++	+++	++	+++	++	-	++
E. hirta	Aqueous	-	++	++	-	++	++	-	+++	++	-
	Methanol	++	++	++	++	++	++	++	++	-	++
	Hexane	-	-	-	++	++	++	++	-	++	-
C. rotundus	Aqueous	+	-	++	++		++	-			++
	Methanol	-	-	++	-	-	++	-	++	++	++
	Hexane	-	-	-	-	++	-		-		++

The sign (+++), (++) and (+) shows the highest, moderate, weak reaction while (-) shows no reactions.

IV. Discussion:

The presence of certain oils, histamines, terpenes, polyphenols, alkaloids, and pseudoguaianolides in *P. hysterophorus* are the main reasons for its properties associated with the health benefits (Kamal & Mathur1991, Amorim., 2013). The study revealed presence of different toxic phytochemicals (alkaloids, saponin, tannin and rotenone) in all three P. hysterophorus extracts. In corroboration with to present findings Krishnavignesh et al. (2013), Deshpande et al (2017) and Tarekegn et al. (2021) reported the presence of alkaloids, tannin and saponin in different solvent-derived extracts including hexane, acetone, ethanol, methanol and petroleum ether. Similarly, Gupta et al. (1977) also reported saponin in the aqueous extract of gajar ghas. Moreover, present findings also revealed the superior ability of methanolic solvent as compared to water and hexane solvent in extracting all three toxic botanicals. There is a slight difference in the present amount of bioactive compounds and their presence, It is evident that plant constituents are varied with the geographical location, climatic conditions, soil nature and many other factors (Bisht et al., 2018, Das et al., 2019). Not only that, but the bioactivity of plant elements differs depending on geographic location (Mangoale and Afolayan, 2020, Vilkickyte and Raudone, 2021). It is very essential to isolate the bioactive component form plant so that it can be used further designing specific drug (Krishnamoorthy et.al.,2014).

V. Conclusion:

Leaves of Parthenium hysterophrous was rich source of important antifungal chemicals such as tannins, saponins, terpenoids, flavonoids, alkaloids, cardiac glycosides and steroids which has enabled them to show varying degree antifungal properties. Both distilled water and methanol crude leaf extracts exhibit antifungal action. However, methanol crude leaf extract had higher antifungal potential than the distilled water extract. On the basis of the data obtained in the present research, conclude that the methanolic extract of weeds can be used as a novel fungicide against different devastating fungi but for large scale use bioactive component identification is important. The results of this study can be utilized for the further investigation to recognize the compounds that are responsible and its quantification can be done for large scale production.

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