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THE PHYTOEXTRACTION AND PRELIMINARY TEST OF PHYTOCHEMICALS OF *PARTHENIUM HYSTEROPHORUS* L (LEAVES AND STEM) - INVASIVE ALIEN SPECIES

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ABSTRACT

Phytoconstituents obtained from plants have profound influence on culture and civilization of human beings. *P. hysterophorus* is a weed growing wild in many parts of India. Phytoextraction and qualitative phytochemical of various alcoholic and aqueous extracts of leaves and root parts of *P. hysterophorus* were investigated. The extraction yield calculated for petroleum ether, ethanol, methanol and water extract of both parts of *P. hysterophorus*. Preliminary phytochemical analysis for alkaloids, flavonoids, phenols, carbohydrates, saponins, amino acid, proteins and diterpenes were made by standard procedures. The methanol extract of *P. hysterophorus* exhibited higher yield followed by ethanolic, aqueous extract and petroleum ether extract. The majority of secondary constituents studied in leaves and stem parts of *P. hysterophorus* have present in methanolic extract than other solvent extract. From this study, it can be concluded that *P. hysterophorus* is expected to have many medicinal uses.

Keywords: *P. hysterophorus*, Alcoholic and Aqueous extracts Phytoextraction, Secondary constituents

1. INTRODUCTION

From ancient times to the modern era in several parts of the world and India, natural objects obtained from plants, animals and others have profound influence on culture and civilization of human beings [1]. *P. hysterophorus* L(Carrot-weed) is one such plant. It is a flowering plant of the Asteraceae family and native plant of sub-tropical America and it is rapidly invading in the Himachal Pradesh, from last two decades onwards [2,3]. *P. hysterophorus* is a weed growing wild in many parts of India. In India, the weed was first pointed out in Poona (Maharashtra) by Professor Paranjape, 1951, as stray plants on rubbish heaps and was reported by Rao1956 [4,5]. The weed was mostly seen in grasslands, roadsides, orchard, unattended lands, wastelands, horticulture fields [2].

The weed became famous due to its notorious invasive role in the environment and agricultural fields. The presence of invasive species always reduced the number of associated species [6]. A single plant *P. hysterophorus L* can produce between 15000 and 25,000 seeds. Seeds have no dormancy period and can germinate at any time if moisture is sufficient. Parthenium can regrow from broken or cut pieces [7]. It was found that parthenium should be seriously considered as a substrate for the production of biogas in India via anaerobic digestion [8]. Inspite of invasive nature, scientific validation has been made for this plant for its medicinal uses. The present study was carried out for qualitative phytochemical analysis of leaves and stem parts of *P. hysterophorus* using various alcoholic (petroleum ether, ethanol, methanol) and aqueous extract.

Table 1: Systematic position of plant

Kingdom	Plantae
Order	Asterales
Family	Asteraceae
Genus	Parthenium
Species	*P.hysterophorus*

Table 2: Vernacular name

P. hysterophorus	Carrot Grass, Congress grass, Gajar ghas, Chatak chandani, Santa-Maria, Santa Maria, feverfew, whitetop weed, and famine weed.

Table 3: Vegetative characters of *P. hysterophorus*

Habit	Bushy multi branched herb, upright weed, grows up to 1.5 m height.
Root	Taproot system
Leaves	alternate, simple and deeply pinnatifid. Blade - 11 to 15 cm long and 6-10 cm wide. Lobes- linear to lanceolate and irregular toothed. apex - sharp, the base - reduced in area and then stalk. The upper leaves are entire, decreasing in size towards the top of the stems and becoming bracts from the simple inflorescences. The upper surface is smooth, the lower surface is covered with white hairs. Veins- pinnate, prominent on the lower surface.
Stem	cylindrical, solid, more or less fluted with longitudinal lines corresponding to the extension of the midrib of the leaves.
Flowers	Heads composed by 5 external florets, female, arranged pentagon. Ligule- white, 5 teeth, of 0.5 to 0.7 mm long and 0.5 to 1 mm wide. Internal flowers - numerous, male, tubular, ivory-colored to yellowish white.
Cotyledons	Cotyledons -sessile, oval to rounded, 3 to 4 mm long. The blade - finely pubescent.
Fruit	achene, black obovoid, 2 mm long and 1.5 mm wide, hairy at the top with a pappus of 3 or 4 scales, membranous, curved, 0.5 mm long.

2. MATERIALS AND METHODS

2.1 Plant sample

The *P. hysterophorus* (leaves, stem) used for this study were collected from the herbal garden of AKS university in the month of Jan 2021. The species for the proposed study was identified and authenticated by botanist, AKS University, satna [9].

2.2 Chemicals

Ethanol, methanol, Alpha naphthol, Fehling solution A and Fehling solution B, Distilled water, aqueous HCl, concentrated sulphuric acid, picric acid, $Fecl_3$ etc.

2.3 Extraction of plant sample

The stem and leaves (shade dry) of *P. hysterophorus* made into coarsely powdered using mechanical grinder and preserved in air tight container. For defatting of plant sample, dried and coarsely powdered stem and leaves were extracted with petroleum ether by maceration. Three different solvents (ethanol, methanol and water) were used for successive extraction of all the defatted powdered plant samples. The extraction was done at room temperature. Subsequently, extracts were filtered using Whatmann no.1 filter paper to obtain plant extract. The concentrated extracts were evaporated to dryness and the extracts obtained with each solvent were weighed. Their percentages yield was calculated in terms of initial air-dried plant material [9].

$$\textbf{Percentage yield} = \frac{\text{Weight of extract (W1) x 100}}{\text{Weight of powdered plant sample taken (W0)}}$$

2.4 Phytochemical estimation

The presence of various phytoconstituents of plant extracts were analysed by standard phytochemical tests [10,11,12].

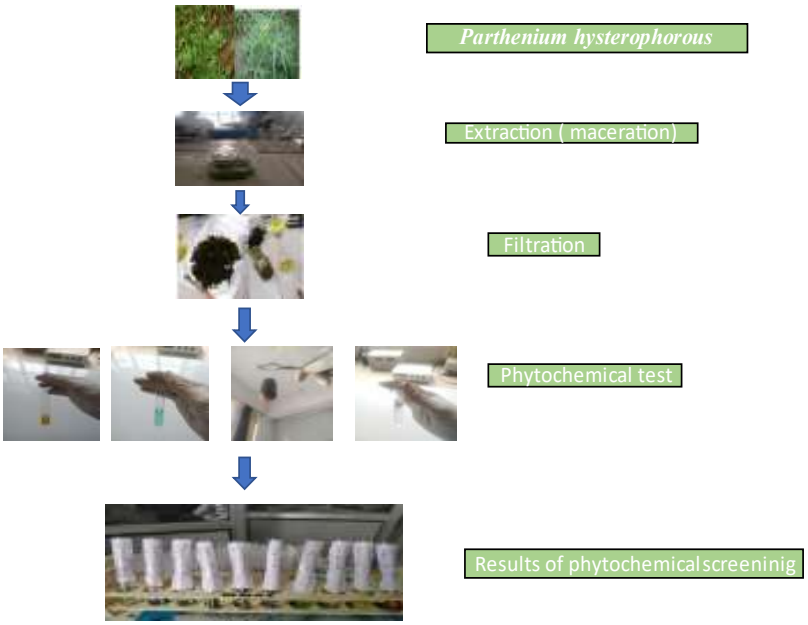

Fig-1: Experiment Design

3. RESULTS AND DISCUSSION

3.1 Percentage yield of phytoextraction

The percentage yield evaluates the standard extraction efficiency of particular solvents used. The yield of extracts obtained from *P. hysterophorus* using petroleum ether, ethanol, methanol and aqueous as solvents are shown in the figure 2. In *P. hysterophorus*, leaves (ethanolic, methanolic and water extract) gave greater percentage yield than stem (ethanolic, methanolic and water extract). The methanol extract of *P. hysterophorus* exhibited higher yield followed by ethanolic, aqueous extract and petroleum ether extract.

3.2 Preliminary test for phytochemicals

This research work was carried out on *P. hysterophorus* (stem, leaves) which shows that phytochemical constituent's *i.e.*, flavonoids, alkaloids, reducing sugars, phenols, amino acid, diterpenes and proteins are either present or absent in different parts and the results were summarized in Table 5 and 6**.** The ethanolic, methanolic and water extract showed the presence of alkaloids and saponins whereas phenol and amino acid were absent in all the extracts of *P. hysterophorus* stem. The presence of secondary metabolites contributes significantly towards the biological activities of medicinal plants [13]. All the extract of *P. hysterophorus* leaves showed positive results for alkaloids and saponins.

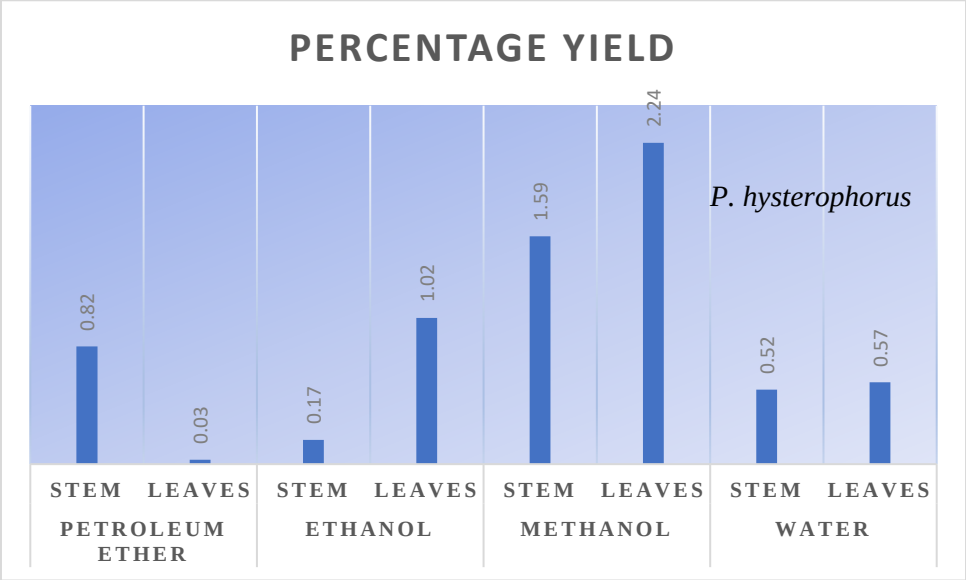

Fig-2: Percentage yield of *P. hysterophorus* stem and leaves

Table 5: Phytochemical analysis of *P. hysterophorus* stem

S No.	Chemical constituents	Test/ Reagent	Petroleum ether extract	Ethanol Extract	Methanol extract	Water extract
1	Alkaloid	Wagner's test	-ve	+ve	+ve	+ve
		Hager's test	-ve	+ve	+ve	+ve
2	Carbohydrate	Molish test	+ve	+ve	-ve	+ve
		Fehling test	+ve	+ve	-ve	+ve
3	Saponin	Foam test	-ve	+ve	+ve	+ve
4	Phenol	Ferric test	-ve	-ve	-ve	-ve
5	Flavonoids	Lead acetate test	-ve	-ve	+ve	-ve
		Alkaline test	-ve	-ve	+ve	-ve
6	Diterpenes	Cupper acetate test	-ve	+ve	+ve	-ve
7	Protein	Nitric acid test	-ve	-ve	+ve	-ve
8	Amino acid	Ninhydrin test	-ve	-ve	-ve	-ve

+ve: Indicates the presence of phytochemicals, -ve: Indicates the absence of phytochemicals

Table 6: Phytochemical analysis of *P. hysterophorus* leaves

S No.	Chemical constituents	Test/ Reagent	Petroleum ether extract	Ethanol extract	Methanol extract	Water extract
1	Alkaloids	Wagner's test	-ve	+ve	+ve	+ve
		Hager's test	-ve	+ve	+ve	+ve
2	Carbohydrates	Molish test	-ve	+ve	+ve	+ve
		Fehling test	-ve	+ve	-ve	+ve
3	Saponins	Foam test	-ve	+ve	+ve	+ve
4	Phenols	Ferric test	-ve	-ve	-ve	-ve
5	Flavonoids	Lead acetate test	-ve	-ve	-ve	+ve
		Alkaline test	-ve	-ve	-ve	+ve
6	Diterpenes	Cupper acetate test	-ve	+ve	+ve	-ve
7	Proteins	Nitric acid test	-ve	-ve	+ve	+ve
8	Amino acids	Ninhydrin test	-ve	-ve	-ve	-ve

+ve: Indicates the presence of phytochemicals, -ve: Indicates the absence of phytochemicals

4. CONCLUSION

The extraction yield calculated for petroleum ether, ethanol, methanol and water extract of both parts of *P. hysterophorus* showed that methanol extract registered higher percentage yield. It may be due to high polarity of methanol solvents which can draw several constituents of this plant than other solvent did. The majority of secondary constituents studied in leaves and stem parts of *P. hysterophorus* have present with higher amount in methanolic extract than other solvent extract. From this study, it can be concluded that *P. hysterophorus* is expected to have many medicinal uses.

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