INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
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www.ijrbat.in

PHYTOCHEMICAL STUDY OF *SPILANTHES ACMELLA L. (MURR.)* - A MEDICINAL HERB

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ABSTRACT:
Preliminary testing of plants for the phytochemicals is an important step, leads to the detection of the bioactive compounds present in the plants and subsequently may lead to drug discovery and development. In the present study, Preliminary phytochemical screening of the crude extract of *Spilanthes acmella* revealed the presence of various bioactive components of which alkaloids, flavonoids, saponin and tannin were the most prominent. Quantitative phtytochemical analysis was done for the Carbohydrate, Protein, Phenol, Alkaloid, Tannin and Flavonoids.

Keywords: *Spilanthes acmella, Phytochemical, Alkaloid, Phenol, Tannin.*

INTRODUCTION:

Medicinal plants instead the therapeutic agents also serve as big source of information for different chemical constituents which could be developed as drugs with precise selectivity. These are the natural lake of potentially useful chemical compounds which could use for the modern drug design (Vijyalakshmi et al., 2012). The major and most useful important bioactive constituents of plants are alkaloids, flavonoids, tannins and phenolic compounds (Doss, 2009). The linkage between the phytoconstituents and the bioactivity of plant is useful to know for the manufacturing of the drugs with specific activities which could help to treat various health ailments and chronic diseases (Pandey et al., 2013).

Spilanthes acmella, also called as *Acmella oleracea*, most commonly as jambu or toothack (Akkalkada), is a native plant of the tropics of Asia and South America (Chung et al., 2008). *S. acmella*, a member of Asteraceae family, is one of the nine plant families that have been reported to contain alkylamides as secondary metabolites (Greger, 1984). These innate, naturally occurring bioactive compounds often play vital role in plant growth-regulator functions, plant defense against herbivory and other interspecies defenses (Ramirez-Chavez et al., 2004).

This species has been used traditionally in medicines for long time ago. In folk medicine, they are typically chewed to relieve toothache and affections of throat and gums, as well as to paralyze the tongue (Jirovetz *et al.*, 2006). It is also reported as one of the active ingredients for the treatment of acute- or long-term microbial infections, particularly, oral pathogenic microorganisms, dental caries, periodontosis, gum disease, gum bleeding and/or plaque reduction (Adler, 2006; Boonen *et al.,* 2010). Knowing the significance of bioactive compounds, such preliminary phytochemical screening of plants is the need of the era in order to discover and develop novel therapeutic agents with improved efficacy.

METHOD AND MATERIAL:

Plant material

The aerial parts (Leaf, Steam and Flower) of *Spilanthes acmella* L. (Murr.) were collected from the Rajbhavan (Governor's Haouse) Nagpur (21o10'06.57"N 79o04'28.67"E).

Preparation of the plant extracts

Freshly collected plant materials were washed with distilled water and chopped into small pieces then shade dried so as to bring down the initial large moisture content to enable its prolonged storage life. After drying, they were grinded to powder, which was later used for the preparation of solvents extracts like petroleum ether, chloroform, ethanol, methanol, hot water. Phytochemical tests were carried out on the extract of the powdered specimens using standard procedures (Harborne, 1998; Sadashivam, *et al.*, 2015)

Qualitative Analysis

The crude extract of leaf, stem and flower of the plant were qualitatively screened for the occurrence of various secondary metabolites such as alkaloids, phenol, flavonoids, tannins, terpenoids, steroids, carotenoids, saponins and glycosides in addition with Carbohydrate and proteins.

Quantitative phytochemical analysis

Quantitative phytochemical analysis was done for the detection of total carbohyadrate by Anthrone method, total protein by Bradford method (Sadasivam & Manickam 2015), Tannin, Phenol, Alkaloid (Fazel *et al.*, 2008) and Flavonoid (Boham & Kocipai-Abyazan 1974).

RESULT AND DISCUSSION:

The qualitative and quantitative analysis of the phytochemical constituents of *Spilanthes acmella* is considered to be a valuable step in medicinal plant research. Phytochemical estimation conducted on the plant extracts showed the presence of constituents which are well known to exhibit medicinal as well as physiological activities. Analysis of the plant extracts revealed the presence of phytochemicals such as tannins, flavonoids, saponins, carbohydrates and alkaloids.

Preliminary test for the phenol showed the positive response for all the different extracts. The maximum qualitative occurrence of Phenol was observed in the chloroform extract of leaf, petroleum ether extract of stem and methanol extract of flower comparative with other extracts. Alkaloid was found to be present in all the extracts of leaf, stem and flower of *Spilanthes acmella*. Alkaloid was found to be present in all the extracts of leaf, stem and flower of *Spilanthes acmella*. From the leaf extract it was occurred at maximum intensity in Chloroform extracts and in petroleum ether extract of stem whereas it was moderately occurred by all the solvents from flower extract. In *Spilanthes paniculata* it was less in flower compared to stem and leaf extracts (Table 1). Nobori *et al.*, 1994 reported that Alkaloids have been associated with medicinal uses for centuries and one of their common biological properties is their toxicity against cells of foreign organisms. Several workers have reported the analgesic (Antherden, 1969; Harbone, 1973), antispasmodic and antibacterial (Stray, 1998; Okwu & Okwu 2004) properties of alkaloids. These activities have been widely studied for their potential use in the elimination and reduction of human cancer cell lines (Nobori *et al.*, 1994). The alkaloids contained in plants are used in medicine as anaesthetic agents (Herourat *et al.*, 1988).

Petroleum ether, choloform, hot water and Ethanol extracts of *Spilanthes acmella* showed positive test to Ferric chloride test of tannin whereas methanol extracts showed the negative test (Table 1). The presence of tannin in the leaves of *Spilanthes* was reported by Nakatami & Nagashima, 1992 and Amal & Sudhendu, 1998. The crude extracts of leaves of *Spilanthes amella* showed the positive test for flavonoid in all the solvent extracts except the Ethanol. The presence of flavonoids in the *Spilanthes* was also reported by the Preetha *et al.,* 2014. Several health beneficial properties of dietary flavonoids are recognized for their anti oxidant and anti proliferative effects which may protect the body from various diseases, such as Cancers, cardiovascular disease and inflammatory were reported by the Middleton *et al.*, 2000; Nijvldt *et al.*, 2001.

Plant showed positive test for carotenoid in all the solvent extracts. Being one of the important plant metabolite, the protein was isolated from the studied plants by using different solvents extracts. The Hot water extract, entanol extract and methanol extract showed the positive response to Ninhydrin test by developing the blue color of the plant samples. All the solvents extracts of the plants showed the positive response to Iodine test indicating the presence carbohydrate. In *Spilanthes acmella* carbohydrate showed maximum occurrence in the petroleum (Table 1). The presence of carbohydrate in *Spilanthes acmella* was also reported by the Preetha *et al.,* 2014.

Terpenoid was found to be occurred in all the solvent extracts except petroleum ether and chloroform extract. Okwu & Josiah in 2006 reported that tannins contribute property of astringency i.e. faster healing of wounds and inflamed mucous membrane. Petroleum ether and chloroform extracts of *Spilanthes acmella* showed the negative test for Glycoside. The study of Nyarko and Addy, 1990 revealed that the Glycosides were play a role in lowering the blood pressure. The petroleum ether and chloroform extract showed the negative response to the Froth or Foam test showing the absence of Saponin. In addition to industrial applications as foaming and surface active agents, saponins have been extensively used as detergents, pesticides and molluscicides & also have beneficial health effects (Arunasalam, 2004). The hot water extract, ethanol extract and methanol extract showed the positive response when tested for the Salkowski test for presence of steroid.

The carbohydrate concentration was found to be more (43.68mg/g) in the Stem whereas it was less (38.35mg/g) in Flower heads. The total protein and phenol concentration was reported in higher amount from the leaves of *Spilanthes acmella* i. e.

0.1660 mg/g and 0.1920 mg/g respectively. The concentration of Alkaloid and Tannin was less in stem compare with leaves and flower. Flavonoid concentration was found to be maximum in Stem (0.027 mg/g) followed by Flower (0.026 mg/g) and leaves (0.022 mg/g) (Table 2).

Conclusions

This work studied the phytochemical composition of different plants parts (flowers, leaves and stems) of the *Spilanthes acmella* by using different solvents extracts. It was observed that all factors affected the chemical composition of the extracts, both quantitatively and qualitatively, concerning their total phytochemical contents. When comparing the results obtained for the different plant parts, it was clear that the stem are richer in carbohydrate, leaves are richer in phenols and alkaloids validating the use of plants for pharmaceutical/ medical purposes. The leaves were an important source of phenols. As leaves presented relatively low or even pro-inflammatory responses, the valorization of this part of the plant may focus the food industry. *Spilanthes acmella* is a commonly cultivate ornamental plant with high therapeutic benefits like diuretic, antifungal, treatment of rheumatoid arthritis, antimalarial etc. It also has many dental uses. It can be used to treat toothache, in the treatment of periodontitis and aphthous ulcers.

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Table 1: Preliminary phytochemical analysis of *Spilanthesacmella*

Sr. No.	Tests	Leaf					Stem					Flower				
		PE	CL	HW	E	M	PE	CL	HW	E	M	PE	CL	HW	E	M
1	Phenol	++	+++	++	++	++	+++	++	+	++	+	++	++	++	++	+++
2	Alkaloid	++	+++	+	+	+	+++	++	+	+	+	+	+	+	+	+
3	Tannin	+	+++	++	++	-	++	++	+++	-	-	+	+	+	+	-
4	Flavonoid	+	+	+	-	+	+	+	+	-	-	-	+++	++	-	++
5	Carotenoids	++	+++	+++	+++	+++	+	++	++	++	+	+	++	+	+	+++
6	Protein	-	-	+++	+	++	-	-	+	-	-	-	-	+	+	+++
7	Carbohydrate	+++	++	+	+	+	+++	++	+	+	+	+++	++	+	+	+
8	Terpenoid	-	-	+	++	++	++	+	+	++	+	-	-	+	++	+
9	Glycosides	-	-	+	++	+	-	-	+	+	+	-	-	+	++	+
10	Saponin	-	-	+	-	+	-	-	+		+	-	-	+	-	+
11	Steroids	-	-	+	++	++	-	-	+	+	+	-	-	+	++	+
PE: Petroleum Ether, CL: Chloroform, HW: Hot Water, E: Ethanol, M: Methanol.																

Table 2 : phytochemical estimation of *Spilanthesacmella* (mg/g)

	Carbohydrate	Protein	Phenol	Alkaloid	Tannin	Flavonoid
Leaves	41.44	0.1660	0.1920	0.1062	0.0035	0.022
Stem	43.68	0.1526	0.0594	0.0883	0.0033	0.027
Flower	38.35	0.1623	0.0348	0.1016	0.0061	0.026