

A Morphological, Phytochemical and Physico-chemical Investigation of *Polygonum chinensis* L. (Mahaga-kyan-sit)

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Abstract

Polygonum chinensis L. is a medicinal plant belonging to the family Polygonaceae. It is known as Mahaga-kyan-sit which is found throughout India and Myanmar. The morphological characters, preliminary phytochemical tests and physico-chemical characterization have been carried out. In the morphological study, perennial herbs with ochreate stipules, leaves alternate, simple, linear, lanceolate, flowers few in small clusters are arranged in racemose, fruit is a compressed nutlet. In phytochemical study, it was found that alkaloids, glycosides, phenolic compound, flavonoids, tannin, saponin glycosides, basic compound carbohydrate were present in leaves.

Key words: Medicinal plant, Phytochemical, Physico-chemical, Hinthada Township

Introduction

Polygonum chinensis L. is distributed in India and Ceylon, Myanmar and Malaya to Malaysia and the Philippines to China and Japan (Dassanayake, 1997). It belongs to the family Polygonaceae. Its common name is Ma-ha-gar-kyansit. *Polygonum chinensis* L. is common in brushwood, forest borders, open forest, river banks and tea and cinchona plantations in the whole of Indo-china at 250-3300m altitude. On mountain tops they are often small and erect (Valkenburg & Bunyaphatsara, 2002).

In Indonesia, the juice of the plant is employed in the treatment of eye diseases. A poultice is applied to the abdomen for stomach-ache. In Vietnam, a decoction of the plant is used as a depurative. Externally it is used to treat eczema of the ears (Valkenburg & Bunyaphatsara, 2002).

The species *Polygonum chinensis* L. are glabrous perennial herbs, stem often very long and climbing and dropping, ridged, often woody at base. Leaves alternate; stipules membranous, connate into a tubular ocrea, broadly ovate to oblong, base rounded, truncate or round, apex acute to abruptly acuminate, margins often crispate, glabrous or pubescent, petioles 1.5 to 2cm long, often with rounded, amplexicaul basal auricles, auricles of highest petioles attached to leaf blade, ocrea 1-2cm long, membranous, glabrous, truncate, veined. Inflorescence of panicle cymes is 2.5-7.5cm long with leafy bracts. Flowers are few in small clusters, 2.5mm through, white or pink. Stamens are 7-8, in 2 whorls. Ovary trigonous; style trifid above petioles stout; stipules ochreate, membranous, pubescent, nutlet trigonous, pulpy, black (Kirtikar & Basu, 1975; Hundley & Chit Ko Ko, 1987; Kress et al., 2003).

Materials and Methods

The plants were collected from Hinthada Township from July to September 2006. The samples were cut into small pieces and then dried in room temperature for about two weeks. It was then ground into powder with a machine and stored in air tight containers. Phytochemical and physico-chemical characters are conducted according to British Pharmacopeia (1968) and Physico-chemical standard of Central Council for Research in Unani Medicine.

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Preliminary phytochemical test of *Polygonum chinensis* L.

Phytochemical tests were carried out to determine the presence or absence of chemical constituents such as alkaloids, glycosides, reducing sugar, steroid or terpenoids, phenolic compound, carbohydrate, amino acids, flavonoids, tannin, saponin, glycosides, acidic or basic, cyanogenetic glycoside (Treace & Evans, 1980). The results are shown in Table 1.

Test for alkaloid

Two grams of Powdered sample was boiled with N/10 hydrochloric acid for about 30 minutes and filtered using in a filter paper. The filtrate were divided into four portions and tested with Mayer's reagent, Drangendorff's reagent, Sodium picrate solution, and Wagner's reagent. The precipitates were formed on addition of the above mentioned reagents. It indicated the presence of alkaloids.

Test for glycoside

Two grams of Powdered sample was boiled with distilled water for about 30 minutes and filtered. The filtrate was treated with 10% lead acetate solution. White precipitates which took place on addition of the reagents indicated the presence of glycosides.

Test for reducing sugar

Two grams of Powdered sample was boiled with distilled water for about 30 minutes and filtered. To the filtrate, the Benedict's solution was added and boiled for ½ an hour. No brick red precipitate indicated the absence of reducing sugar.

Test for steroid or terpenoid

Two grams of Powdered sample was extracted with benzene for 30 minutes and filtered. The benzene extract obtained was evaporated to dryness and treated with few drops of acetic anhydride, followed by the addition of concentrated sulphuric acid. The test solution did not turn pink indicating the absence of steroid or terpenoids.

Test for phenolic compound

Tow grams of Powdered sample was boiled with distilled water and filtered. The filtrate was treated with 10% ferric chloride solution. The test solution did not turn green. It indicated the absence of phenolic compound.

Test for carbohydrate

Two grams of Powdered sample was boiled with distilled water for about 30 minutes and filtered. The filtrate was placed into a test tube and few drops of 10% α -naphthol were added and shaken. Then, this test tube was inclined at an angle of 45° and about 1 ml of concentrated sulphuric acid was added slowly along the side of the test tube. No purple ring formed between two layers showed the absence of carbohydrate.

Test for α -amino acid

Two grams of Powdered sample was boiled with distilled water for about 30 minutes and filtered. The filtrate was applied on a filter paper by using capillary tube and allowed to dry. Then, the spot was sprayed with ninhydrin reagent and heated in an oven at 110 °C. Purple colour spot observed on the filter paper showed the presence of α -amino acid.

Test for flavonoid

Two grams of Powdered sample was extracted with benzene and filtered. Ferric chloride solution was added to the filtrate. A yellow precipitate indicated the presence of flavonoids.

Test for tannin

Two grams of Powdered sample was boiled with distilled water and filtered. The filtrate was added with ferric chloride solution with 10% lead acetate. White precipitates were formed indicating the presence of tannins.

Test for saponin glycoside

Two grams of Powdered sample was introduced into a test tube followed by the addition of distilled water and mixture was vigorously shaken for a few minutes. No frothing indicated the absence of saponin glycosides.

Test for acidic or base compound

Two grams of Powdered sample was boiled with distilled water for about 30 minutes and filtered. To the filtrate a few drops of bromocresol green was added. The resulting solution turned to blue indicated the presence of base.

Test for cyanogenetic glycoside

Two grams of Powdered sample was mixed with distilled water and few drops of concentrated sulphuric acid was added. The sodium picrate paper was inserted with the cork at the top of the test tube. Then, the resulting mixture was gently heated by means of a spirit burner. The sodium picrate paper did not turn pink. This indicated the absence of cyanogenetic glycoside.

Physico-chemical characterization of *Polygonum chinensis* L.

In physico-chemical characterization study, the moisture content, solubility in ethanol, water and petroleum ether were tested.

Determination of moisture content

The samples (weighing approximately 3g) were cut into small pieces. Then, they were placed in an oven at 110 °C for 5 hours. After being placed in a desiccator for ½ hour, they were weighed again. It was done for altogether 3 times. The difference between initial weight and final weight is the moisture content of the sample.

Determination of soluble matter**Determination of water soluble matter porcelain basin**

5g of powdered samples were weighed and placed in a conical flask. 100cm³ of chloroform water (0.25% v/v) was added and the flask was stopped with a cork. The sample was allowed to macerate for 24 hours. The flask was shaken continuously for 6 hours. The suspension was allowed to stand for 18 hours. The contents were filtered and washed with a small portion of each solvent to ensure a complete removal of water soluble matter. The filtrate and washed liquids were mixed. The volume was made up to 100ml. Each portion of the filtrate (10ml) was taken and placed in a weighted porcelain basin and then evaporated to dryness on water bath and dried at room temperature. The procedure was repeated until a constant weight was obtained. The difference in weight of basin before and after the experiment was taken to be the water soluble matter.

Determination of Ethyl-alcohol soluble matter

The ethyl-alcohol soluble matter content was determined by the method described above by using ethyl alcohol.

Determination of pet-ether soluble matter

The petroleum ether soluble matter content was determined by the method described above by using petroleum ether (60-80°C).

Results and Discussion

Morphological characters

Perennial herbs to sub shrubs, stem about 5 ft. (1.524m) tall, erect. Leaves alternate, simple, linear-lanceolate to ovate-lanceolate, the base acute, the margin entire, the tips acute to acuminate amplexicaul basal auricles present and both surfaces silky pubescent. Inflorescences axillary or terminal spiciform racemes. Flowers white, bracteates, pedicellate, bisexual, 5-merous; perianth tepals 5, fused, white, stamens 8, free, ditheous; carpel 3, one locule, ovule solitary, placentation basal, style 3, combined at base, stigma sub-capitate; fruit nutlet, trigonous, pulpy, black (Figure 1).



Habit



Flowering branch



Inflorescences



Flower as seen



Fruits

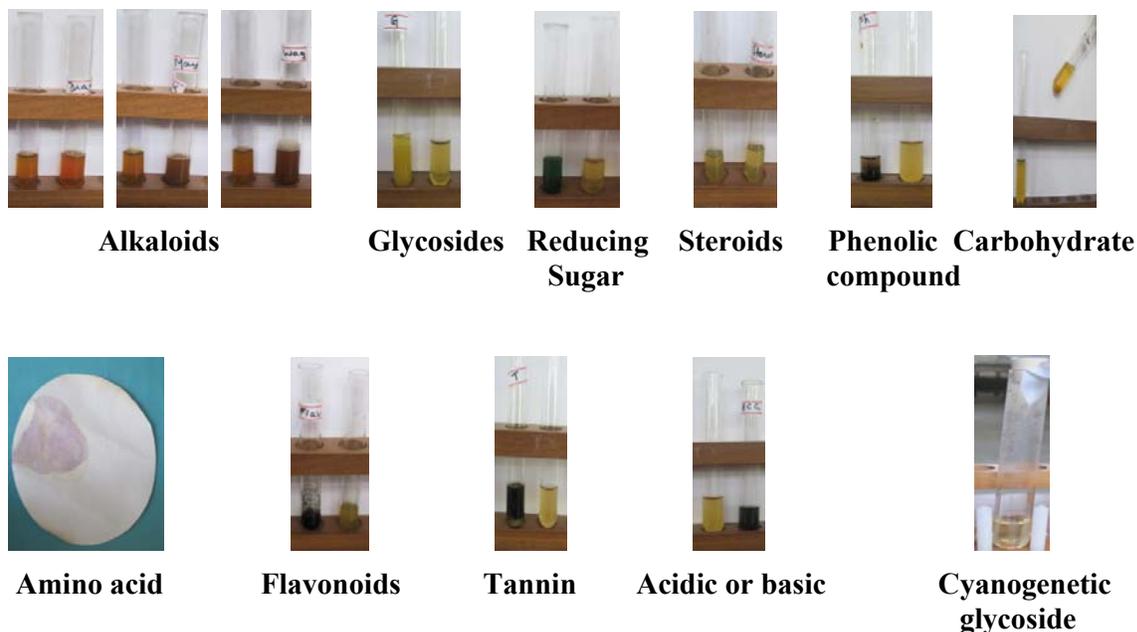


Seeds

Figure (1) Morphological characters of *Polygonum chinensis* L.

Preliminary phytochemical investigation of leaves of *Polygonum chinensis* L.

A qualitative analysis is concerned with determination of the presence or absence of phytochemical in qualitative value. The investigation of these tests confirms the presence of alkaloids, glycosides, steroids, phenolic compound, flavonoids, tannin, saponin glycosides basic compound and carbohydrate in the leaves (Figure 2). The results are tabulated in Table (1).

Figure (2) Tests on the leaves power of *Polygonum chinensis* L.Table (1) The result of the phytochemical investigation of leaves of *Polygonum chinensis* L.

No.	Constituents	Extract	Test Reagent	Observation	Results
1	Alkaloids	EtOH	(i)Mayer's reagent (ii)Dragendroff's reagent (iii) Wagner's reagent	White ppt Orange ppt Reddish brown ppt	+ + +
2	Glycosides	H ₂ O	10% lead acetate	White ppt	+
3	Reducing sugar	H ₂ O	Benedicts solution	No reddish brown	+
4	Steroids or terpenoids	Benzene	(i)Acetic anhydride (ii)Sulphuric acid	Pink color	No color change
5	Phenolic compound	H ₂ O	Ferric chloride solution	Green color	+
6	Carbohydrate	H ₂ O	10% α -naphthols sulphuric acid	Purple ring	+
7	Amino acid	H ₂ O	Ninhydrin reagent	Pink color	+
8	Flavonoids	Benzene	Benzene, Ferric chloride	Blue black ppt	+
9	Tannin	H ₂ O	Ferric chloride and 10% lead acetate	White ppt	+
10	Saponin glycosides	H ₂ O	Distilled water	Frothing take place	+
11	Acidic or basic	H ₂ O	Bromocresol green	Green color	Neutral
12	Cyanogenetic glycosides	H ₂ O H ₂ SO ₄	Distilled water conc: Sulphuric acid + sodium picrate	No pink color	-

Physico-chemical characterization of leaves of *Polygonum chinensis* L.

The Physico-chemical characterization of the dry leaves was carried out; moisture content, ethanol soluble matter and petroleum ether soluble matter of the dried leaves were following respectively. The results were tabulated in Table (2).

Table (2) Physico-chemical characterization of leaves of *Polygonum chinensis* L.

No.	Physico-chemical characters	Content Percentage of leaves
1	Moisture content	13.3%
2	Ethanol soluble matter	20%
3	Petroleum ether soluble matter	8%

Leaves of *Polygonum chinensis* L. has been studied in this research. There are about 17 species of the genus *polygonum* reported to be abundantly growing wild in Myanmar. Many members of the genus *polygonum* belonging to the family Polygonaceae are commonly and broadly utilized in pharmaceutical preparations throughout the world. The plant as a whole is used as bitter tonic, vulnerary and for treating sores and bites of insects or snakes. Leaves of most species are used for curing skin diseases and many of them are also eaten as vegetables. The leaves contain essential oil, oxymethyl anthraquinones, polygonic acid glycosides, quercetin zarabinosid and aviularin (Wealth of India, 1948).

In Myanmar, *P.chinensis* L. is used as tonic and in the treatment of skin disease.

Conclusion

The physico-chemical characteristic such as the moisture content, ethanol and petroleum ether were determined. The solubility of leaves in ethanol was found to be the highest. According to the phytochemical test, alkaloids, glycosides, steroid or terpenoids, phenolic compound, flavonoids, tannin and saponin glycosides were also detected in both of the parts. So it also agreed with the literature of Trease & Evans (1980).

The genus *polygonum* belongs to the family polygonaceae under the order polygonales (Lawrence, 1967). The generic name "*Polygonum*" is a Greek word, "polus" means many and "gony" means a knee, ryening to the numerous joints of the stem (Brondis, 1906).

The polygonaceae, commonly known as the buck wheat or knot weeds family include a large series of apetalous forms (Bor, 1953).

According to Chopra et al., (1956) the members of polygonaceae family contains (a) glycosides such as rehapanticin, chrysophan, polygonin, rutin, glucogallin, polydatoside, rheochrysin and tetraarin etc., (b) anthraquinone derivatives such as emodin, isoemodin, rhein, such asoxalic acid, formic acid, polygonic acid and resins. *Polygonum chinensis* L. is well known for tonic, antiscobutic, vulnerary (Chopra et al., 1956; Kirtikar & Basu, 1975).

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