Studies on Morphological Characterization and Phytochemical Test of *Operculina turpethum* (L.) Silva Manso

Thinzar[1], Khin Nyo[2], Cho Zin Swe[3]

Abstract

Operculina turpethum (L.) Silva Manso is highly traded medicinal plant belonging to the family Convolvulaceae. It is widely distributed grown wild in road-side and many places. This plant is locally known as kya-hin-nyunt in Myanmar and Turpeth in English. It was collected from Pathein University Campus during the flowering and fruiting period. The present study attempts to analyse morphological characters and phytochemical tests with the help of available literature and internet website information. Major phytochemical constituents as reported by the concerned studies are alkaloid, phenolic compound, flavonoid, starch, reducing sugar, glycoside, saponin, tannin, α-amino acid and carbohydrate. Efforts have been made to give a pragmatic description of the plant with its pharmacological and phytochemical properties so as to study its inherent potentialities for the welfare of the ailing masses.

Keywords: *Operculina turpethum* (L.) Silva Manso, morphology and phytochemical constituents of fresh and powdered the whole plant

Introduction

Medicinal plants have played an essential role in the development of human culture. Many of the modern medicines are produced indirectly from medicinal plants. Plants are directly used as medicines by a majority of cultures around the world. Many food crops have medicinal effects. Medicinal plants are resources for new drugs. It is estimated there are more than 250,000 flowering plant species (Website 1).

The importance of medicinal plants and traditional health systems in solving the health care problems of the world is increasing attention. Because of this resurgence of interest, the research on plants of medicinal importance is growing phenomenally at the international level. Most of the developing countries have adopted traditional medical practice as an integral part of their culture. Historically, all medicinal preparations were derived from plants whether in the simple form of raw plant materials or in the refined form of crude extracts, mixtures, etc (Krishnaraju AV., TVN Rao, 2005).

Operculina turpethum (L.) Silva Manso of the order Solanales, family Convolvulaceae, is a potent medicinal plant, used in both the Unani and Ayurvedic systems of medicine. The plant is native to Asia, India, Nepal, Bangladesh, Pakistan, Sri Lanka, China, Taiwan and Myanmar (Website 2)

Operculina is a genus member of the morning glory family of plants which contains 15 species that are located throughout the world (Website 3).

Operculina turpethum (L.) Silva Manso is a large perennial twiner of the family Convolvulaceae. Young leaves and stem of the plant are used as vegetables. The stem of *O.turpethum* (L.) Silva Manso was found to be a source of phytochemicals such as phenol, flavonoid, phytosterol, terpenoid and cardiac glycosides.

The roots of the plant *O. turpethum* (L.) Silva Manso taken in the investigation were also found to contain similar biologically active constituents.

These constituents may be responsible for the pharmacological potential of the plant product. It also scientifically proved certain traditional claims of the plant *O. turpethum* (L.)

[1] Demonstrator, Department of Botany, University of Yangon
[2] Associate Professor, Department of Botany, Pathein University
[3] Demonstrator, Department of Botany, University of Yangon

Silva Manso, Convolvulaceae family, is a well-known traditional Indian medicinal plant various parts of which were traditionally claimed for the treatment of snake, scorpion bites, as laxative, antianemic, anti hypercholoesterimic, for gout, fevers and leprosy conditions. These were also scientifically reported for the presence of various bioactive constituents of pharmaceutical significance such as alkaloids, glycosides, coumarins, steroids, volatile oils, carbohydrates and turpethinic acids (Website 5).

Therefore, the aims of the present study are to promote and to share the knowledge of the medicinal properties of *Operculina turpethum* (L.) Silva Manso, to study the morphological characters and phytochemical tests of *Operculina turpethum* (L.) Silva Manso.

Materials and Methods

Botanical Studies

Collection and Identification of Plant Specimens

The specimens used in this research were collected from the surrounding area of Pathein University Campus, Pathein Township, during the flowering period from November 2018 to March 2019. After collection, both the vegetative and reproductive parts of the fresh specimens were identified by using a dissecting microscope, available literature such as Hooker, 1885; Kirtikar and Basu, 1935; Backer and Brink, 1965; Cronquist, 1981; Dassanayake, 1983; Hundley and Chit Ko Ko, 1983; Hu Qi-ming and Wu De-lin, 2009) and internet website information. The mounted herbarium sheets were also prepared by the methods of Lawrance, 1969 and Nyo Maung, 2003 were kept in the Botany Department, Pathein University. The habit, leaves, and flower as seen, T.S of flower, T. S of ovary, fruits and seeds were presented with a photographic record.

Preparation of powdered samples

The collected specimens were washed with water to remove impurities and then dried at room temperature for several days. After that, the samples were pulverized with a grinding machine to get powder, stored in an airtight container for further studies.

Chemical Studies

Phytochemical Test of the Whole Plant of *Operculina Turpethum* (L.) Silva Manso

In this qualitative analysis, the air dried powdered of the sample was tested for alkaloids, phenolic compounds, flavonoid, starch, reducing sugar, glycoside, saponins, tannins, α-amino acid, carbohydrates. These experiments were investigated by using the extracts obtained from water and various solvents. The tests were conducted at the Department of Botany, Pathein University by the methods of British Pharmacopoeia, 1968; Marini Bettolo *et al*., 1981; Central Council for Research in Unani Medicine, 1987; Trease and Evans, 2002; and Harbone, 2005.

Test for Alkaloids

The powdered sample of 3g was boiled in 1% HCl 50 mL for about 20 minutes and filtered off. The filtrate was divided into three portions and tested with Dragendroff's reagent, Mayer's reagent and Wagner's reagent. Treatment with the above mentioned alkaloidal reagents furnished alkaloidal precipitates (Central Council for Research in Unani Medicine, 1987).

Test for Phenolic compounds

The powdered sample of 2g was boiled with 1% HCl/Mg 25mL for about 20 minutes and filtered. The filter was treated with a 3% ferric chloride test solution. Observation was made to see if a dark green colour appeared (Marini Bettolo *et al*., 1981).

Test for Flavonoids

The powdered sample of 2g was boiled with 95% ethanol 25 mL for about 20 minutes and filtered. The alcoholic solution was then treated with 0.5 g of Mg and a few drops of concentrated hydrochloric acid. Dark green colouration developed within three minutes (Central Council for Research in Unani Medicine, 1987).

Test for Starch

The powdered sample of 2g was boiled with 25mL of distilled water for about 20 minutes and filtered, 2 drops of iodine solution were added to the filtrate. Observation was made to see if a reddish brown precipitate was formed (Central Council for Research in Unani Medicine, 1987).

Test for Reducing Sugars

The powdered sample of 2g was boiled with 25mL of distilled water for about 20 minutes and filtered. To this filtrate a mixture of Benedicts solution was added and boiled for a few minutes in a boiling water bath. Brick red precipitate deposited, when the solution was allowed to cool (Trease and Evans, 2002).

Test for Glycosides

The powdered 2g of was boiled with 25mL of distilled water for about 20 minutes, allowed to cool and filtered. The filtrate was treated with 10% lead acetate solution. White precipitate took place on addition of the solution (Marini Bettolo*et al*., 1981).

Test for Saponins

The powdered sample 2g of was put into a test tube and some distilled water was added. The mixture was vigorously shaken for a few minutes. Observation was made to see if frothing took place (Marini Bettolo *et al*., 1981).

Test for Tannins

The powdered sample 2g of was boiled with distilled water 25 mL for about 20 minutes and filtered. The filtered was treated with 3% ferric chloride solution. Dark blue precipitates settle down (Central Council for Research in Unani Medicine, 1987).

Test for α-amino acids

The powdered sample of 2g was boiled with 25 mL of distilled water for 20 minutes and filtered. And then, a few drops of each filtrate were spotted on filter paper using a capillary tube, allowing it to dry and spray with ninhydrin reagent. The filter paper was dried at room temperature and then kept in an oven at 110ºC for a few minutes, after which the purple colour appears due to the presence of α-amino acid (Marini Bettolo *et al*., 1981).

Test for Carbohydrates

The powdered sample of 2g was boiled with 25 mL of distilled water for 20 minutes and filtered. The filtrate was placed into a test tube 10% α-napthol was added and shaken for a few minute. The test tube was kept inclined at an angle of 45ºC and about 1 mL of concentrated sulphuric acid was slowly introduced along the inner side of the test tube. A violet ring was formed between the two layers (Trease and Evans, 2002).

Results

Botanical Studies

Scientific name - *Operculina turpethum* (L.) Silva Manso

Synonym - *Ipomoea turpethum* R. Br.

Vernacular name - Kya-hin-nyunt, Kyahin-bin

English name - Turpeth

Family - Convolvulaceae

Location - Pathein University Campus

Morphological Characters

Perennial twining herb, milky juice present, stem very long, stout, narrowly 3-5 winged, angular, scabrous tough and brown old. Leaves simple, alternate, orbicular blade, about 7.8 cm x 7.0 cm in long, cordate base, entire margin, tip acuminate, upper surface appressed pilose, lower surface pubescent, scabrous, petiole cylindrical, narrowly 2 wing, tomentose, sericeous, exstipulate. Inflorescence of axillary and solitary cymes about 9.0 cm long, peduncle cylindrical, tomentose, sericeous. Flower showy, white about 3.2-5.4 cm long, bracts oblong, tomentose, pale green, pedicellate, tomentose, scabrous, complete, bisexual, regular, actinomorphic, pentamerous, cyclic, hypogynous. Calyx 2+3 free, pale green, unequal, ovate, quincuncial, twisted in bud about 2.5 cm x 1.7 cm, the outer surfaces tomentose, sericeous, the inner ones glabrous, persistent. Corolla (5), fused, campanulate, white, corolla tube glabrous. Stamens 5, distinct petalostemonous, filament slender, equal, hairy at the base, anther 2 celled, about 1.1 x 1.4 cm in long, twisted tip rounded base sagittate dorsifixed, introrse, longitudinal dehiscence. Ovary superior, ovoid, about 0.4 x 0.3 cm in diameter, glabrous, carpels (2), syncarpous, axile placentation, style single, filiform, stigma bi-lobed, globose, ring-shape, intrastaminal disc present. Fruits loculicidal capsule, globose, pointed at tip, green when young, pink colour in ripening, about 1.5-1.9 cm long. Seeds 4, each chamber contain 2 seeds, smooth, ovoid about 0.8 cm, enclosed with persistent calyx, dark black colour.

Flowering and fruiting periods - November-March

Part Used - The whole plant

Uses - laxative, antianemic, anti hypercholesterimic, fevers, leprosy, gastric ulcer, asthma, diabetic.

Fig. 1 (a).Habit

Fig. 1 (b). Lower surface of leaves

Fig. 1(c). Upper surface of leaves

Fig. 1(d). Inflorescence

Fig. 1. Morphological characters of *Operculin turpethum* (L.) Silva Manso

Fig. 1(e). Flower as seen

Fig. 1(f). L.S of flower

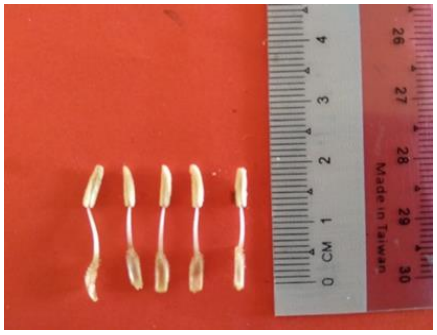


Fig. 1(g). Stamens

Fig. 1(h). T.S of ovary

Fig. 1(i). Mature fruit

Fig. 1(j). Seeds with persistent calyx

Fig. 1. Morphological characters of *Operculina turpethum* (L.) Silva Manso

Sensory characters of powdered sample of *Operculina turpethum* (L.)Silva Manso

The sensory characters of powdered samples are pale green in colour, pungent odour, slightly sweet and fibrous. These characters were shown in Figure 2 and Table 1.

Fig 2.Powdered sample of *Operculina turpethum* (L.) Silva Manso

Table 1. The sensory characters of powdered sample of *Operculina turpethum* (L.) Silva Manso

No.	Sensory characters	Powdered sample
1	Colour	Pale green
2	Odour	Pungent
3	Taste	Slightly sweet
4	Texture	Fibrous

Chemical Studies

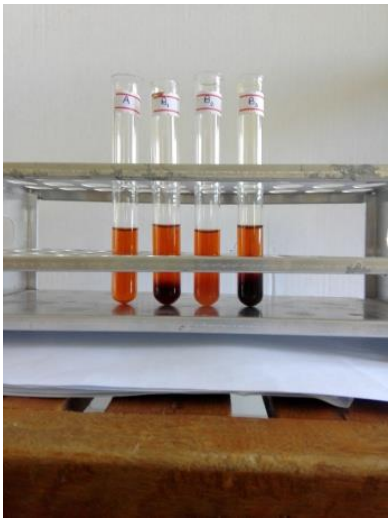
Phytochemical tests of powdered sample of *Operculina turpethum* (L.) Silva Manso

The phytochemical tests of a powdered sample of *Operculina turpethum* (L.) Silva Manso indicated that the presence of alkaloids, phenolic compounds, flavonoids, starch, reducing sugar, glycoside, saponin, tannin, α-amino acid and carbohydrates were found to be present. The results are shown in figures 3-4 and Table 2.

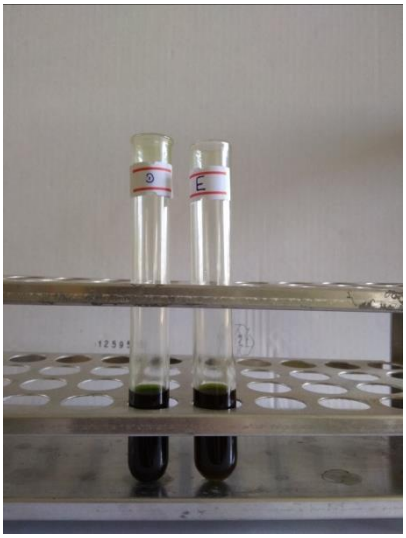
Table 2. Phytochemical tests from the powdered sample of *Operculina turpethum* (L.) Silva Manso

No.	Tests	Solvent is used for extraction	Test reagents	Observation	Results
1	Alkaloid	1%HCl	Dragendroff's reagent Mayer's reagent Wagner's reagent	Orange brown ppt. White ppt. Reddish brown ppt.	+ + +
2	Phenolic compounds	1% HCl	3% $FeCl_3$ solution	Dark green	+
3	Flavonoids	Ethanol	HCl/Mg	Dark green	+
4	Starch	H_2O Extract	Iodine solution	Reddish brown	+
5	Reducing sugar	H_2O Extract	Benedict's solution	Brick red	+
6	Glycoside	H_2O Extract	10% lead acetate solution	White ppt	+
7	Saponin	H_2O Extract	Distilled water	Frothing	+
8	Tannin	H_2O Extract	3% $FeCl_3$ solution	Dark blue	+
9	α-amino acid	H_2O Extract	Ninhydrin reagent	Purple	+
10	Carbohydrates	H_2O Extract	10% α-napthol and conc: H_2SO_4	Violet ring	+

Present = (+)



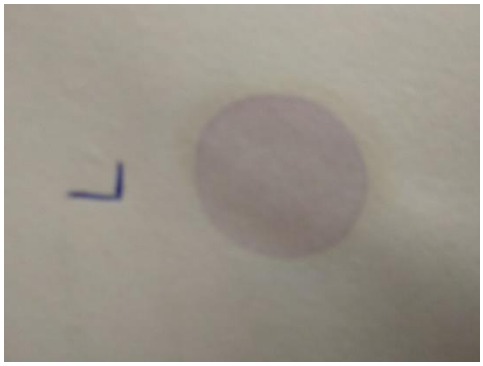
A = HCl extract of powdered sample
B-1 = Test for alkaloid with Dragendroff's reagent
B-2 = Test for alkaloid with Mayer's reagent
B-3 = Test for alkaloid with Wagner's reagent
C = Test for phenolic compound



D = Ethanol extract of powdered sample
E = Test for flavonoid

Fig. 3. Phytochemical tests of the alkaloid, phenolic compound and flavonoid of *Operculina turpethum* (L.) Silva Manso

F = Distilled water extract of powdered sample
G = Test for reducing sugar
H = Test for starch
I = Test for glycoside
J = Test for saponin
K = Test for tannin



L = Test for α-amino acid

M = Test for carbohydrate

Fig. 4. Phytochemical tests of starch, reducing sugar, glycoside, saponin, tannin, α-amino acid and carbohydrate of *Operculina turpethum* (L.) Silva Manso

Discussion and Conclusion

The study plant, *Operculina turpethum* (L.) Silva Manso, belongs to the Convolvulaceae was collected from Pathein Universtiy Campus. It is commonly known as kya-hin-nyunt in Myanmar. The plant is a perennial twining herb, the stem very long, narrowly 3-5 winged, angular, scabrous tough and brown old. The leaves are simple, alternate, orbicular blade, cordate base, entire margin, tip acuminate, scabrous, petiole cylindrical and narrowly 2 winged. The inflorescences are axillary and solitary cymes. The flowers are white, showy, bisexual, actinomorphic, 5-merous cyclic,and hypogynous. The bracts are oblong, tomentose and pale green. The calyx is 2+3, free, pale green, unequal ovate, quincuncial. The corolla consists of (5), fuse, campanulate, white corolla tube glabrous, twisted in bud. The stamens are 5, petalostemonous,the filament slender, hairy at the base. Anther 2 celled, twisted tip rounded, base sagittate, dorsifixed. The ovary is superior, carpels (2), axile placentation, style single, stigma bi-lobed, intrastaminal disc present. The fruits are loculicidal capsules, globose pointed at the tip, green when young, pink turning as they ripen. The seeds are four, each chamber contains two seeds,they are ovoid, enclosed by a persistent calyx and dark-black colour. These characters are in agreement with those reported by (Hooker, 1885, Kirtikar and Basu, 1935; Backer, 1965; Cronquist, 1981; Hundley and Chit KoKo, 1987; Dassanayake, 1980; Hu Qi-ming and Wu-De-Lin, 2009).

According to the results of phytochemical studies, chemical constituents such as starch, reducing sugar, glycoside, saponin, tannins, α-amino acid, carbohydrates, alkaloid, flavonoid and phenolic compounds were isolated from the sample of *Operculina turpethum* (L.) Silva Manso. These characters are similar to those described by Marini Bettolo, 1981; the Central Council for Research in Unani Medicine, 1987; Trease and Evans, 2002 and Harborne, 2005. According to the website information, tannins, flavonoids, alkaloids and several other aromatic compounds of plants that serve as defense mechanisms against predation by many microorganisms, insects and herbivores. The antibacterial activity of flavonoids is probably due to their ability to bind with bacterial cell walls. The main properties of flavonoid includes antioxidant activity. Several reports are available in support of the antimicrobial activity of saponins against bacterial and fungal pathogens. The alkaloids are known to have antimicrobial and anti-parasitic properties. The alkaloids have a wide range of pharmacological activities including antimalarial, antiasthma, anticancer, antibacterial, etc. Many have found use in traditional or modern medicine or as starting points for drug discovery. They almost uniformly evoke a bitter taste (Website 6). Carbohydrates are one of the main types of nutrients. They are the most important source of energy for our bodies. (Website 7).(Belinha *et al*., 2007).

The medicinal plant *Operculina turpethum* (L.) Silva Manso possesses many medicinal values. Moreover, other bioactive compounds should be isolated from the various plant parts that may serve as leads for the development of new therapies that better address unmet therapeutic needs.

Therefore, the present research aims to provide a comprehensive overview of the traditional and ethnomedicinal uses and phytochemistry of *Operculina turpethum* (L.) Silva Manso. So, this plant should be the subject of effective pharmacological research in the near future.

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