



Received on 06 July, 2011; received in revised form 14 October, 2011; accepted 07 December, 2011

OPERCULINA TURPETHUM AS A PANORAMIC HERBAL MEDICINE: A REVIEW

Veena Sharma* and Manu Singh

Department of Bioscience and Biotechnology, Banasthali University, Banasthali 304022, Rajasthan, India

ABSTRACT

Keywords:

Operculina turpethum,
Turpeth,
Ayurveda,
Purgative

Correspondence to Author:

Veena Sharma

Associate Professor, Department of
Bioscience and Biotechnology, Banasthali
University, Banasthali 304022, Rajasthan,
India

O. turpethum is the source of the drug known as Turpeth or Indian Jalap and it is widely grown throughout India and it is occasionally cultivated in gardens as an ornament. It has been used as a traditional medicine in many countries. The root is prescribed in scorpion sting and snake bite. The roots are bitter, acrid, sweet, thermogenic, purgative, carminative, antihelmintic, expectorant, antipyretic, hepatic, stimulant and hydragogue. They are useful in colic constipation, dropsy, vitiated conditions of vata, paralysis, myalgia, arthralgia, pectoralgia, bronchitis, obesity, helminthiasis, gastropathy, ascites, inflammations, intermittent fever, leucoderma, pruritus, ulcers, erysepelas, haemorrhoids, tumors, jaundice, ophthalmia, employed in drug formulations, dropsical effusions and rheumatism. Some of the Ayurvedic preparations are Trivritaadi ghrita, Trivritadi kwaatha, Abhyarishta, Kaishorgugglu and Chandraprabha vati. It is the best amongst the herbs used for Virechana (i.e. therapeutic purgation), one of the procedures of Ayurvedic Panchakarma therapy. This review comprehensively incorporates the medicinal uses, and pharmacology of *O. turpethum*. The plant, *Operculina turpethum* is endangered so it also prompts attention to protect it from extinction.

INTRODUCTION: The Ayurvedic concept appeared and developed between 2500 and 500 BC in India. The literal meaning of Ayurveda is "science of life," because ancient Indian system of health care focused views of man and his illness¹. Ayurveda remains an important system of medicine and drug therapy in India. Phytochemicals are the primary active ingredients of Ayurvedic drugs.

Today the pharmacologically active ingredients of many Ayurvedic medicines are being identified and their usefulness in drug therapy being determined and high percentage of plants are used in traditional medicines. It is estimated that of the discovered 17,000 species, nearly 3,000 species are used in medicinal field².

The practice of Ayurveda therapeutics consisted of 8 sections divided into 180 chapters and listed 314 plants, which are used as medicines in India¹. The Indian subcontinent is a vast repository of medicinal plants that are used in traditional medical treatments³. Many Westerners have long regarded the Indian systems of medicine as a rich source of knowledge¹.

In India, around 20,000 medicinal plants have been recorded however traditional communities are using only 7,000 - 7,500 plants for curing different diseases⁴. The medicinal plants are listed in various indigenous systems such as Siddha, Ayurveda, Amchi, Unani and Allopathy with specific species for various ailments³. Sarangdhara mentioned detailed information about various formulations with respect to their methods of

preparation as well as basic standards and are documented in Sarangdhara Samhita. The medicinal plants contain several phytochemicals such as Vitamins (A, C, E, and K), Carotenoids, Terpenoids, Flavonoids, Polyphenols, Alkaloids, Tannins, Saponins, Enzymes, and Minerals etc. These phytochemicals possess antioxidant activities, which can be used in the treatment of multiple ailments⁵.

Operculina turpethum Linn is convolvulaceous plant which is found throughout India, China, Ceylon, Australia. The bark of the fresh root is rubbed up with milk and administered as purgative⁶. *Trivrit* has two varieties as *Aruna* or *Shweta* (i.e., having whitish or reddish coloured root) & *Shyama* (i.e., having blackish root). The botanical name of *Aruna* or *Shweta Trivrit* is *Operculina turpethum* (L.) Silva Manso (syn. *Ipomoea turpethum*), while that of *Shyama* is *Ipomoea petaloides* Choisy⁷.

The active principle of the leaves is a cardiotonic substance named oleandrin. The roots, bark and seeds contain cardio-active glycosides, formerly designated as neriodorin, neriodorein and karabin⁶. It also contains β -sitosterol, α - and β -turpethin, coumarin, scopoletin, lupeol, betulin. The fresh juice of leaves is dropped into the eyes for inducing lachrymation in ophthalmia.

BOTANICAL DESCRIPTION

Taxonomical Classification:

- Kingdom : Plantae
- Subkingdom : Tracheobionata, vascular plants
- Superdivision : Spermatophyta, seed plants
- Division : Angiosperma
- Class : Dicotyledons
- Order : Solanales
- Family : Convolvulaceae
- Genus : Operculina
- Species : *O. turpethum* (L.) Silva Manso
- Binomial name : *Operculina turpethum* (L.) Silva Manso⁸

Distributional Range:

Native:

- **Africa:**
East Tropical Africa: Kenya; Tanzania

South Tropical Africa: Mozambique; Zimbabwe
Western Indian Ocean: Madagascar; Mauritius; Reunion

- **Asia-Temperate:**
China: China - Guangdong, Guangxi [w.], Yunnan [s.] Eastern Asia: Taiwan
- **Asia-Tropical:**
Indian Subcontinent: India; Nepal; Pakistan [possibly]; Sri Lanka
Indo-China: Indochina; Myanmar; Thailand
Malaysia: Indonesia; Malaysia; Papua New Guinea; Philippines
- **Australasia:**
Australia: Australia - Northern Territory, Queensland
- **Pacific:**
Northwestern Pacific: Micronesia

Naturalized:

- **Southern America:**
Caribbean: West Indies^{9, 10, 11}

Synonyms:

Basionym:

- *Convolvulus turpethum* (L.)

Homotypic:

- *Ipomoea turpethum* (L.)
- *Merremia turpethum* (L.)
- *Spiranthera turpethum* (L.)¹²

Heterotypic:

- *Argyreia alulata* (L.)
- *Convolvulus anceps* (L.)
- *Convolvulus triqueter* (L.)
- *Ipomoea anceps* (L.)
- *Ipomoea diplocalyx* (L.)
- *Ipomoea silvana* (L.)
- *Ipomoea turpethum* Var. *Anceps*. (L.)
- *Operculina triquetra* (L.)
- *Operculina turpethum* var. *heterophylla* Hallier F (L.)^{13, 14, 15}

Morphological Description:

Macroscopic: It is a perennial aromatic creeper with a simple stem, triangular or rectangular stems. Leaves are many and are oval in shape, 2 to 5 inch in length. It consists of cylindrical pieces of root and stem, 1.5-15 cm. long x 1-5 cm. diameter, often with central woody portion removed by splitting the bark on one side, external surface longitudinally furrowed giving the drug a rope-like appearance, fracture short in bark and fibrous in wood, odor distinct but unpleasant or musty, taste somewhat like bland at first, then slightly acrid.

The pieces of root are cylindrical, somewhat twisted and externally of a dull gray color ¹⁶. The flower presentation is 1 to 4 inch long and has 3 to 4 branches that bear white flowers. Fruit is round $\frac{1}{2}$ or $\frac{3}{4}$ inch in diameter, it bears 4 shiny 2 inch long seeds. The plant bears fruits and flowers from March to December.

Microscopic: Mature root shows thin cork, consisting of 3-5 rows of brown cells, secondary cortex 4-6 layered, composed of tangential elongated, thin-walled cells, some of the cortical cells become thick-walled appearing as isolated, oval to sub-rectangular sclerenchymatous cells having wide lumen, secretory cavities surrounded by subsidiary cells and resin canals found scattered in secondary cortex, secondary phloem, a wide zone, consisting of sieve elements and phloem parenchyma, vascular bundles arranged in a continuous and a discontinuous ring, traversed by uni and biseriate medullary rays, numerous resin cells also seen in phloem in longitudinal rows.

Xylem shows 3-5 radiating arms, small patches of intraxillary phloem often formed, xylem vessels in singles or 2-3 in groups, having simple pits on their walls, calcium oxalate crystals as prisms and rosettes found scattered in cortex, phloem parenchyma, xylem parenchyma and medullary ray cells starch grains, both simple and compound, simple ones elliptical to spherical with central cleft hilum, compound grains consisting of 2-4 components, size vary from 5-44 μ in diameter, found scattered in cortex, phloem parenchyma, xylem parenchyma and medullary ray cells ¹⁷.



FIG. 1: ROOTS OF *O. TURPETHUM*



FIG. 2: *O. TURPETHUM* PLANT WITH FLOWERS

PHARMACOLOGY: It is a vata and pitta moderator. It helps in improving the peristaltic movements in the body therefore are used as laxative. It is anti-inflammatory in action because of its hot potency. It also helps in managing the normal body temperature.

According to Ayurveda it contains:

- **Gunna (properties)** – laghu (light), tikshan (sharp) and ruksha (dry)
- **Rasa (taste)** – katu (pungent) tickta (bitter)
- **Virya (potency)** – ushan (hot) ¹⁸

Chemical Constituents: Upon literature survey, it was found that the active principle of the plant is glycosidic resin. The scopoletin, a coumarin derivative, turpethinic acid and its derivatives were isolated from the plant. Boutron-Chalard found in turpeth root a volatile oil, albumen, starch, a yellow coloring matter, lignin, salts, and ferric oxide. The root contains 10 percent of resin. According to Spigatis this resin is a glycoside, *turpethin* like that of other Convolvulaceae, insoluble in ether, but soluble in alcohol.

Alcoholic extract of *O. turpethum* showed the presence of glycosides, saponins flavonoids, steroids and carbohydrates. Turpethin is mainly responsible for purgative action of *Trivrit*. The plant contains b-sitosterol, α - and β -turpethin, lupeol and botulin¹⁹.

Medicinal Uses: Turpeth has long been in use in India as a purgative, i.e., a drug, which hastens active movement of the bowels, but it was officially acknowledged in the list of Indian Pharmacopoeia only in 1946. Only the dried roots of the white variety with its undamaged bark find its place there. The roots are bitter, acrid, sweet, thermogenic, purgative, carminative, antihelmintic, expectorant, antipyretic, hepatic, stimulant and hydragogue²⁰. They are useful in colic constipation, dropsy, vitiated conditions of vata, paralysis, myalgia, arthralgia, pectoralgia, bronchitis, obesity, helminthiasis, gastropathy, ascites, inflammations, intermittent fever, leucoderma, pruritis, ulcers, erysepelas, haemorrhoids, tumors, jaundice, consumption and ophthalmia²¹.

Chronic Constipation cured by turpeth: Turpeth is used as a laxative. It has virtually similar properties as the true jalap, botanically known as *Exogonium purga* and can be used with benefit as its alternative. It is a better-quality herb compared to rhubarb. Its pulverized roots are used as a laxative and to alleviate any acute constipation²².

Arthritis cured by turpeth: The drug is advantageous in treating rheumatic and paralytic diseases. A single dosage of 3 to 4 grams should be taken everyday.²²

Dropsy healed by turpeth: Turpeth is a priceless drug for treating dropsical infections. The tuberous roots in dosages of 2 to 4 grams, blended with *Chebulic myroblan* (harad) are particularly valuable in such disorders²².

Gout healed by turpeth: Turpeth is administered in an equivalent manner like dropsical infections for the treatment of gout²².

Jaundice cured by turpeth: In Ayurveda, turpeth is regarded one of the two indispensable drugs with which the treatment of jaundice should begin. One or two teaspoon of the grind of each of the two drugs may be dispensed with hot water twice everyday.²²

Anti-venom: The root purgative and prescribed in scorpion sting and snake bite. Other Diseases healed by turpeth. Turpeth is also efficacious for other diseases like melancholia, leprosy, enlargement of spleen and paralysis. Its effectiveness magnifies threefold when mixed with *chebulic myroblan*²³⁻²⁴.

Ayurvedic Formulations: There are at least 135 herbal and herbomineral formulations used in Ayurvedic medicine, which contain *Trivrit* as their vital ingredient. The concise list of commonly used formulations and their indications is given.

Common Ayurvedic Formulations of Trivrit with their Indications:

1. *Trivrit Avaleha* - GI disorders, hepatosplenomegaly, abdominal tumors
2. *Panchasama Churna* - Flatulence, constipation, anorexia, dysentery
3. *Alambushadi* - Yoga Ascites, edema, arthritis
4. *Malashodhak Churna* - Constipation, flatulence
5. *Avipattikar Churna* - Acid peptic disorder, constipation
6. *Abhayadi Modak* - Constipation, therapeutic purgative
7. *Agnimukh loha* - Anaemia, edema, haemorrhoids, & GI disorders
8. *Kalyanak Gud* - Gastrointestinal disorders, tumors, ascites, edema & skin diseases
9. *Vyoshadi Gutika* - Gastrointestinal disorders, debility, vertigo, urinary disorders
10. *Narach Churna* - Ascites
11. *Sukhavirechak Churna* - Habitual constipation
12. *Tryushanadi Churna* - Abdominal tumor, chest pain
13. *Haridra Khanda* - Urticaria & other skin disorders
14. *Punarnavadi Mandoor* - Anaemia, ascites, edema, hepatosplenomegaly
15. *Mahamanjishthadi Kwath* - Skin disorders, paralysis, elephantiasis, wounds
16. *Trivritadi Kalka* - Worm infestation
17. *Kaishore Guggulu* - Musculoskeletal disorders, skin ailments, diabetes, wound, ascites
18. *Aragwadhadi Kwath* - Anticardiac, laxative & colon cleanser
19. *Chandraprabha Vati* - Urinary & musculoskeletal disorders
20. *Ashwagandharishta* - Anxiety, stress, sexual or general debility

21. *Bharangyadi Kwath* - Flu, asthma, pneumonia
22. *Trivritadi Modak* - Respiratory disorders, backache
23. *Trivrit Arishta* - Abdominal tumor, edema, anaemia & sprue
24. *Vachadi Lepa* - Topically for skin disorders, alopecia, lymphadenitis, & fistula
25. *Jambvadi Taila* - Topically for wounds and Gonorrhoea (genital ulcers)²⁵

Precautions: Its use in children or in physically or mentally weaker persons or overdose of *Operculina turpethum* may lead to complications like excessive purgative activity, bleeding per rectum, vomiting, abdominal pain, chest pain, dehydration, hypotension, vertigo, confusion, shock, & unconsciousness.²⁶ It should not be used in pregnancy, in children below 12 years of age, in elderly, in physically or mentally weaker persons, and in persons suffering from diarrhoea, bleeding per rectum, rectal prolapse, or fecal incontinence²⁷. *Trivrit* may act as an abortifacient when used in pregnant ladies.

CONCLUSION: *Operculina turpethum* is a convolvulaceous plant which is found throughout India, China, Ceylon, Australia, and is occasionally cultivated in botanical gardens as an ornamental plant. There are two varieties, viz., *Sveta* or white turpeth, and *Kirshna* or black turpeth⁷. *Operculina turpethum*, which is commonly known as trivit, is a large stout perennial twinner with milky juice and fleshy branched roots. It is one of the plants mentioned in the literature having claims of activity against liver disorders.

It also has antihelmintic, expectorant, antipyretic, anti-inflammatory and purgative properties. It contains a wide variety of phytoconstituents, which are useful in treatment of different ailments and includes glycosidic resin, coumarins, β -sitosterol, and essential oils. Few toxicity studies done in rodents have confirmed the safety of both crude powder and extract of *O. turpethum*²⁸. The bark of the plant contains a glycosidic resin, which has the insoluble glycoside turpethin and two ether soluble glycosides. In addition, it also contains a minor amount of essential oil, glucose and fructose²⁹.

ACKNOWLEDGEMENT: The authors are thankful to the authorities of Banasthali University for providing support to the study.

REFERENCES:

1. V. Subhose. Bull Indian Hist Med Hyderabad.,35:83,2005
2. M.P. Nayar, Bull.Bot. Surv. Ind. 29:319,1987
3. B. Ballabh and O.P. Chaurasia J.Ethanopharmacoe., 112:341,2007
4. R. Perumal Samy and S. Ignacimuthu J.Ethanopharmacoe. 62:173, 1988
5. Bhattacharyajee S.K. Handbook of Medicinal Plants. Pointer Publishers Jaipur, India 1998
6. 6.Nadkarni,K.M. and Nadkarni A.K. 1999 Indian Materia Medica Vol I Popular Prakashan Ltd BOMBAY.,131:965
7. K.P. Srikantha Murty, Bhavprakash of Bhavmishra, voll Chaukhamba Shri Krishna Das, Varanasi, India.,258:259 2008
8. www.ars-grin.gov,USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - GRIN* taxonomy for Plants Online Database. National Germplasm Resource Laboratory, Beltsville, Maryland, updated 2002 Feb 25; cited on 2010 May 3. Available from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?25779>
9. Turrill, W. B. *et al.*, eds. 1952-. Flora of tropical East Africa. ,F TE Afr
10. Hnatiuk, R. J. 1990. Census of Australian vascular plants. Australian Flora and Fauna Series No. L Aust
11. Matthew, K. M. 1983. The flora of the Tamil Nadu Carnatic. F TamilC, = *Merremia turpethum*].
12. THE INTERNATIONAL PLANT NAMES INDEX 2009
13. Vahl J.F. Macbr,Fieldiana,Bot.,480,1959
14. Roem and Schult Systemic Bio.,4:23,1819
15. Bojer,Hortus Maurit 226,1837
16. D.F. Austin,*Operculina turpethum* as a Medicinal Plant in asia Eco. Bot.,260:265,1982
17. The Ayurvedic Pharmacopoeia of India,Part I, Vol III, 1st edn, Government of India,Ministry of health and family welfare, Department of ISM & H, New Delhi India., 213:214 & 404,2001.
18. Brahmanand Tripathi, Ed. *Charakasamhita* of Agnivesha elaborated by Charaka &Drudhabala. Vol II, Chaukhamba Surbharti Publishers, Varanasi India. 1105:1105,2008.
19. Yoganarasimhan, 2000 and Akthar Hussain et al., 1992.
20. Vasudesan N.V., Indian Medicinal Plants, Vol. IV, Orient Longman Ltd, Chennai. 172 1995.
21. Aswal, B.S., Bhakuni, D.S., Goel, A.K., Kar, K. and Mehrotra, B.N.1984. Screening of Indian plants for biological activity. Part XI. Indian J. Exp. Biol., 22:487.
22. The Ayurvedic Pharmacopoeia of India, Part I, Vol III, 1st edn, Government of India, Ministry of health and family welfare, Department of ISM & H, New Delhi India,pp. 213-214 & 404, 2001.
23. Brahmanand Tripathi, Ed. *Charakasamhita* of Agnivesha elaborated by Charaka & Drudhabala, Vol I, Chaukhamba Surbharti Varanasi India., 60 2008.
24. K. R. Srikantha Murty, Ed. *Bhavprakash of Bhavmishra*, Vol. II, Chaukhamba Shrikrishna Das Varanasi India.,598,2008.
25. Shivprasad Sharma, Ed. *Astangasangraha of Vriddha Vagbhata* with *Shashilekha* Commentary by Indu, Chaukhamba Sanskrit Series Varanasi India, pp. 584-590, 2006.
26. Brahmanand Tripathi, Ed. *Charakasamhita* of Agnivesha elaborated by Charaka & Drudhabala, Vol II, Chaukhamba Surbharti Varanasi, India. 1176:1181,2008.
27. Brahmanand Tripathi, Ed. *Charakasamhita* of Agnivesha elaborated by Charaka & Drudhabala, Vol II, Chaukhamba Surbharti Varanasi India.,1161:1162 2008.
28. Deeaph G and Malti Indian drugs.,31:294 1994
29. Ram Rastogi, B. N. Mehrotra, Shradha Sinha,Mukta Shrivastava, & Bela Bhushan, Compendium of Indian Medicinal Plants, Vol IV, CDRI Lucknow & National Institute of Science Communication New Delhi India.,5132002.