REVIEW ARTICLE

Ayurveda

A REVIEW ON ANCIENT UNANI MEDICINAL HERB NISHOTH *(OPERCULINA TURPETHUM LINN.)*

KEY WORDS: Turbud, Nishoth, Unani, Turpethin, Cardioprotective

Manish Grover Shuddhi Ayurveda, Jeena Sikho Lifecare Pvt. Ltd. Chandigarh 140603, Punjab

ABSTRACT

Restorative plants consistently assumed a significant part in maintaining the wellbeing of humankind. *Operculina turpethum* linn. is one of the medical herb used in Unani and Ayurvedic systems of medicine to treat various diseases. It is widely grown throughout India and it is also cultivated as an ornament in the kitchen gardens. *Operculina turpethum linn.* is also known as 'Turbud' in Arabic and 'Nishoth' in Hindi. Traditionally, it is mentioned that Turbud is white, light-weighted, and possesses good quality of resin on both sides. The root is the most beneficial part of the plant. Traditionally, the root is prescribed in scorpion sting and snakebite. The plant is enriched with various secondary metabolites including saponins, flavonoids, glycosides like turpentine and phenols. It also contains some amount of essential oil, glucose and fructose. The main therapeutic actions of the plant are laxative action, hypoglycemic, anti-dyslipidemia action, anti-inflammatory, ulcer protective and antimicrobial activity. The present review revealed the Ayurvedic and Unani value of *Operculina turpethum* along with its utilization in modern medication systems.

INTRODUCTION:

Plant-based medicines are a major part of the cultural heritage of a society. Natural drugs are used to combat a wide range of disorders. Ayurveda is the ancient Indian system of medicine that developed between 2500 and 500BC. Ayurveda means "Science of Life" and phytochemicals are the primary active ingredient of those natural drugs [1]. In India, there are around 20000 medicinal plants recorded in which only 7000-8000 plants have been used for curing different diseases [2]. *Operculina turpethum* (Linn.) is belonging to the family Convolvulaceae i.e. Morning glory family. The family comprises 55 genera and 1650 species which were found mainly in the tropical region of the world [3]. This is a potent medicinal plant utilized in both Unani and Ayurvedic system of medicine. The plant is indigenous to India, Nepal, Bangladesh, Pakistan, Sri-Lanka, China, Taiwan and Myanmar [4]. This plant is cultivated in hot areas like Karnataka and Tamil Nadu. A large climber perennial plant with milky juice [5-6]. In Ayurveda, *Operculina turpethum* (Figure 1) has two varieties as Aruna or Shweta (i.e. having whitish or reddish colored root) and Shyama (i.e. having blackish root). Oleandrin is an active principle compound of the leaves of *Operculina turpethum* [7]. There are many cardio-active glycosides present in the roots, bark and seed part of plant. Turpethin resin is a rich source present in the root bark of *Operculina turpethum* Linn. It contains many Turpethinic acids i.e. A, B, C, D and E, Volatile oil, albumin, starch, lignin salts, ferric oxide, Scopoleptin, Betulin, Lupiol and Beta-sitosterol. Turpetin is the main compounds used as a purgative [8]. There are about 135 herbal formulations utilized in Ayurvedic medicine, which contain this plant as their vital ingredient. Turbud in combination of ginger and bitartrate of potash is very effective for the removal of dropsical effusion [9]. The plant is utilized in many disorders like colic constipation, dropsy, paralysis, myalgia, arthralgia, pectoraligia, bronchitis, obesity, helminthiasis, gastropathy, ascites, inflammations, intermittent fever, leukoderma, puritus, ulcers, erysipelas, haemorrhoids, tumors, jaundice, ophthalmia and rheumatism arthritis. The plant species is also utilized in the procedures of Ayurvedic Panchakarma therapy. *Operculina turpethum* is called Turbud in Arabic. This word is considered to be coined from its Sanskrit name Tripatak meaning triangulated as its stems are triangulated [10]. The plant is also mentioned as a useful component in many Unani pharmacopeia formulations such as Itrifal Mulaiyyin, Habb-e-Ayarij, Habb-e-Suranjan, Hebb-e-Muqil, Majoon Anjeer and Jawarish Kamooni. Reported studies revealed that *Operculina turpethum* has many therapeutic actions like anti-inflammatory, analgesic, antioxidant and hepatoprotective. The vernacular names or taxonomical classification of *Operculina turpethum* are mentioned in the table no. 1 and 2 respectively.

Table 1. Taxonomical classification of *Operculina turpethum linn.*

Taxonomical Rank	Taxon
Kingdom	Plantae
Division	Angiosperma
Class	Dicotyledons
Order	Solanales
Family	Convolvulaceae
Genus	Operculina
Species	Operculina turpethum

Table 2. Vernacular names of *Operculina turpethum linn.*

Sanskrit	Ardhachandra, Aruna, Kalameshi, Kalaparni, Kali, Kalingika, Kumbhadhatri, Laghurochani, Malavika, Masuravidala, Masuri, Nandi, Paripakini, Rechani, Rochani, Saha, Sara, Sarana, Sarasa, Sarata, Triputa, Trivela, Trivrit, Trivrittika, Vidala
Hindi	Nishothra, Nisotar, Nisoth, Nukpatar, Pitohri, Trivrut, Tarbal, Tarbud, Trabal
English	Indian Jalap, Turpeth, Terpeth Root, False Jalap
Bengali	Teudi, Tvuri, Dhdha kalami
Gujarati	Kala Nasottara
Kannada	ViliTigade
Malayalam	Trikolpo kanna
Marathi	Nisottar
Oriya	Dudholomo
Punjbai	Nisoth
Tamil	Karum Sivadai, Adimbu, Kumbam, Kumbanjan, Kunagandi, Paganrai, Samaran, Sivadai
Telugu	Tella, Tegada
Urdu	Turbud, Nishoth

Figure 1. *Operculina turpethum linn.* (Nishoth)

Botanical Description

Operculina turpethum linn. belongs to the family Convolvulaceae. It is a perennial aromatic creeper with a

simple triangular or rectangular stem. Leaves are simple pubescent on both sides and variable in shape. Leaves are oval in shape long up to 2 to 5 inches. It consists of cylindrical pieces of root and stem, 1.5-15 cm long and 1-5 cm in diameter. It is often with a 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. Root pieces are cylindrical, somewhat twisted and externally of a dull gray color. The flower presentation is 1 to 4-inch-long and has 3 to 4 branches that bear 4 shiny 2-inch-long seeds. The plant bears fruits and flowers from March to December [11-12].

Geographical Distribution

The plant is widely found on the roadside areas in India, up to 1000 square feet. The plant is widely distributed among several tropical regions of India, America, Pakistan, Sri Lanka, China, Philippines, Bangladesh, Madagascar, Mauritania and Africa [13]

Phytochemical constituents

There are many chemical constituents present in this plant. The aerial parts of the plant contain turpethosides A, B glucosidal resin and acid glycosides turpethic acids A-C [14]. There are four new dammarane-type saponins isolated from the root part of the plant [15-16]. Some new triterpenoids and steroidal esters were isolated from the root metabolic extract of the plant. The isolated chemical constituents are 3α, 7α-epoxy lanost-5, 25- dien-3 β-ol, lanost-5,25-dien-3α-ol, 4β-hydroxy-3α, 7α-epoxy stigmast -5, 20- dien- 3β-hexadecanoate, 12β-hydroxy-3α, 7α-epoxy lanost- (Z)-5, 20,22- trien-26-oic acid-3β- tetradecanoate and 3α, 7α-epoxy stigmast –(Z)-5, 20,22- trien-28-oic acid- 3β-hexadecanoate [17]. The stigma 5, 22 dien 3 O-β-D- Glucopyranoside was obtained from an alcoholic extract from the roots of the plant [18]. The roots of the plant contain various bioactive compounds such as β-sitosterol, Scopoletin, Betulin, Cycloartenol, Lanosta-5-ene, Coumarin, acrylamide 3-(4-hydroxy-phenyl)-N-[2-(4-hydroxy-phenyl)-ethyl] and salicylic acid [19].

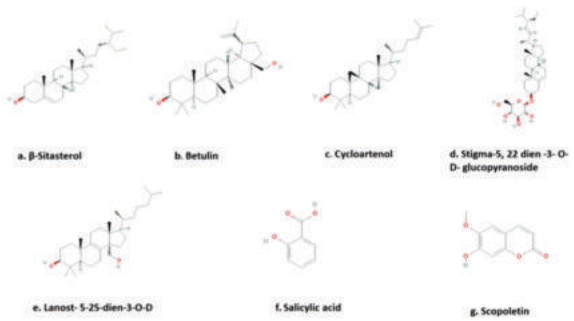

Figure 2: Structures of some major phytochemical constituents of *Operrculina turpethum Linn.*

Traditional and Modern Usages

Ayurvedic View: *Operrculina turpethum linn.* is an ayurvedic herb which is also known as Trivrit. Apart from pharmacological and therapeutic activities, it is also a very important herb utilized in Panchakarma therapy called Virechana-Purgation treatment [20-21].

Table 3. Rasa Panchak of *Operrculina turpethum linn.*

Sanskrit/English	Sanskrit/English
Rasa/Taste	Tikta/Bitter, Katu/Pungent
Guna/Qualities	Laghu/Light, Rooksha/Dryness, Teekshna/Strong piercing
Vipaka/ Metabolic Property	Katu/Pungent
Veerya/ Potency	Ushna/Hot

There are several properties of *Operrculina turpethum linn.*

Operculina turpethum is the best purgative. It has strong, pungent and piercing nature, it helps in losing weight. It is beneficial in constipation. Other ayurvedic uses [22] of this plant are:

Krumihara – Useful in worm infection, infected wounds
Shleshmodara- useful in ascites
Jvaraghna- The plant is used in fever.
Shophahara- Also prescribed in anemia, early stage of liver disorders
Pleeha- Utilized to treat splenomegaly
Hrudroga- It is used as a cardiotonic.
Vatasruk- Also useful in gout.
Udavartahara- give relieves from blotting, gas distension in the abdomen.

There are about 135 herbal formations in which Trivrit is considered a vital ingredient. Some common ayurvedic formulations of trivrit are:

Trivrit Avaleha – GI disorders, hepatosplenomegaly, abdominal tumors
Panchasarma Churma – Flatulence, constipation, anorexia, dysentery
Alambushadi-Yoga Ascites, edema, arthritis
Malashodhak Churna- Constipation, Flatulence
Avipattikar churma – Acid peptic disorder, constipation
Abhayadi Madak- Constipation, therapeutic purgative

a. Unani View: *Operculina turpethum* is named as Turbud in Unani. Turbud is of two types i.e. white and black. White Turbud is utilized for medicinal purposes whereas black Turbud is not used for therapeutical purposes because of its emetic effect. In the Unani system of medicine, there are many therapeutic usages of this plant i.e. Mus'hil (Purgative), Mulaiyyin (Laxative) and Da' fa-e-Amraz- e-BalghamwaSauda (removes morbific matters of phlegmatic and biliary disease). The plant is also given in brain disorders. It has Mus'hil-e-Balgham, Qata-e-Balgham-e-Ghaleez (Expectorant), Munaqqi-e-Dimag (Brain evacuant) Muqawwi-e-Dimagh (Brain tonic), Munaqqi-e-Meda (Gastric depurative), Mujaffi-e-Badan (desicative) Istifiragh-e-Rutubat (Excretory), Mus'hil (Laxative) activities. The major indications of Turbud are Waja-ul-Mafasil (Arthiritis), Istisqa (Ascites), Niqris (Gout), Irq-un-Nasa (Sciatica), Falji (Hemiolegia), LAqwa (Facial Palsy) Sua'lcounh], xeeq-un-nagas (Bronchial action), janoon (insanity), and Sara (Epilepsy) [23].

There are two important Unani Formulation of Turbud i.e.

Itrifal Ustu-Khud' dus, Itrifal Ustu-lkhud'udI, Itrif Zamani, Itrifal Muqil, Itrifal Mulaiyyin, Jawarish Kamooni, Sharbat Mushil, Habb-e-Mafasil, Habb-e- Ayurij, Habb-e-Suranjan

Modern View: The consumption of herbal medicines has increased nowadays world widely. Reported studies have revealed an increased growth in the sale of herbal products from the year 2000 to 2008 ranges from 3% to 12 % per year [24]. Due to the increased demand of herbal products, the risk with herbal medicines also rises. The quality of the end product compromises because of the contamination of raw material with toxic metals microbes, other residues and adulteration (addition of fake or inferior plant material, orthodox drugs, foreign material) which results in the poor quality of medicinal products [25]. Internal issues like non-uniformity (rises due to environmental factors and geographical distribution, use of pesticides, fertilizers) and complexity in the ingredients of herbal medicines are also raised which affects the quality of herbal medicines [26]. Lack of standardization technique for herbal products is also responsible for the poor quality of drugs because of the failure to detect the original drug which exploits its usage in the conventional system of medicines [27]. The development of new dosage forms without affecting the principal

component is the present-day need. Many polyherbal formulations contain Opercculina turpethum plant as the main ingredient to treat several ailments like Arthcure capsule effective in arthritis, Saraswata ghrita in anti-dementing activity in worm infestation, Vranashodana Taila in wound healing, Tekshan Virechana churna, Avipattikar Churna, Panchsam churna, and Sukha Virechana churna in treatment of constipation [28-32].

Reported Pharmacological Properties of *Operrculina turpethum Linn*.

Several scientific research/studies showed that this plant consists of various pharmacological activities such as antimicrobial, antiulcer, antidiabetic, hepatoprotective, antidepressant, laxative and many others. They are mentioned below:

Antimicrobial Activity: Alam et al., reported antimicrobial activity of petroleum ether and ethanolic extracts of leaves of *Operrculina turpethum* plant by standard disc diffusion method against Gram-positive bacteria such as *Strptococcus haemolytica* and *Bacillus subtilis* and Gram-negative bacteria such as *Pseudomonas aeruginosa, Shigellasonnei*, and *Shigella dysenteriae* [33]. Shuaib et al., reported the antibacterial activity of resin-rich methanolic extracts (RRMEs) of *Operrculina turpethum*, *Commiphora myrrha* and *Pinus roxburghii*. The finding revealed that RRMEs of *Operculina turpethum* possess higher antimicrobial activity than *C. myrrha* and *P. roxburghii* [34]. Ahmad et al., investigated antimicrobial activity of three selected unani plants i.e. *Operculina turpethum, Cyperus rotundus* and *Acorus calamus* against *Escherichia coli* (ATcc 259220, *staphylococcus aurens* (ATCC 25923), *Pseudomonas aeruginosa* (ATCC 27853) [35]. Harun et al. reported antimicrobial activity of three compounds isolated from the chloroform extract of stem of *Operculina turpethum* i.e. H-1 (□-sitosteryl-□-D glucoside), H-2 (22,23-dihydro-□-spinosteryl glucoside and salicylic acid. All three compounds have shown antimicrobial activity against thirteen pathogenic bacteria's [36].

Antiulcer Activity: Ignatius et al., reported antiulcer activity of hydro-alcoholic and methanolic stem bark extracts of *Operculina turpethum* to treat various diseases like peptic ulcer, inflammation and pain. The dose of 100 mg/kg was administered orally in the animal model. The finding revealed that hydroalcoholic extract has better antiulcer effect than methanolic extract [37]. Nitin et al., reported potential antiulcer activity of *Operculina turpethum* in pylorous ligated albino rats. Lansoprazole drug was given as a standard. *Operculina turpethum* showed better antiulcer effects than standards [38].

Antidiabetic Activity: Onoja et al., reported antidiabetic activity of various fractions of *Operculina turpethum* i.e. Flavonoid fraction (OTFF), tannin fraction (OTFF), saponin fraction (OTSF) in the albino mice by alpha-amylase inhibition assays and MTT assay. The finding revealed that OTFF was more potent than standard Acarbose [39]. Pulipaka et al., reported antidiabetic activity of methanolic extract of roots and stems of *Operculina turpethum* in Streptozotocin-induced type-2 diabetic animal model. The extract of 100mg/kg of body weight was administered orally to normal, glucose loaded and experimental diabetic rats for 21 days. A significant reduction was found in fasting glucose levels in rats [40].

Anti-diarrhoeal Activity: Shareef et al., reported antidiarrhoeal activity of crude extract of *Operculina turpethum* in the castor oil-induced diarrhea animal model. The dose of 300-1000mg/kg body weight exhibited an antidiarrhoeal effect in models which was similar to a standard drug i.e. Loperamide [41].

Hepato-protective Activity: Ahmad et al. reported hepatoprotective activity of ethanolic extract of *Operculina turpethum* in paracetamol-induced rats. The result showed a significant reduction in the serum levels of SGOT, SGPT, Alkaline, Phosphatase and Bilirubin in rats [42]. Vijayabhaskar et al., reported hepatoprotective activity of methanolic extract of *Operculina turpethum* rhizomes in carbon tetrachloride-induced Wister albino rats. The dose of 200, 400mg/kg body weight showed significant hepatoprotective activity in rats [43]. Prakash et al. reported hepatoprotective activity of herbomineral formulation of *Operculina turpethum* in carbon tetrachloride-induced hepatotoxicity in rats [44].

Analgesic Activity: Prabhavathi et al., reported analgesic activity of chloroform and petroleum ether extract of *Operculina turpethum* at different doses (125, 250, 500, 1000 mg/kg) against various types of pain stimuli in mice [45].

Anti-inflammatory Activity: Khare et al., reported anti-inflammatory activity of ethanolic, aqueous and ethereal extract of *Operculina turpethum* in carrageenan-induced paw edema, cotton pellet induced granuloma and formalin-induced arthritis rats. Aqueous extract of *Operculina turpethum* was reported as more potent fraction in all three animal models [46].

Anti-Cancer Activity: Anbuselvam et al., reported anticancer activity of methanolic extract of *Operculina turpethum* stems. The dose of 100mg/kg body weight retrieved the level of antioxidant enzymes such as Superoxide Dismutase (SOD), catalase (CAT), Glutathione (GSH), Ascorbic acid (vitamin C), Alpha-tocopherol (Vitamin E) and inhibited the levels of lipid peroxidation in 7, 12 dimethylbenzanthracene (DMBA) in female Sprague-Dawley rats [47]. Umamaheswari et al., showed an ameliorating effect of ethanolic and chloroform extract of *Operculina turpethum* in N-nitrosodiumethylamine induced male mice. The chloroform extract showed the highest inhibition of cell growth in comparison to ethanolic extracts [48].

CNS Depressant Activity: Islam et al., reported antidepressant activity of ethanolic extract of *Operculina turpethum* in rats. The dose of 500 mg/kg body weight showed potent antidepressant activity [49].

Laxative Activity: Onoja et al., reported laxative activity of leaf extract of *Operculina turpethum* in mice. The dried leaves of *Operculina turpethum* were successively extracted with hexane, chloroform and 70% methanol using cold maceration method. A significant laxative action was found in the mice treated with the *Operculina turpethum* extract [50].

Anti-Obesity Activity: Sudan et al., studied anti-obesity activity of roots of *O. turpethum*. The roots are beneficial in treating fatty liver and improving fat metabolism in the liver. This plant works effectively against obesity by decreasing excessive body fat [51]. Reported studies on *Operculina turpethum* are listed in table no. 4.

Table 4: Reported experimental and clinical studies on *Operrculina turpethum*

S. No.	Extract	Method	Pharmacological Activity	References
1.	Petroleum ether and Ethanolic Extracts of leaves	*Strptococcus haemolytica, Bacillus subtilis, Pseudomonas aeruginosa, Shigellasonnei,* and *Shigella dysenteriae*	Antimicrobial	33
2.	Resin rich methanolic extracts	*Staphylococcus aureus, Enterobacter aerogenes, Bacillus subtilis, Salmonella typhimurium, Escherichia coli*		34

3.	Hydro-alcoholic and methanolic stem bark extracts	Albino Rats	Antiulcer	37
4.	Flavonoid fraction (OTFF), tannin fraction (OTFF), saponin fraction (OTSF)	Albino Rats	Antidiabetic	39-40
5.	Methanolic extract of roots and stems			
6.	Crude extract of *O. turpethum*	Rats	Anti-diarrheal	41
7.	Ethanolic extract	Rats	Hepatoprotective	42-44
8.	Methanolic extract	Wister male rats		
9.	Herbominearal formulation	Rats		
10.	Chloroform and petroleum ether extract	Mice	Analgesic	45
11.	Ethanolic, Aqueous and Ethereal Extract	Arthritis Rats	Anti-inflammatory Activity	46
12.	Methanolic Extract	Female Sprague-Dawley rats	Anti-Cancer Activity	47-48
13.	Ethanolic and Chloroform extract	Male mice		
14.	Ethanolic Extract	Rats	Antidepressant	49
15.	Leaf extract	Mice	Laxative	50

CONCLUSION:

Nature has been a good source of the medicinal plant since past time. At present, many modern drugs have been isolated from the plant source. The present review compiles the information of *Operculina turpethum* plant on the basis of traditional and modern uses and pharmacological actions. Many scientific studies have proved the pharmacological activities of *Operculina turpethum* like antimicrobial, anti-inflammatory, anticancer, analgesic, antidiabetic and antiulcer and many more. Conclusively, *Operculina turpethum* is proved to be a potent unani medicinal herb with many commercial value.

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