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A Review on *Operculina turpethum*: A Potent Herb of Unani System of Medicine

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Abstract

Operculina turpethum (L.) Silva Manso (Convolvulaceae) is a well-known medicinal herb traditionally used in Unani system of medicine to treat various diseases. It is mainly used as expectorant, brain tonic and laxative. The drug has been indicated for the treatment of arthritis, ascites, gout, hemiplegia and facial palsy. Since ages, it has been mentioned as a useful component in many Unani pharmacopoeial formulations such as; Itrifal Mulaigyin, Habb-e-Ayarij, Habb-e-Suranjan, Habb-e-Muqil, Majoon Anjeer, and Jawarish Kamooni. Pharmacological studies have revealed that *Operculina turpethum* exerts anti-inflammatory, analgesic, antioxidant, anti-diabetic, anti-ulcer, anti-diarrhoeal, antispasmodic, bronchodilator, anti-cancer, antimicrobial and hepatoprotective actions. The major phytochemical constituents as reported by the concerned studies are phenol, flavonoid, phytosterol, terpenoid, cardiac glycosides, resin, glucoside, turpethinic acid, volatile oil, scopoleptin, triterpenes and sitosterol. The efforts have been made to give a pragmatic description of the plant with its pharmacological and phytochemical properties so as to utilize its inherent potentialities for the welfare of ailing masses.

Keywords: *Operculina turpethum*, Turbud, Unani

1. Introduction

Operculina turpethum (L.) Silva Manso of family Convolvulaceae, is a potent medicinal plant, used in both Unani and Ayurvedic systems of medicine. The plant is native to Asia; India, Nepal, Bangladesh, Pakistan, Sri Lanka, China, Taiwan and Myanmar. Generally, it is reported throughout the warmer parts of India; whereas, in Karnataka and Tamil Nadu the plant is recorded from the dry zones. The plant is a large climber and perennial twinner. The leaves are simple, pubescent on both sides and variable in shape. The leaf base is either cordate or truncate at base, nearly 5-12.5 cm long and 1.3-7 cm wide. The flowers are white, campanulate, sepals long, borne in cymes of few flowers, giving way to globose capsules enclosed within overlapping brittle sepals. The capsule is rounded, being 1 to 1.5 centimeters and contains normally 4 black smooth seeds (Fig.1B) The stems are very long twisting, pubescent, angled and winged which become very tough and brown when become old. The roots are long, slender, fleshy and much branched. The thin root is about 4 mm in diameter and is circular with irregular wavy outline ^[1].

During the flowering season, plants are uprooted and detached roots from the plants are shed dried to be used as a drug. It is called Turbud Safaid in Urdu, Nisoth in Hindi, Dudh Kalmi in Bangali, Tellategada in Telugu, Shivadai in Tamil, Billitigate in Kannada and Chivaka in Malayalam. The plant contains resin, jalapine and convolvulin which are insoluble in ether, benzene and carbon sulphide. It is used as purgative and mild cathartic. Turbud in combination of ginger and bitartrate of potash is very effective for the removal of dropsical effusion ^[1, 2].

2. Description**2.1 Macroscopic**

It consists of the root and stem of the plant, cut into short lengths, usually 1.5-5 cm in diameter; the central woody portion is often removed by splitting on one side. The exterior surface has twisted rope like or columnar appearance and is of dull grey colour. A transverse section shows a porous surface of dirty white colour loaded with pale yellowish white resin. ^[3]

2.2 Microscopic

The epidermis consists of tubular brown cells; parenchyma is starchy and thick, scattered very large resin cells and various rosettes like raphides. Many large vascular bundles are composed

of large dotted vessels surrounded by wood fibres; each of prominent external ridges of the bark contains one of these bundles. Central cane like woody column of the root or stem, when present, is seen to be divided into four parts by four bands of parenchyma. [3]

2.3 Powder

The root powder is greyish to light brown in colour consisting of parenchymatous cells. The cellulosic fibres have pointed



Fig 1: A) Plant of *Operculina turpethum*



B) Fruits of *Operculina turpethum*

tips. The vessels consist of simple pits. The starch grains are simple and compound, elliptical to spherical with central cleft, measuring 5-44 μ in diameter having 2-4 component, rosette and prismatic crystals of calcium oxalate [3, 4].

3. *Operculina turpethum* in Unani System of Medicine

Unani name of *O. turpethum* is Turbud. According to Unani system, it is of Hot³ and Dry² temperament and is slightly bitter in taste. There are two types of Turbud i.e. white and black; white Turbud is used for medicinal purposes; while black one, is not considered therapeutically safe due to its emetic effect. It exerts Mus'hil (Purgative), Mulaiyyin (Laxative) and Da'fa-e-Amraz-e-Balgham-wa-Sauda (removes morbidic matters of phlegmatic and biliary diseases) actions; it is also used in neurological 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 (Arthritis), Istisqa (Ascites), Niqris (Gout), Irq-un-Nasa (Sciatica), Falij (Hemiplegia), Laqwa (Facial palsy), Sua'l (Cough), Zeeq-un-Nafas (Bronchial Asthma), Junoon (Insanity), and Sara (Epilepsy). The recommended therapeutic dose of Turbud is 3-5 gm in form of Safuf (powder), and 5-7 gm in form of Joshanda (decoction). It has also been included in some important Unani formulations such as Itrifal Ustu-khud'dus, Itrifal Zamani, Itrifal Muqil, Itrifal Mulaiyyin, Jawarish Ood-e-Mulaiyyin, Jawarish Kamooni, Sharbat Mus'hil, Habb-e-Mafasil, Habb-e-Aftimoon, Habb-e-Istisqa, Habb-e-Ayarij, Habb-e-Suranjan, Sharbat Mus'hil, Majoon-e-Anjeer, Majoon-e-Sana, Majoon-e-Suranjan, and Majoon-e-Najah. The prominent Unani physicians such as Avicenna and Ibn-e-Masoya have also mentioned the herb in their treatises [1, 3, 5-13].

4. Pharmacological properties of *Operculina turpethum* L.

4.1 Anti-inflammatory, Analgesic and Antioxidant Property

Anti-inflammatory potential of different extracts (ethanolic, aqueous and ethereal) of *O. turpethum* has been reported in carrageenan-induced paw oedema, cotton pellet-induced granuloma and formalin induced arthritis animal model of rats. The aqueous extract was reported more potent fraction in all three animal models [14].

In another study, pre-treatment of roots of *O. turpethum* and its polyherbal formulation; Avipattikar Churna (100 mg/kg body weight) showed anti-inflammatory activity in rat paw oedema induced by formalin in experimental animal model [15].

Methanolic extract of leaves of *O. turpethum* has shown analgesic and antioxidant effects in mice experimental model by using acetic acid induced abdominal writhing reflex and tail flick methods. The antioxidant activity was assayed using photometric 2, 2-diphenyl-1-picrylhydrazyl free radical scavenging assay method. In this study, the methanolic extract at the dose level of 100mg/kg, 200 mg/kg, 400 mg/kg body weight produced a significant ($p < 0.05$) dose-dependent reduction in the number of abdominal constriction induced by intraperitoneal injection of acetic acid in treated mice when compared to the distilled water treated mice. The extract (100, 200, and 400 mg/kg), aspirin (100 mg/kg) and Pentazocine (3 mg/kg) showed a significant dose-dependent increase in the pain reaction time in the treated mice groups [16].

In another study by Prabhavati *et al*, different doses (125, 250, 500, 1000 mg/kg) of chloroform extract and petroleum ether extract of *O. turpethum* showed potent analgesic activity against various types of pain stimuli in mice experimental model. [17].

4.2 Anti-ulcer Activity

Oral administration of hydro-alcoholic and methanolic stem bark extracts of *O. turpethum* at the dose level of 100 mg/kg body weight exhibited potent anti-ulcer activity in aspirin and pylorus ligation (APL) rat animal model. This study further substantiates anti-ulcer activity as per the biochemical and histopathological parameters when compared with standard drug Ranitidine. In this study, hydroalcoholic extract showed better effect than the methanolic extract [18]. In another study, *O. turpethum* exhibited potential anti-ulcer activity at the dose of 100 mg/kg body weight given orally in pylorus ligated albino rat model, wherein Lansoprazole at the dose of 30 g/kg body weight was given as a standard drug [19].

4.3 Anti-diabetic Activity

Methanolic extract of *O. turpethum* roots and stems revealed anti-diabetic activity in Streptozotocin induced type-2 diabetic animal model. In this study, methanolic extract of roots and stems at the dose of 100 mg/kg of body weight was administered orally to normal, glucose loaded and experimental diabetic rats for 21 days and found significant reduction of fasting glucose level in both roots and stems methanolic extract treated groups [20].

4.4 Anti-diarrhoeal Activity

The crude extract of *O. turpethum* at a dose-dependent manner (300-1000 mg/kg body weight) exhibited anti-diarrhoeal effect in the castor oil-induced diarrhoea animal model, similar to that of Loperamide (10 mg/kg) which was used as a standard drug in this study [21].

4.5 Hepato-protective Activity

Ethanol extract of *O. turpethum* exhibited hepatoprotective effect in Paracetamol induced hepatotoxicity in rat animal model. In this study, administration of *O. turpethum* at the dose dependent manner (100-200 mg/kg body weight) showed significant reduction in the serum levels of SGOT, SGPT, Alkaline Phosphatase and Bilirubin when compared to the non-treated rats [22]. In another study, *O. turpethum* containing Ayurvedic herbo-mineral formulation (Prak-20) showed good protection against CCl₄ induced liver toxicity in animal model [23]. In a recent study, a polyherbal formulation containing *O. turpethum* showed potent antioxidant and hepatoprotective activity against CCl₄ induced acute liver toxicity in albino rats [24]. *O. turpethum* has also shown hepatoprotective effect against N-nitrosodimethylamine induced liver toxicity in rats [25, 26].

4.6 Anti-microbial Activity

O. turpethum has manifested antimicrobial activity against gram-positive and gram-negative bacterial strains such as *Staphylococcus aureus*, *Bacillus subtilis*, *Streptococcus haemolytica*, *Micrococcus luteus*, *Micrococcus pyogenes*, *Enterococcus faecalis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Shigella dysenteriae* and *Shigella sonnei* [27-30].

Three compounds were isolated from the chloroform extract of stem of *O. turpethum*: H-1 (β -sitosteryl- β -D glucoside), H-2 (22, 23-dihydro- α -spinosteryl glucoside) and CH-2 (salicylic acid). These compounds have shown antibacterial activity against thirteen pathogenic bacteria for their antimicrobial activities [31].

In this study, crude extracts and isolated compounds of *O. turpethum* showed significant antimicrobial activity. Kanamycin was used as a standard drug and was found to be more potent than the isolated compounds [31]. The findings of above studies corroborate with the traditional use of this plant in management of microbial infections.

4.7 Anti-cancer Activity

Methanolic extract of *O. turpethum* stems at the dose of 100 mg/kg body weight retrieved the level of antioxidant enzymes such as Superoxide Dismutase (SOD), Catalase (CAT), Glutathione Peroxidase (GPx) and non-enzymic antioxidants like Glutathione (GSH), Ascorbic acid (Vitamin C), α -tocopherol (Vitamin E) and inhibited the levels of lipid peroxidation on 7, 12 dimethylbenz anthracene (DMBA)

induced breast cancer in female Sprague-Dawley rats. Moreover, a significant reduction in tumour weight was observed in *O. turpethum* treated groups compared to the non-treated group. This study revealed that the *O. turpethum* possess antioxidant activity and may play a protective role against DMBA induced breast cancer [32]. Another study showed ameliorating effects of *O. turpethum* and its isolated Stigma-5,22 dien-3-o- β -D-glucopyranoside on haematological parameters in male mice exposed to a potent carcinogen N-nitrosodimethylamine [33].

5. Phytochemical ingredients present in *Operculina turpethum*

The stem of *O. turpethum* is a rich source of phytochemicals such as phenol, flavonoid, phytosterol, terpenoid and cardiac glycosides [34]. Chemical constituents present in *O. turpethum* include resin, glycosides, saponins, flavanoids, steroids and carbohydrates, starch, volatile oil, lignin, ferric oxide, glucoside, scopoleptin, triterpenes etulinic acid, betulin, and lupeol) and sitosterol glucose and rhamnose. The turpethinic acids- A, B, C, D and E isolated from resins, sugar moiety identified as O- β -D-glucopyranosyl (1-3)-O- α -L-rhamnopyranosyl(1-3)-O- β -D-glucopyranosyl (1-3)-O- β -D-glucopyranoside; a glycone of turpethanic acid A identified as 3,12-dihydroxypentadecanoic acid, B as 4, 12-dihydroxypentadecanoic acid, C as 3, 12-dihydroxyhexadecanoic acid, D as 4, 12-dihydroxyhexadecanoic acid and E as 11-hydroxyhexadecanoic acid. [35-38, 19]. Turpethin is mainly responsible for purgative action of *O. turpethum* and is a harmless substitute for Jalap [39]. Oil extracted from the root bark of *O. turpethum* is used in skin diseases [29].

The active principle of the leave is oleandrin, which is a cardio-tonic agent having anti-inflammatory property. The bark, root and seed containing cardio-active glycosides, neriodorein and karabin have shown anti-inflammatory, analgesic activities and also act as a good stimulant [40].

6. Conclusion

The extensive literature survey clearly infers that *O. turpethum* is a very potent Unani medicinal plant which has diverse pharmacological actions and therapeutic indications. Preclinical and clinical studies with ample size may be done for further evaluation and validation of Turbud with the help of modern scientific techniques.

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