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Phytochemical and Pharmacological Review of Turbud *(Operculina turpethum)*

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Shahid Suhail*[1], Waris Ali[2], Mohd Tarik[3], Saeedur Rahman[4]

[1]Associate Professor, Department of Moalajat, Eram Unani Medical College and Hospital, Lucknow, India.

[2]Associate Professor, Department of Ilm-us-Saidala Eram Unani Medical College and Hospital, Lucknow, India.

[3]Assistant Professor, Department of Moalajat, Eram Unani Medical College and Hospital, Lucknow, India.

[4]Assistant Professor, Department of Ilm-ul-Advia, Eram Unani Medical College and Hospital, Lucknow, India.

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ABSTRACT

Turbud *(Operculina turpethum* (L.) R. Br.*)* is commonly used to treat various ailments In the Unani system of medicine. Turbud *(Operculina turpethum)* belongs to the family Convolvuceacea. It is popularly known as "transparent wood rose" and widely used for the treatment of *Qurooh* (ulcers), *Amraz-e-Asaab* (neurological disorders), *Qabiz* (constipation), *Wajae-Tams* (dysmenorrhea), and *Warm* (inflammation). It is commonly used since centuries in Unani system of Medicine to treat *Falij* (paralysis), *Waja al-Mafasil Balghami* (phlegmetic joint pain), *Malikholia* (melancholia), Mania/*Junoon* (psychosis/insanity), *Sara/Mirgi* (epilepsy), *Irq al-Nasa* (sciatica), *Sual muzmin* (chronic cough) *Waj al-sadar* (chest pain), *Zeeq al-Nafas* (bronchial asthma), *Istisqaa* (ascites) *Bawaseer* (piles,) etc. This review is aimed to explore phytochemical, pharmacological actions and therapeutic uses of Turbud *(Operculina turpethum)* present in Unani literature in support of the available clinical and animal studies.

INTRODUCTION

Operculina turpethum (L.) Silva Manso is a synonym of *Ipomoea turpethum* (L.) R. Br. (Convolvulaceae) and commonly known as Indian Jalap or Turpeth. It occurs in two forms namely sveta and krishna which are commonly known as white and black respectively. It is found in Pakistan, India, Southern China, South East Asia, Pacific Islands, and Australia [1].It is popularly known as "transparent wood rose" [2]. *Operculina turpethum* (Indian Jalap), a plant in the morning glory family, is a perennial herbaceous plant with purplish stems and somewhat hairy vine reaching a length of 4 to 5 metres or more. Leaves are entire, alternate and variable in shape, narrowing to a pointed tip, broad and somewhat heart-shaped or straight at the base. Sepals are brittle and green [3]. *Operculina turpethum* is a perennial climber with slender, fleshy and branched roots, hard and twisted cord like stem with small ovate leaves [4]. Root bark, root stem and leaves of this herb have high medicinal value [5]. It is one of the plants mentioned in the literature having claims of activity against liver disorders and cancer [6,7]. It also has anthelmintic expectorant, antipyretic, anti-inflammatory and purgative properties [7]. In Indian traditional system of medicine, *Operculina turpethum* is used internally to treat fevers, edema, anemia, constipation, hepatitis, ulcers, skin disorders, obesity, hemorrhoids, cough, asthma, paralysis, gout, and rheumatism. It is proved to have antisecretory and ulcer protective, anti-inflammatory, hepatoprotective, antimicrobial, anticancer, and antioxidant activities [8]. The root bark of Trivrit is rich in turpethum resin consisting of 10% 'turpethin' which is a glycoside analogue of Jalapine and Convolvulin and is insoluble in ether, benzene, carbon sulphide and essential oils. Under the action of alkaline bases, turpethin is transformed into turpethic acid, while it gets converted into turpetholic acid, Glucose and fructose in presence of hydrochloric acid. Trivit also contains Turpethinic acids- A, B, C, D, & E,6 some ether soluble resin, volatile oil, albumin, starch, lignin salts, ferric oxide, Scopoleptin, Betulin, lupiol & beta- sitosterol Turpethin is mainly responsible forpurgative action of Trivit and is an excellent relatively safer substitute for jalap [9].

Vernacular names

Arabic : Turbud [10, 11, 12].

Persian : Turbud [11].

Sanskiriti : Syama, Tribhandi [11].

Hindi : Nishothra[11]. Nishoth [10]. Nagpatr [13].

Bengali : Teudi, tvuri, Dhdhakalami [10, 11,].

Gujarati : Kala Nasottara [11].

Tamil : Karum sivadai [14,11].

Malayalam : Trikolpokanna [11].

Marathi : Nisottar [11].

Orissa : Dudholomo [11].

Punjabi : Nisoth [11, 14].

Telugu : Tella, Tegada [11].

Unani : Futar [13.15].

Siryani : Toorbud [13.15].

English : Indian Jalap, Turpeth [16.14].

Ayurvedc :Trivrta, Trivrtaa, Tribhandi, Triputaa, Saralaa, Suvahaa, [16].

Unani :Turbud, Nishoth [11].

Siddha/Tamil : Karumchivadai [11].

Scientific 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 [9].

Mahiyat (Morphology):

Macroscopic:

Turbud: A plant in the morning glory family (Convolvulaceae), is a perennial herbaceous plant with purplish stems and somewhat hairy vine reaching a length of 4 to 5 metres or more.

Leaves: Leaves are egg shaped and heart-shaped 4-10 cm by 1.5-7 cm in size.

Flowers: Flowers are 4-5cm long, white and funnel shaped in bunches.

Fruits: Fruits are rounds with four seeds.

Colour: are Black & yellow externally, Light white internally [12].

Test: Pheeka (testlees) or talkh (bitter) and sharp [12, 17].

Roots are 1.5 to 15 cm long and 1 to 5 cm in diameter usually unbranched, cylindrical elongated; occasionally split, thicker pieces, and; reddish-grey to light brown, surface dull grey, longitudinal wrinkles giving a rope-like or columnar appearance; transversely cut surface shows thick, whitish bark and light yellow centre; odour indistinct; taste slightly acrid and nauseating when kept in mouth for some time.

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 cortica1 cells become .thick walled appearing as isolated, oval to' subrectangular l &-enchymatous cells having wide lumen; vascular undles arranged in 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 radiameter ting arms; small patches of intraxylary phloem often formed; xylem vessels in singles or 2-3 in groups, having simple pits on their walls; 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 [11].

Geographical Description

Operculina turpethum is native to Asia, Africa & Australia while is naturalized in West Indies. The plant is grown throughout India up to 1000 m; and is occasionally grown in gardens [18].

Mizaj: (Temperament):

Hot^3 and Dry^3 [13, 14].

Hot^2 and Dry ^{2} [15, 12].

Hot2 and Dry1[18].

Ajzae-mustamela (Parts used): Dried root, steam and the root bark [14].

Afaal wa khawas (Medicinal action of Turbud)

Mujaffif Qawi (Strong desiccant) [15].

Munaqqie Dimagh. (Brain clenser) [15, 16].

Mushile Balgham, (Phlegmagogue) [12,13,15].

Munaqqi-e- Me'dah (Gastric cleanser) [15, 12].

Munaqqi-e-Ama (purgative) [15, 17].

Munaqqi-e- Reham (Uterus cleanser) [15, 12].

Mufatteh Sudad (Deobstruent) [15, 12, 13].

Dafi'-e-Sarataan (Anticancer) [15].

Mohallil-e-Waram (Anti-inflammatory) [17].

Muhaafiz Kabid (Hepatoprotective) [6].

Dafi'- e-Jaraaseem (Antimicrobial)

Dafi'-e-Qurooh (Anti-ulcer) [2].

Dafi'-e-Tashannuj (Anti-spasmodic

Ittisa-e-Riya (Broncho-dilator) [1].

Antioxidant activity

Analgesic, activity [19].

Antipyretic,(17)

Antihelminthic(17)

Alexiteric(17)

Mawaqe-e- Istemal (Therapeutic uses of Turbud)

Amraz-e-Asaab (Nerves disease) [15, 12, 13].

Faalij (Paralysis/Hemiplegia) [15, 12, 13, 14].

Waja `al Mafasil Balghami (Phlegmetic joint pain) [15, 13, 18 , 20].

Irq al- Nasa (Sciatica) [15, 12,18,20]

Maali Kholia (Melancholia) [15, 12, 14, 20].

Mania/Junoon (Psychosis/Insanity/Mania) [15, 12].

Sara/Mirgi (Epilepsy) [13].

Sual Me'dah (Cough due Gastric) [15].

Sual Muzmin (Chronic cough) [15, 12, 13].

Waj-al-Sadar (Chest pain) [15, 12].

Waja`-al-Qatan (Lumbago) [15, 13].

Waja'-al-Meda (Gastralgia) [15, 13].

Musakkin Waja'-e-Tams (Sedative Menstruation pain) [13].

Zeeq-al-Nafas (Bronchial asthma) [15].

Istisqaa (Ascites) [17,18].

Niqris (Gout) [14, 20].

Laqwa [20].

Samne-mufrit [18, 20].

Bawaseer [20].

Badal (Substitute):

Ghariqoon (*Polyporus officianalis*) [15, 12, 18].

Sibr (aloe vera) [15,18].

Habbbul-Neel (*Ipomoea hederacea*) [15, 12].

Turmus (*Lupinus albus* Linn.)[15].

Hanzal (*Citrullus colocynthis* (Linn.) [15].

Bekh-e-toot (Root *Morus nigra* Linn. [15,13].

Miqdar-e-Khurak (Therapeutic Dosages)

Jirm-e- turbud 7-10.5 gm, 1.75-3.5gm[15].

Matbookh 14gm, 17.5gm ,3.5-7gm[15].

With Other drugs 14gm [13].

Safoof (Pawder) 3gm

Joshanda (Decoction) 7gm [12].

Muzir Asraat (Adverse effects)

Medah (Stomach), *Ama* (Intestine) [15].

Qalb (Heart) *Matli* (Nausea) *Karb* (Restlessness) [12].

Musleh (Corrective)

Kateera/Katira (Astragalus gummifer) [15].

Mastagi Roomi (Pistacia lentiscus Linn.) [15].

Charb in Roghan Badam (Prunus amygdalus) [12].

Murakkabat (Formulations)

Itrifal Ustukhuddus [11].

Itrifal Deedaan,

Safoof Deedaan,

Itrifal Mulayyen,

Jawarish-e-shahr-e-Yaran,

Habb-e-ayaraj

Majoon-e-Kalkalaanaj [21].

Kimiyawi Ajza (Chemical Constituents):

The stem of *O. turpethum* is a rich source of phytochemicals such as phenol, flavonoid, phytosterol, terpenoid and cardiac glycosides. 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-Lrhamnopyranosyl(1-3)-O-β-D-glucopyranosyl (1-3)-O-β-Dglucopyranoside; a glycone of turpethanic acid A identified as 3,12-dihydroxypentadecanoicacid, B as 4,12 dihydroxypentadecanoic acid, C as 3, 12-dihydroxyhexa- decanoic acid, D as 4, 12-dihydroxyhexadecanoic acid and E as 11-hydroxyhexadecanoic acid. Turpethin is mainly responsible for purgative action of *O. turpethum* and is a harmless substitute for Jalap. Oil extracted from the root bark of *O. turpethum* is used in skin diseases.The active principle of the leave is oleandrin, which is a cardiotonic 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. Alkaloids, carbohydrates, saponins, flavonoids and cardiac glycosides [6].

Pharmacological Studies:

Analgesic activity - According to a study by N.B. Prabhavathi et al., experimental albino mice showed *Operculina turpethum* plant extract had strong analgesic and anti-inflammatory effect that almost equal to that of standard drug. [22].

Anti-inflammatory activity: The oral administration of h According to a study by N.B. Prabhavathi et al., experimental albino mice showed *Operculina turpethum* plant extract had strong analgesic and anti-inflammatory effect that was practically on par with that of standard drugs. erbal formulation Avipattikar churna at 100 mg/kg concentration significantly decrease rat paw edema induced by formalin by 36.45% [23].

Hepato-protective activity- The plant extract significantly restored the antioxidant enzyme level in the liver and exhibited significant dose dependent curative effect against NDMA induced toxicity. It was also supported by histopathological studies of the liver in a study conducted by Veena Sharma and Manu Singh in Swiss Albin mice [24].

Anti-ulcer activity- According to a study by Vidya Ignatius et al. on the anti-ulcer impact of turbud on experimental mice, both extracts (HAOP and MOP) of *Operculina turpethum* increased ulcer preventative and protective actions when compared to the common medication ranitidine. Additionally, as compared to MOP, HAOP's effects were more prominent. [2].

Analgesic and CNS Depressant effect:

Operculina turpethum was extracted with ethanol and tested for its CNS activity using a mouse model in a study by M.N. Islam et al. It was discovered that the 500 mg/kg dose of *Operculina turpethum*'s ethanolic extract shown more pronounced depressant effect than the 250 mg/kg dose. [5].

Anti-diarrhoeal, Antispasmodic and Bronchodilator activities - A study conducted by Huma Sharee et al. suggest that the crude extract of *O. turpethum* possesses antidiarrhoeal, antispasmodic and bronchodilator activities, mediated possibly through the presence of Ca++ antagonist like constituent(s), though additional mechanism(s) cannot be ruled out [1].

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 [25].

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 sonne* [26, 27]. 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. 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 [28]. The findings of above studies corroborate with the traditional use of this plant in management of microbial infections [25].

Anti-Arthritic activity: The anti-arthritic potential of the root extracts of *Operculina turpethum* was evaluated by the in-vitro models of inhibition of protein denaturation. The ethanolic root extracts in various concentration with BSA was tested for the activity. Acetyl Salicylic acid was used as a standard with an inhibition of 70% whereas it was 67.22% in case of the ethanolic extract [6].

Nephroprotective Activity:. In NDMA-induced renal carcinogenesis in male mice and hepatopathy in mouse livers, Veena Sharma et al. explained the therapeutic anti-nephrotoxic activity of the isolated steroidal glycoside, Stigma -5,22dien-3-o-b-D-glucopyranoside from the root bark of *Operculina turpethum*. When mice were given the ethanolic extract of the roots and the isolated chemical, both significantly improved their condition at doses of 400 mg/kg and 50 mg/kg, respectively. [29].

Cytotoxic Activity: Anbuselvam et al. investigated the protective effects of *Operculina turpethum* stem extracts in DMBA caused breast cancer in rat models in 2007. The ethanolic stem bark extracts were given orally at a dose of 100 mg/kg to evaluate their antioxidant properties, and DMBA was also utilised as an inducer at a dose of 20 mg for a 45-day period. The outcomes demonstrated remarkably decreased lipid peroxidation, elevated antioxidant levels, and a decrease in tumour weight. [30].

CONCLUSION:

The present review summarizes some important pharmacological studies and phytochemical investigations on *Operculina turpethum*, this view shows it is use full to treat various diseases like Falij (paralysis), Waja al-Mafasil Balghami (phlegmetic joint pain), Malikholia (melancholia), Mania/Junoon (psychosis/insanity), Sara/Mirgi (epilepsy), Irq al-Nasa (sciatica) etc.The present literature supports the potential of Turbud (*Operculina turpethum*) as a medicinal tree. It is need of hours to explore hidden effect of Turbud on the basis of classical text, preclinical and clinical trial sources. In view of the findings of the review, it can be concluded that it is very promising drugs in respect to its traditional claim proven after contemporary research.

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HUMAN

	Shahid Suhail Assosiate Professor, Department of Moalajat (Medicine), Eram Unani Medical College and Hospital, Lucknow
	Waris Ali Assosiate Professor, Department of Ilm-us-Saidala (Unani Pharmacy), Eram Unani Medical College and Hospital, Lucknow
	Mohammad Tarik Assistant Professor, Department of Moalajat (Medicine), Eram Unani Medical College and Hospital, Lucknow
	Sayeedur Rahman Assistant Professor, Department of Ilm-ul-Advia (Pharmacology), Eram Unani Medical College and Hospital, Lucknow