Exploring the Therapeutic Potential of Paeonia Officinalis (Oodsaleeb): A Systematic Review

Swaleha Akhtar[1], Tanzeel Ahmad[2], Jamal Azmat[3], S Javed Ali[4]
[1]PG Scholar, [2]Professor, [3]Assistant Professor, [4]Assistant Professor
[1,2,3,4] Dept of Moalejat (Medicine), Ajmal Khan Tibbiya College and Hospital, A.M.U, Aligarh

Corresponding Author: **Jamal Azmat**

Abstract:
Aim: To provide a systematic overview of the morphology, ethnobotanical uses, phytochemistry, and pharmacological activities of Ood saleeb (Paeonia officinalis). **Material and Methods:** A comprehensive review was conducted using diverse search engines and databases, including PubMed, Scopus, Google Scholar, and traditional Unani manuscripts. The review included experimental, clinical, and ethnopharmacological studies. **Results:** Paeonia officinalis, native to temperate regions of Europe and Asia, is highly valued in Unani and other traditional medicine systems for its extensive therapeutic applications. The roots and other plant parts are traditionally used to treat neurological, gastrointestinal, and reproductive disorders. Phytochemical analysis reveals bioactive compounds such as paeoniflorin, tannins, flavonoids, and alkaloids, which contribute to the following pharmacological properties:Anti-inflammatory, Anxiolytic, Antioxidant, Anticonvulsant, Analgesic. Scientific evidence supports its potential in managing conditions such as epilepsy, anxiety, depression, and oxidative stress through mechanisms involving neurotransmitters and signaling pathways. Additionally, it exhibits cardioprotective, gastroprotective, antithrombotic, and abortifacient effects. **Conclusion:** This review highlights the therapeutic potential of Paeonia officinalis as a versatile medicinal agent, particularly in managing generalized anxiety disorder and other psychosomatic conditions. Further clinical research is warranted to validate its efficacy and safety.

Key Words: Ood saleeb, Paeonia officinalis, Anxiolytic, Scientific studies

Introduction

The common garden peony, Paeonia officinalis(Anonymous, 2008)- is a member of the familyPaeoniaceae.Earlier the drug was placed under the family Ranunculaceae but Paeonia was separated from it and placed in its own family of Paeoniaceae(Anonymous; Khare, 2004; Khare, 2007).In Classical Unani literature and other standard books of

Herbal Medicine Oodsaleeb is described somewhere under heading of Paeonia officinalis and somewhere under Paeonia emodi.(Anonymous, 2007; Kirtikar & Basu, 1981)

A native of Southern Europe and Western Asia, this plant is now widespread across the temperate regions of the Northern Hemisphere. Both Hippocrates and Galen, notable ancient physicians, recommended parts of the plant for treating various ailments, including epilepsy and disorders of the female reproductive system. It is highly valued as a traditional remedy for regulating the female hormonal cycle. The roots of P. officinalis have been noted for their abortifacient, antihypertensive, and antiulcer properties. In traditional Unani, homeopathic, and Chinese medicine, it has been used to treat liver conditions like jaundice and bladder stones, as well as stomach pain, diarrhea, labor pains, nightmares, and epilepsy.

Plant of Paeonia officinalis

Root of Paeonia officinalis

Botanical Name

Paeonia officinalis(Al-Razi, 1999; Anonymous, n.d., 2008, 2011; Khare, 2004; Khare, 2007; P. Rastogi & Mehrotra, 2005; Rafeequddin, n.d.)

Family

Paeoniaceae- (Anonymous, n.d.; Chevallier, 1996; Khare, 2004; Khare, 2007; Safi Uddin Ali, 2013)

Part Used - Root (Anonymous, 2007; Chatterjee & Chandra Prakrashi, 2013; Chevallier, 1996; H. Kabeeruddin, n.d.-b)

Vernacular Names

Unani: (Khare, 2004; Khare, 2007; Anonymous Part-II, 2007)
Ood gharqi
Ood saleeb
Phaavaania

Arabic: (Abdul Hakeem, 2002; Al-Razi, 1999; Betar, 1999)
Fawania
Ood-ul-Reeh

English: (Anonymous, n.d., 2007; Khare, 2007)
Paeoney Rose
Paeony

Bengali: (Anonymous, 2007; Chatterjee & Chandra Prakrashi, 2013)
Ood-e- Salam Chandra

Persian: (Ahmad Tariq, 2010; Anonymous, 2007; Hussain, 1960; Taqweem al Adwia, n.d.)
Fawania
Fadania
Ood-ul-Hameer

Urdu: (Anonymous, 2007)
Ood-e-Saleeb

Punjabi: (Anonymous, n.d.; Kirtikar & Basu, 1981; Nadkarni, 1976)
Mamekh
Chandra

Hindi:(Anonymous, n.d., 2007; Nadkarni, 1976)
Ud-salap
Ood-salap

Kashmiri: (Chopra et al., 1996, 2009; Hussain, 1960; Nadkarni, 1976)
Malokh
Mamokh
Mid

Bhutia: (Kirtikar & Basu, 1981; Nadkarni, 1976)
Bhuma Madiya
Yet Ghas

Syriac: (Khan, 2014)
Fareewafa
Kaheena
Kehyaana

Sanskrit: (Chatterjee & Chandra Prakrashi, 2013)
Svetamula

Description: (Anonymous, 2007; Ghani, n.d.; Khan, 2014; Kirtikar & Basu, 1981; Rafeequddin, n.d.)
Ood saleeb is glabrous perennial herb has a cluster of fleshy roots, with stems ranging from 0.3 to 0.6 meters tall. The stems are leafy and erect. Its alternate leaves are 15-30 cm long, with 3 leaflets that are usually divided into 3 parts; the segments are lance-shaped, pointed, and entire. The herb produces a few, large, showy flowers, measuring 7.5-10 cm across, borne on long stalks, often solitary in the axils of the upper leaves. It has 5

concave green sepals, 5 to 10 broad ovate red or white petals, numerous stamens, and a few large seeds.

The tuberous roots are light brown, up to 8 cm long and 3 cm wide, spindle-shaped, with a deeply furrowed, shriveled surface. The roots are brittle, with a granular fracture, faint odor, and a sweet taste that turns bitter later. According to Unani medicine, there are two types of tubers: male, known as Ood-e-saleeb, and female, called Fawania. The male tuber has ridges on its surface, known as saleeb, while the female does not have these ridges. The tubers have a sweetish acrid taste and are used to treat epilepsy, headaches, uterine diseases, and bladder problems. They also serve as blood purifiers. The seeds have emetic and cathartic properties.(Anonymous, 2007; GHANI, n.d.;Khan, 2014; Kirtikar & Basu, 1981; Rafeequddin, n.d.)

Habitat & Distribution

Western temperate Himalaya from Kumaon to Hazara in Upper Tones Valley and Kashmir(Anonymous, n.d.; Khare, 2004; Nadkarni, 1976)

Himachal Pradesh(Rafeequddin, n.d.)

Southern Europe and Mediterranean region(Chevallier, 1996; Ram Lubhaya, 2013; Safi Uddin Ali, 2013)

Great Britain(Khare, 2004; 'Khare, 2007)

Af 'al (Actions)

Anti diarrheal(Chatterjee & Chandra Prakrashi, 2013)

Antiepileptic (Dāfi'-i- Ṣar')(Anonymous, 2007; Bin Hubl Baghdadi, 2005; Chatterjee & Chandra Prakrashi, 2013; Ghani, n.d.; Ghulam Hussain Kantoori, 2010; H. Kabeeruddin, n.d.-b; Khan, 2014)

Antiparalytic (Ghani, n.d.; Ghulam Hussain Kantoori, 2010; H. Kabeeruddin, n.d.-b)

Brain tonic in epilepsy and psychic disorder (Ghulam Hussain Kantoori, 2010; H. Kabeeruddin, n.d.-b; Khan, 2014)

Dāfi'-i-Tashannuj (Antispasmodic) (Anonymous, 2007; Chevallier, 1996; Khare, 2007)

Hypoglycaemic

Hypotensive (Khare, 2004; Khare, 2007)

Jālī(detergent)(Khan, 2014)

Mudirr-i-Bawl (Diuretic) (Ahmad Tariq, 2010; Khare, 2007)

Mudirr-i-Ḥayḍ (Emmenagogues)(Abdul Hakeem, 2002; Al-Razi, 1999; H. Kabeeruddin, N.D.-A; Khare, 2004; Khare, 2007; Sayeed, 2007)

Mufarriḥ(exhilarant)(Rafeequddin, n.d.)

Mufattiḥ(deobstruent)(Ahmad Tariq, 2010; Khan, 2014)

Mufattiḥ-i-'Urūq(deobstruent of vessels)(Ahmad Tariq, 2010; Khan, 2014)

Mufattiḥ-i-Sudad(deobstruent drug)(Ahmad Tariq, 2010; Khan, 2014)

Mufattit-i-Ḥaṣāt-i-Kulya(renal lithotriptic drug)(Bin Hubl Baghdadi, 2005; H. Kabeeruddin, n.d.-b)

Muḥāfiẓ-i-Jigar(hepatoprotective)(Abdul Hakeem, 2002; Khare, 2004; Khare, 2007; Kirtikar & Basu, 1981)
Muḥallil(resolvent)(Ahmad Tariq, 2010; Khare, 2007)
Muḥallil-i-waram (Anti-inflammatory) (Ahmad Tariq, 2010; Chopra et al., 1996; Khare, 2004; Khare, 2007; Kirtikar & Basu, 1981)
Muḥarrik (Stimulant)- General (Safi Uddin Ali, 2013; Sayeed, 2007)
Muḥarrik-i-Aʻṣāb(nerve stimulant)(Safi Uddin Ali, 2013; Sayeed, 2007)
Mujaffif (drying agent) (Ahmad Tariq, 2010; Khan, 2014; Ram Lubhaya, 2013; Sayeed, 2007)
Mujaffif-i-Miʻda (H. Kabeeruddin, n.d.-a; Khan, 2014; Sayeed, 2007)
Mukhrij-i -Akhlāṭ-i-Ghalīẓa (Internally)
Mukhrij-i-Balgham
Mulaṭṭif(attenuant)(Khan, 2014)
Munaqqī(cleanser)(Abdul Haleem Lakhnawi, 2009)
Munawwim(hypnotic agent)(Chevallier, 1996; H. Kabeeruddin, n.d.-a; Khare, 2007)
Muqawwī (Tonics)(Anonymous, 2007; Ghulam Hussain Kantoori, 2010; Khan, 2014)
Muqawwi jigar(Abdul Hakeem, 2002; Khare, 2007)
Muqawwī-i-Aʻṣāb (Nervine tonic)(Anonymous, 2007; Chatterjee & Chandra Prakrashi, 2013; Ghulam Hussain Kantoori, 2010; Safi Uddin Ali, 2013)
Muqawwī-i-Bāh (Aphrodisiac) (Anonymous, 2007; Chatterjee & Chandra Prakrashi, 2013)
Muqawwī-i-Dimāgh (Brain tonic)(Abdul Haleem Lakhnawi, 2009; Khare, 2007)
Muqawwī-i-Kabid / Muqawwī-i-Jiga(hepatotonic)(Abdul Hakeem, 2002; Khare, 2004; Khare, 2007; Kirtikar & Basu, 1981)
Muqawwī-i-Kulya(renal tonic)(Chatterjee & Chandra Prakrashi, 2013; Khan, 2014)
Muqawwī-i-Mathāna(vesical tonic)(Chatterjee & Chandra Prakrashi, 2013; Khan, 2014)
Muqawwī-i-Miʻda (Stomachic) (Chatterjee & Chandra Prakrashi, 2013; Ghulam Hussain Kantoori, 2010; H. Kabeeruddin, n.d.-b; Khan, 2014)
Muqawwī-i-Reham(Uterine tonic)(Abdul Hakeem, 2002; Ahmad Tariq, 2010; Al-Razi, 1999; Sayeed, 2007)
Muṣaffī-i-Dam(Blood purifier)(Chopra et al., 1996, 2009; Khare, 2004; Khare, 2007)
Musakkin(soothing agent)(Chevallier, 1996; Khare, 2004; Khare, 2007)
Musakkin-i-'Lādhi(Anonymous, n.d.; Bin Hubl Baghdadi, 2005; Chevallier, 1996; Khare, 2004; Khare, 2007; Ram Lubhaya, 2013)
Musakkin-i-Alam (Analgesic) (Ahmad Tariq, 2010; H. Kabeeruddin, n.d.-b; KHARE, 2004; Khare, 2007; Kirtikar & Basu, 1981; NadkarnI, 1976)
Qābiḍ(astringent)(Khan, 2014; Sayeed, 2007)
Respiratory disorders(Chopra et al., 1996, 2009; Khare, 2007)
Smooth muscle relaxant(Khare, 2004; Khare, 2007)

Indications (Uses)(Abdul Haleem Lakhnawi, 2009; Ahmad Ansari, 1930; Ahmad Tariq, 2010; Anonymous, n.d., 2007; Bin Hubl Baghdadi, 2005; Chatterjee & Chandra Prakrashi, 2013; Chopra et al., 1996, 2009; Ghani, n.d.; Ghulam Hussain Kantoori, 2010; H. Kabeeruddin, n.d.-b; Khan, 2014; Khare, 2004; Khare, 2007; Kirtikar & Basu, 1981; P. Rastogi & Mehrotra, 2008; Rafeequddin, n.d.; Safi Uddin Ali, 2013; Sayeed, 2007)

'Usr al-Wilāda(dystocia)
Barash(freckle)
Bawāsīr(haemorrhoid)
Dīdān al-Am'ā'(intestinal worms)
Ḍu'f al-Bāh(sexual debility)
Ḍu'f al-Haḍm(delayed digestion)
Ḍu'f al-Kabid(hepatic insufficiency)
Ḍu'f al-Mi'da(gastric debility)
Ḍu'f al-Ṭiḥāl(debility of spleen)
Ḍu'f -i-Kulya(renal insufficiency)
Ḍu'f-i-Dimāgh(mental weakness / cerebrasthenia)
Fālij(Paralysis)
Ḥaṣā wa Raml al-Kulya(renal calculus and sand)
Ḥummā Balghamiyya(phlegmatic fever)
Ikhtinaq al-Rahim(Hysteria)
Ishāl (diarrhoea)
Kābūs(nightmares with feeling of compression)
Kalaf(melasma)
Laqwa (Facial palsy)
Mālankhūliyā(melancholia)
Māniyā(Mania)
Munaqqī al -Kabid (Cleanser of liver)
Niqras (Gout)
Nisyān(Amnesia)
Ri'sha(Tremor)
Ṣar'(Epilepsy)
Sarsām(Meningitis)
Shahiqa(whooping cough)
Shaqīqa(Migrain)
Shiqāq al-Maq'ad(anal fissure)
Sū' Mizāj al-Ṭiḥāl(morbid temperament of spleen)
Ṣudā'(headache)
Sudad al-Kabid(obstructions of liver)
Tashannuj(muscular spasm)
Tashannuj-i-Aṭfāl (muscular spasm of children)
Umm ali-Sibyan(infantile epilepsy)

Waja‘ al-Kabid(hepatalgia)
Waja‘ al-Kulya(renal pain)
Waja‘ al-Mathāna(vesicular pain)
Waja‘ al-Mi‘da(Gastralgia)
Waja‘ al-Ṭiḥāl(pain of spleen)
Waram al-Kabid(inflammation of liver)
Waram al-Kulya(nephritis)
Waram al-Raḥim(metritis)
Waram-i-Mi‘da(gastritis)
Waram-i-Ṭiḥāl(inflammation of spleen)
Waswās / Junun (Insanity)
Yarqān(yellowish or blackish discoloration of skin)
Zarba wa Sakta

Miqdare Khurak (Dose):

1-2 gm(M. ’Kabeeruddin, n.d.)

1-3 gm(Ahmad Tariq, 2010; Hussain, 1960; Khare, 2004; Safi Uddin Ali, 2013)

1-5 gm(H. Kabeeruddin, n.d.-a, n.d.-b)

4 gm(Ghani, n.d.)

4.5 gm(Khan, 2014)

3-5 gm(Anonymous, 2007)

Mizaj (Temperament):
Hot 3 and Dry 3(Abdul Haleem Lakhnawi, 2009; Al-Razi, 1999; Anonymous, 2007; M. Kabeeruddin, n.d.; Khan, 2014; Rafeequddin, n.d.)
Hot 2 and Dry 2(Hussain, 1960)
Hot 1 and Dry 2(Sayeed, 2007)
Hot 1 and Dry 1(Taqweem al Adwia, n.d.)

Mazah (Taste): Sweetish acrid taste(Anonymous, 2007; Ghani, n.d.; Ghulam Hussain Kantoori, 2010)

Muzir (Toxicity):
For Ḥāmila (Pregnant women)(Abdul Haleem Lakhnawi, 2009; Ahmad Ansari, 1930; Ahmad Tariq, 2010; Chevallier, 1996)
For Haar Mizaj (Hot temperament)(Abdul Hakeem, 2002; Ahmad Tariq, 2010)
For Stomach (Meda)(Anonymous, n.d.)

For Kidney (Kulliya)(Anonymous, n.d.)
Headache,(Anonymous, n.d.; Nadkarni, 1976)
Giddiness, (Anonymous, n.d.; Nadkarni, 1976)
Vomiting (Anonymous, n.d.; Nadkarni, 1976)

Musleh (Corrective):
Gulqand(Abdul Hakeem, 2002; Ahmad Tariq, 2010; H. Kabeeruddin, n.d.-b; Rafeequddin, n.d.)
Maa-ul-asal(Abdul Hakeem, 2002; Ahmad Tariq, 2010; H. Kabeeruddin, n.d.-b)
Katera(Khan, 2014)
Nabat Safed(Abdul Haleem Lakhnawi, 2009; Ahmad Ansari, 1930)
Gabeera(Sayeed, 2007)
Sheer taza(Ahmad Ansari, 1930)

Badal (Substitute):
Ghariqoon(Khan, 2014)
Zarawind Mudharaj(Khan, 2014)
Post Anar(Al-Razi, 1999; Khan, 2014)
Barg-e-Anar(Al-Razi, 1999; Khan, 2014)
Far-al-Samoor(Al-Razi, 1999)
Ezam Aswaqat al- Ghazlaan (Calf bones of Deer)(Al-Razi, 1999)
Sana'a(Sayeed, 2007)

Murakkabat (Compound Formulations):
Hab-e-Asaab(Ahmad Tariq, 2010; Anonymous, 2007; H. Kabeeruddin, n.d.-a, n.d.-b)

Hab-e- Ambar Momiyayi(Anonymous, 2007)

Majoon Sar'aa(Anonymous, 2007)

Majoon Zabeeb(Anonymous, 2007)
KhameeraGaao-zaban-ambariJadwarood-e-saleebwala(Ahmad Tariq, 2010; Anonymous, 2007; Ishaq & Pharm Sci, 2014)
Majoon-e-hamal Ambari (Anonymous, 2007; H. Kabeeruddin, n.d.-b, n.d.-a)

Chemical Constituents:
The herb contains various compounds such as monoterpene ester glucosides of the pinene type, including paeoniflorin, as well as anthocyanins like paeonin, tannins such as pentagalloyl glucose, and flavonoids like kaempferol.(Khare, 2007) Alkaloids in the herb are known to induce contraction of renal capillaries and increase blood coagulability. (Anonymous, n.d.)Phytochemical analysis of Paeonia officinalis roots reveals the presence of alkaloids, tannins, saponins, glycosides, carbohydrates, flavonoids, terpenes, steroids, and proteins.(Ahmad & Tabassum, 2013)

Paeoniflorin, a monoterpene glycoside from the roots, demonstrates smooth muscle relaxant, vasodilator, anti-inflammatory, immunostimulant, and mild CNS depressant properties in animal studies. The tubers contain malic acid, oxalic acid, phosphoric acid, small amounts of tannin, sugars, starch, and volatile oil.(Khare, 2007; NADKARNI, 1976) The herb also includes essential and fixed oils, tannins, terpenes, and paeonine (a volatile oil).(Anonymous, 2007)

Additionally, compounds like gallotannin, glucogallin, oleanolic acid, betulinic acid, ethyl gallate, methyl grevilliate, and beta-amyrin are found in the herb.(Chatterjee & Chandra Prakrashi, 2013) The root oil contains a variety of n-alkanes, sterols (such as beta-amyrin, butyrospermol, and cycloartenol), and fatty acids like palmitic, oleic, linoleic acids, among others. Salicylaldehyde is identified as the main component of the essential oil. (Kirtikar & Basu, 1981) Both saponifiable and unsaponifiable lipids have been reported in the root oil, which also contains additional compounds like asparagin, benzoic acid, flavonoids, paeoniflorin, paeonin, paeonol, protoanemonin, tannic acid, triterpenoids, and volatile oils.(Ahmad F et al., n.d.)

Scientific Studies:

Antioxidant property

In 2019, Lijana Dienaite et al. demonstrated that Paeonia officinalis is a rich source of polyphenolic compounds with significant antioxidant potential.(Dienaitė et al., 2019) Similarly, a study by Simona Oancea et al. revealed that enzyme-ultrasonic extracts of P. officinalis showed strong antioxidant activity, particularly in terms of ferric reducing power and radical scavenging abilities.(Oancea et al., 2019) Additionally, Tao Chen et al., in 2011, reported that paeoniflorin (PF), extracted from the root of Paeonia lactiflora Pall., exhibited antioxidant effects by protecting human umbilical vein endothelial cells (HUVECs) from oxidative damage induced by hydrogen peroxide (H_2O_2).(Chen et al., 2011)

Antibacterial

In their study, Liliana Cristina Soare et al. demonstrated that ethanol extracts from the petals of Paeonia officinalis L. exhibited both antioxidant and antibacterial activities, effectively acting against Staphylococcus aureus and Escherichia coli.(Ferdeş, n.d.)

Anxiolytic

Xiao Juan Mi et al. demonstrated that paeonol exhibits anxiolytic-like effects at specific doses in the elevated plus maze and light/dark box tests. Compared to diazepam, paeonol showed a superior safety profile, as it did not impair motor activity in either the open-field or inclined plane tests, even at doses exceeding its anxiolytic range.(Xiao et al., 2005)

Similarly, S.M. Abbas Zaidi et al., in 2012, found that Paeonia emodi root extract at doses of 300 and 600 mg/kg displayed anxiolytic, antiepileptic, and antioxidant effects in

mice.(Abbas Zaidi & Ahmad, 2012)
In 2018, Zhi Kun-Qiu et al., demonstrated that paeoniflorin (PF) has anxiolytic effects in a PTSD animal model. PF reversed elevated levels of corticosterone (Cort), corticotropin-releasing hormone (CRH), and adrenocorticotropic hormone (ACTH) caused by stress exposure. Additionally, it restored serotonin (5-HT) and 5-hydroxyindoleacetic acid (5-HIAA) levels in the prefrontal cortex and hippocampus. These findings suggest that PF's anti-PTSD effects are linked to regulation of the HPA axis and activation of the 5-HT system.(Z. K. Qiu et al., 2018)

Antiepileptic
In 2012, S.M. Abbas Zaidi and colleagues demonstrated that Paeonia emodi root extract, administered at doses of 300 and 600 mg/kg, exhibits anxiolytic, antiepileptic, and antioxidant properties in mice.(Abbas Zaidi & Ahmad, 2012)

Anti inflammatory
In their 2020 study, Yan-Xi Zhou and colleagues revealed that paeoniflorin interacts with B and T lymphocytes, dendritic cells (DCs), and various signaling molecules involved in inflammatory and immune-related pathways, functioning as an anti-inflammatory and immunoregulatory agent.(Zhou et al., 2020)

Anticonvulsive
In 2012, Hitomi Hino et al. investigated the anticonvulsive effects of paeoniflorin (PF) and Keishikashakuyaku-to (KS), a PF-containing herbal medicine, in a model of human febrile seizures (FS) using immature rats with hyperthermia-induced seizures. Their findings suggest that PF and PF-containing herbal medicines have anticonvulsive properties, making them potential candidates for treating FS in children.(Hino et al., 2012)

Analgesic
In a 2008 study, Xiao-Jun Zhang and colleagues demonstrated that paeoniflorin (PF), a primary active compound in the root of Paeonia lactiflora (family Ranunculaceae), effectively alleviates colorectal distention (CRD)-induced visceral neonatal maternal separation (NMS). pain in rats with visceral hyperalgesia caused by The results suggest that PF's analgesic effect may be mediated through the adenosine A1 receptor by inhibiting CRD-triggered glutamate release and NMDA receptor-dependent ERK signaling.(Zhang et al., 2009)

Antithrombotic
In their 2015 study, Songshan Ye and colleagues demonstrated that paeoniflorin has the potential to improve the prethrombotic state and promote thrombus recanalization by upregulating the expression of uPA. This effect may be mediated through the regulation

of the p38 and JNK MAPK signaling pathways.(Ye et al., 2016)

Antidepressent

In 2013, Fengmei Qiu and colleagues evaluated the antidepressant-like effects of paeoniflorin in mice and explored its underlying mechanisms. Their findings showed that intraperitoneal administration of paeoniflorin significantly reduced immobility in both forced swimming and tail suspension tests, without affecting locomotor activity. Additionally, paeoniflorin counteracted reserpine-induced ptosis, akinesia, and hypothermia. It also notably increased serotonin (5-HT) levels and its metabolite, 5-hydroxyindoleacetic acid (5-HIAA), in the hippocampus. These results suggest that the antidepressant-like effects of paeoniflorin may be largely due to the upregulation of serotonergic systems.(F. Qiu et al., 2013)

Abortifacient

In 1951, Duane G. and colleagues demonstrated that a crude alcohol extract of the root induces uterine stimulation in rats. (Wenzels & Haskells, n.d.)

Cardioprotective

In 2008, Muhammad N. and colleagues studied the effects of a 70% ethanolic extract of peony root (Pe.Cr) on guinea pig atria, trachea, and rat aorta tissues, as well as its activity against arachidonic acid (AA)-induced platelet aggregation in human platelet-rich plasma. The results demonstrated that the extract exhibited cardiosuppressant, vasodilatory, antiplatelet, and tracheal relaxant effects, supporting its potential medicinal use for treating various hyperactive cardiovascular and respiratory disorders.(Ghayur et al., 2008)

Gastro protective

In 2018, Young-Sik Kim and colleagues demonstrated that Paeonia Extract Mixture (HT074) has gastroprotective effects against various ulcer-inducing agents, including HCl/EtOH, immersion stress, and NSAIDs. These protective effects are linked to reduced gastric secretions and the preservation of the gastric mucosal barrier through increased mucus production, partially mediated by endogenous sulfhydryl compounds and PGE2. Based on these findings, HT074 is suggested as a potential therapeutic agent for treating gastritis and gastric ulcers. (Kim et al., 2019)

Hepatoprotective property

In 2013, Feroz Ahmad and colleagues demonstrated the hepatoprotective effects of an aqueous extract from Paeonia officinalis roots in counteracting the damaging impact of CCl_4 on liver histology. While rats treated with CCl_4 exhibited extensive histological damage, those treated concurrently with CCl_4 and the extract at doses of 100 mg/kg/day and 200 mg/kg/day showed only mild to moderate changes. The 200 mg/kg/day dose

was more effective than the 100 mg/kg/day dose in protecting the liver from hepatocellular injury. This protective effect is likely due to the glycoside content of P. officinalis roots.(Ahmad & Tabassum, 2013a)Feroz Ahmad et al indicate the protective effect of P. officinalis roots against acute liver injury in rats, which may be attributed to its glycoside content. (Ahmad & Tabassum, 2013a) In 2014, Zequn Jiang and colleagues showed that paeoniflorin (PF) effectively suppresses apoptosis in human hepatocytes. The potential mechanisms involve not only the inhibition of intracellular calcium increase and mitochondrial dysfunction but also the inhibition of caspase activity, along with the regulation of apoptotic mediators in both the ER stress and mitochondria-dependent pathways.(Jiang et al., 2014)

Hypotensive property

In 1952, Duane G. Wenzel demonstrated the effects of P. officinalis extract on blood pressure. Rats were anesthetized using an intraperitoneal injection of pentobarbital sodium (50 mg/kg). A 20-gauge needle filled with a heparin solution in normal saline was used to cannulate the carotid artery, which was then connected to the pressure head of a Technitrol C-R Lilly Manometer, linked to a Hathaway Mechanical Oscilloscope. After injecting 1 milliliter of the prepared extract (equivalent to 160 mg/kg of the total extract) into the jugular vein, a transient decrease in blood pressure was observed.(Wenzels & Haskells, n.d.) In 2016, Bo Li and colleagues indicated that the combination of Paeoniflorin Enriched Extract (RE) and Metoprolol (MP) shows significant potential for the effective treatment of hypertension. When administered together at lower doses, this combination could lower blood pressure, enhance microcirculation, and upregulate eNOS expression, thereby alleviating endothelial dysfunction.(B. Li et al., 2018)

Neuroprotective

In 2011, Qing-Qiu Mao and colleagues demonstrated the protective effects of paeoniflorin against corticosterone-induced neurotoxicity in cultured rat pheochromocytoma (PC12) cells. The study found that paeoniflorin increased cell viability and reduced levels of intracellular reactive oxygen species (ROS) and malondialdehyde (MDA) in corticosterone-treated PC12 cells. Additionally, paeoniflorin reversed the decrease in nerve growth factor (NGF) mRNA levels caused by corticosterone. These results suggest that paeoniflorin provides neuroprotective effects against corticosterone-induced neurotoxicity in PC12 cells, likely through the inhibition of oxidative stress and the upregulation of NGF expression.(Mao et al., 2012)

In 2014, Peng Li and colleagues demonstrated that paeoniflorin (PF) may protect PC12 cells from oxidative injury induced by H_2O_2. PF was shown to modulate H_2O_2-induced oxidative stress, as evidenced by changes in LDH and ROS levels in PC12 cells. Additionally, PF reduced H_2O_2-induced apoptosis and enhanced overall cell survival. Furthermore, the results indicated that PF downregulated neuroinflammation caused

by H_2O_2 by regulating NF-κB-associated inflammatory signaling.(P. Li & Li, 2015)

Conclusion

Paeonia officinalis, known as Ood Saleeb in Unani medicine, is a botanically and therapeutically significant plant with a long history of use in traditional medical systems. Its rich phytochemical profile, including bioactive compounds such as paeoniflorin, tannins, flavonoids, and alkaloids, underpins its diverse pharmacological properties. These properties, particularly its anti-inflammatory, anxiolytic, antioxidant, anticonvulsant, and analgesic effects, offer promising therapeutic avenues for managing generalized anxiety disorder (GAD) and other psychosomatic conditions.

Scientific studies provide substantial evidence supporting the plant's efficacy in neurological, gastrointestinal, and reproductive health, along with its cardioprotective and gastroprotective benefits. However, despite these promising findings, further clinical research is essential to confirm its therapeutic efficacy, establish standardized dosages, and ensure safety in clinical settings. This review emphasizes the potential of Paeonia officinalis as a valuable natural therapeutic agent and calls for integrating traditional knowledge with modern research to explore its full potential in contemporary medicine.

Funding: Not applicable

Credit Authorship Contribution Statement: Swaleha Akhtar: Investigation, Methodology, Validation, Formal analysis, writing reviewing and editing. Tanzeel Ahmad: Supervision, Resources, Visualization, Formal analysis All authors read and approved the final manuscript.

Declaration of competing interest: Not applicable

Acknowledgements: We acknowledge the contributions of all co-authors.

References

1. Anonymous. National Formulary of Unani Medicine. Vol. 6. New Delhi: Department of AYUSH, Ministry of Health and Family Welfare, GOI; 2011. 141 p.
2. Anonymous. National Formulary of Unani Medicine. Vol. 5. New Delhi: Department of AYUSH, Ministry of Health and Family Welfare, GOI; 2008. 162 p.
3. Anonymous. The Wealth of India. Vol. 7. New Delhi: Publication & Information Directorate, CSIR; 211 p.
4. Khare CP. Indian Medicinal Plants. Springer-Verlag Berlin/Heidelberg: Springer; 2007. 461–462 p.
5. Khare CP. Indian Herbal Remedies. Berlin, Heidelberg: Springer Berlin Heidelberg; 2004. 348 p.
6. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Blatter E, Caius JF, editors. Vol. 1. Allahbad: Lalit Mohan Basu, M.B. 49; 1981. 25–26 p.

7. Anonymous. The Unani Pharmacopoeia of India (PART-I). Vol. 3. New Delhi: CCRUM, Department of AYUSH, Ministry of Health and Family Welfare, GOI; 2007. 74–75 p.
8. P. Rastogi R, Mehrotra BN. Compendium of Medicinal Plants. P. Rastogi R, editor. Vol. 5. New Delhi: Central Drug Research Institute, Lucknow & National Institute of Science Commuinication and Information Resources; 2005. 593 p.
9. Rafeequddin HM. KanzulAdviya. Aligarh: Department of Ilmul Adwia, Ajmal Khan Tibbiya College; 498–499 p.
10. Al-Razi Z. Maqala Fi Abdal Al-Adwiya Al-Mustamala Fi Al-Tib Wa Al-Ilaj (English Translation). 1st ed. New Delhi: Central Council for Research in Unani Medicine, Ministry of Health & Family Welfare; 1999. 88 p.
11. Safi Uddin Ali HS. Unani AdviyaMufarrada. 7th ed. New Delhi: National Council for Promotion of Urdu Language; 2013. 206–207 p.
12. Chevallier A. The Encyclopedia of Medicinal Plants. 1st ed. New York: DK Publishing inc.; 1996. 241 p.
13. Kabeeruddin H. Makhzan-ul- Mufradat. New Delhi: Eijaz Publication House; 407 p.
14. Chatterjee A, Chandra Prakrashi S, editors. The Treatise of Indian Medicinal Plants. Vol. 1 (Revised). New Delhi: National Institute of Science Communication And Information Resources; 2013. 141–143 p.
15. National Formulary of Unani Medicine PART-II. Vol. 1. New Delhi: Department of AYUSH, Ministry of Health and Family Welfare, GOI; 2007. 153 p.
16. Abdul Hakeem M. Bustan ulMufaradat. New Delhi: Idara Kitab-us-Shifa; 2002. 398–399 p.
17. Betar I. Al Jam ulMufradat Al Adwia wa Al Agzia (Urdu Translation). Vol. 3. New Delhi: CCRUM; 1999. 345–347 p.
18. Taqweem al Adwia. 66 p.
19. Hussain M. Kitab ulMufradat. 3rd ed. Lahore; 1960. 334 p.
20. Ahmad Tariq HN. Taj ulMufradat(Khwaasul Adwia). 1st ed. New Delhi: IDARA KITAB-US-SHIFA; 2010. 504–505 p.
21. Nadkarni Km. Indian Materia Medica. 3rd Ed. Vol. 1. Bombay: Popular Prakashan Private Limited; 1976. 894 p.
22. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants. 4th ed. New Delhi: National Institute of Science Communication ; 1996. 184 p.
23. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants. 8th ed. New Delhi: National Institute of Science Communication and Information Resources; 2009. 184 p.
24. Khan MA. Muhit-e-Azam (Urdu Translation). Vol. 3. New Delhi: CCRUM; 2014. 671–674 p.
25. Ghani HN. Khaza Inul Adviya. New Delhi: Idara Kitab-us-Shifa; 955–956 p.
26. Ram Lubhaya H. Kitab ulMufradat. 4th ed. Lahore: Idara Matbooaat Sulemani; 2013. 353–354 p.
27. Bin Hubl Baghdadi AHA. Kitab ulMukhtarat fit Tib(Urdu Translation). 1st ed. Vol. 2. New Delhi: CCRUM; 2005.

28. Ghulam Hussain Kantoori MHS. Al Qanoon (Urdu Translation). Vol. 2. New Delhi: IDARA KITAB-US-SHIFA; 2010. 429 p.
29. Kabeeruddin H. Kitab ulMufradat. Mohammad Basheer and Sons; 287 p.
30. Sayeed A. Kitab al-Fath fi al-Tadawi(Urdu Translation). 1st ed. New Delhi: Department of Kulliyat, Faculty of Medicine (Unani), Jamia Hamdard; 2007. 182–183 p.
31. Abdul Haleem Lakhnawi HM. Mufradat-e- Azizi. New Delhi: Central Council for Research in Unani Medicine; 2009. 17 p.
32. P. Rastogi R, Mehrotra BN.Compendium of Indian Medicinal Plants. P. Rastogi R, editor. Vol. 4. New Delhi: Central Drug Research Institute Lucknow and National Institute of Science Communication and Information Resources; 2008.
33. Ahmad Ansari HJ. TaleemulAdwiya. Lucknow: Office Takmeelut tib College; 1930. 78 p.
34. Kabeeruddin M. Ilmul Adwia Nafeesi. Delhi: Daftar al Maseeh
35. Ishaq H, Pharm Sci PJ. Anxiolytic Effect of Herbal medicine, Khamira Gaozaban Ambri JadwarOodSalib Wala (KGJ) in experimental rat models [Internet]. Vol. 27, Article in Pakistan Journal of Pharmaceutical Sciences. 2014. Available from: www.researchgate.net.
36. Ahmad F, Tabassum N. Preliminary phytochemical, acute oral toxicity and antihepatotoxic study of roots of Paeonia officinalis Linn. Asian Pac J Trop Biomed. 2013;3(1):64–8.
37. Ahmad F, Tabassum N, Rasool S. Medicinal Uses And Phytoconstituents Of Paeonia Officinalis [Internet]. Vol. 2012, IRJP. Available from: www.dehlvi.com
38. Dienaitė L, Pukalskienė M, Pukalskas A, Pereira C V., Matias AA, Venskutonis PR. Isolation of strong antioxidants from paeonia officinalis roots and leaves and evaluation of their bioactivities. Antioxidants. 2019 Aug 1;8(8).
39. Oancea S, Perju M, Olosutean H. Influence of enzyme-aided extraction and ultrasonication on the phenolics content and antioxidant activity of Paeonia officinalis L. petals. Journal of the Serbian Chemical Society. 2019 Nov 1;85(7):845–56.
40. Chen T, Guo Z pei, Jiao X yan, Zhang Y hong, Li J yi, Liu H jie. Protective effects of peoniflorin against hydrogen peroxide-induced oxidative stress in human umbilical vein endothelial cells. Can J PhysiolPharmacol. 2011 Jun;89(6):445–53.
41. Ferdeș M. New Therapeutic Formulations With An Antibacterial Effect, Based On Plant Extracts Liliana Cristina Soare, Ionica Deliu, Ion Iosub, CodruŃa-Mihaela Dobrescu.
42. Xiao JM, Si WC, Wen JW, Wang R, Yi JZ, Wei JL, et al. Anxiolytic-like effect of paeonol in mice. PharmacolBiochemBehav. 2005 Jul;81(3):683–7.
43. Abbas Zaidi SM, Ahmad S. Effect of Repeated Administration of Paeonia emodi Root Extract in Experimental Models of Epilepsy and Behaviour. Journal of Pharmacology and Toxicology. 2012;7(2):64–77.
44. Qiu ZK, He JL, Liu X, Zeng J, Xiao W, Fan QH, et al. Anxiolytic-like effects of paeoniflorin in an animal model of post traumatic stress disorder. Metab Brain Dis. 2018 Aug 1;33(4):1175–85.

45. Zhou YX, Gong XH, Zhang H, Peng C. A review on the pharmacokinetics of paeoniflorin and its anti-inflammatory and immunomodulatory effects. Vol. 130, Biomedicine and Pharmacotherapy. Elsevier Masson SAS; 2020.
46. Hino H, Takahashi H, Suzuki Y, Tanaka J, Ishii E, Fukuda M. Anticonvulsive effect of Paeoniflorin on experimental febrile seizures in immature rats: Possible application for febrile seizures in children. PLoS One. 2012 Aug 16;7(8).
47. Zhang XJ, Chen HL, Li Z, Zhang HQ, Xu HX, Sung JJY, et al. Analgesic effect of paeoniflorin in rats with neonatal maternal separation-induced visceral hyperalgesia is mediated through adenosine A1 receptor by inhibiting the extracellular signal-regulated protein kinase (ERK) pathway. PharmacolBiochemBehav. 2009 Nov;94(1):88–97.
48. Ye S, Mao B, Yang L, Fu W, Hou J. Thrombosis recanalization by paeoniflorin through the upregulation of urokinase-type plasminogen activator via the MAPK signaling pathway. Mol Med Rep. 2016 Jun 1;13(6):4593–8.
49. Qiu F, Zhong X, Mao Q, Huang Z. The antidepressant-like effects of paeoniflorin in mouse models. Exp Ther Med. 2013 Apr;5(4):1113–6.
50. Wenzels DG, Haskells AR. Pharmacological Actions of PueoiziuoficinuZis*.t.
51. Ghayur MN, Gilani AH, Rasheed H, Khan A, Iqbal Z, Ismail M, et al. Cardiovascular and airway relaxant activities of peony root extract. Can J PhysiolPharmacol. 2008 Nov;86(11):793–803.
52. Kim YS, Park HJ, Kim H, Song J, Lee D. Gastroprotective Effects of Paeonia Extract Mixture HT074 against Experimental Gastric Ulcers in Rats. Evidence-based Complementary and Alternative Medicine. 2019;2019.
53. Ahmad F, Tabassum N. Effect of 70% ethanolic extract of roots of Paeonia officinalis Linn. on hepatotoxicity. J Acute Med. 2013 Jun;3(2):45–9.
54. Jiang Z, Chen W, Yan X, Bi L, Guo S, Zhan Z. Paeoniflorin protects cells from GalN/TNF-α-induced apoptosis via ER stress and mitochondria-dependent pathways in human L02 hepatocytes. Acta BiochimBiophys Sin (Shanghai). 2014 May 1;46(5):357–67.
55. Li B, Yang ZB, Lei SS, Su J, Jin ZW, Chen SH, et al. Combined Antihypertensive Effect of Paeoniflorin Enriched Extract and Metoprolol in Spontaneously Hypertensive Rats. Pharmacogn Mag. 2018 Jan 1;14(53):44–52.
56. Mao QQ, Zhong XM, Qiu FM, Li ZY, Huang Z. Protective effects of paeoniflorin against corticosterone-induced neurotoxicity in PC12 Cells. Phytotherapy Research. 2012 Jul;26(7):969–73.
57. Li P, Li Z. Neuroprotective effect of paeoniflorin on H2O2-induced apoptosis in PC12 cells by modulation of reactive oxygen species and the inflammatory response. Exp Ther Med. 2015 May 1;9(5):1768–72.