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Therapeutic usefulness of *Delphinium denudatum* (Jadwar): An update

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Abstract

Delphinium denudatum (Jadwar) is a potent drug of Central Nervous System, an annual herb belongs to family Ranunculaceae occurring in the western Himalayas from Kashmir to Uttarakhand. The word Jadwar is Arabic form of Persian Zadwar means the great purifier or antidote. It is also called Nirbisi due to its antidotal properties. According to Dymock Jadwar is of five types. It is mainly adulterated with the root of Aconite (Beesh) due to some morphological resemblance which is poisonous in nature. In various classical texts, it has been recommended in the management of various nervous disorders like mania, epilepsy, tremors, hysteria, atony, numbness, paralysis as well as in the management of addiction of various drugs like morphine also serves as antidote to various toxic drugs like Aconite and venoms (snake, scorpion). Its antioxidant and antiasthmatic activity have been reported. Ethanolic and aqueous extract of Jadwar showed protective role in Parkinson's disease and morphine de-addiction properties respectively.

Keywords: Jadwar, *Delphinium denudatum*, antidote, therapeutic, roots

1. Introduction

Delphinium denudatum (Jadwar) belongs to Family-Ranunculaceae, an annual or perennial erect and hardy ornamental herb grows in the western Himalayas from Kashmir to Uttarakhand at an altitude of 2400-3600 m especially on grassy slopes^[1]. The plant density in Himalayan region was most in Sirmaur followed by Solan and Shimla with only a few plants found in Bilaspur district^[2]. The roots are used in various medical formulations in Unani and Ayurveda to reduce the withdrawal symptoms in people on de-addiction therapy^[3]. Jadwar is Arabic word Persian Zadwar, which means the antidote. In Persian it is also called Mahparwin (Moon and Pleiades), as it blossoms in the beginning of summer when the Pleiades rise. Indian Jadwar named as Narbisi/Nirbisi due to its antidotal properties. Nir means to oppose or to remove and Bisi means Bis or Vish (Poison)^[4, 5]. Some of its vernacular names are Antila, Balootularz, Jadwar, Mahpervin, Zadwar, Nirbisi, Nirbishi, Vishalakarani, Nilobikh, Nirvisha, Mahferfin, Apavisha, Avisha^[6-9]. It is one of the most important drugs used in the indigenous system of medicine in India, especially in Unani Medicine^[1].

2. Taxonomical Classification

Kingdom: Plantae; **Class:** Angiosperms; **Order:** Ranunculales; **Family:** Ranunculaceae; **Genus:** *Delphinium*; **Species:** *denudatum*.

3. Morphology**3.1 Macroscopic Examination**

Annual or perennial branched erect herb. Leaves are orbicular, segments cuneate to obviate, pinatifid. Flowers in racemes, bluish in color^[9]. The root of *Delphinium denudatum* is dark brownish black in color, 3-6 cm long and 1-2 cm width at the crown in length, conical shape, very hard, externally covered by a suberized metaderm and bears numerous small circular scars (remains of lateral rootlets) (Figure1). Longitudinal wrinkles are present with short fracture. It bears characteristic odour, bitter taste^[6].

3.2 Microscopic Examination

Transverse section of tuberous root shows circular and wavy outline, epidermis consisting of single layer of irregularly arranged brown tubular cells with suberised walls, consisting of narrow zone of about 5-10 layers of thin walled, polygonal to rectangular parenchymatous cells. Endodermis distinct with suberised radial walls, cambium present, secondary phloem present above the cambium and secondary xylem present below the cambium, primary xylem

present near cells in surface view. Pith region, starch grains present in the entire parenchymatous cells of the tuberous root [6].

Part Used	Root [10]
Toxic	To Kidney [11]
Temperament	Hot and dry along with slight variation in grade of temperament [10-12], and cortical parenchyma
Taste	Bitter [5]
Dose	0.5-1 gm powdered root (orally) [6, 10]
Correctives	<i>Coriandrum</i> (Kishniz) [10,11], <i>Tragacanth</i> (Kateera) and milk [10].
Substitutes	<i>Curcuma zeodaria</i> (Zaranbad) [11].

3.3 Preservation and Storage

The drugs dried under shade, repeatedly shake or brushed during and after drying to remove the sandy soil. Thereafter, roots are stored in air-tight containers in a cool and dry place [10].

3.4 Cultivation

Plant propagated through seeds. The rate of germination is very low as the germination is very sensitive to temperature. The optimal temperature to germinate seeds is at 12-15 °C. The better method of propagation is by dividing clumps [9].

3.5 Varieties

Researchers have mentioned four types of Jadwar viz. white, violet, black and yellow [13]. According to Dymock, Jadwar is of 5 types-

1. Jadwar Khatai: externally black, internally purplish brown, scorpoid, knotted, initially sweetish then very bitter in taste.
2. Yellowish brown on both sides (Externally and internally), scorpoid shape, bitter in taste.
3. Black on both sides, Bitter in Taste on rubbing it leaves a blue tint.
4. Blackish in colour, olive sized, bitter in taste.
5. Antila: black in colour, soft and bitter taste, Spanish variety, inhibits the Beesh toxicity.

In all of these, Jadwar Khatai is said to be most esteemed [4].

4. Adulterant

Jadwar is mainly adulterated with the roots of Aconite due to resemblance in morphological characters as well as occurrence on the same place [4].

5. Distinguishing Jadwar from Aconite

At some places Jadwar is very precious due to less production which leads to its adulteration with roots of other drugs termed as "False Jadwar". It is mainly prepared by boiling the roots of some of the milder kinds of Beesh in milk and coloring them. We can distinguish it from True Jadwar by three ways-

- On dipping in hot water False Jadwar, loses its colour.
- False Jadwar has rough, irregular and wrinkled surface due to boiling in some colored substances while true Jadwar has regular and smooth surface.
- On fracture, the parenchyma of false Jadwar is non uniform in colour; the central portion to which the colour has not penetrated is pale [4].

Since, Jadwar is mainly adulterated with roots of Aconite (Beesh) as both grow together. Beesh can be distinguished

from Jadwar as smaller, reddish and its taste is first sweetish, but soon becomes acrid accompanied with a tingling sensation and numbness and even leads to inflammation and blisters on tongue. Jadwar is free from such adverse effects and act as antidote of Beesh [11, 14].

6. Important formulations

There are some important formulations of Jadwar. These includes: Habb-e-Jadwar, Habb-e-Jawahar, Khamiragauzabanambarijadwarood-saleebwala, Jawahar Mohra, Marham-e-Jadwar, Zimad-e-warm-e-lozatain, Roghan Mujarrab, Qurs Ood-Saleeb [6, 15], Habbe Amber Momyaee, Majun Chobchini, Majun Murawwehul Arwah, Mufarreh Azam [14].

7. Phytochemical Constituents

According to classical literature there are many bioactive constituents found in *Delphinium denudatum* such as flavonoids, alkaloids including delpho-curaine, conelphine, denudatine, denudatine, delphinine, staphisagrine, delphadienone, hetisinone, delnudine, delnuline, condelphine and diterpenoid alkaloid C₂₅H₃₉NO₆ identical with condelphine have been reported [13, 16]. Moreover, sugar, protein, phenol and starch are the organic content and Iron, zinc, calcium, manganese and potassium are the inorganic content of *Delphinium* [10]. A number of compounds have been isolated from roots of *Delphinium denudatum*. Diterpenoid alkaloids like condelphine, isotalatizidine, denudatine, talatizidine, vilmorrianonimouse and acetylhetero-phyllisine also have been reported. The other natural products reported from this plant are sterols which are campesterol, stigmasterol, and β-sitosterol and fatty acids [17]. Isolated new diterpenoid alkaloids i.e. 8-acetyl heterophyllisine, panicutine and 3-hydroxy-2-methyl-4H-pyran-4-1 from the root of *Delphinium denudatum*. The former two diterpenoid alkaloids including vilmorrianone showed antifungal activity against a number of human pathogenic fungi [17, 18].

8. Pharmacological Action

The roots of this plant have various pharmacological actions. These include: Nervine tonic (Muqawwi-e-Asab) [2, 9]; Sedative (Musakkin) [15]; Aphrodisiac (Muqawwi bah) [15]; Detergent (Jali) [15]; Diuretic (Mudirr-e-baul) [15]; Cardio-tonic (Muqawwi-e-qalb) [15, 19, 20]; Exhilarant (Mufarreh) [6]; Antipyretic (Dafe-Humma) [6, 15, 21, 22]; Deobstruent (Mufatteh) [1,6]; Anti-inflammatory (Mohallil) [6, 15]; Analgesic (Musakkin) [15]; Astringent (Qabiz) [19]; Anticonvulsant (Dafetashannuj) [23, 24]; Anti-asthmatic (Dafe-rebu) [5, 25]; Antioxidant [5,17]; Stomachic (Muqawwi-e-Meda) [3, 16, 21, 22]; Demulcent [15]; Snake and aconite Antidote (Tiryag) [5, 15, 16, 24]; Syphilis (Atshak) [3, 5, 24] and Rheumatism (Hudar) [5, 21, 22, 23, 24]. Delphine resembles aconitine and is antidotal against muscarine and digitaline. Staphisagrine acts like curare and paralysis of the motor nerves, Stimulates heart, liver, brain (Muharrik-e-dimag, qalbwajigar) [5].

9. Therapeutic Uses

Roots of *Delphinium denudatum* are used in the treatment of many ailments like chronic catarrh (Nazlamuzmin) [10]; Sinusitis (Iltahabtajaweef-e-anaf) [10]; Epilepsy (Sara) [9, 10, 15, 19]; Paralysis (Laqwa) [10, 15, 19]; Cholera (Waba) [10]; Jaundice (Yarqan) [10, 19]; Weakness of the stomach (Zoaf-e-meda) [10]; Cardiac diseases (Amraz-e-qalb) [10]; Palpitation (Khafqan) [10]; Scorpion bite (Tiryagezhar) [10]; Aconite poisoning [10];

Insanity (Junun) [6, 19]; Psychosis (Mania) [1, 17, 19]; Hysteria (Ikhtinaqurreham) [1, 6]; Atony (Istirkha) [1, 6]; Migraine (Shaqiqa) [1, 6, 15, 19]; Numbness (Khadar) [1, 6]; Tremors (Ra'sha) [1, 6]; Convulsions (Tashannuj) [1, 6, 19, 24]; Snake bite [1, 6, 15, 24]; Opium de-addiction [20, 27]; Arthritis (Wajaulmafasil) [1, 6]; Leukoderma (Bars) [1, 6]; For improving skin complexion [13]; Toothache (Dard-e-dandan) [1, 6, 9, 18, 22, 24, 27]; In spermatorrhoea (Jarayan); weakness of the genitals [16]; Ulcers (Quruh), Urinary disorders (Amraz-e-gurdawamasana) [15, 19]; Dysurea [19]; Calculi (Hasat) [19]; used in Abdominal pain, Hookworm (Mustadira) [1, 6]; Cough (Sual) [19]; diseases of blood (Amraz-e-dam) [1, 6]; Natural analgesic [19]; stimulant (Muharrik), alterative and tonic [28].

The roots are used in various compound formulations in Unani and Ayurveda. Jadwar formulations are used in Unani System of Medicine are: Khamira Gaozaban Ambri Jadwar Ood Salib Wala (KGJ), which reported anxiolytic effect and antidepressant activity in rodents [29]. Jawahar Mohra, in which *Delphinium denudatum* is a main constituent, has been reported to exert an anti-stress effect against diverse stressors [30], Immunomodulation [31]. The root of this plant is reputed for its beneficial effects in nervous disorders and opium addiction [32]. Various medical formulations of roots are used to reduce the withdrawal symptoms in de-addiction therapy [3].

10. Pharmacological Studies

A number of studies have been done on its phytochemical and pharmacological properties [17, 18, 21].

10.1. Anti-oxidant activity: This study showed the antioxidant potential of β -Sitosterol from the extract of *Delphinium denudatum* showed a high activity toward DPPH free radical scavenging assay [17].

10.2. Anti-parkinson's Activity: The protective effects of ethanolic extract of *Delphinium denudatum* in rat model of Parkinson's disease [33].

10.3. Analgesic Activity: Hydro-alcoholic extract of roots of *Delphinium denudatum* and leaves of *Amaranthus spinosus* were used in dose dependent manner to check analgesic activity in rats. There was significant reduction in number of writhing and increased in the reaction [34]. Time with animals as compared to standard drug Diclofenac

10.4. Anticonvulsant Activity: It is also used as an anticonvulsant drug and this property of the plant has recently been observed in aqueous and ethanolic fractions extracted from *Delphinium denudatum* in mice [24].

10.5. Nephro-protective activity: The aqueous extract was used for Nephro-protective in animal rat model at various doses. The result showed significant dose-dependent reduction in elevated blood urea, uric acid, s. creatinine, and normalized histo-pathological changes. Aqueous extract of *Delphinium denudatum* showed nephroprotective in renal injury caused by cisplatin [22].

10.6. Anti-anxiety activity: Hydro-alcoholic extract of roots of *Delphinium denudatum* and leaves of *Amaranthus spinosus* in combination were used in dose dependent manner to check anxiolytic activity and both the drugs synergistically showed better anxiolytic activity compared to standard drug diazepam [36].

10.7. Hepato-protective activity: Aqueous extract was reported to have hepato-protective activity on experimental carbon tetrachloride induced liver damage in rats [32].

10.8. Immuno-modulating Property: Organic solvent extracts showed Immuno-modulating Properties [31].

10.11. De-addiction property: *Delphinium denudatum* use in opium addiction is mentioned in Unani classical literature [22, 27]. A study reported the protective role of *Delphinium denudatum* against morphine-induced dependence and tolerance in mice. The aqueous extract of *Delphinium denudatum* roots showed a significant effect against morphine induced tolerance and dependence in mice [37].

In a study on morphine induced tolerance and dependence in mice, chronic treatment of the aqueous extract (200-1600mg/kg) of the *Delphinium denudatum* root, suppressed morphine withdrawal jumps in a dose dependent manner, a sign of development of dependence to opiate as assessed by naloxone (2mg/kg) precipitation withdrawal on day 10 of testing in mice [26].

Another study was done on de-addiction property of the *Delphinium denudatum* root in morphine dependent rats. The alcoholic extract of the root was administered in different regimen; a) single dose (700 mg/kg) 10 hours before the first dose of morphine, b) single dose (700 mg/kg) 10 hours after the last dose of morphine and, c) multiple doses (350 mg/kg) along with morphine twice a day for 7 days. Administration of the extract caused significant reduction in the frequency of counted signs as well as the presence of checked signs of morphine withdrawal [19].

Another study showed that the ethanolic extract and methanolic fraction of *Delphinium denudatum* root significantly reduced the mean scores of various 'counted signs' and 'checked signs' of morphine withdrawal syndrome and could thus be proved to be an alternate remedy in morphine de-addiction [38].



Fig 1: Root sample of *Delphinium denudatum*

11. Conclusion

In Unani classical literatures and other modern literatures, *Delphinium denudatum* (Jadwar) is mentioned for its de-addiction property. Preliminary investigations and scientific studies showed promising results on use of *Delphinium denudatum* in dependence and tolerance. Further investigations are needed to find out the mechanism of action, active ingredients and utility in clinical practice so that it can be established as a standard drug in De-addiction therapy.

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