

*Persian Medicine***Jadwar (*Delphinium denudatum* Wall.): a medicinal plant**

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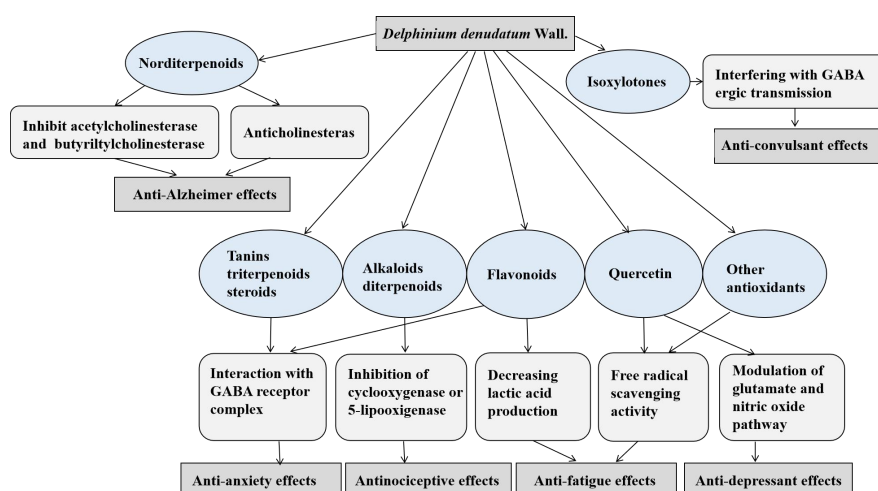
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**Highlights**

This review summarizes the different features of *Delphinium denudatum* Wall., popularly known as jadwar in the sub-continent, and focuses on the well-known therapeutic effects of this herbal drug on various human disorders and animal disease models, including anti-fatigue, anxiolytic and anti-depressive, anticonvulsant, analgesic activities, etc.

**Traditionality**

According to the historical written documents and books of traditional Persian medicine, medicinal of *Delphinium denudatum* Wall. were recognized over 1,000 years ago. The first recorded report of the *Delphinium denudatum* Wall. medical utilization is credited to the great Persian chemist and physician, Rhazes, who lived between the ninth and tenth century (845–925 C.E.). He introduced *Delphinium denudatum* Wall. in his book *Emergency Treatments* which was written in the tenth century C.E., as antidote to rat poison, and snake and scorpion venom. During the following centuries, the usage of *Delphinium denudatum* Wall. in the treatment of various diseases has been mentioned in the books and references in traditional Persian medicine such as neurologic and psychiatric disease, gastrointestinal disease, fever, pain, and poisoning. Presently, *Delphinium denudatum* Wall. are used in Iran, Pakistan, India, and some countries of Middle East for traditional medicine.



## Abstract

*Delphinium denudatum* Wall. is one of the important medicinal herbs of traditional Persian medicine and is known as Jadwar. Medicinal plants are the most widely used drugs in traditional Persian medicine and has been used for various diseases since earlier times. The medicinal uses of *Delphinium denudatum* Wall. date back to over 1,000 years ago. Rhazes (845–925 C.E.) was the first Persian physician and scientist who reported the use of *Delphinium denudatum* Wall. as a herbal remedy. During the following centuries, the usages of *Delphinium denudatum* Wall. in the treatment of various diseases has been mentioned in the books and references of traditional Persian medicine for cures to various diseases such as neurologic and psychiatric disease, gastrointestinal disease, fever, pain, and poisoning. According to modern studies, the dried roots of *Delphinium denudatum* Wall. have antipyretic, antimicrobial, anticonvulsant, hepatoprotective, antioxidant, and pain-relieving properties. Biomolecules from roots of *Delphinium denudatum* Wall. were also identified as potential cures for central nervous system diseases as well as for the amelioration of morphine addiction. *Delphinium denudatum* Wall., with its properties involving the prevention of mitochondrial dysfunction, reduction of oxidative stress, and inflammation and immune dysregulation, can be utilized in curing inflammatory disorders. The effective therapeutic influence of root extract of *Delphinium denudatum* Wall. against several diseases needs to be confirmed through controlled clinical trials. This article reviews the different features of *Delphinium denudatum* Wall. and focuses on the well-known therapeutic effects of this herbal drug on various human disorders and animal disease models.

**Keywords:** *Delphinium denudatum* Wall., Jadwar, root, Traditional Persian medicine, Neurologic and psychiatric effects, Anticonvulsant effects

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## Author contributions:

Roghayeh Baghervand Navid and Alireza Bagherzadeh karimi wrote the manuscript and edited the final version of the manuscript; Morteza Ghojzadeh and Seyed Mostafa Araj-Khodaei designed and wrote some parts of manuscript; Sanam Dolati and Mehri Bansans drew figures and submitted the paper; Mehrdad Karimi and Seyed Mohammad Bagher Fazljou supervised the study and correspondence during the paper submission.

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## Abbreviations:

CNS, central nervous system; DPPH,  $\alpha$ -diphenyl- $\beta$ -picrylhydrazyl; EE, ethanolic extract; AF, aqueous fraction; SRF, sustained repetitive firing; DNP, *Delphinium denudatum* nanophytosome.

## Competing interests:

The authors declare that there is no conflict of interest.

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## Background

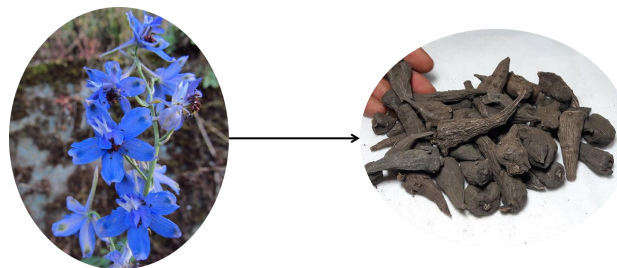
Complementary and alternative medicines are commonly used as resources for both the prevention and treatment of various diseases [1]. During the past few decades, more attention has been focused on traditional medicines and their popularity has been rapidly increasing among adults [2, 3]. Plants as traditional medicines exert potent effects on inflammatory diseases via different cellular mechanisms, involving the down-regulation of pro-inflammatory cytokines, the suppression of oxidative stress, and the increase in antioxidant functions [4-6]. Although the people of different traditional societies and rural communities have been using plants for the treatment of different diseases for a long time, there are only a few documented studies validating their medicinal properties [7, 8].

Traditional Persian medicine is a holistic system of medicine that is an important branch of the complementary and alternative medicines, and has been used in Iran, India, Pakistan, and some countries of Middle East for thousands of years [9-12]. One of the most important medicinal plants that Traditional Persian medicine emphasizes for the treatment of many diseases is Jadwar (*Delphinium denudatum* Wall.) [13]. *Delphinium denudatum* Wall. is a medicinally significant genus of the family Ranunculaceae, with several species found in the Himalayan region. The *Delphinium denudatum* Wall. is one of the most important medicines used in traditional medicine in India, Pakistan, and Iran, particularly in the Unani system [14].

Dried roots of *Delphinium denudatum* Wall. are a popular folk remedy for the treatment of epilepsy in the traditional Unani system of medicine (Figure 1). The first recorded report of the *Delphinium denudatum* Wall. medical utilization is related to the great Persian chemist and physician of ninth and tenth century, Rhazes (845-925 C.E.). He introduced *Delphinium denudatum* Wall. in his book *Emergency Treatments* which was written in the tenth century C.E., as antidote for rat poison, and snake and scorpion venom [15, 16]. During the following centuries, the usage of *Delphinium denudatum* Wall. in the treatment of various diseases has been mentioned in historical written documents and books of traditional Persian medicine. These diseases include neurologic and psychiatric disease, gastrointestinal disease, fever, pain, and poisoning, are summarized in Table 1 [16-25]. Currently, *Delphinium denudatum* Wall. is used in Iran, Pakistan, India, and some countries in the Middle East. The application of *Delphinium denudatum* based on the record of ancient literature and Western medicine is summarized in Figure 2.

The present study aims to review *Delphinium denudatum* Wall. properties and its potentially

beneficial role in the treatment of different disorders including nervous system disorders and other chronic diseases.



**Figure 1** The whole plant and roots of *Delphinium denudatum* Wall.

## Botanical description and phytochemical study

The genus *Delphinium* L. (Ranunculaceae) belongs to the tribe Delphinieae and includes about 385 species, mostly from temperate parts of the Northern hemisphere and mountainous regions of tropical Africa [26]. This genus includes 53 species in Flora Iranica area, 29 of which were reportedly from Iran. *Delphinium semibarbatum* occurs in North East of Iran (Khorassan), Afghanistan and Turkmenistan [27]. A total of 27 species of *Delphinium* were recorded from India [28]. The name “*delphinium*” is derived from the Latin for “dolphin”, referring to the shape of the nectary [29]. In June and July, the plant is topped with a raceme of many flowers, with different colors such as purple, blue, red, yellow, or white, with lengths varying between 40 to 80 cm [30, 31]. It is used in treating asthma and respiratory problems, skin disorders, and central nervous system (CNS)-related diseases. It has anticonvulsant and antimicrobial activities [32, 33].

The mechanisms behind the pharmacological action of *Delphinium denudatum* Wall. can significantly be assisted by the isolation of its active principle from the roots and determination of its structural and functional relationship. The chemical and phytochemical analysis of roots of *Delphinium denudatum* Wall. has identified various active components, including different alkaloids, namely delphinine, sthisagrine, delphocurarine, condelfine, denudatin, and isotalatizidine, sterols, fatty acids, sugar, protein, starch, and flavonoids [34]. Furthermore, phenolic groups and tannins, carbohydrate, steroids, amino acids, glycosides, and terpenoids were also present in the extracts of *Delphinium denudatum* Wall. [35]. The main probable mechanisms of the roots of *Delphinium denudatum* Wall. pharmacological effects including anti-Alzheimer, anti-convulsant, anxiolytic, and antinociceptive effects are shown in Figure 3.

*Delphinium denudatum* Wall. is well known as a rich source of diterpenoid and norditerpenoid alkaloids

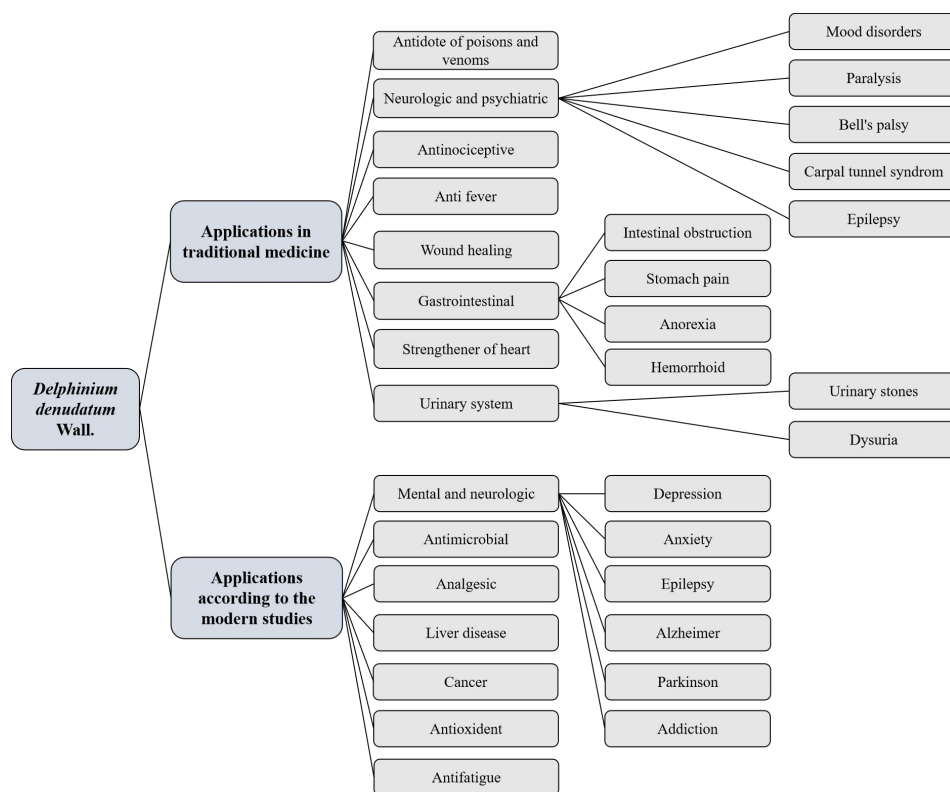


Figure 2 Summary of medicinal applications of *Delphinium denudatum* Wall.

Table 1 The medicinal uses of *Delphinium denudatum* Wall. in historical written documents and books

Century	Name of historical physician/scientist	Name of related books	Medicinal uses which mentioned in books	References
9–10 <sup>th</sup> C.E.	Rhazes	<i>Emergency Treatments</i>	Antidote of rat poison snake and scorpion venom.	[16]
10–11 <sup>th</sup> C.E.	Avicenna	<i>The Canon of Medicine or Laws in Medicine</i>	Strengthener of body and heart, mood improver, and antidote of poisons and venoms.	[17, 18]
	Herawi	<i>The Facts about Drugs</i>		
11–12 <sup>th</sup> C.E.	Jorjani	<i>The Treasure of the Dynasty of Kharazmshahian</i>	Mood enlivener and mood enhancer.	[19]
	Teflisi	<i>Enough in Medicine</i>	Effects on paralysis, Bell’s palsy, and carpal tunnel syndrome.	[20]
13 <sup>th</sup> C.E.	Torkamani	<i>The Trustworthy Remedies</i>	Antidote and antinociceptive effects.	[21]
14–16 <sup>th</sup> C.E.	Ansari	<i>The Choices of Badei-e</i>	Effects on intestinal obstruction, urinary stones, stomach pain, inguinal lymphadenopathy, palpitation, ague, and wound healing.	[22, 23]
	Yousefi	<i>The Gardens of Drugs</i>		
17–18 <sup>th</sup> C.E.	Hakim Momen	<i>The Gift to Believers</i>	Effects on vision power, pain, epilepsy, dysuria, ichter, anorexia, hemorrhoid, arthritis, and facilitation of delivery.	[24, 25]
	Aqili Shiazhi	<i>The Repertory of Drugs</i>		



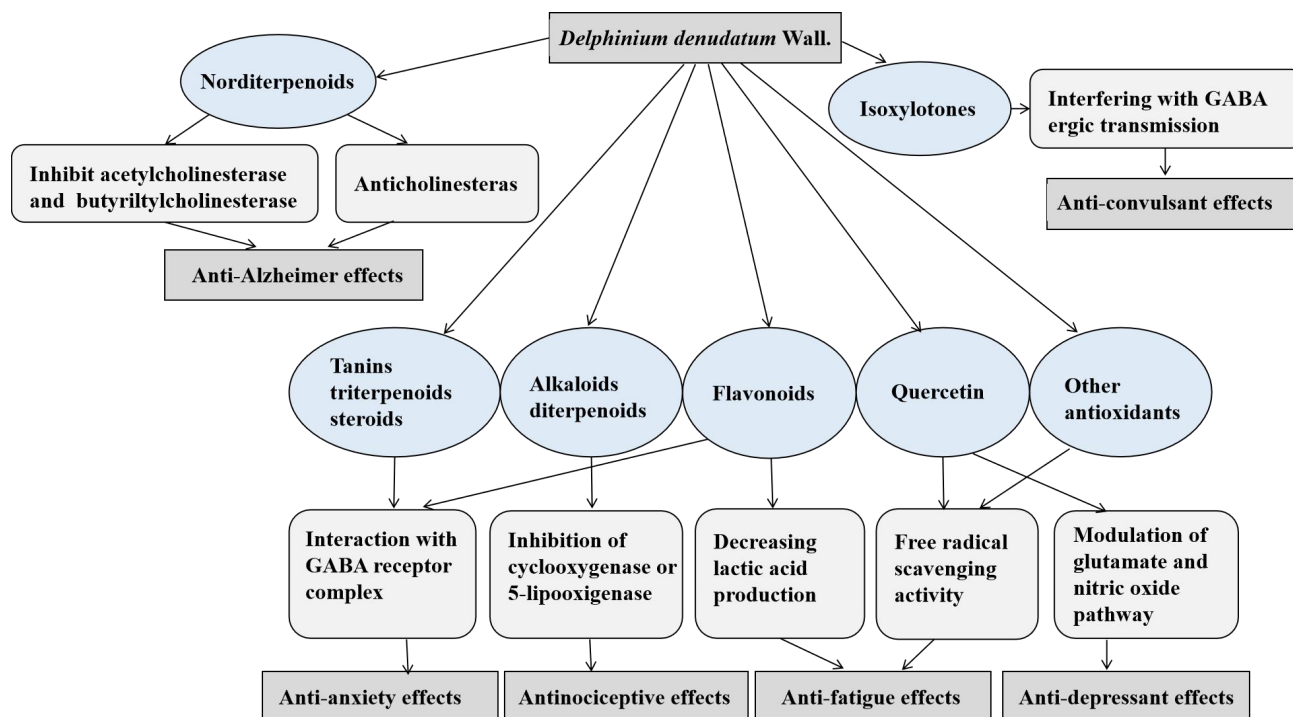


Figure 3 The main mechanisms behind the *Delphinium denudatum* Wall. pharmacological effects

with sedative, cardiotoxic and analgesic activities [36, 37]. The roots of *Delphinium denudatum* Wall. have been reported to be beneficial for mitigating various diseases, including fungal infections, CNS-related diseases, toothaches, and mental and physical fatigue [38]. Its use has also been confirmed for ameliorating morphine addiction [39]. Quercetin is the main flavonoid content of *Delphinium denudatum* Wall. which has antioxidant, anti-inflammatory, anti-aging, neuroprotective, anti-fatigue, and cardioprotective properties [40].

## Therapeutic effects

### Anti-microbial effects

*Delphinium denudatum* Wall. is used to treat intestinal worms and fluid retention [41]. The ethanol extracts of the roots of *Delphinium denudatum* Wall. have shown antibacterial and antifungal activities. Most natural alkaloids and their derivatives are used as basic medicinal agents for their antibacterial properties [42]. Newly identified diterpenoid alkaloids of the roots of *Delphinium denudatum* Wall., including 8-acetylheterophyllisine, alkaloids vilmorrianone, and panicutine have shown antifungal activity against a number of human pathogenic fungi [43]. The application of green synthesis of silver nanoparticles with aqueous root extract of *Delphinium denudatum* Wall. has shown antibacterial effects against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus cereus*, and *Pseudomonas aeruginosa* in addition to anti-mosquito activity by effective larvicidal action

against second instar larvae of dengue vector *Aedes aegypti* [44]. For the biosynthesis of silver nanoparticles with aqueous root extract of *Delphinium denudatum* Wall., 1.5 mL of plant extract was mixed with 30 mL of 1 mM aqueous silver nitrate solution and incubated for 2 h. The bio-reduction of the  $Ag^+$  ions from silver nitrate solution was monitored periodically by measuring the UV-Vis spectroscopy. The silver nanoparticles acquired from the solution were purified by repeated centrifugation and finally, water-suspended nanoparticles were lyophilized [34].

### Protective effects on liver

In recent times, there has been increasing interest in confirming the therapeutic potentials of plant derived molecules for liver disorders [45]. Co-administration of ethanolic root extract of *Delphinium denudatum* Wall. (low, medium, and high doses (100, 200, 400 mg/kg)) leads to significant amelioration of alcohol-induced changes such as changes in aspartate transaminase, alanine transferase, and alkaline phosphatase, total bilirubin, and cholesterol in hepatotoxic rats [46]. Ethanolic root extract of *Delphinium denudatum* Wall. prevents alcohol-mediated lipid peroxidation. In the above research, a 400 mg/kg *Delphinium denudatum* Wall. dose gave optimal results, similar to that of silymarin. *Delphinium denudatum* Wall. treatment restored the changed parameters in a dose-dependent manner (36–100%). These results suggest that *Delphinium denudatum* Wall. has potential as a source of treatment for alcohol-induced liver dysfunction [46].

### Anti-fatigue effects

Traditional medicinal therapies can be used for treating symptoms of fatigue [47]. Different active contents from plants, including alkaloids, some proteins, anthraquinones, terpenes, saponin, polyphenols, and unsaturated fatty acid monomer compounds, have anti-fatigue properties [48]. Flavonoids and fatty acids are important components of *Delphinium denudatum* Wall. that have anti-fatigue properties. However, other kinds of alkaloids have been found in *Delphinium denudatum* Wall., and it is important to examine their probable anti-fatigue properties as well [49]. *Delphinium denudatum* Wall. root powder can significantly ameliorate the physical, mental, and emotional perception of individuals, thereby relieving both mental and physical fatigue [50]. The saturated ( $\text{CH}_3(\text{CH}_2)_n\text{COOH}$ ) and also  $\omega$ -3 and  $\omega$ -6 polyunsaturated fatty acids ( $\text{CH}_3(\text{CH}_2)_m\text{CH}=\text{CH}(\text{CH}_2)_n\text{COOH}$ ), which have been identified in roots of *Delphinium denudatum* Wall., may possibly be involved in its anti-fatigue properties [50, 51]. It has been demonstrated that using quercetin supplementation for seven days was associated with a modest increase in  $\text{VO}_{2\text{max}}$  and endurance capacity [52]. These advantages of quercetin can have significant implications for the improvement of athletic and military performance.

### Antioxidant effects

The ethanolic extract of *Delphinium denudatum* Wall. contains the free radical  $\alpha$ -diphenyl- $\beta$ -picrylhydrazyl (DPPH) and superoxide-scavenging inhibitors acting as primary antioxidants, whereas ethyl acetate had hydroxyl radical scavenger as a primary antioxidants [53]. The  $\beta$ -sitosterol from the roots of *Delphinium denudatum* Wall. is one of the phytosterols with a chemical structure identical to that of cholesterol and has the ability to scavenge the radicals generated by DPPH method [54]. This suggests that  $\beta$ -sitosterol has potential antioxidant properties. Furthermore, other reports have shown the significant free radical scavenging capacity of  $\beta$ -sitosterol [55]. Moreover, the chloroform extract of the root part of *Delphinium denudatum* Wall. showed the highest DPPH scavenging activity (86.56%), which was higher than the standard ascorbic acid (82.77%) at a similar dose [56]. Also, flavonoids act as antioxidants and free radical scavengers, which inhibit oxidative cell damage [53]. Therefore, various extracts from *Delphinium denudatum* Wall. are prevent oxidation, have anti-carcinogenic and anti-atherogenic properties, and can have the potential for the inhibition and treatment of human cancer [57].

### Anti-cancer effects

Cancer is the most important public health problem in both developed and developing countries [58].

Forty-four extracts from 16 plants used traditionally as anticancer agents were assessed in vitro for their antiproliferative activity against human epithelial type 2, MCF-7, and vero cell lines [59]. *Delphinium denudatum* Wall., with different extracts that have antioxidants effects, could act as an anti-tumor agent. Currently, the number of patients leaning towards the use of such herbal medicines is increasing in cancer patients. The chloroform extract of the root part of *Delphinium denudatum* Wall. and chloroform extract of the aerial part as well as the methanolic extracts of the root part of *Delphinium denudatum* Wall. have shown selective cytotoxicity against leukemia, ovarian cancer cell line, and breast cancer cell line, with an inhibition percentage of 50–100% [56]. Moreover, the novel sulfated derivative of quercetin (as a flavonoid content of *Delphinium denudatum* Wall.) has strong antitumor activity exerted through a reactive oxygen species-dependent apoptosis pathway, and can potentially be developed into an antitumor precursor compound [60].

### Neurologic and psychiatric effects

In traditional Persian medicine, a number of herbal medicines have been used for different neurological disorders due to their neuroprotective potentials.

**Antinociceptive effects.** Many traditional medicines have been used for pain relief. Herbal medicines have anti-inflammatory and also analgesic effects on patients with arthritis [61]. The acute oral toxicity of the aqueous root extract of *Delphinium denudatum* Wall. was determined in Swiss albino mice. Doses of up to 14,000 mg/kg did not induce death but caused abnormal physical behavior for 6 h along with CNS depression [62]. At the four dose levels used (200–1,600 mg/kg), *Delphinium denudatum* Wall. extract confirmed its dose-dependent antinociceptive effect which was measured by tail-flick latency and acetic acid induced writhing in the thermal and chemical models of analgesia. There is no scientific report available from the toxicological and antinociceptive perspective about this observation [62]. Administration of ethanolic extract of *Delphinium denudatum* Wall. in low dose (300 mg/kg) and high dose (600 mg/kg), and the low dose (200 mg/kg) and high dose (400 mg/kg) of methanol fraction exhibited statistically significant enhancements in reaction time and pain threshold in both eddy's hot plate and the tail flick test in Wistar albino rats [63]. Alkaloids have analgesic properties. It was shown that diterpenoid alkaloids selectively interact with nicotinic acetylcholine receptors in the CNS [64].

**Anticonvulsant effects.** Bioassay-guided isolation studies on *Delphinium denudatum* Wall. were conducted in several studies to isolate its anticonvulsant components [65]. The non-alkaloidal aqueous extract of the plant was further exposed to vacuum liquid chromatography, which provided

partially purified oily subfraction by elution with acetone [65]. The ethanolic extract (EE) and aqueous fraction (AF) were used to evaluate the effectiveness of *Delphinium denudatum* Wall., with EE doses of 200, 400, 600 mg/kg and the AF doses of 400, 600, 800 mg/kg in male CF-1 mice [66]. The aqueous fraction greatly reduced the duration of the hind limb tonic extension of the maximal electroshock test in a dose-dependent manner (at the doses of 600 and 800 mg/kg) and had stronger anticonvulsant activity against seizures. However, EE had weak dose-dependent anticonvulsant effects on seizures (at a dose of 600 mg/kg) [66]. The results of one study showed that the partially purified oily subfraction of *Delphinium denudatum* Wall. (0.06 mg/mL) inhibits sustained repetitive firing (SRF) in hippocampal neurons in a use-dependent and voltage-dependent manner in Sprague Dawley rat pups [67]. At 0.6 mg/mL, the AF exhibited anticonvulsant activity similar to that of phenytoin at the cellular level in blocking SRF in Sprague Dawley rat pups [68].

There is a new class of anti-seizure compounds isolated in *Delphinium denudatum* Wall. that prevent sodium channel function and inhibits the development of epileptic seizures. Isoxylitone, a molecule discovered in *Delphinium denudatum* Wall., is a strong inhibitor of voltage-gated sodium channels, which was shown to have anticonvulsant properties, stopped stage five seizures, and reduced the brain-derived neurotrophic factor mRNA expression in experimental epilepsy using the kindling model [69, 70]. Based on the above research, it may be implied that the root extract of *Delphinium denudatum* Wall. shows significant antiepileptic activity.

In recent times, nanotechnology in drug formulation is being increasingly used and its advantages, such as enhancing compound solubility, decreasing medicinal doses, and increasing the absorbency of herbal medicines, have been appreciated [71]. Water-soluble phytoconstituent molecules, such as flavonoids, are poorly absorbed because of their poor miscibility with oils and other lipids, or due to their multiple-ring large-sized molecules [22]. The binding constituents of *Delphinium denudatum* Wall. AF towards phosphatidylcholine, followed by nanosizing, results in the preparation of *Delphinium denudatum* Wall. nanophytosome (DNP) [72]. This particle size of the complex (around 500 nm) increase compound solubility and improves the absorbency of herbal medicines [73]. DNP also exhibits anxiolytic and antidepressant effects in a dose-dependent manner [72]. DNP (400 and 800 mg/kg) has better bioavailability and has better access to the CNS because it can easily cross the blood brain barrier. It significantly altered the seizure latency time in comparison with the free aqueous fraction in Swiss albino mice [74].

**Effects on Alzheimer and Parkinson diseases.** In one study, norditerpenoids alkaloids including 1 $\beta$ -hydroxy,

14 $\beta$ -acetyl condorphine, jadwarine-A, and jadwarine-B together with alkaloids including isotalatizidine hydrate and dihydropentagynine were isolated from *Delphinium denudatum* Wall. [75]. Jadwarine-A, alkaloids isotalatizidine hydrate and dihydropentagynine displayed competitive inhibitory effects through inhibiting acetylcholinesterase and butyrylcholinesterase, respectively [75, 76]. Isotalatizidine hydrate has anticholinesterase properties in comparison with standard drugs being used, such as allanzanthane A and galanthamine, and can be used as a target drug for treating Alzheimer's disease [77].

Parkinson's disease is a relatively common age-dependent neurodegenerative disease [78]. Herbal medicine could possibly improve the symptoms of Parkinson's disease and they are considered to be safe and well-tolerated [79]. The ethanolic extract treatment of *Delphinium denudatum* Wall. for three weeks in a rat model of Parkinsonism considerably weakened the activities of superoxide dismutase and catalase in striatum, which were significantly decreased by lesioning [80]. Additionally, an increase in the expression of tyrosine hydroxylase in the ipsilateral striatum following the ethanolic extract treatment with *Delphinium denudatum* Wall. was exhibited [80].

**Effects on opium addiction.** Morphine addiction is the worst socio-economic global problem [81]. Oral administration of the aqueous root extract of *Delphinium denudatum* Wall. (200–1,600 mg/kg) exhibited a significant dose-dependent inhibition of naloxone-induced (1 mg/kg) withdrawal on morphine-induced tolerance in mice [82]. *Delphinium denudatum* Wall. methanolic extract (especially 700 mg/kg) reduced symptoms resulting from morphine withdrawal in rats [83]. The use of ethanolic root extract of *Delphinium denudatum* Wall. from a single dose (600 mg/kg) and methanolic root fraction of *Delphinium denudatum* Wall. from a single dose (400 mg/kg) significantly decreased the mean scores of several "counted signs" such as chewing, headshakes, and yawning, and "checked signs" such as screaming after touching, which are symptoms of morphine withdrawal syndrome in Wistar albino rats. Therefore, it may be an alternative medicine in for treating symptoms of withdrawal in recovering morphine addicts [81]. The  $\alpha 7$  nicotinic acetylcholine receptor blockade by *Delphinium denudatum* Wall. may explain the reductions of scores in different counted and checked signs, which were demonstrated during morphine withdrawal [84, 85].

**Antidepressant effects.** *Delphinium denudatum* Wall. has beneficial properties against several neurological disorders. Quercetin of *Delphinium denudatum* Wall. has promising effects on anxiety and depression [50]. The aqueous extract (200–1,600 mg/kg, orally) of *Delphinium denudatum* Wall. has shown significant



antidepressant effects depressive paradigms in mice [86]. The antidepressant effect of quercetin could potentially be influenced by the inhibition of the N-Methyl-d-aspartic acid receptors and/or the synthesis of nitric oxide through the modulation of the glutamate and nitric oxide pathway. It has also been confirmed that the administration of quercetin decreases the levels of cyclic guanosine monophosphate. Furthermore, the antioxidant effects of quercetin are also involved in its anti-depressive properties, with regard to the decrease of lipid hydroperoxide levels in the hippocampus [87].

**Anxiolytic effects.** Anxiety is an ambiguous, nervous feeling of discomfort or dread that is accompanied by an autonomic (self-controlling) response [88]. Psychotropic medicines are usually prescribed for anxiety; however, they have major side effects. *Delphinium denudatum* Wall. can be used in the management of anxiety because it can mitigate the effects of psychiatric disorders. The *Delphinium denudatum* Wall. has antispasmodic effects on rats and has wide-ranging anti-stress properties exerted on different stressors [89]. Results of a new study showed that the hydroalcoholic root extract of *Delphinium denudatum* Wall. provided anxiolytic effects in Wistar albino rats at doses of 200 and 400 mg/kg [89]. The root extract of *Delphinium denudatum* Wall. significantly reduced the number of rearing and number of steps climbed. It also decreased spontaneous locomotor activity in Wistar rats [90]. These properties may be due to the interaction of flavonoids, alkaloids, tannins, triterpenoids, and steroids of the plant with the gamma-aminobutyric acid/benzodiazepine receptor complex in the brain. Nevertheless, flavonoids have proven anxiolytic activities [90].

## Conclusion

Traditional herbal medicines used by local populations play a significant role in treating different illnesses. It appears that determining the efficacy of traditional medicine therapies concerning for a variety of diseases needs to be further studied and researched. *Delphinium denudatum* Wall., found on the outer ranges of Western Himalayas, is one of the most important drugs used in Indian traditional medicine. It was shown that different root extracts of *Delphinium denudatum* Wall. possess antioxidant, anticonvulsant, anti-fatigue, anti-microbial, and anxiolytic activities and could have a promising role in the treatment of various diseases, including mental disorders such as depression, anxiety, insomnia, and stress, neurological disorders, and inflammatory diseases. Our recommendations for prospective of studies on *Delphinium denudatum* Wall. are to consider investigating the mechanisms underlying the medical efficacy of *Delphinium denudatum* Wall. and to assess the efficacy of

*Delphinium denudatum* Wall. for treating various illnesses.

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