Evaluation of the central depressant activity of Jadwar 
(Delphinium denudatum Wall.) in mice

Shadab Zafar¹, M. Aftab Ahmad¹ & Tariq A. Siddiqui²*  
¹Department of Ilmul Adviya (Pharmacology), ²Department of Surgery 
Faculty of Medicine (Unani), Jamia Hamdard (Hamdard University), 
Hamdard Nagar, New Delhi 110 062, India 
E-mail: shadabzafar@rediffmail.com; shadabzafar@yahoo.co.in 
Received 4 April 2001; revised 12 September 2001

In Unani medicine, Jadwar (Delphinium denudatum Wall.) is reputed for its beneficial effects in various neurological disorders. The present investigation was undertaken to evaluate the central depressant activity of the aqueous extract of Delphinium denudatum (Dd) in mice, using various experimental paradigms of depression viz. pentobarbitone sodium induced hypnosis (PSH), spontaneous motor activity (SMA) and open-field behaviour (OFB) tests. Pilot studies indicated that single dose (2000 mg/kg) administration of Dd had little to no acute behavioural effects, hence the extract of Dd was administered orally at different dose levels. Dd extract (200-1600 mg/kg, orally) showed significant depressant effects on all the paradigms of depression. The results indicate that Dd induced a significant increase in sleeping time of pentobarbitone sodium induced hypnosis. In SMA test, significant decrease was observed in activity counts on photoactometer readings. In OFB test, there was significant decrease in open-field ambulation, sniffing, defeecation and slight decrease in preening whereas rearing remained unchanged. The Dd extract showed consistent and significant depressant activity in all the tests. The effects induced by aqueous extract of Dd were less marked at lower dose than at higher dose.

Keywords: Unani, Jadwar, Delphinium denudatum, CNS depressant activity.

Delphinium denudatum Wall. (Ranunculaceae) grows abundantly on the grassy slopes of western temperate Himalayas, from Kashmir to Kumaon, between 8,000 and 12,000 feet¹. This plant is also found growing in Jari and Parvati valleys of Himachal Pradesh, India². In Unani system of medicine the roots of the plant are used in aconite poisoning³, numbness⁴, palpitation⁵, opium addiction⁶, scorpion sting⁷, snakebite⁸, paralysis⁹, epilepsy¹⁰, and as analgesic¹¹, exhilarant¹², and a tonic for brain and nerves¹³.

The alcoholic and aqueous extracts of the roots have been found to have anticonvulsant activity in albino rats¹⁴,¹⁵. The aqueous extract of the root has hepatoprotective activity in rats¹⁶. The root of the plant has exhibited very good

*Correspondent author
cardioprotective activity against russels viper's envenomation and radiation-induced changes in rat myocardium\textsuperscript{17,18}. The ethanolic extracts, organic solvent extract and isolated compounds of the roots have antibacterial, antimicrobial, antifungal and immunomodulating activities\textsuperscript{19-21}. A compound Unani formulation containing Delphinium denudatum Wall. having role in de-addiction, attenuates abstinence behaviours in morphine-dependent rats\textsuperscript{22,23}. Recently it is reported that Jawahar Mohra (JM), a compound formulation of Unani Medicine containing Delphinium denudatum Wall., has shown antistress activity against diverse stressors\textsuperscript{24}. Therefore, the present investigation was undertaken to investigate the depressant activity of the aqueous extract of Dd in mice.

**Materials and methods**

**Animals**

Adult Swiss albino mice (25 ± 5 g), of either sex, were obtained from Central Animal House Facility, Hamdard University, and were randomly distributed into different experimental groups. The mice were housed, six in each group under standard laboratory conditions with food and water provided ad libitum. Experiments were conducted between 0900 and 1200 hrs.

**Drug treatments**

The roots of Delphinium denudatum Wall. (Dd) were procured from Khari Bavli market, in central Delhi, India, in August 1997, and air-dried. The identity of plant material was verified by Dr. M.P. Sharma at Dept. of Botany, Faculty of Science, Hamdard University, New Delhi-110062, where a voucher specimen has been deposited. The aqueous extract of the drug was obtained with the help of soxhlet’s apparatus. The yield of the extract was 30% w/w in term of dried starting material. The aqueous extract of the roots of Dd was diluted in distilled water prior to oral administration. The animals of group II, III, IV and V were administered Dd root extract orally by using orogastric cannula in doses of 200, 400, 800 and 1600 mg/kg respectively, while the animals of group I served as control. Pentobarbitone sodium (Loba chemicals, Germany) (40 mg/kg, ip) was used as the reference drug and its solution was prepared in distilled water. Control experiments were performed under similar experimental conditions for the proper evaluation of the pharmacological activity of the aqueous extract of Dd.

**CNS depressant testings**

1. **Pentobarbitone sodium induced hypnosis (PSH)**\textsuperscript{25}—Dd root extract was administered orally 30 min. before the administration of pentobarbitone sodium. The time of administration of pentobarbitone sodium in both control and Dd treated animals was recorded and the animals were observed for the onset and the duration of sleep, as evidenced by the observation of the loss and recovery of the righting reflex.

2. **Spontaneous motor activity test (SMA)**\textsuperscript{26,27}—The photoactometer is a quadrangular (40x40 cm) box comprised of 3 photocells placed just above the floor level. For the purpose of familiarization
the mice were placed in the activity box 5 min. prior to the administration of the drug or vehicle (distilled water). The experiment was carried out for 4 hours and the locomotor activity was recorded at every 1 hr interval after the administration of Dd root extract or vehicle. An automatic counter recorded the number of movements of each mouse.

3. Open-field behavior test (OFB)[28,29]—The open-field arena was made of plywood and consisted of 19 segments by lines drawn with black paint. The diameter and the height of the arena were 84 cm and 23 cm, respectively. It was open at the top for observation. Two hours after Dd root extract or vehicle (distilled water) administration, each animal was centrally placed individually in the arena for a period of 2 min. and the following behavioural aspects were noted:

(a) Ambulation: This was measured in terms of the number of segments crossed by the animal.
(b) Sniffing: The frequency of sniffing bouts was recorded.
(c) Defecation: The number of fecal bolus excreted was recorded.
(d) Preening: Whenever the animal preened, i.e. trimmed the whiskers with both forepaws, it was counted.
(e) Rearing: When the animal lifted both forepaws and stood on its hind limbs, it was assigned the score of two (2) and when the animal stood on its hind limbs with one forepaw in the air, with the other paw resting against the wall, it was assigned the score of one (1). The aggregate of the scores was taken as the total score for rearing.

Statistical analysis:

Results were expressed as mean ± SE and subjected to one way analysis of variance (ANOVA) followed by student’s t-test. *P<0.05* were considered significant.

Results and discussion

Pentobarbitone sodium is a short-acting barbiturate, which acts as a sedative. The site of inhibition in CNS is either postsynaptic, as at the cortical and cerebellar pyramidal cells and in the caudate nucleus, the substantia nigra, and the thalamic relay neurons, or pre-synaptic, as in the spinal cord[30]. The pentobarbitone sodium induced hypnosis test was carried out to be more certain about the central effect of the drug. Mice treated with the two higher doses of Dd root extract showed dose dependent increase in pentobarbitone sleeping time in comparison to control mice, evincing significant depressant activity (*P<0.01, *P<0.05*) of Dd root extract (800 and 1600 mg/kg). However, the effect of the lower dose (200 and 400 mg/kg) was not statistically significant (Table 1).

Another important step in evaluating the action of drug acting on CNS is to observe its effect on the locomotor activity of the animal. In its broadest sense, motor activity refers to the whole repertoire of unconditioned behaviour and in its narrowest sense, it refers to the whole body locomotor activity, such as running and walking. For this reason the spontaneous motor activity test was carried out. The results of the experiment showed that, the activity count almost remained uniform in the control animals.
throughout the four hours observation period whereas there was significant decrease in the activity count after treatment with the Dd root extract. The depression in activity counts after the administration of lower dose (200-400 mg/kg) and higher dose (800-1600 mg/kg) of the Dd root extract was found to be dose dependent. The effect of the drug was maximum after 2 hours and the difference in reduction of activity count between control and Dd root extract was significant ($P<0.05$, $P<0.01$) at 800 and 1600 mg/kg. However the lower dose (200 and 400 mg/kg) was not statistically significant (Table 2).

In the open-field behaviour test when the mice treated with Dd root extract are taken from their home cage and placed in a novel environment, they express their depression and fear by dose-dependent decrease in ambulation, sniffing,

Table 1—Effect of Delphinium denudatum root extract on pentobarbitone induced hypnosis in mice

<table>
<thead>
<tr>
<th>Drug and dose</th>
<th>Count reading before drug administration</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>168.5±4.80</td>
<td>165.5±2.89 NS</td>
<td>167±3.08 NS</td>
<td>165±5.24 NS</td>
<td>167±4.85 NS</td>
</tr>
<tr>
<td>Dd (200 mg/kg)</td>
<td>170.2±3.02</td>
<td>151.16±4.98 NS</td>
<td>149±9.68 NS</td>
<td>158±4.64 NS</td>
<td>166.7±6.98 NS</td>
</tr>
<tr>
<td>Dd (400 mg/kg)</td>
<td>167±2.1</td>
<td>148±9.68 NS</td>
<td>152±4.72 NS</td>
<td>150±6.28 NS</td>
<td>164.7±7.21 NS</td>
</tr>
<tr>
<td>Dd (800 mg/kg)</td>
<td>165±2.85</td>
<td>138±8.14 NS</td>
<td>129±5.21 NS</td>
<td>140±7.54 NS</td>
<td>156±8.28 NS</td>
</tr>
<tr>
<td>Dd (1600 mg/kg)</td>
<td>168±3.72</td>
<td>134±5.58 NS</td>
<td>122±6.21 NS</td>
<td>136±5.87 NS</td>
<td>149.7±8.64 NS</td>
</tr>
</tbody>
</table>

* $P<0.05$, ** $P<0.01$ as compared with control
NS = non-significant
Figures in parenthesis indicate per cent decrease (-) over control.

Table 2—Effect of Delphinium denudatum root extract on spontaneous motor activity in mice

<table>
<thead>
<tr>
<th>Drug and dose</th>
<th>Count reading before drug administration</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>55.66±4.17</td>
<td>58.33±3.94 NS</td>
<td>65.33±4.94 NS</td>
<td>79±3.59 NS</td>
<td>92.66±2.72 NS</td>
</tr>
<tr>
<td>Dd (200 mg/kg)</td>
<td>(0)</td>
<td>(+4.79)</td>
<td>(+17.37)</td>
<td>(+41.93)</td>
<td>(+66.47)</td>
</tr>
</tbody>
</table>

** $P<0.01$, *** $P<0.001$ as compared with control
NS = non-significant
Figures in parenthesis indicate per cent increase (+) over control.
defecation and preening behaviour in comparison to vehicle treated mice, evincing significant depressant activity ($P<0.05$, $P<0.01$) of Dd root extract. However, the rearing behaviour was not significantly affected. The effects induced by aqueous extract of Dd were less marked at lower (200 and 400 mg/kg) than those of higher dose (800 and 1600 mg/kg) (Table 3).

In the present study, Dd root extract potentiated the pentobarbitone induced hypnosis, decreased the locomotor activity count and decreased the score observed in open-field behaviour test. The mechanism of these observed findings by Dd root extract remains unclear. But it is presumed that analgesic, anticonvulsive and antistress activity of Dd root extract could be mainly due to its central depressant action as well.

Though our results seem to justify the reported claim of the Unani medicine, further studies are needed to confirm the CNS depressant activity of this plant and to evaluate its potential in the treatment of neurological disorders.

**Acknowledgement**
Dr. S.B. Vohora, Head Dept. of Medical Elementology and Toxicology, Faculty of Science, Hamdard University, supported this work. We would like to thank for the technical assistance.

**References**
3 Ali M N, Jadwar, Mufradat-e-Nasir, (Matba Rehmani, Delhi, India), 1886, 53.
6 Hakim M A, Jadwar, Bustan-ul-Moqradat, (Karkhana Jamil-ul-Advia, Lucknow, India), 1893, 134.
8 Husain S M, Jadwar, Qarahadeen-e-Kabir, Vol I, (Urdu Translation by Hadi Husain Khan), (Matba Munshi Naval Kishore, Lucknow, India), 1897, 561.
10 Ibne-Sina, Jadwar, Al-Qanoon, Vol II, (Urdu Translation by S. Ghalam Husain Kantoori), (Matba Munshi Naval Kishore, Lucknow, India), 1887, 77.
11 Khan H A, Jadwar, Majna-ul-Bahrain, (Matba Munshi Naval Kishore, Lucknow, India), 1905, 140.
12 Momin M M, Jadwar, Tahfar-ul-Mominin, (Matba Mohammad Hasan, Delhi, India), 1855, 73.
29 Kulkarni S K and Dandiyia P C, Effects of antidepressant agents on open field behaviour in rats, Psychopharmacologia (Berl.), 33 (1973) 333.