

Pharmacological Evaluation of Ethanolic Extract of *Selinum Vaginatium* Rhizome for CNS Activities

Anuj Kumar^{1*} and Najam Ali Khan²

^{1,2}School of Pharmaceutical Sciences, IFTM University, Moradabad (Uttar Pradesh), India.

ABSTRACT

CNS Disorders are widespread disorder affecting around 5% of the population. Furthermore, it is difficult to predict which patient will respond to any given treatment. In the traditional systems of medicine, many plants and formulations have been used to treat CNS Disorder for thousands of years. *Selinum vaginatium* contains Phenolic compounds as its main ingredient and this compound has been shown to have non-selective mono-amine oxidase activity. Therefore, the present study was undertaken to evaluate the antidepressant, anti anxiety, sedative, and muscle relaxants potential of chronic administration of EESVR in forced swim test (FST) and tail suspension test (TST), Open field test (OFT), Elevated plus maze test (EVMT), Bright & Dark Area test, Stair Case test (SCT), Actophotometer test, inclined plane test, Rota Rode test. Inbred adult male Rats weighing 150 - 200 were used in the study. Standard drug (Diazepam) and test drug (EESVR) were suspended in 1% CMC. The vehicle (10ml/kg, p.o), Diazepam (4mg/kg, p.o) and EESVR (400 mg/kg, 200 mg/kg, p.o. respectively) were in study, all (test & standard) drugs were given for 7 days and the last dose was given 1hour before the experiment. The results revealed that the ethanol extract of Rhizome of *Selinum vaginatium* at 400 and 200 mg/kg caused a significant reduction in the spontaneous activity Anti depressants, Anti anxiety remarkable decrease in exploratory behavioral pattern (OFT, TST, FST, EPMT, bright & dark area and stair case test), a reduction in muscle relaxant activity (Rota rod and Inclined plan), and also significantly potentiated Diazepam sleeping time. The results suggest that ethanol extract of *Selinum vaginatium* exhibit CNS activity in tested animal models.

Keywords: *Selinum Vaginatium* Rhizome; CNS Activities, Pharmacological Evaluation. Chronic Administration, Standard drug- Diazepam.

INTRODUCTION

Depression is a potentially life-threatening disorder. It can occur at any age from childhood to late life and is a tremendous cost to society as it causes severe distress and disruption of life, two third of depressed patients has suicide thoughts and 10-15% of women attempt suicide before the age of 40. The monoamine theory suggests that the main cause of depression is Serotonin, Norepinephrine and/or Dopamine deprivation in the central nervous system. It is characterized by down cast mood, loss of pleasure, negative thoughts, disturbed by sleep or appetite, low energy and suicidal thoughts[1,2].

Anxiety disorders afflict approximately 10% of the world population. It's, defined as a subjective sense of unease, dread or foreboding, can indicate a primary psychiatric condition, or it can be a component of, or reaction to, a primary medical disease. Symptoms of anxiety are due to the release of stress hormones like adrenaline and cortisol which almost affect every organ of the body[3–5]. Insomnia and other sleep disorders are worldwide medical problems and its defined as persistent difficulty in falling or staying a sleep that affects daytime function, can induce psychological and physical dysfunctions. Its normally treated with

sedatives, currently there are no suitable drugs for the treatment of chronic insomnia[6]. The skeletal muscle relaxants are used for musculoskeletal conditions including low back pain, neck pain, fibromyalgia tension, headaches, and myofascial pain syndrome. 35% patients visiting a primary care physician for low back pain are prescribed muscle relaxants. Muscle spasm is a sudden involuntary contraction of one or more than one muscle groups unusually an acute condition associated with muscle strain[7,8].

AIM AND OBJECTIVES

The Indian medicine system is widely usable and safer system. Maximum population of India and other countries are blindly trusted on the Indian system. A detailed literature survey was conducted to find out the alternative medication which may show Anti-Depressive, anti-anxiety, Sedatives and muscle co-ordination activities. *Selinum vaginatum* was selected for the present research study, as enough scientific data was not available to support its tradition us in the above mentioned activities. It was necessary to screen the above mention herbal drug for different Pharmacological activities to evaluate its traditional uses and develop safer and effective therapies. Extracts of this plant rhizome were evaluated for different pharmacological activities. The need for safer and effective anti-depressants agents and the lack of enough scientific data to support the claims made in ancient literature prompted the present study[9,10,11].

PROBLEM STATEMENT

Now a day, most of the people are suffering from depression, anxiety, insomnia, and muscle stress. According to World Health Report, about 450 million people suffer from a mental or behavioral disorder, these amounts to 12.3% of the global burden of disease, and predicted to

rise up to 15% by 2020. It has been estimated that adults with current (past month) psychiatric disorders con-sum 44% of all cigarettes in the US each year. The reactive depression is more common (about 75% cases)[12]. On the other hand, patients of endogenous depression (about 25% of cases) show a familiar pattern unrelated to external stresses, and with a somewhat different symptomatology. Although, a number of synthetic drugs are being used as the standard treatment for clinically depression, anxiety, insomnia, and muscle stress patients, they have adverse effects that can compromise the therapeutic treatment. Several drug-drug interactions can also occur. These conditions create an opportunity for alternative treatment of anxiety and depression by use of medicinal plants or by plant based antidepressant, anti-anxiety, sedatives and muscle relaxants formulations[13]. The plant called *Selinum vaginatum* has anti-depressant, anti-anxiety, sedatives and muscle relaxants property. So *Selinum veginatum* can be used as a herbal treatment. The present review is focused on the medicinal plant (*Selinum veginatum*) as an antidepressant, antianxiety, sedatives and muscle relaxants in animal studies[14].

PLANT PROFILE

Nardostachys Jatamansi DC. And *Selinum vaginatum* (Edgew) Cl. are two endemic high altitude Indian medicinal plants that have been traditionally known as “Jatamansi” and “Bhootkeshi,” respectively. These are used in a variety of traditional herbal formulations and nutraceuticals, as well as to treat neurological disorders like epilepsy, hysteria, syncope, convulsions, and mental weakness. They resemble each other in their external morphological characters and characteristic odour, so their roots are often confused with each other[6]. *Selinum vaginatum* C.B. Clarke. is a significant medicinal and aromatic plant species

(MAPs) of family Apiaceae. Plants of this genus grow in humus rich slopes of temperate zone of the Himalaya, South African and Andean mountains between 6000-14000 ft[2,8]. Rhizomes of *S. vaginatum* produce odor, and are mixed as



an adulterant with rhizomes of Nardostachys Jatamansi due to similar appearance but can be differentiated with anatomical detail along with chemical composition[4,5].



Regional Language Names[5,15]

Ben. : Bhutakesi
Hin. : Bhutakesi, Muramaansi
Kan. : Mura
Mal. : Moramamsi
Mar. : Mura
Ori. : Bhutakesi
Pun. : Pushwari
Tel. : hutakesi

Chemical Composition

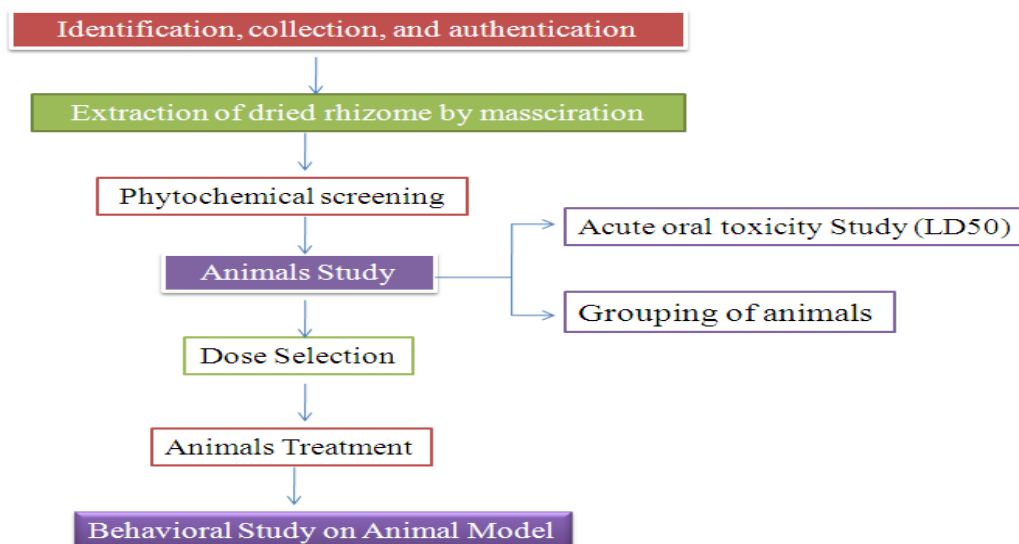
Selinum Vaginatum roots contain coumarins like selinidin, vaginidine, angelicin. Dried roots yields aromatic oil

1.54% β -pinene, 45.5%, limonene, 25.3%[9,14 [16].

Traditional use

Rhizome parts of *Selinum Vaginatum* is used as Apasmara (Epilepsy), Jvara (Fever), Kāsa (Cough), Krmi (Helminthiasis), Pratisyaya (Coryza), Ucca Raktacapa (Hypertension), Unmada (Mania / psychosis), Vatavyadhi (Disease due to Vata dosa) Hypotension, as sedative, aphrodisiac and having analgesic properties. Rhizomes are used to prepare local liquors and for treating the patient with mental disorder[13].

EXPERIMENTAL FLOW CHART



RESULTS

Preliminary Phytochemical Screening

S. N.	Phytoconstituents	EESVR
1	Alkaloids	+
2	Carbohydrates	—
3	Tannins	+
4	Phenolic compound	+
5	Flavonoids	+
6	Proteins	—
7	Amino acids	—
8	Saponins	+
9	Cardiac glycosodes	+
10	Triterpinoids	+

Effect of EESVR on Anti-Depressant Activity by using Swim Endurance Test

S.No	Treatment groups	Duration of immobility after 30 min.	Duration of immobility after 60 min.
1.	Group I (Control CMC 5ml/kg p.o)	86.17 ± 3.52	70.33 ± 6.24
2.	Group II (Diazepam 4 mg/kg,p.o.)	50.83 ± 2.62***	44.33 ± 2.04***
3.	Group III (EESVR 200 mg/kg, p.o)	72.50 ± 3.01*	63.67 ± 2.30*
4.	Group III (EESVR 400 mg/kg, p.o)	52.05 ± 4.06***	52.25 ± 4.06**

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30 and 60 min.) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test

- Standard drug diazepam (4 mg/kg p.o.) highly significantly decreased duration of immobility after 30 & 60 min of treatments
- Low dose EESVR (200 mg/kg p.o.) less significantly decrease duration of immobility after 30 & 60 min of treatment.
- High dose EESVR (400 mg/kg p.o.) highly significantly after 30 min of treatment whereas after 60 min of treatment moderate significantly decreased duration of immobility

Effect of EESVR on Anti-depressant Activity by using Tail Suspension Apparatus

S.No.	Treatment groups	Duration of Immobility in 30min.	Duration of Immobility in 60min.
1.	Group I (Control CMC 5ml/kg p.o)	78.17 ± 2.24	72.83 ± 2.83
2.	Group II (diazepam 4 mg/kg,p.o.)	63.00 ± 2.63***	62.17 ± 1.54**
3.	Group III (EESVR 200 mg/kg, p.o)	67.50 ± 1.66**	61.33 ± 1.54**
4.	Group III (EESVR 400 mg/kg, p.o)	66.5. ± 0.76**	61.0 ± 1.12***

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30, & 60 min) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test

- Standard drug diazepam (4 mg/kg p.o.) highly significantly after 30 min of treatment whereas after 60 min treatment moderate significantly reduced the duration of immobility.
- High dose EESVR (400 mg/kg p.o.) highly significantly after 30 min of treatment whereas after 60 min treatment moderate significantly reduced the duration of immobility.

- Low dose EESVR (200 mg/kg p.o) moderate significantly reduced the duration of immobility after 30 min and 60 min of treatment.
- High dose EESVR (400 mg/kg) moderate significantly after 30 min of treatment whereas after 60 min of treatment highly significantly reduced duration of immobility.

Effect of EESVR on Anti depressant Activity by using Open Field Apparatus

S.No.	Treatment Groups	No. of Squares Crossed	No. of Rearing
1.	Group I (Control CMC 5ml/kg p.o)	4.83 ± 0.60	8.00 ± 1.78
3.	Group II (Diazepam 4 mg/kg,p.o.)	3.16 ± 0.30 [*]	4.83 ± 0.477 ^{**}
4.	Group III (EESVR 200 mg/kg, p.o)	2.16 ± 0.30 ^{***}	5.66 ± 0.42 [*]
5.	Group III (EESVR 400 mg/kg, p.o)	1.66 ± 0.33 ^{***}	7.50 ± 0.56 ^{ns}

Data represented as Mean ± SEM, n= 6, *** p<0.001 n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test

- Standard drug diazepam (4mg/kg p.o.) less significantly reduced number of squire crossed and moderate significantly reduced the frequency of rearing.
- Low dose EESVR (200 mg/kg p.o.) highly significantly reduced no of squire crossed and less significantly reduced frequency of rearing.
- High dose EESVR (400 mg/kg p.o.) highly significantly reduced no of squires crossed and none significantly reduced frequency of rearing.

Effect of EESVR on Anti anxiety Activity by using Elevated Plus Maze

S.N.	Treatment Groups	No. of Entry into		Time Spent in Open Arms
		Closed Arms	Open Arms	
1	Group I (Control CMC 5ml/kg p.o)	4.00 ± 0.33	3.33 ± 0.33	133.5 ± 2.52
3	Group II (Diazepam 4 mg/kg,p.o.)	1.33 ± 0.21 ^{***}	1.33 ± 0.21 ^{**}	171.0 ± 2.45 ^{***}
4	Group III (EESVR 200 mg/kg, p.o)	2.00 ± 0.44 ^{**}	5.16 ± 0.60 [*]	147.7 ± 2.45 ^{**}
5	Group III (EESVR 400 mg/kg, p.o)	2.16 ± 0.30 [*]	4.50 ± 0.42 ^{ns}	145.0 ± 3.00 [*]

Data represented as Mean ± SEM, n= 6, *** p<0.001 n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test

- Standard drug diazepam (4 mg/kg p.o.) highly significantly decreased the no of entries into closed arms, moderate significantly decreased the no of entries into open arms whereas highly significantly increased the time spent in open arms.
- Low dose EESVR (200 mg/kg p.o) moderate significantly decreased the no of entries into closed arms, less significantly decreased the no of entries into open arms whereas moderate significantly increased the time spent in open arms.
- High dose EESVR (400 mg/kg p.o) less significantly decreased the no of entries into closed arms, non significantly decreased the no of entries into open arms whereas less significantly increased the time spent into open arms.

Effect of EESVR on Anti Anxiety Activity by using Bright and Dark Area

S.N.	Treatment Groups	Time Spent in Open Arm 30 min.	Time Spent in Close Arm 60 min.	No. of Crossing
1	Group I (Control CMC 5ml/kg p.o)	134.5 ± 4.53	135.5 ± 4.53	14.33 ± 1.16
3	Group II (Diazepam 4 mg/kg,p.o.)	181.8 ± 1.74 ^{***}	180.0 ± 3.20 ^{***}	9.83 ± 1.01 ^{**}
4	Group III (EESVR 200 mg/kg, p.o)	155.5 ± 2.15 ^{***}	153.3 ± 2.04 [*]	10.50 ± 0.84 [*]
5	Group III (EESVR 400 mg/kg, p.o)	169.2 ± 1.74 ^{***}	160.8 ± 5.12 ^{***}	10.67 ± 0.71 [*]

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30,& 60 min.) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test.

- Standard drug diazepam (4 mg/kg p.o.) highly significantly increased the time spent in open arms and closed arms after 30 & 60 min of treatment whereas moderate significantly increased the no of crossing in light compartment.
- Low dose EESVR (200 mg/kg p.o) highly significantly increased the time spent in open arms after 30 min of treatment, less significantly increased the time spent in open arms and no of crossing in light compartment.
- High dose EESVR (400 mg/kg p.o.) highly significantly increased the time spent in open arms and close arms after 30 & 60 min of treatment whereas less significantly increased the number of crossing in light compartment.

Effect of EESVR on Anti-Anxiety Activity by using Staircase Apparatus

S.No.	Treatment groups	No. of Climbing in 30 min.	No. of Climbing in 60 min.	No of Rearing
1.	Group I (Control CMC 5ml/kg p.o)	10.00 ± 0.96	14.33 ± 1.05	6.83 ± 0.70
3.	Group II (Diazepam 4 mg/kg,p.o.)	8.00 ± 0.57 ^{**}	9.83 ± 0.30 ^{**}	2.66 ± 0.33 ^{***}
4.	Group III (EESVR 200 mg/kg, p.o)	5.16 ± 0.47 ^{ns}	9.83 ± 1.01 ^{**}	4.33 ± 0.49 ^{**}
5.	Group III (EESVR 400 mg/kg, p.o)	6.5, ± 0.76 ^{***}	9.83 ± 0.94 ^{**}	3.83 ± 0.47 ^{**}

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30, & 60 min.) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test.

- Standard drug diazepam (4 mg/kg p.o.) moderate significantly decreased the no of climbing after 30 & 60 min of treatment whereas highly significantly reduced the no of rearing.
- Low dose EESVR (200 mg/kg p.o) non significantly decreased the no of climbing after 30 min of treatment, moderate significantly decreased the climbing after 60 min of treatment whereas no of rearing also moderate significantly reduced.
- High dose EESVR (400 mg/kg) highly significantly decreased the no of climbing after 30 min of treatment whereas after 60 min of treatment moderate significantly decreased no of climbing and no of rearing.

The Effect of EESVR on Loco Motor Activity using Actophotometer

S. No.	Treatment Group	Actophotometer Score (30 min.)	Actophotometer Score (60 min.)	Actophotometer Score 90 (min.)
1.	Group I (Control CMC 5ml/kg p.o)	79.33 ± 3.04	73.00 ± 2.80	72.50 ± 2.34

3.	Group II (Diazepam 4 mg/kg, p.o.)	56.50 ± 3.92***	57.50 ± 2.80***	60.00 ± 1.21***
4.	Group III (EESVR 200 mg/kg, p.o.)	55.17 ± 4.45**	60.67 ± 4.11*	60.33 ± 1.30***
5.	Group III (EESVR 400 mg/kg, p.o.)	47.83 ± 3.48***	48.83 ± 2.38***	51.17 ± 1.44***

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30, 60 and 90 min.) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test.

- Standard drug diazepam (4 mg/kg p.o.) highly significantly decreased the locomotor activities after the 30 min, 60 min & 90 min of treatment.
- Low dose EESVR (200 mg/kg p.o.) moderate significantly decreased locomotor activities after 30 min of treatment, less significantly decreased after 60 min of treatments whereas after 90 min of treatment highly significantly decreased the locomotor activities.
- High dose EESVR (400 mg/kg p.o.) highly significantly decreased the locomotor activities after 30,60 & 90 min of treatment.

Effect of EESVR on Muscle Co-Ordination Activity using Inclined Plane

S. N.	Treatment groups	Time taken by Animal on Inclined Plane	
		30 min. after Administration	60 min. after Administration
1.	Group I (Control CMC 5ml/kg p.o.)	22.33 ± 1.08	18.50 ± 0.99
2.	Group II (Diazepam 4 mg/kg, p.o.)	9.16 ± 0.79***	7.16 ± 0.44***
3.	Group III (EESVR 200 mg/kg, p.o.)	17.83 ± 0.87**	14.00 ± 0.57***
4.	Group III (EESVR 400 mg/kg, p.o.)	17.50 ± 0.42**	13.50 ± 0.76*

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30, & 60 min) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test.

- Standard drug diazepam (4 mg/kg p.o.) highly significantly decreased the time taken by animal on inclined plane after 30 & 60 min of treatment.
- Low dose EESVR (200 mg/kg p.o.) moderate significantly decreased time taken by animal on inclined plane after 30 min of treatment whereas after 60 min of treatment highly significantly decreased the time taken by animal on inclined plan.
- High dose EESVR (400 mg/kg p.o.) moderate significantly decreased the time taken by animal on inclined plan after 30 min of treatment whereas after 60 min of treatment less significantly decreased time taken by animal on inclined plan.

Effect of EESVR on Muscle Co-Ordination Activity using Rota-Rod Apparatus

S.No	Treatment Groups	Time Spent on Rota Rod after 30 min.	Time Spent on Rota Rod after 60 min.	Time Spent on Rota Rod after 90 min.
1.	Group I (Control CMC 5ml/kg p.o.)	62.50 ± 3.08	60.83 ± 1.57	64.17 ± 1.57
2.	Group II (Diazepam 4 mg/kg, p.o.)	33.50 ± 3.25***	34.83 ± 4.18***	40.33 ± 3.70***
3.	Group III (EESVR 200 mg/kg, p.o.)	41.67 ± 3.36***	43.00 ± 3.23**	48.00 ± 2.16***
4.	Group III (EESVR 400 mg/kg, p.o.)	36.00 ± 2.38***	37.83 ± 3.26***	47.00 ± 2.67***

Data represented as Mean ± SEM, n= 6, *** p<0.001(after 30, 60 and 90 min.) n= 6, **p<0.01 & n=6, *p<0.05 when compared with group I One way ANOVA with Dunnett's test.

- Standard drug diazepam (4 mg/kg p.o.) highly significantly decreased the time spent on rota rod after 30, 60, and 90 min of treatment.
- Low dose EESVR (200 mg/kg p.o.) highly significantly decreased the time spend on rota rod after 30 and 90 min of treatment whereas after 60 min of treatment moderate decreased the time of spent on rota rod.
- High dose EESVR (400 mg/kg p.o) highly significantly decreased the time spent on rota rod after 30, 60 & 90 min of treatment.

CONCLUSION

The pharmacological profiles of the present investigation of the ethanol extract of *Selinum vaginatum* indicate that the extract possess strong CNS depressant, anti anxiety, sedative and hypnotics and muscle relaxants activities as it significantly reduced behavioral activities and inhibition of central and peripheral mechanisms of rat in different experimental model.

REFERENCES

1. Evans WC. Trease and Evans Pharmacognosy, Edn 15, published by Elsevier; Noida, India, 2008. 3.
2. Ayurveda. <http://www.ayushveda.com/herbs/nardostachysjatamansi.html>. 4. India. www.iloveindia.com/indian-herbs/jatamansi.html, 22 Nov, 2014. 5.
3. Nadkrani KM. Indian Materia Medica V-I, Second Reprint of 3rd Revised and Enlarged edition, Popular Prakashan Pvt. Ltd, Bombay, Nardostachys jatamansi DC, 1691, 840.
4. Kokate CK, Prohit AP, Gokhale SB. Pharmacognosy, Edn 39, Nirmal Prakshan, Pune, 2007, 357-358. 13.
5. Chatterjee B, Basak U, Dutta J, Banerji A, Neuman T. Prange Studies on the Chemical Constituents of N. jatamansi Cheminform 2005; 36:17.
6. Rucker G, Tautges J, Wenzl H, Graf E. Isolation and pharmacological active its of the sesquiterpene valeranone from Nardostachys jatamansi DC (in German). Arzneimittelforschung 1978; 28:7-13. 15.
7. Shabhag SN, Mesta CK, Maheshwari ML, Bhattacharya SC, Terpenoids LxxV. Constituent of jatamansi and synthesis of (+)Dihydrosamidin and Visnadin from jatamansi. Tetrahedron 1965; 21:3591. 16.
8. Kapoor LD. CRC Handbook of Ayurvedic Medicinal Plants; Boca Raton, FL, CRC, Press, 2001. 17.
9. Bose BC, Vijayvarngiya R, Bhatnagar JN. Nardostachys jatamansi DC: a phytochemical study of its active constituents. Indian J Med Science 1957; 11(10):799-802. 18.
10. Hoerster H, Rucker G. Tautges Valeranone content in the roots of Nardostachys jatamansi and Valeriana officinalis. Phytochemistry 1977; 16:1070-1071.
11. Mishra D, Chaturvedi RV, Tripathi SC. The fungitoxic effect of the essential oil of the herb N. jatamansi DC, Trop Agric, 1995; 72:48-52. 38.
12. Sarbhoy AK, Varshney JL, Maheshwari ML, Saxena DBE. Isolation and activity of the sesquiterpene valeranone from N. jatamansi DC. Arzeimittelforschunmg 1978; 28(1):7-13.
13. Metkar B, Pal SC, Kasture S. Antiepressant activity of N. jatamansi DC. Indian J Nat Prod; 1999; 15:10.
14. Prabhu V, Karanth KS, Rao A. Effects of Nardostachys jatamansi on biogenic-amine and inhibitory amino-

- acids in the rat-brain. *Planta Med* 1994; 60:114–117.
15. Rao VS, Rao A, Karanth KS. Anticonvulsant and neurotoxicity profile of *Nardostachys jatamansi* in rat. *J Ethnopharmacol* 2005; 102:351-6.
16. Salim S, Ahmad M, Zafar KS, Ahmad AS, Islam F. Protective effect of *Nardostachys jatamansi* in rat cerebral ischemia. *Pharmacol and Biochem Behav* 2003; 74:481- 486.