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Identification of Chemical Composition of Plant Extracts of *Nardostachys Jatamansi* DC Using GC/MS

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Abstract
Background:
Nardostachi Jatamansi DC is perennial herbal plant. Valerian is the common name given to the crude drug consisting of the underground parts of species of valeriana species. Valerians are known to be reservoir of mixture of essential oils. Complex mixture are mostly comprises of rich volatile.
Materials and Methods:
Rhizome powders were extracted using different extraction solvents and Gas chromatography mass spectroscopy (GC-MS) was used for screening of the extracts of the Nardostachys jatamansi DC.
Results and Conclusion:
Around 44 chemical compound from hexane extract alongwith Veridiflorol (23.65%) and valerenic acid (0.49%). From methanolic extract 38 chemical compounds were identified with Globulol (29.11%) and Valerenic acid (0.27%). Other compounds were mostly consists of sesquiterpenes, terpenes, Alkeloids which have medicinal properties. Nowadays importance and demand of herbal drug can be observed. Detected compounds may be isolated and used for targeted treatment of disease using selective compound as a drugs. Specific methods used for extraction may be helpful in procuring desired compound to meeting the need of pharmaceutical industries.
Key words*: GC-MS, Essential oils, Nardostachi Jatamansi DC*

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I. Introduction

Nardostachys jatamansi DC is well knows medicinal herb. *Nardostachys jatamansi DC* is distributed in sub-alpine to alpine regions at an altitude of 3000–5000 m. In 1790 Sir William Jones, famous orientalist, discovered that 'Nardus' of Greeks, the 'Spikenard' of the Holy bible,'Sumbul-e- Hind' of Arabians and 'Balchir' of India are the 'Jatamansi' of Sanskrit (1). *Nardostachys jatamansi* is also now known as *Nardostachys grandiflora* (2, 3). *Nardostachys jatamansi DC* is a perennial herb with a spindle-shaped woody, aromatic rootstock covered with short, thick, dark reddish brown thick fibers. The roots of the *Nardostachys jatamansi DC* contain essential oil, rich in volatile constituents like sesquiterpenes and non-volatile constituents like sesquiterpenes, coumarins, lignans, neolignans, alkaloids and steroids. Jatamansone or valeranone is the principal sesquiterpenes also found in rood (4,5). Complex mixture are mostly comprises of rich volatile components like lipids, terpenoids, ketones, phenols, oxygenated derivatives like antimicrobial, insecticidal and antioxidants (6). *Nardostachys jatamansi* was used as traditional medicine for the treatment of anxiety disorders (7) have anxiolytic property, used in clinical prescription, mild to moderate sleep disorders (8), depressant activity (9,10). *Nardostachys jatamansi* also contains essential oils like iridoids, and flavonoids (11, 12). According to Ayurveda the roots and rhizome of *Nardostachy jatamansi* DC. have various effects on 'doshas'. The plant is tridoshashamak but especially kapha-pittanashak been clinically employed for their anti-ischemic, antioxidant, anticonvulsant, and neuroprotective activities. Rhizome of *Nardostachy jatamansi* DC is proved to be a useful memory restorative agent in the treatment of dementia and as anti-stress (13).

II. Material and Methods

The roots and rhizomes of *Nardostachys jatamansi* DC were collected from herbal market of Mumbai, India. Specimen samples were authenticated at NBRI, Lucknow, India. Roots and rhizomes were shade dried and were subjected to coarse powdered form by mechanical grinder. Powder were passed through a 40-mesh sieve to get a uniform particle size and then used for extraction purpose.

Selected roots and rhizomes of *Nardostachys jatamansi* DC were extracted using Soxhlet extraction and maceration extraction method. The powder drug was extracted in soxhlet apparatus with the Methanol and n- Hexane separately, at 50-60 ^{0}C in 1:6 ratios in several batches for 16 – 18 hours. The powder drug was macerated with Methanol and n-Hexane separately for a week using shaker. Extracts were filtered and stored in

cool and dry place. Two types of extract were obtained; 1) Soxhlet Methanolic Extract (SME), 2) Soxhlet Hexane Extract (SHE), All extracts were collected & concentrated under vacuum in a rotary flash evaporator (Equitron). The residue was dried in the desiccator and stored in cool and dry place for further use.

Preparation of plant extracts for analysis: 10 mg of plant extracts Jatamansi SME, Jatamansi SHE were dissolved in 10 mL of their respective solvents; methanol or n- hexane. Samples were sonicated and filtered through 20µ filter before injecting into column.

Chromatographic conditions for GC/MS: The GC-MS analysis was carried out using Simadzu GC-MS model QP2010 ultra, equipped with flame ionized detector (FID) and capillary column Rtx- 5MS (30m×0.25mm) 0.25um thickness. Helium was used as carrier gas. GC oven temperature was variable programmed from 60^0C-220^0C. The temperature was raised 220 ^{0}C at the rate of 70 ^{0}C/min and hold for 11 min. Both SME and SHE samples were injected at temperature 250 ^{0}C, column oven temperature was maintained at 60^0C, split ratio was 10, pressure was maintained at 173.7 kPa, column flow was 3 mL/min. The gas chromatography-mass spectrometry (GC-MS) analyses were performed on detector GCMS-QP2010 ion source temperature was maintained at 250°. Mass-spectra recording were done by electron impact ionization at 70eV with scanning mass range recorded from 35 to 450, Injection volume (sample) was 2µl, and total run time was 15 min. The identity of each compound was assigned by comparison of their retention index (RI), relative to a standard mixture of n-alkanes, as well as by comparison of their spectra with those available from MS libraries (NIST/Wiley/Adams) and with the literature values.0 Relative amounts of individual components were calculated based on GC peak area (FID response) without using any correction factor.

III. Results and Conclusions

GC-MS is widely accepted method for the analysis of phyto-constituents of herbal drugs preferably volatile constituents. This method is ideal as it is highly sensitive, stable and efficient. Combination of GC with mass spectrometry (MS) has added the identification of compounds with more reliable information (15).

In this study quantitative identification of volatile component in plant extracts was done by directly injecting plant extracts in GC column. In Nardostachys jatamansi hexane extract total 44 major constituents of the extract were determined as Veridiflorol (23.65%), alpha.-Cadinol (13.87%), Verrucarol (8.04%), hexadecanoic acid (7.4%), Oleic Acid (7.7%), valerenic acid (0.49%) (Table: 1). In methanolic extracts 38 chemical constituents were identified, major constituents of the extract were (-)-Globulol (29.11%), Actinidine (3.58%), alpha.-Cadinol (5.37%), Patchouli alcohol (1.96%), Valerenic acid (0.27%), hexadecanoic acid (1.28%) (Table: 2), by matching with NIST.LIB library.

Table no. 1: Chemical constituents in *Nardostachy Jatamansi* DC *SHE*

Sr. No.	Plant extract	Area%	Structural Formula
1	dl-Alanyl-dl-norleucin	1.41	C9H18N2O3
2	Lemonene	0.28	C12H10
3	Diphenyl ether	0.79	C12H10O
4	Naphthalene, 2-ethenyl-	0.15	C12H10
5	Diphenyl ether	0.93	C12H10O
6	Aromadendrene, dehydro-	0.62	C15H22
7	Tetracosane	0.35	C24H50
8	Dodecanoic acid	0.24	C12H24O2
9	Benzene, 1,2,3,4-	0.29	C13H18
10	Valtrate	0.16	C22H30O8
11	7,9-Di-tert-butyl	0.64	C17H24O3
12	trans-.beta.-Ionone	0.34	C13H20O
13	Atraric acid	0.36	C10H12O4
14	Tetradecanoic acid	1.46	C14H28O2
15	7-Acetyl-2-hydro	1.03	C15H26O2
16	Undecane, 2,8-dimethyl-	0.69	C13H28
17	(-)-Spathulenol	1.37	C15H24O
18	Veridiflorol	23.65	C15H26O
19	valerenic acid/Coumarin-6-ol, 3,	0.49	C15H22O2
20	1,6-Octadiene, 3-	0.9	C12H22O
21	.alpha.-Cadinol	13.87	C15H26O
22	Phthalic acid, but	0.78	C26H42O4
23	11-Isopropyliden	3.09	C15H22O2
24	Kavain	1.44	C14H14O3
25	myrtenyl isovalerate	0.77	C15H24O2
26	Hexadecanoic acid, methyl ester	2.91	C17H34O2
27	Verrucarol	8.04	C15H22O4
28	n-Hexadecanoic acid	7.76	C16H32O2

29	vulgarone B/ Longiverbenone	3.95	C15H22O
30	2-tert-Butyl-4-hex	0.34	C16H26O
31	Cycloheptanone,	0.62	C14H22O3
32	Veridiflorol	0.4	C15H26O
33	15-Acetoxyvaleranone	0.39	C15H24O3
34	Heneicosanoic ac	0.26	C22H44O2
35	Cinnamic acid, 4-	0.7	C31H40O15
36	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	1.56	C19H34O2
37	9-Octadecenoic a	1.46	C19H36O2
38	Octadecanoic acid, methyl ester	0.89	C19H38O2
39	Oleic Acid	7.4	C18H34O2
40	Octadecanoic acid	1.87	C18H36O2
41	Z,Z-3,13-Octadecadien-1-ol	1	C18H34O
42	Eicosanoic acid,	0.39	C21H42O2
43	17-Octadecynoic	0.54	C19H34O2
44	Docosanoic acid,	3.43	C23H46O2

Table no. 2: Chemical constituent of *Nardostachy Jatamansi* DC *SME*

Sr. No.	Plant extract	Area%	Structural Formula
1	Trichloroethylene	9.65	C2HCl3
2	Acetic acid, (tert-butyldimethylsily	0.38	C8H18O2Si
3	Naphthalene, 2-ethenyl-	3.03	C12H10
4	Eugenol	1.81	C10H12O2,
5	Actinidine	3.58	C10H13N
6	Biphenyl	1.93	C12H10
7	Naphthalene, 2-ethenyl-	5.39	C12H10
8	Tetradecane	1.15	C14H30
9	Diphenyl ether/O-Tolyl)carbamic acid,	1.04	C12H10O/ C20H17NO2
10	Diphenyl ether	3.15	C12H10O
11	Diphenyl ether	0.49	C12H10O
12	Dopamine/Octopamine	0.16	C8H11NO2
13	Veridiflorol	0.37	C15H26O
14	(-)-Spathulenol	0.30	C15H24O
15	Globulol	0.57	C15H26O
16	2-Naphthalenemethanol, 2,3,4,4a,5/ humulane-1		C15H26O
17	Benzene, 2-(2-buteny1)-1,3,5-trime	0.62	C13H18
18	Selina-6-en-4-ol/ Epiglobulol	0.89	C15H26O
19	.alpha.-Cadinol	2.04	C15H26O
20	.alpha.-Cadinol/ .tau.-Muurolol	1.61	C15H26O
21	6-Isopropenyl-4,8a-dimethyl-1,2,3/ -Spathulenol	1.12	
22	Patchouli alcohol	1.96	C15H26O
23	Valerenic acid	0.27	C15H22O2
24	Bicyclo[4.2.0]oct-1(6)-ene, 3,3,4,4	3.04	C22H24N4
25	4-(1,5-Dihydroxy-2,6,6-trimethylc	1.22	C13H20O3
26	Aromadendrene, dehydro-	1.91	C15H22
27	(-)-Globulol	29.11	C15H26O
28	5-Fluorouracil	1.10	C4H3FN2O2
29	Tricyclo[5.1.0.0(2,4)]oct-5-ene-5-pr	0.92	C15H22O2
30	tau.-Muurolol	5.37	C15H26O
31	Norpatchoulenol	1.28	C14H22O
32	4-(6-Methoxy-3-methyl-2-benzofu	0.79	C14H14O3
33	n-Hexadecanoic acid	1.28	C15H30O2
34	Verrucarol	2.22	C15H22O4
35	Dodecyl isothiocyanate	0.54	C15H30O2
36	Octadecanoic acid	2.91	C18H36O2
37	vulgarone B/ Longiverbenone	1.88	C15H22O
38	Decanoic acid,	1.76	C19H36O2

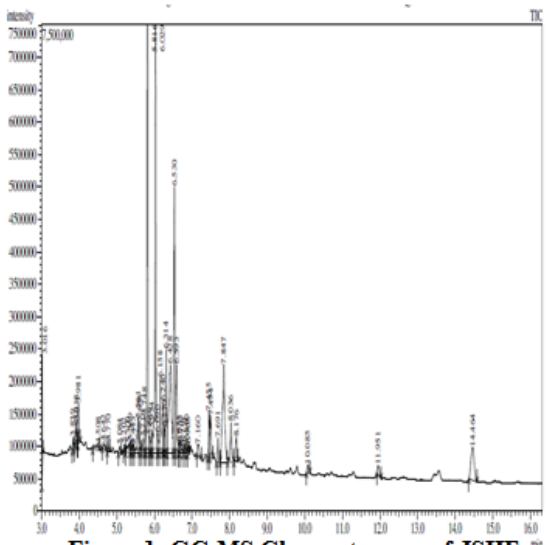

Figure 1: GC-MS Chromatogram of JSHE

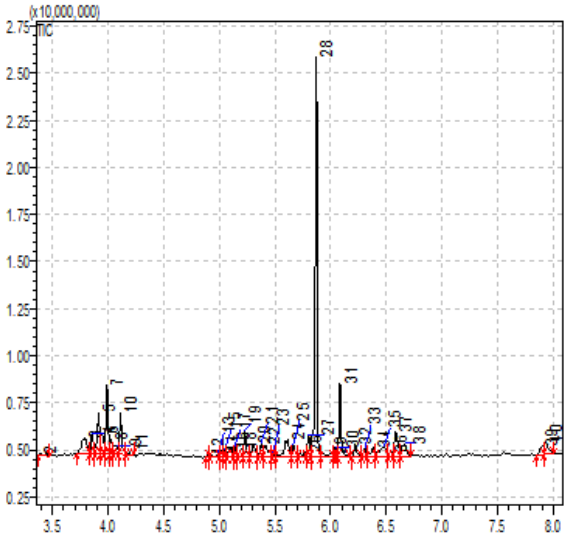

Figure 2: GC-MS Chromatogram of JSME

Thus present study has provided information on variation in chemical composition of *Nardostachys jatamansi DC* extracts procured using different solvents viz methanol and hexane respectively. The quantitative composition and the relative proportions of the chemical components are found to be widely influenced by the extraction method and solvent used. Considering the use of *Nardostachys jatamansi DC* in various diseases and in view of growing demand for its raw material in the industries, mentioned extraction methods may be adopted for commercial benefits and mass scale of desired compounds from raw *Nardostachys jatamansi DC* . These findings would cater to the need of promoting specific mode of extraction for meeting need of pharmaceutical industries in getting desired compound for targeted treatment of disease.

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References

[1]. Leaman, D. J. (2007). Medicinal plant conservation and sustainable use: questions about an important global resource. In *Building a sustainable future: the role of botanic gardens. Proceedings of the 3rd Global Botanic Gardens Congress, Wuhan, China, 16-20 April, 2007* (pp. 1-5). Botanic Gardens Conservation International.
[2]. Houghton, P. (Ed.). (1997). *Valerian: the genus Valeriana*. Crc Press.
[3]. Bhatt, I. D., Dauthal, P., Rawat, S., Gaira, K. S., Jugran, A., Rawal, R. S., & Dhar, U. (2012). Characterization of essential oil composition, phenolic content, and antioxidant properties in wild and planted individuals of Valeriana jatamansi Jones. *Scientia Horticulturae*, *136*, 61-68.
[4]. Duke, J.A., 2007. *Duke's Handbook of Medicinal Plants of the Bible (Google eBook)*,CRC.
[5]. URL: http://books.google.com/books?id=UcLYLpwdcm8C&pgis =1 [Accessed June 18, 2014].
[6]. Disket, J., Mann, S., & Gupta, R. K. (2012). A review on spikenard (Nardostachys jatamansi DC.)-an 'endangered'essential herb of India. *Int. J. Pharm. Chem*, *2*, 52-60.
[7]. Singh, A., Kumar, A., & Duggal, S. (2009). Nardostachys jatamansi DC. potential herb with CNS effects. *Asian Journal of Pharmaceutical Research and Health Care*, *1*(2).
[8]. Burt, S. (2004). Essential oils: their antibacterial properties and potential applications in foods—a review. *International journal of food microbiology*, *94*(3), 223-253.
[9]. Wang, S. N., Ding, Y. S., Ma, X. J., Zhao, C. B., Lin, M. X., Luo, J., ... & Shi, J. L. (2018). Identification of bioactive chemical markers in Zhi zhu xiang improving anxiety in rat by fingerprint-efficacy study. *Molecules*, *23*(9), 2329.
[10]. Kulkarni, R., Girish, K. J., & Kumar, A. (2012). Nootropic herbs (Medhya Rasayana) in Ayurveda: an update. *Pharmacognosy Reviews*, *6*(12), 147.
[11]. Indurwade, N. H., & Biyani, K. R. (2000). Evaluation of comparative and combined depressive effect of Brahmi, Shankhpushpi and Jatamansi in mice. *Indian journal of medical sciences*, *54*(8), 339-341.
[12]. Negi, J. S., Bisht, V. K., Bhandari, A. K., & Sundriyal, R. C. (2012). Effects of extraction solvents on concentration of valerenic acid and antioxidant property of Valeriana jatamansi Jones. *Int J Pharma Bio Sci*, *3*(4), 28-35.
[13]. Lin, S. et al., 2010. Iridoids and lignans from Nardostachys jatamansi DC . *Journal of Natural Products*, 73, pp.632–638.
[14]. Lyle, N., Gomes, A., Sur, T., Munshi, S., Paul, S., Chatterjee, S., & Bhattacharyya, D. (2009). The role of antioxidant properties of Nardostachys jatamansi in alleviation of the symptoms of the chronic fatigue syndrome. *Behavioural brain research*, *202*(2), 285-290.
[15]. Available at: https://doi.org/10.1016/j.bbr.2009.04.005 (Accessed July 26, 2020)
[16]. Raina, A. P., & Negi, K. S. (2015). Essential oil composition of Valeriana jatamansi Jones from Himalayan regions of India. *Indian Journal of Pharmaceutical Sciences*, *77*(2), 218.
[17]. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4442472/ (Accessed March 23, 2020)