

Investigation on Himalayan *Nepeta* Species VII: Essential Oil of *Nepeta spicata* Benth

MANISHA BISHT, SEEMA SHARMA and C.S. MATHELA*

Department of Chemistry
Kumaon University, Nainital-263 002, India

The chemical composition of the essential oil obtained from the aerial parts of *Nepeta spicata* Benth was analysed by using GC/MS and GC/FTIR. Out of at least 43 constituents, 33 have been identified. β -caryophyllene (27.01%) was found to be the most abundant constituent of the oil along with linalool (25.08%), germacrene-D (20.10%) and β -caryophyllene oxide (10.60%) as the next major compounds. *Nepeta* lactones (characteristic of *Nepeta* species), iridodial derivatives and C₁₂ compounds were not found in the oil of *Nepeta spicata*. The essential oil is dominated by sesquiterpenoids (> 67%).

INTRODUCTION

Nepeta species (Lamiaceae) are known to contain diastereomeric nepeta lactones which are characteristic of *Nepeta* species and are responsible for their feline attractant properties.^{1,2} New substituted cyclopentanoid iridodial derivatives present in *Nepeta* species have been identified and their biological activity determined.^{3,4} Coleons were already isolated from some *Nepeta* species.^{5,6} Pregeijerene and its C₁₂ isomeric compounds that are rarely present in the essential oils were reported in *N. govaniensis* Benth.⁷ In continuation of our program to screen *Nepeta* species²⁻⁷ we report here the chemical composition of *Nepeta spicata* Benth, an aromatic and wild herb with purple coloured flowers found in the rainy as well as dry Himalayas at an altitude of 8-12,000 ft.⁸

EXPERIMENTAL

The aerial parts of *Nepeta spicata* were collected during the flowering stage. Identification was done by a local taxonomist and confirmed by the Botanical Survey of India, North Zone, Dehradun. The essential oil was obtained by steam distillation of the aerial parts of the plant. The GC and GC/MS analysis was done using fused silica capillary column (30 m \times 0.25 mm) liquid phase SE-30 with helium as carrier gas in a Hewlett-Packard 5840A GC interfaced with Hewlett-Packard 5985 mass spectrometer. The column temperature was programmed at 3°C/min from 70° to 220°C. The mass spectra corresponding to GC peaks were scanned at 70 eV under EI conditions. GC-FTIR analysis was performed using a gas chromatograph fitted with a similar capillary column as that described above

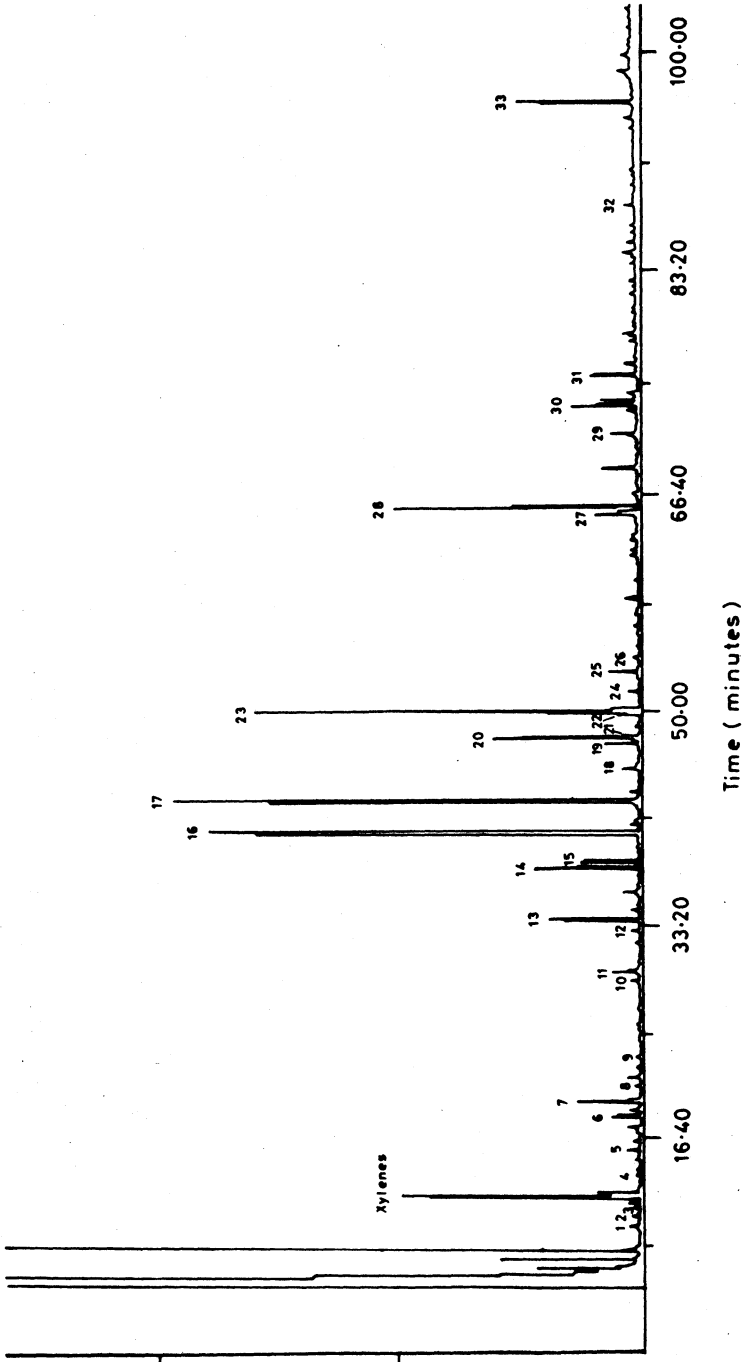


Fig. 1 G.C of the essential oil of *Nepeta spicata*.

which was connected *via* a light pipe to a Hewlett-Packard 5965A infrared detector. Characterization of compounds was made by comparison using MS-FTIR data and retention indexes on both polar and non-polar phases.

RESULTS AND DISCUSSION

The chromatogram (Fig. 1) showed the presence of at least 43 peaks, 33 of which were identified and are listed in Table-1 along with their area percentage data. The major constituents of the oil were β -caryophyllene (27.01%), linalool (25.08%), germacrene-D (20.10%), and β -caryophyllene oxide (10.60%). Besides these, the oil also showed the presence of *trans*- β -farnesene (3.19%), β -bourbonene (1.61%), 1-octen-3-ol (1.30%) and 26 other minor constituents. The oil investigated differs significantly from those of other *Nepeta* species examined so far, notably because of the absence of nepetalactones which are the characteristic of *Nepeta* species. Iridodial derivatives and C₁₂ compounds reported earlier from the *Nepeta* species were also found to be absent in the oil of *Nepeta spicata*.

TABLE-1
CHEMICAL COMPOSITION OF THE OIL OF *NEPETA SPICATA* BENTH.

GC Peak No.	Compound	% Content
1.	hexanal	tr
2.	β -pinene	0.05
3.	sabinene	tr
4.	myrcene	tr
5.	limonene	0.15
6.	<i>cis</i> -ocimene	0.33
7.	<i>trans</i> -ocimene	0.95
8.	<i>p</i> -cymene	tr
9.	3-methyl butanol	tr
10.	<i>cis</i> -3-hexanol	0.08
11.	3-octanol	0.35
12.	linalool oxide	0.05
13.	1-octen-3-ol	1.30
14.	β -bourbonene	1.61
15.	benzaldehyde	0.96
16.	linalool	25.08
17.	β -caryophyllene	27.01
18.	<i>cis-p</i> -mentha-2, 8-dien-1-ol	0.30
19.	α -humulene	0.34
20.	<i>trans</i> - β -farnesene	3.19
21.	<i>trans-p</i> -mentha-2, 8-dien-1-ol	0.20

GC Peak No.	Compound	% Content
22.	α -terpineol	0.30
23.	germacrene-D	20.10
24.	bicyclogermacrene	0.30
25.	isopiperitenols	0.33
26.	methyl salicylate	tr
27.	isocaryophyllene oxide	0.76
28.	β -caryophyllene oxide	10.60
29.	elemol	0.36
30.	spathulenol	0.89
31.	eugenol	0.48
32.	coumarin	0.06
33.	<i>trans</i> -phytol	0.39

tr = trace (< 0.05%)

ACKNOWLEDGEMENT

The authors are grateful to Dr. R. Laurent, France for running GC-MS and GC-FTIR of the sample.

REFERENCES

1. F.E. Regnier, G.R. Waller and E.J. Eisenbraun, *Phytochemistry*, **6**, 1281 (1967).
2. A.T. Bottini, V. Dev, D.J. Garfagnoli, H. Lohani, C.S. Mathela and A.K. Pant, *Phytochemistry*, **26**, 1200 (1987).
3. A.T. Bottini, V. Dev, G.C. Shah, C.S. Mathela, A.B. Melkani, A.T. Nerio and N.S. Sturm, *Phytochemistry*, **31**, 1653 (1992).
4. J. Saxena and C.S. Mathela, *Appl. and Environ. Microbiol.*, **62**, 702 (1996).
5. R. Bhandari, C.S. Mathela, P. Beauchamp, A.T. Bottini and V. Dev, *Phytochemistry*, **32**, 1438 (1993).
6. C.S. Mathela, A. Gupta, P. Upreti, A.K. Pant, M.M. Olmsted, H. Hope and A.T. Bottini, *J. Nat. Prod.*, **54**, 910 (1991).
7. C.S. Mathela, H. Kharkwal and R. Laurent, *J. Essent. Oil Res.*, **6**, 425 (1994).
8. R. Strachey, Catalogue of the Plants of Kumaon, Periodical Experts, Delhi, pp. 142-143 (1974).

(Received: 6 December 1996; Accepted: 15 May 1997)

AJC-1262