

**The Essential oil of *Brachanthemum mongolorum* Grub
From Mongolian Paleo-Endemic Plant**

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Abstract : The leaf and flower essential oil of *Brachanthemum mongolorum* Grub. were analyzed by GC/MS. The leaf oil was dominated by 1,8-cineol (14.67%), chamazulene (13.23%), camphor (8.52%), germacrene-D (6.28%), beta-caryophyllene (6.16%), borneol (4.25%) and paracymene (2.67%). The flower oil contained Chamazulene (11.72%) beta-caryophyllene (12.76%) germacrene-D (10.93%), alpha-zingiberene (4.56%), borneol (3.25%), caryophyllene oxide (4.10%).

Introduction : The genus *Brachanthemum* Krasch. comprise three species *Brachanthemum gobicum* Krasch., *B. Mongolicum* Krasch. and *B. mongolorum* Grub. spread over the Mongolian Gobi, Dzungarian Gobi and Eastern Mongolia. The *Brachanthemum mongolorum* Grub (Asteraceae) is represented by only one species in Mongolia. It is a wild herb having yellow flowers with a pleasant fragrance. The plants can be found distributed in some eastern provinces of Mongolia^{1,2,3,4}. This plant has not been the subject of any research upto now, and therefore, present study aimed to analyse the chemical constituents of its leaves and flowers by GC-MS.

Plant Material : The leaves and flowers were obtained from the Eastern Mongolian steppe of Matalula. (S. Shatar. 7521/95, 7522/95, 7523/95). Voucher specimens were deposited in the herbarium at the Mongolian Academy of Sciences, Ulaanbaatar-51, Mongolia.

Isolation and analysis. Dry leaves and flowers were steam distilled in a circulatory Clevenger-type apparatus for 2 h to produce a blue oil with yields of 0.18% and 0.22% respectively. GC/MS analysis was made using a Finnigan Ion Trap 800 instrument fitted with a 30m x 0.26mm DB-5 fused silica capillary column (film thickness : 0.25µm). The column was programmed from 60^o-240^oC at 30^oC/min. Oil components were identified by comparing retention times and mass spectral data (6).

Results and Discussion : Composition of the leaf and flower oil of *Brachanthemum mongolorum* Grub. has been shown in Table I. The major constituents of the leaf oil were 1,8-cineole (14.67%), chamazulene (13.23%), camphor (8.52%), germacrene-D (6.28%), β -caryophyllene (6.16%), borneol (4.25%) and p-cymene (2.67%); β -pinene (3.85%), limonene (2.01%), trans-cimene (2.81%), α -terpineol (1.62%), terpin-4-ol (1.30%), gamma-terpinene (1.19%), alpha-zingiberene (2.05%), caryophyllen oxide (2.49%), beta-selinene (1.14%) and spathulenol (0.69%) were found in lesser amounts. The major components of the flower oil were chamazulene (11.72%), beta-caryophyllene 12.76%, germacren-D (10.93%), alpha-zingiberene 4.56%, camphor (3.25%), caryophyllen oxide (4.10%), viridiflorol (4.10%), 1,8-cineole (5.52%), borneol (3.25%), longiborneol (2.58%), beta-selinene (2.01%), guaial (1.73%) myrcene (1.28%), spathulenol (1.50%), p-cymene (1.35%), gamma-terpinene (1.02%).

Mass spectra of unidentified constituents : IITMS, m/z (rel. int.) KI 1952, 41 (92), 44 (100), 55 (8), 59(20) 67 (23), 73 (8), 79 (31), 91(40), 105(33), 119(17), 133(16), 149 (9), KI 2300, 43 (95), 57(100), 71(60), 77(7), 85 (43), 91 (9), 97 (11), 105 (5), 113 (5), 119 (5), 125 (3), 133 (2), 149 (4),

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Table 1. Composition of the volatile leaf and flower oils of *Brachanthemum mongolorum* Grub. from Mongolia

KI	Compounds	Percentage	
		Leaf oil	flower oil
0931	α -Thujene	0.135	
0939	α -Pinene	0.412	0.195
0953	Camphene	0.999	0.402
0976	Sabinene	0.690	0.201
0980	β -Pinene	0.560	0.231
0991	Myrcene	3.845	1.278
1005	α -Phellandrene	0.072	
1018	α -Terpinene	0.220	0.135
1026	p-Cymene	2.672	1.348
1031	Limonene	2.013	0.821
1033	1,8-Cineole	14.671	5.516
1040	cis-Ocimene	0.461	0.150
1050	trans-Ocimene	2.810	0.787
1062	γ -terpinene	1.193	1.012
1063	cis-Sabinene hydrate	0.941	
1088	Terpinolene	0.111	
1095	α -Pinene oxide	0.221	
1097	trans-Sabinene hydrate	0.610	0.360
1098	Linalool	0.600	
1102	α -Thujone	0.326	0.255
1121	cis-Pinene hydrate	0.102	
1129	allo-Ocimene	0.143	
1140	trans-Pinene hydrate	0.200	
1143	Camphor	8.521	4.365
1149	neo-3Thujonol	0.125	
1156	Sabina ketone	0.111	
1162	Pinocarvone	0.110	

1165	Borneol	4.250	3.249
1175	Terpin-4-ol	1.298	0.963
1189	α -Terpineol	1.617	0.549
1240	Nerol	0.105	.....
1270	Geranial	0.206	.....
1285	Bornyl acetate	0.109	0.280
1376	α -Copaene	0.202	0.461
1384	β -Bourbonene	0.378	0.716
1398	β -Longipinene	0.073	.....
1418	B-Caryophyllene	6.160	12.764
1436	α -Trans-bergamotene	0.097	.....
1454	α -Humulene	0.448	0.897
1458	(E)- β -Farnesene	0.493	0.752
1480	Germacrene-D	6.281	10.929
1485	β -Selinene	1.142	2.005
1493	epi-cubebol	0.381	.....
1495	α -Zingiberene	2.049	4.560
1499	β -Himachalene	0.536	.....
1503	Germacrene-A	0.685	0.470
1509	β -Bisabolene	0.370	0.316
1524	γ -Cadinene	0.742	1.045
1564	(E)-Nerolidol	.....	0.490
1576	Spathulenol	0.691	1.233
1581	Caryophyllene oxide	2.490	4.100
1590	Viridiflorol	t	.....
1592	Longiborneol	0.419	2.590
1595	Guaiol	0.083	1.732
1725	Chamazulene	13.229	11.720
1764	oxy- α -Muurolene	0.117	0.461
1783	Santalol acetate	0.106	.....
1952	Unidentified	0.473	0.425
2300	Unidentified	2.614	5.240