COMPOSITION OF THE ESSENTIAL OIL OF *Chrysanthemum macrocarpum* FROM ALGERIA

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Asteraceae plants are widely distributed; there are more than 25000 species and ca. 1600 genera. Fifteen *Chrysanthemum* species are found in Algeria [1, 2]. For many centuries, *Chrysanthemum* plants have been used in folk medicine to treat fever, arthritis, vertigo, hypertensive symptoms, and infectious diseases such as pneumonia, colitis, and stomatitis [3, 4].

Anti-cancer [5], anti-HIV-1 [6], and antioxidant [7] activities have been reported for some *Chrysanthemum* species. However, only a few studies have reported the activities and analyses of *Chrysanthemum* essential oils. Antibacterial [8–10], antifungal [11], and antimicrobial [12] properties have been reported from *Chrysanthemum* species.

TABLE 1. Composition of the Essential Oil of *Chrysanthemum macrocarpum* from Algeria

Compound	RRI	%	Compound	RRI	%
n-Octane	800	0.5	Salvial-4(14)-en-one	1590	2.5
2,4-Dimethylheptane	920	1.0	Isoaromadendrene oxide	1595	0.9
α-Fenchene	953	0.2	Hexadecane	1600	1.0
β-Phellandrene	1030	0.8	*T*-Cadinol	1608	19.6
Undecane	1100	2.1	α-Cadinol	1616	5.6
Octenyl acetate	1106	2.4	Valeranone	1639	1.0
Linalool oxide	1078	1.0	α-Bisabolol	1659	3.0
Safranal	1197	0.5	*trans*-Longipinocarveol	1688	3.5
Dodecane	1200	1.4	6,10,14-Trimethyl-2-pentadecane	1770	2.2
Hexyl isovalerate	1243	0.2	Bicyclic[3.3.1]nona-2,6-diol	1820	1.5
Thymol	1266	4.0	Nonadecane	1900	1.0
Methyldecanoate	1290	1.7	Methylhexadecanoate	1908	0.8
α-Copaene	1376	0.5	*n*-Eicosane	2000	1.0
n-Tetradecane	1400	1.0	Heneicosane	2100	0.6
β-Caryophyllene	1416	0.2	Oleic acid	2105	0.1
(*E*)-α-Ionone	1433	0.7	Linoleic acid	2197	1.0
(*E*)-β-Farnesene	1458	2.3	Tricosane	2300	2.0
δ-Cadinene	1524	3.9	*n*-Octacosane	2800	1.0
Spathulenol	1577	12.5			
Caryophyllene oxide	1582	6.5	Total		93.8

RRI: relative retention indices on a DB-5 column.

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The essential oil of *C. coronarium* [11] is mainly represented by α-pinene (14.8%), β-pinene (9.5%), camphor (29.2%), and lyratyl acetate (9.8%), while α-pinene (5.7%), sabinene (6.4%), 1,8-cineole (23%), camphor (14.7%), and muurolol (6.8%) were identified as the major components of *C. cuneifolium* essential oil [13]. *Chrysanthemum yoshinaganthum* [13] was mainly characterized by 1,8-cineole (6.8%), myrtenol (54.8%), and germacrene D (10.6%), while myrcene (6.0%), 1,8-cineole (6.0%), bornylacetate (7.5%), β-farnesene (5.0%), germacrene D (8.5%), α-selinene ((8.0%), γ-cadinene (5.1%), and *T*-muurolol (5.3%) were mainly found in *C. indicum* oil from Japan [13]. 1,8-Cineole (30.4%), camphor (23.5%), borneol (8.3%), and bornylacetate (10.8%) were reported as the major components of *C. indicum* from China oil [12], while *C. viscidehirtum* essential oil [9] was mainly characteried by β-farnesene (25%) and limonene (21.8%).

We report here the essential oil composition of the endemic species *Chrysanthemum macrocarpum*, which is used in folk medicine as a popular remedy for fever and migraine and as a flavoring in milk drinks.

The hydrodistillation yielded 0.5% of a yellowish oil. Thirty-eight components were identified representing 93.8% of the oil, characterized mainly by *T*-cadinol (19.6%), spathulenol (12.5%), caryophyllene oxide (6.5%), and α-cadinol (5.6%) (Table 1). *T*-Cadinol was found in *C. viscidehirtum* (0.8%) [9], which also contains α-cadinol (1.5%) as reported in *C. indicum* from Japan (4.5%) [13]. Crayophyllene oxide (12.3%) was identified in the oil of cultivated *C. indicum* from Spain [14], which is also characterized by limonene (10.7%) and α-pinene (8.5%).

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