

## Essential oil composition of some *Centaurea* sp. (Asteraceae) from different Italian islands

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### INTRODUCTION

The genus *Centaurea* (Cardueae tribe, Asteraceae) is represented by a very large number of species (400-700) with predominantly the Old World distribution (Greuter, 2006-09). Several papers on secondary metabolites of *Centaurea* species are available in the literature (Baykan-Erel *et al.*, 2010); a few studies are on volatile constituents (Rosselli *et al.*, 2009, Tava *et al.*, 2010; Viegi *et al.*, 2010).

### MATERIALS and METHODS

The aerial parts (fresh and dry flower heads and leaves) of *Centaurea veneris* (Sommier) Bég. from Palmaria island, in the Ligurian Sea, *C. gymnocarpa* Moris & De Not. from Capraia island, as well as *C. ilvensis* (Sommier) Arrigoni, and *C. aetaliae* (Somm.) Bég. from Elba island (Mt. Capanne and Mt. Volterraio, respectively) in the northern Tyrrhenian Sea, were collected (thanks to A. Marchese and M. Boracchia) during their flowering period (April-July) in 2006 and 2007. Voucher specimens of these plants are deposited in PI (Pisa University, Herbarium Horti Pisani). For each population, a sample of 20 individuals was collected. Nomenclature follows Greuter (2006-09). The volatile components of all the samples were obtained by hydrodistillation and identified by GC and GC/MS. The essential oil from these four species has never been previously investigated.

### AIM OF THE RESEARCH

Taxonomically this taxon is very complex and could benefit from research using new cytological and chemical techniques. The present study extends our work on *Centaurea* species in Italy, and its aim was to investigate the essential oil composition of four species from different Italian islands.

### DESCRIPTION and DISTRIBUTION of the SPECIES

- *Centaurea veneris* (Somm.) Bég. is an endemic perennial species with spreading-branching stems, prostrate to erect, ash gray in juveniles, later glabrous and green, and slightly fleshy, bipinnatisect leaves. Heads (10-15 mm diameter) in corymbs with lilac florets, achenes with pappus as long as the fruit (3-4 mm). It grows among the rocks of Portovenere and in the nearby islands of Palmaria, Tino and Tinetto (Fig. 1). Chromosome number is  $2n=18$  (Viegi *et al.*, 1972).
- *Centaurea gymnocarpa* Moris & De Notaris is an endemic perennial species with erect hairy white stems, leaves from bipinnatisect to pinnatisect. Heads (about 15 mm diameter) in corymbs with pink-lilac florets, achenes 3-4 mm long, without pappus. It grows among the rocks of Capraia island (Tuscan Archipelago) (Fig. 1). Chromosome number is  $2n=18$  (Guinochet and Foissac, 1962; Viegi and Cela Renzoni, 1976). The species is considered endangered (EN) according to I.U.C.N. Red List criteria (I.U.C.N., 1994; Conti *et al.*, 1997; <http://www.iucnredlist.org/apps/redlist/search>).
- *Centaurea ilvensis* (Sommier) Arrigoni is an endemic perennial species, with spreading-branching stems, and glaucous pinnatisect leaves. Heads with lilac florets and achenes with pappus 1/3-1/2 the length of achenes. It grows among the rocks of Mt. Capanne on Elba island (Fig. 1). Chromosome number is  $2n=18$  (Viegi and Cela Renzoni, 1976). The species is included in L.R. Toscana n.56/2000, Art. 6, annex C1.
- *Centaurea aetaliae* (Sommier) Béguinot is an endemic perennial species, with erect-ascending stems and glabrous pinnatisect leaves. Heads ovoid with pink florets and black achenes with pappus about half as long as achene. It grows on Mt. Volterraio on Elba island (Fig. 1). Chromosome number is  $2n=18$  (Viegi and Cela Renzoni, 1976; Signorini *et al.*, 2001).



Fig 1. Distribution of *C. veneris* in Liguria, *C. gymnocarpa*, *C. ilvensis* and *C. aetaliae* in Tuscany, Italy.

### RESULTS

The volatile oils of the four species contained several compounds, the most abundant of which were sesquiterpenes (34.4-61.7% of total oil) with germacrene D as the dominant constituent (13.8-42.7%). The other classes of compounds detected were: aldehydes (6.5-10.3%), hydrocarbons (1.7-14.7%), alcohols (0.6-7.9%), monoterpenes (0.6-2.2%), ketones (0.3-2.4%), acids (0.8-4.0%), esters (0.1-4.7%) and miscellaneous (0.1-1.2%). Several unidentified compounds (15.0-37.2%) were also found in greater amounts than in other *Centaurea* sp. (Tava *et al.*, 2010; Viegi *et al.*, 2010).

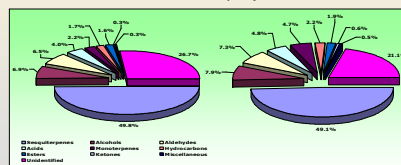


Fig. 2. Essential oil composition (expressed as % composition of the total oil) of *C. aetaliae* and *C. ilvensis*, whole plant.

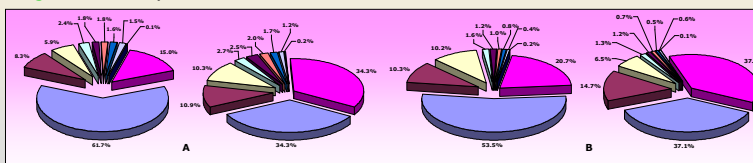


Fig. 3. Essential oil composition (expressed as % composition of the total oil) of *C. veneris* and *C. gymnocarpa*, leaves (A) and flowers (B).

### CONCLUSIONS

The compounds identified in the volatile oils of the four species only differed in quantitative composition, whereas a series of unidentified compounds seemed more species-specific as previously observed in other Italian *Centaurea* species (Tava *et al.*, 2010; Viegi *et al.*, 2010). As previously reported, these substances seem to belong to the class of polyunsaturated linear-chain compounds and their occurrence is not unusual, already having been reported in the Asteraceae family, including the genus *Centaurea* (Bohlmann *et al.*, 1966; Anderson *et al.*, 1977; Binder *et al.*, 1990). Further investigations are needed to identify these compounds and to compare their presence in other *Centaurea* volatile oils.

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