Posterbeitrag Themenkreis E: Wildsammlung, Inkulturnahme, Züchtung

P 15 *Clinopodium nepeta* und *Clinopodium menthifolium*: agronomisches und phytochemisches Potenzial von zwei Arten von Kalaminth

Clinopodium nepeta and Clinopodium menthifolium: agronomical and phytochemical potential of two species of calamint

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Zusammenfassung

Ein möglicher kommerzieller Anbau von «Kalaminth», auch bekannt als Bergminzen, wurde hinsichtlich des agronomischen und phytochemischen Potentials in den Vegetationsperioden 2014 und 2016 näher untersucht. Verschiedene Herkünfte der Arten *Clinopodium nepeta* (L.) Kuntze (kleinblütige Bergminze) und *Clinopodium menthifolium* (Host) Stace (Wald-Bergminze) wurden unter alpinen Vegetationsbedingungen in den Schweizer Alpen angebaut und anschliessend phytochemisch analysiert. Die Ausbeute von getrocknetem Pflanzenmaterial betrug 4 Tonnen/Ha ab dem zweiten Jahr. Für beide Arten schwankte der Gehalt an ätherischem Öl zwischen 1 und 1.5% (v/m) in Abhängigkeit von Erntejahr und der Phänologie zum Erntezeitpunkt. Der Hauptbestandteil (>80%) des ätherischen Öls von *C. nepeta* war Pulegon, und von *C. menthifolium* war Carvon (33-38%). Im Falle einer Industriekollaboration wäre eine Studie zur Variabilität von Phänotyp und den Sekundärmetaboliten der Schweizerischen Herkünfte angebracht.

Schlüsselwörter: Calamintha, Kultur, Ätherrisches Öl, Pulegon, Carvon

Abstract

From 2014 to 2016, the agronomic and phytochemical potential of two commercial accessions of calamint, one of Lesser Calamint (*Clinopodium nepeta* (L.) Kuntze) and one of Woodland Calamint (*Clinopodium menthifolium* (Host) Stace) was evaluated in the mountainous climatic conditions of the Swiss Alps. The production of dry whole plants has reached 4 tons/ha from the second year of cultivation. For both species, the essential oil content fluctuated between 1 and 1.5%, depending on the season and on the phenological stage of harvest. The major component of *C. nepeta* is pulegone (> 80%), and of *C. menthifolium* is carvone (33 to 38%). In collaboration with the industry, a study of the phenotypic and phytochemical variability of Swiss ecotypes of calamints would be desirable.

Keywords: Calamintha, Cultivation, Essential oil, Pulegone, Carvone

Introduction

Lesser Calamint (*Clinopodium nepeta* (L.) Kuntze; syn. *Calamintha nepeta*) and Woodland Calamint (*Clinopodium menthifolium* (Host) Stace; syn. *Calamintha sylvatica*) are two species of the Lamiaceae family, the former reminding the scent of pennyroyal, the latter a hypothetical cross between mint and marjoram (Eggenberg and Möhl, 2008). Their natural distribution areas cover Europe, with the exception of the northernmost areas, as well as Central and Minor Asia and North Africa. They are naturalized in North America.

In Herbal Medicine, *C. nepeta* is known for its antimicrobial, antioxidant, anti-inflammatory, anti-ulcer and insecticidal activities. Its main therapeutic indications are insomnia, depression, cramps, convulsions and the treatment of respiratory and gastroenteric diseases (Božović and Ragno, 2017; Bruneton 2009).

In Mediterranean countries, calamints are used as spices, for herbal tea, and in ethnopharmacology, having digestive, sedative, antispasmodic, carminative and tonic properties (Karousou *et al*., 2012). However, none of these species has ever been cultivated under the Swiss Alpine pedoclimatic conditions. The aim of the present study is to evaluate the agronomic and phytochemical potential of *C. nepeta* and *C. menthifolium* in the mountainous climatic conditions of the Swiss Alps in order to provide local food and beverage industries with innovative plant material.

Materials and Methods

Field trials following organic practices were carried out between 2014 and 2016 in Bruson, Valais Alps (1050 m), from seeds of *C. nepeta* CA 021 and *C. menthifolium* CA 019 obtained from Jelitto Staudensamen GmbH. Plantation of four replicates was done on June 25th 2014 with a density of 9.4 plant/m^2. Harvests were done with portable Supercut NT 2000 on 29.10.2014, 16.7.2015, 29.9.2015 and 23.08.2016. Yields in dry matter, leaves and essential oil (hydrodistillation 2h with 2-3 ml/min) were analyzed with XLSTAT. The essential oil composition was analyzed on a mix of replicates by UHPLC and GC-FID.

Results and Discussion

For both species, yields in dry matter reached a maximum of 4 tons/ha from the second year of cultivation, with an average of 22.1 to 23.9, and the essential oil content fluctuated between 1.0 and 1.5% (Table 1). The major component of Lesser Calamint is pulegone (> 80%), a ketone that has many antimicrobial, antibacterial, insecticidal, and allelopathic properties, but has demonstrated hepatic toxicity to mammals (Božović and Ragno, 2017; Bruneton 2009). Those of Woodland Calamint are dominated by carvone (21 to 32%), another ketone used as a flavor since thousands of years (Bruneton 2009). The essential content and composition is similar to those observed in wild populations in Greece (Hanlidou *et al*. 1991; Karousou *et al*., 2012). Rosmarinic acid content was higher in *C. nepeta*, while chlorogenic acid and rutin were higher in *C. menthifolium* (Figure 1). However, due to the absence of standard, a few peaks in the chromatogram of *C. nepeta* and *C. menthifolium* could not be identified (Figure 1).

Conclusions

Both calamints have been successfully cultivated in the climatic conditions of the Swiss Alps following organic practices, with potential yields of 4 tons/ha. *C. nepeta* is dominated by pulegone and *C. menthifolium* by carvone. Given their toxicity, the formulation of food products, drugs or bioinsecticides must take into account the legislation in force. A study of the phenotypic and phytochemical variability of native populations in Switzerland could help identifying the best ecotypes (Negro *et al*., 2013).

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Figures and tables

Table 1. Dry matter and essential oil yields of *C. nepeta* and *C. menthifolium* over four harvests in three years, mix of four repetitions.

	C. nepeta	***C. menthifolium***
Dry matter	22.1	23.9
Essential oil [%]	1.2	1.3

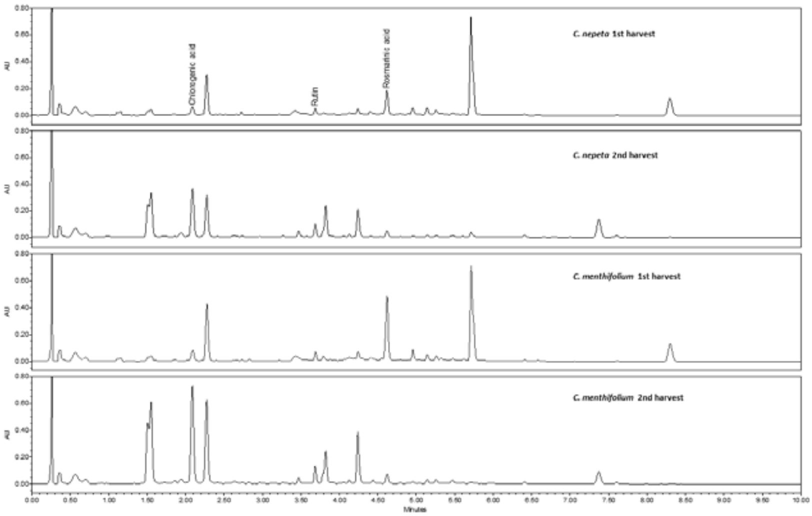

Figure 1. UHPLC analyses showing the presence of chlorogenic acid, rutin and rosmarinic acid (UV/Vis MAX plot).