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Influence of chosen agrotechnical factors and drying method on essential oil content and composition in garden angelica (*Archangelica officinalis* L.) leaves

INTRODUCTION

Garden angelica (*Archangelica officinalis* L.) is a protected species in Poland, therefore the raw materials (rhizomes with roots, fruits, leaf petioles, and whole leaves) are obtained only from cultivation. They are used in herbal medicine as well as in pharmaceutical, cosmetic and food industries in many countries. Garden angelica leaves are often used in traditional Polish cuisine. They contain many biologically active compounds, among which essential oil is regarded as the most important component.

The aim of this study was to determine the effect of time of plantation establishment and time of harvesting of angelica leaves as well as method of their preservation on the content and composition of essential oil in this raw material.

MATERIAL AND METHODS

The experiment was established in the experimental field of the Department of Vegetable and Medicinal Plants (WULS-SGGW) in Wilanów-Zawady. Seeds were sown into the ground in the second decade of November ("late autumn sowing") and in the first decade of April ("early spring sowing"). Single plot area was 5 m^2 and row spacing 20 cm. Leaves were collected twice: in the second decade of July and in the second decade of September (regrowth) when the plants reached 20-30 cm in height. After harvest the raw materials were divided into three parts. The first part was subjected to chemical analysis directly after collecting ("fresh leaves"). The second part was dried in a drying chamber at 40°C ("thermally-dried leaves"). The third part was freeze-dried at -49°C under the pressure of 0.0043 hPa ("freeze-dried leaves"). In the investigated samples essential oil content was determined by hydro-distillation method. Essential oils were analyzed by GC-MS-FID. The results for the July harvest are presented.

RESULTS

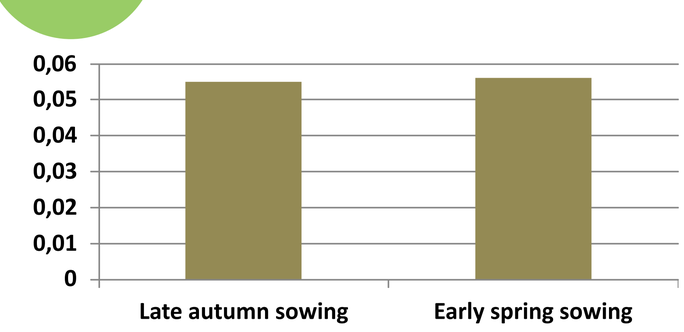

Fig. 1. Influence of time of plantation establishment on essential oil content in fresh garden angelica leaves (ml·100g^{-1})

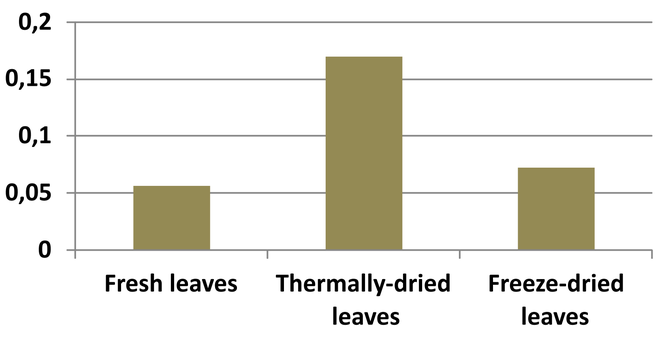

Fig. 2. Influence of method of drying on essential oil content in garden angelica leaves (ml·100g^{-1})

Table 1. Composition of essential oil from garden angelica leaves depending on time of plantation establishment and method of drying (%)

Essential oil component	Fresh leaves		Thermally-dried leaves		Freeze-dried leaves	
	Late autumn sowing	Early spring sowing	Late autumn sowing	Early spring sowing	Late autumn sowing	Early spring sowing
α-Pinene	29.1	18.4	25.3	21.9	20.4	7.9
α-Fenchene	1.6	1.4	1.7	1.2	1.2	0.3
β-Pinene	2.1	1.4	2.0	1.3	1.3	1.1
Myrcene	17.0	39.6	21.3	29.5	26.7	25.1
α-Phellandrene	0.2	1.9	0.2	1.2	3.1	0.9
p-Cymene	1.7	0.8	1.8	0.6	1.1	0.6
Limonene	7.6	5.8	5.1	4.9	5.0	6.0
(Z)-β-Ocimene	trace	3.2	0.4	2.8	2.7	2.7
α-Terpinyl acetate	0.5	0.2	3.0	2.6	0.9	19.0
α-Humulene	1.8	2.9	3.9	4.1	5.3	4.5
ar-Curcumene	0.8	0.5	1.2	0.4	0.7	0.6
Germacrene D	trace	1.2	0.1	2.0	2.1	1.7
α-Murolene	0.2	0.4	0.5	0.7	0.9	0.7
β-Bisabolene	0.4	0.4	0.8	0.5	0.9	0.6
Humulene epoxide II	2.4	0.3	3.0	0.3	0.3	0.7
(Z)-Phytol	0.1	0.1	0.2	0.1	0.3	0.8

CONCLUSIONS

- **The content of essential oil in the raw material and its composition were affected only by drying method.**
- **Thermally-dried raw material was characterised by higher content of essential oil (0.17 ml·100g^{-1}) in comparison with the fresh raw material (0.06 ml·100g^{-1}) and the freeze-dried one (0.07 ml·100g^{-1}).**
- **The dominant components of the investigated essential oils were α-pinene (7.9-29.9%) and myrcene (17.0-39.6%).**
- **The applied drying methods resulted in the decrease in the content of these compounds in essential oil in comparison with the fresh raw material.**