



Quality of wild growing populations of wild thyme (*Thymus serpyllum* L.) and common thyme (*Thymus pulegioides* L.)

INTRODUCTION

The objects of the study were wild thyme (*Thymus serpyllum* L.) and common thyme (*Thymus pulegioides* L.) wild growing in Poland. The herb of these plants is an important aromatic raw material collected almost exclusively from natural sites. The main active compounds of above mentioned raw material are essential oil and phenolic compounds [3, 4]. The extracts from the herb reveal a wide range of biological activities i.e. expectorant, spasmolytic, antibacterial, antifungal, antioxidant and are used mainly in upper respiratory infections [1, 3, 4]. The species, pollinated by insects, are highly heterozygotic, with distinct phenotype variation. The aim of undertaken study was to investigate the differences between those two species and their intraspecific variability in respect of phenolic compounds content and the content and chemical composition of essential oil.

MATERIAL AND METHODS

The study was conducted in 2011-2012 years. The herb from ten wild thyme and four common thyme populations from the Mazowieckie, Świętokrzyskie, Podlaskie and Lubelskie Provinces were used for chemical analysis (Table 1). The herb was collected at the stage of full blooming of plants and dried at temperature 35°C.

The total content of flavonoids, tannins and phenolic acids was determined according to Polish Pharmacopoeia VI (2002) [2]. The content of essential oil was determined by steam distillation in the Deryng's apparatus [Polish Pharmacopoeia VI, 2002]. The qualitative assessment of essential oil was done by using gas chromatography (gas chromatograph Hewlett-Packard 6890 GC with FID detector). The following separation conditions were applied: detector temperature - 250°C, injector temperature - 220°C, the programmed temperature: the initial - 60°C for 2 minutes, temperature growth 4°C/minute till 220°C for 5 minutes, capillary column HP-20M length 25 m, diameter 0.2 mm, carrier gas helium - 1.1 ml/min, quantity of the inject sample - 0.02 µl. The raw materials were analysed in three replications.

The results were statistically analyzed using STATGRAPHIC PLUS 4.1, with the level of significance equal to 0.05. The significance was assessed by the Tukey's HSD test.

Table 1. The natural sites of wild thyme and common thyme population

No.	Collection site	Geographical location	Provinces
<i>Thymus serpyllum</i> L.			
1	Czarnów 1	E 21°06'124" N 52°03'062"	Mazowieckie
2	Czarnów 2	E 21°06'202" N 52°03'031"	Mazowieckie
3	Skowronno 1	E 20°30'037" N 50°32'094"	Świętokrzyskie
4	Skowronno 2	E 20°30'591" N 50°32'143"	Świętokrzyskie
5	Chruścice	E 20°35'551" N 50°33'125"	Świętokrzyskie
6	Szczybiec	E 20°34'516" N 50°33'445"	Świętokrzyskie
7	Podłęże	E 20°34'054" N 50°34'431"	Świętokrzyskie
8	Skrzypiów	E 20°30'236" N 50°29'375"	Świętokrzyskie
9	Drohiczyn	E 22°42'236" N 52°23'599"	Podlaskie
10	Siemiatycze	E 20°53'215" N 50°23'719"	Podlaskie
<i>Thymus pulegioides</i> L.			
11	Kozubów	E 20°29'519" N 50°26'168"	Świętokrzyskie
12	Chomentówek	E 20°40'402" N 50°34'013"	Świętokrzyskie
13	Czarnystok	E 22°39'932" N 50°38'215"	Lubelskie
14	Drohiczyn	E 22°38'449" N 52°23'555"	Podlaskie



Photo 1. *T. serpyllum* L., Podłęże, July 2011



Photo 2. *T. pulegioides* L., Kozubów, July 2011



Photo 3. Hewlett-Packard 6890 GC with FID detector

CONCLUSIONS

1. Wild thyme and common thyme differed in respect of the total content of essential oil, flavonoids and tannins whereas the content of phenolic acids was similar for both species.
2. Both species were characterised by relatively low intraspecific variability in respect of the total content of flavonoids and phenolic acids and high intraspecific variability for the total content of tannins and essential oil.
3. High intraspecific variability was also observed in respect of percentage of chemical compounds in essential oil for both species.

RESULTS

The investigated species differed significantly in respect of the total content of essential oil, flavonoids and tannins in the herb. The total content of phenolic acids was comparable for both species (Figure 1-4). The content of essential oil ranged from 0.14 to 0.70 for wild thyme and from 0.70 to 1.11 per cent for common thyme herb (Fig. 1).

The major components of wild thyme essential oil were terpenes, namely: β-myrcene, 1,8-cineol, borneol, β-terpineol, β-caryophyllene and camphene, whereas the common thyme essential oil was characterised by high content of phenols i.e.: thymol and carvacrol (Table 2). The total content of flavonoids was higher in common thyme in comparison with wild thyme herb. Both, in wild thyme and common thyme there was relatively low intraspecific variability in respect of the total content of these compounds (Fig. 2). No differences between the species were observed in respect of the total content of phenolic acids but similarly to flavonoids, there was no significant intraspecific differences concerning the content of this compounds (Fig. 3). The total content of tannins was higher in wild thyme herb. However, intraspecific variability of both species concerning this trait was very high (Fig. 4).

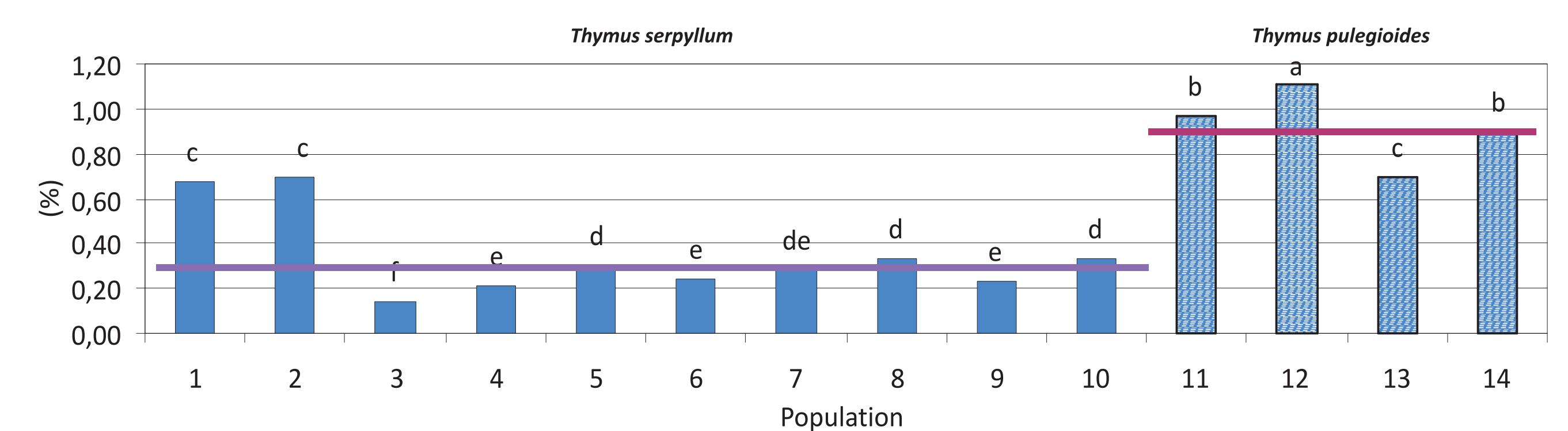


Figure 1. Total content of essential oil in the herb [%]

Means followed by the same letters are not significantly different according to the Tukey's test for $\alpha=0.05$

Table 2. Percentage of major chemical compounds in essential oil

Compound	Species, Population													
	<i>Thymus serpyllum</i> L.										<i>Thymus pulegioides</i> L.			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
α-pinene	2.93	2.57	1.32	2.29	2.68	1.89	1.22	1.69	1.25	1.04	0.64	0.18	1.45	1.06
camphene	5.61	6.95	2.53	5.19	5.36	3.22	2.20	3.74	3.15	2.43	1.64	0.35	0.08	0.09
β-pinene	1.04	0.96	0.88	0.73	0.98	1.14	0.68	1.13	0.37	0.59	0.30	0.11	0.14	0.11
sabinene	-	-	-	0.43	-	-	-	-	-	-	-	-	-	0.10
β-myrcene	8.50	7.93	9.77	18.09	5.42	6.87	5.45	7.66	5.23	5.84	1.26	1.37	0.64	0.51
limonene	-	0.05	0.58	0.78	-	0.46	0.42	0.58	0.55	0.42	1.48	-	-	-
1,8-cineol	6.49	5.36	7.49	3.12	6.98	9.09	6.77	10.50	6.71	4.02	-	1.55	0.15	0.26
γ-terpinene	3.03	3.01	3.88	3.55	2.66	2.69	3.04	3.57	3.20	3.04	25.37	17.00	28.76	30.13
p-cymene	0.43	0.74	0.43	0.78	0.44	0.30	0.40	0.45	0.66	0.29	0.11	0.27	0.03	0.02
β-thujene	2.15	2.81	1.87	0.10	2.39	1.79	1.49	1.51	1.25	1.55	3.57	1.98	0.28	0.19
camphore	5.36	5.46	1.69	8.65	3.18	0.93	0.25	1.48	1.95	0.76	0.16	0.60	0.04	0.07
linalool	2.97	3.01	3.10	3.06	3.54	1.23	1.25	1.14	1.22	1.06	0.87	38.07	0.86	0.90
β-caryophyllene	8.75	7.41	12.28	5.58	6.26	10.57	11.83	9.94	10.37	9.88	3.25	6.02	7.61	6.26
α-humulene	1.08	0.63	1.24	1.44	1.04	1.12	1.30	1.17	0.53	1.01	0.16	-	0.09	0.16
α-terpineol	21.37	19.32	6.08	-	28.45	2.44	5.32	3.59	13.99	6.71	8.62	2.08	0.54	0.42
β-terpineol	-	0.12	14.20	17.89	-	9.59	12.08	10.69	13.57	13.69	-	3.61	0.74	0.75
geraniol	0.45	0.52	1.68	2.17	0.59	0.86	1.12	1.10	1.44	1.95	4.86	5.15	5.83	4.38
geranyl acetate	2.82	1.36	2.73	3.73	3.40	3.48	4.40	2.70	2.20	4.56	-	1.90	-	-
citronellol	0.39	0.23	0.59	-	-	-	-	0.61	0.60	1.05	-	-	-	-
nerol	0.09	0.05	-	0.14	0.07	-	-	-	-	-	-	0.75	0.08	-
geranyl	0.21	0.31	0.03	0.34	0.35	0.09	0.03	-	-	-	0.87	3.02	0.06	-
caryophyllene	3.47	4.58	4.11	4.09	3.18	6.78	6.20	4.68	4.22	4.18	1.61	1.01	-	-
nerolidol	2.48	2.31	2.22	1.69	3.44	2.94	2.99	3.08	8.19	6.34	0.85	0.55	0.03	-
eugenol	3.35	3.00	1.12	0.73	3.64	1.30	3.46	1.33	1.09	1.85	1.20	0.19	0.04	0.22
thymol	0.26	0.39	1.40	2.51	0.38	0.64	0.60	0.52	0.41	0.63	21.25	2.89	3.45	8.36
carvacrol	1.57	1.78	2.02	0.20	1.24	2.49	2.99	2.14	1.91	3.45	3.48	0.33	18.40	17.30

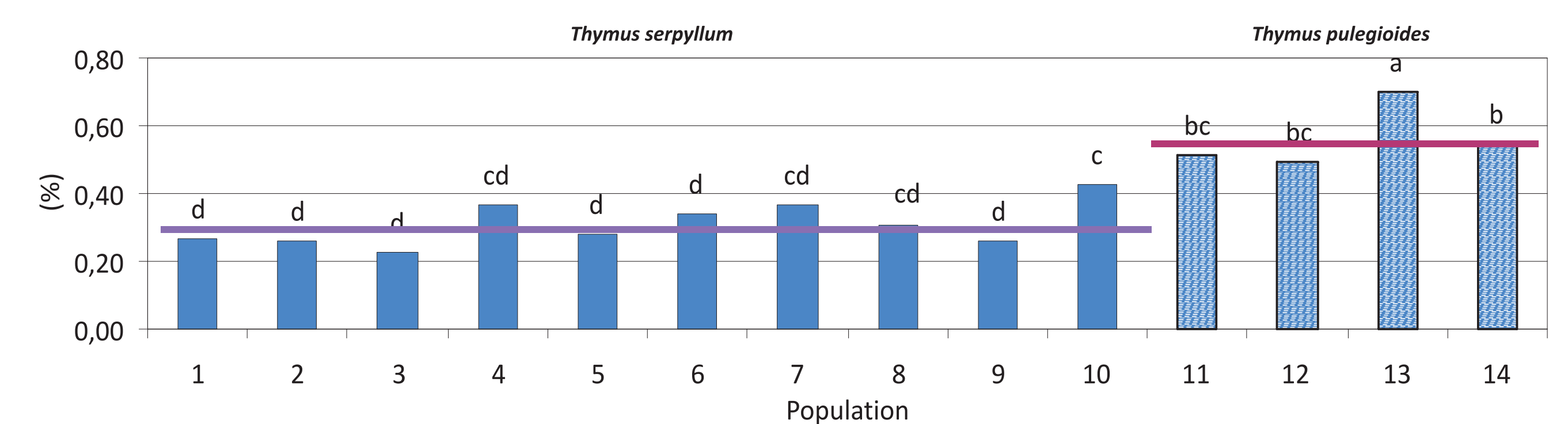


Figure 2. Total content of flavonoids in the herb [%]

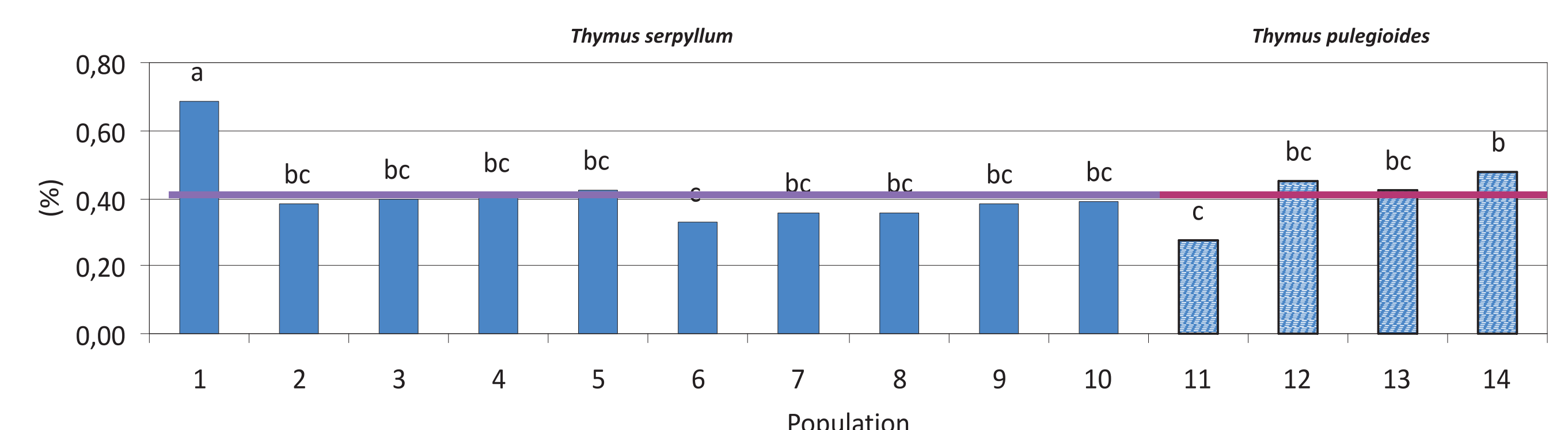


Figure 3. Total content of phenolic acids in the herb [%]

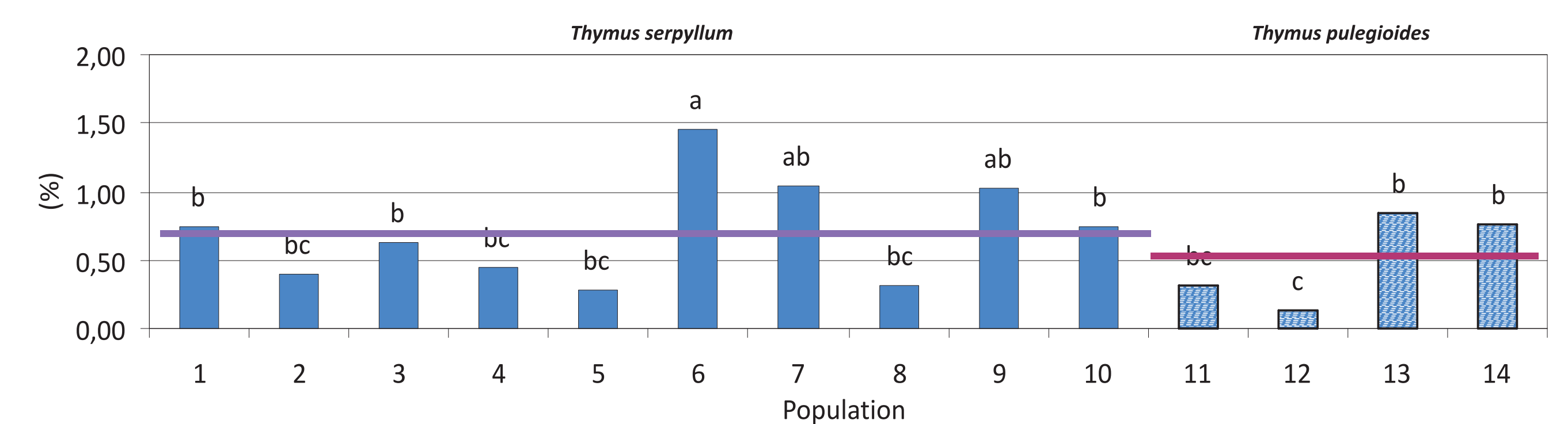


Figure 4. Total content of tannins in the herb [%]

LITERATURE

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