

EFFECT OF SOWING DATE ON BIOMETRICAL FEATURES OF HAMBURG PARSLEY PLANTS

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Abstract. The aim of this study was to determine the relationship between sowing date and the biometrics features of the roots and leaves of parsley. Seeds of parsley cultivars 'Berlińska PNE' and 'Cukrowa' were sown in 5 times in 2004 year: 5 July, 25 August, 5 and 15 September, 17 November and 12 April 2005. Plants were harvested then the average root diameter was greater than 20 mm. Due to harvest time dependence of the size of the root, was no effect of sowing date on the diameter and the weight of gained parsley roots. Shorter roots and the lower coefficient of shape produced plants that sprouted before winter (5 July, 25 August, 5 and 15 September). The highest number of leaves produced by plants sowing on 5 July and 17 November, and the lowest – by plants sowing on 25 August and 12 April. The lowest length of leaves were found in plants obtained from sowing on 5 July (20.8 cm), it was more than twice shorter than in plants from different dates of sowing. The largest weight of leaves had the plants from sowing on 5 and 15 September or 17 November. Those plants are also characterized by a smaller root/shoot weight ratio. Tested cultivars differ in the length and coefficient of shape of the root and root/shoot weight ratio.

Key words: *Petroselinum crispum*, turnip-rooted parsley, roots diameter, coefficient of shape, length, weight, leaves, root/shoot ratio

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Introduction

Hamburg parsley (*Petroselinum crispum* (Mill.) Nyman ssp. *tuberosum* (Bernh.) Crov.) is one of the most popular spice vegetables used in Poland. Both roots and leaves were used for garnish and flavoring dishes. Quality of Hamburg parsley depended on plants biometrical features (PN-R-75370 1996; PETROPOULOS *et al.* 2005). Biometrical features of parsley plants depends on cultivation method, sowing depth, weather conditions, plant population and cultivar (DOWKER & JACKSON 1977; PANTIELEV & KAMNINA 1983; BAKOWSKI *et al.* 1993; BŁAŻEWICZ-WOŹNIAK 1998, 1999b, 2003; POKLUDA 2003; PETROPOULOS *et al.* 2005; Gruszecki 2006, 2007a, b). One of the factors that determines the biometrical features of plants is also the date of sowing (BAKOWSKI *et al.* 1993; BŁAŻEWICZ-WOŹNIAK 1998; PETROPOULOS *et al.* 2005, 2006, 2008; GRUSZECKI 2006, 2007a, b). To this time were published many papers about effect of sowing date on biometrical features of

Hamburg parsley plants (BAKOWSKI *et al.* 1993; Błażewicz-Woźniak 1998; PETROPOULOS *et al.* 2005, 2006, 2008). However, the hitherto studies comprised plants harvested in the same time or at full maturity, it was caused that the plants were in different growing stages.

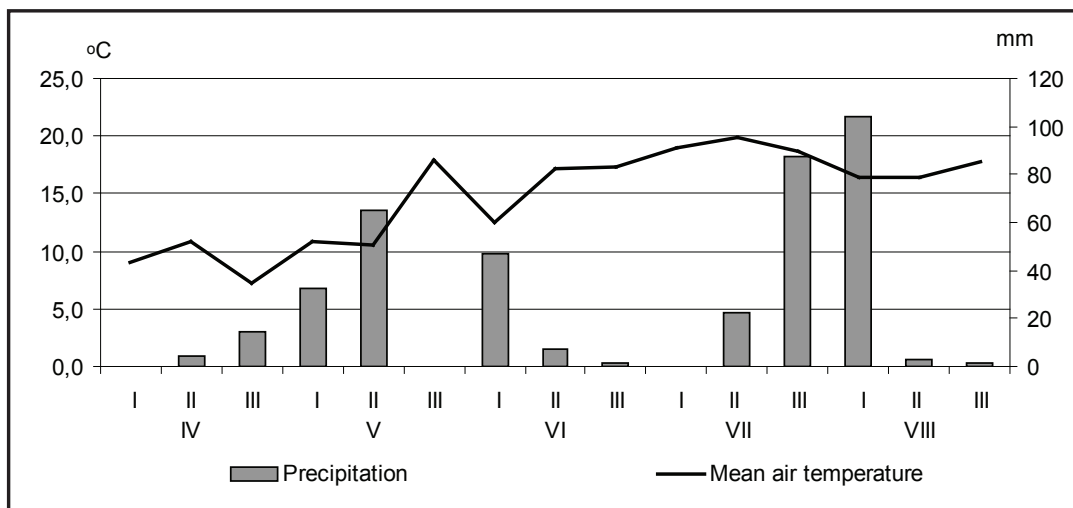
The aim of the presented studies was to determine the effect of sowing time on biometrical features of Hamburg parsley plants harvested at the same growing stage.

Material and methods

The experiment was carried out in the Agricultural Experimental Farm of the University of Life Sciences in Lublin – Felin, on fallow soil of mechanical composition of light soil, comprising 1.5% organic matter. Two parsley cultivars were taken into consideration in the experiment: the early 'Cukrowa' and the late 'Berlińska PNE'. Six sowing dates were applied: 5 July, 25 August, 5 and 15 September, 17 November in 2004 and 12 April 2005. The harvest was commenced when, on the basis of

Table 1. The dates of harvest of the plants grown from different dates of sowing.

Cultivar	Dates of sowing					
	5.VII	25.VIII	5.IX	15.IX	17.XI	12.IV
'Berlińska PNE'	2.V	3.VII	7.VII	23.VI	9.VII	31.VII
'Cukrowa'	2.V	1.VII	18.VI	16.VI	7.VII	30.VII

**Fig. 1.** Mean air temperature and precipitation for harvest time of Hamburg parsley.

weekly measurements, mean root diameter of 30 subsequent plants in a row exceeded 20 mm (minimum for Hamburg parsley roots traded without leaves – PN-R-75370 1996). The dates of harvest were presented in Tab. 1, and the weather conditions during harvest in Fig. 1. Results obtained were statistically processed by calculating the confidence intervals according to Tukey's test at the level $\alpha=0.05$.

Results and discussion

Due to the harvest time dependence on the size of root, was no effect of sowing date on the diameter of the parsley roots (Tab. 2).

The sowing date affected the length of the roots and their coefficient of shape. Shorter roots with lower coefficient of shape formed plants that sprouted before winter (from sowing on 5 July, 25 August, 5 and 15 September). Plants from these sowing dates had the roots length similar, regardless of the growth stage of the plants before winter (Tab. 2). Petropoulos et al.

(2005) found, that sowing date was confirmed as a significant factor influencing the length of roots, when BŁAŻEWICZ-WOZNIAK (1998) did not show such relationship. The length of roots and their coefficient of shape depend on the cultivar, longer roots of higher coefficient of shape, with the exception of the spring sowing, produced by plants of cv. 'Berlińska PNE' (Tab. 2). This confirms the results obtained by POKLUDA (2003) and GRUSZECKI (2007a), but BŁAŻEWICZ-WOZNIAK (1999b), PETROPOULOS *et al.* (2005) and GRUSZECKI (2006) did not find significant differences in the length of the parsley roots between cultivars.

Sowing date did not affect on the average weight of roots, due to the relationship of harvest and growth stage. These results confirm those obtained in other experiments (BŁAŻEWICZ-WOZNIAK, 1998; PETROPOULOS *et al.*, 2005, 2006, 2008). Some authors reported that the average root weight depends on the cultivar (POKLUDA 2003; PETROPOULOS *et al.* 2006; GRUSZECKI 2007a), which was not confirmed

Table 2. The effect of sowing date on biometric features of Hamburg parsley plants.

Date of sowing	Cultivar	Root				Leaves			root/shoot ratio
		diameter (mm)	length (cm)	coefficient of shape	weight (g)	number	length (cm)	weight (g)	
5.VII	'Berlińska PNE'	26.7	13.8	5.4	37.5	29.6	22.0	30.2	1,24
	'Cukrowa'	25.3	12.8	5.1	24.3	24.9	19.5	33.2	0,73
	Mean	26.0	13.3	5.3	30.9	27.3	20.8	31.7	0,99
25.VIII	'Berlińska PNE'	21.6	13.6	6.4	21.0	9.4	37.7	23.4	0,90
	'Cukrowa'	24.3	12.8	5.3	22.8	10.7	52.6	34.9	0,65
	Mean	23.0	13.2	5.9	21.9	10.1	45.2	29.2	0,78
5.IX	'Berlińska PNE'	22.7	14.5	6.4	24.0	10.7	51.9	35.3	0,68
	'Cukrowa'	23.8	13.2	5.6	22.0	15.5	50.0	42.6	0,52
	Mean	23.3	13.9	6.0	23.0	13.1	51.0	39.0	0,60
15.IX	'Berlińska PNE'	22.5	15.6	7.0	24.2	15.4	52.1	43.6	0,56
	'Cukrowa'	25.2	11.4	4.5	21.3	16.3	46.7	50.3	0,42
	Mean	23.9	13.5	5.8	22.8	15.9	49.4	47.0	0,49
17.XI	'Berlińska PNE'	23.9	17.6	7.4	26.3	22.5	44.7	40.5	0,65
	'Cukrowa'	27.1	15.2	5.9	29.5	22.2	50.4	51.5	0,57
	Mean	25.5	16.4	6.7	27.9	22.4	47.6	46.0	0,61
12.IV	'Berlińska PNE'	24.4	18.3	7.5	27.2	13.7	50.7	34.9	0,78
	'Cukrowa'	22.4	18.1	8.1	19.3	10.3	45.7	21.3	0,91
	Mean	23.4	18.2	7.8	23.3	12.0	48.2	28.1	0,84
Mean	'Berlińska PNE'	23.6	15.6	6.7	26.7	16.9	43.2	34.7	0,80
	'Cukrowa'	24.7	13.9	5.8	23.2	16.7	44.2	39.0	0,63
	Mean	24.2	14.7	6.2	25.0	16.8	43.7	36.8	0,72
LSD _{0.05}									
Sowing date (A)		n.i.	3.03	1.65	n.i.	5.18	4.76	15.75	0.164
Cultivar (B)		n.i.	1.18	0.64	n.i.	n.i.	n.i.	n.i.	0.064
A×B		n.i.	n.i.	2.71	n.i.	n.i.	7.79	n.i.	0.270

by the others (BŁAŻEWICZ-WOZNIAK 1999a; PETROPOULOS *et al.* 2005; GRUSZECKI 2006). In present study the effect of cultivar was not significant (Tab. 2).

The biometric leaves features depended on the sowing date. The highest number of leaves produced plants was obtained from sowing on 5 July, at lowest from 25 August and 12 April. It was observed that delaying of sowing date from 25 August to 17 November increased the mean number of leaves produced by plant (Tab. 2). PETROPOULOS *et al.* (2008) proved that time of sowing affected the number of leaves produced by plant, but BŁAŻEWICZ-WOZNIAK (1997)

considers that it had no effect. There were no differences in the number of leaves of studied parsley cultivars (Tab. 2). These results confirm those obtained by BŁAŻEWICZ-WOZNIAK (1999a).

The lowest leaves length was recorded in plants from seed sowed on 5 July (20.8 cm), it was more than two times smaller than from the other sowing dates (from 45.2 to 51.0 cm) (Tab. 1). According to PETROPOULOS *et al.* (2006) the length of the parsley leaves depends on the date of sowing. However, BŁAŻEWICZ-WOZNIAK (1997) found, that only in the initial period of growth sowing date affected the length

of the leaves. PETROPOULOS *et al.* (2006) and GRUSZECKI (2006, 2007b) showed that length of the leaves varied with cultivars. Between cultivars, no significant differences in leaves length were observed (Tab. 2).

Plants that wintered in at least advanced growing stages (15 September), or sowed in late autumn (17 November, and sprouted in the spring) produced the highest leaves weight. Plants grown from seed sowed on 5 July, 25 August and 12 April had the smallest weight of leaves. PETROPOULOS *et al.* (2006, 2008b) found, that mean weight of plant leaves depended on the sowing date. BŁAŻEWICZ-WOŹNIAK (1997) did not confirm this. Mean weight of leaves was not affected by sowing date (Tab. 2). BŁAŻEWICZ-WOŹNIAK (1999) also not found the relationship between cultivar and the mean weight of the leaves, as opposed to PETROPOULOS *et al.* (2006) and GRUSZECKI (2006, 2007b) whose found such relationships.

HOCHMUTH *et al.* (1999) evaluated the root/shoot ratio as an indicator of root productivity. The lowest root/shoot weight ratio was found in the plants of the least advanced growth stage before winter (15 September), followed by those from seed sowed on 5 September and 17 November. The highest root/shoot weight ratio was found in plants obtained from seed sowed on 5 July and 12 April – the first and last of the analyzed sowing dates. The highest root/shoot weight ratio was found in plants of 'Berlińska PNE'. HOCHMUTH *et al.* (1999) found that root/shoot ratio (dry-matter basis) was affected by carrot sowing date and cultivar.

Conclusions

Plants harvested at the same growth stage can vary in biometric features of roots and leaves. The sowing in the year preceding harvest effected on the forming of shorter roots of lower coefficient of shape. Depending on the sowing date, plants that produced roots in a similar diameter, differed in the number, length and weight of leaves and root/shoot weight ratio.

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