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THE EFFECT OF EMERGENCE-IMPROVING TREATMENTS ON THE GROWTH, YIELD AND CONTENT OF MACROELEMENTS IN LEAVES OF GARDEN DILL (*Anethum graveolens* L.) CULTIVATED FOR EARLY CROP

Anita Biesiada, Kamil Kędra
Wroclaw University of Environmental and Life Sciences

Abstract. Garden dill is a popular seasoning plant used in central Europe and Asia. It is characterized by a relatively long period of seeds germination, as well as, uneven emergence of seedlings. The aim of research, conducted in the years 2009–2010, was the assessment of the effect of selected emergence improving cultivation treatments on the germination and growth of plants, as well as yield and chemical composition of dill. Two-factorial experiment was established according to randomized split-plot method, in three replications. The first factor involved post – sowing flat soil covering with the use of white polypropylene textile, transparent perforated foil, as well as 2 cm – thick sand layer and 5 cm layer of peat moss mixed with top layer of the soil. In control object post – sowing covering was not applied. The second factor consisted in irrigation. Results obtained in the experiment show that irrigation contributed to the increase in dill herb yield, on average, by 21.4%. Among cultivation treatments applied, including flat covers and mulching, the highest increase in yield was ensured by the use of polypropylene textile (86.8%). It was also shown that dill accumulated nitrates in its leaves only to a small extent. Both irrigation and introduction of flat covers from polypropylene textile and perforated foil, as well as mulching with sand and peat moss did significantly accelerate garden dill emergence.

Key words: flat covers, sand and peat mulch, yield, germination, irrigation

INTRODUCTION

Garden dill, a plant with a short growing period is cultivated from direct seed sowing [Kmiecik et al. 2002, Bralewski et al. 2005]. This plant, as majority of *Apiaceae* family representatives, has a relatively long period of seeds germination, as well as,

Corresponding author – Adres do korespondencji: Anita Biesiada, Department of Horticulture, Wroclaw University of Environmental and Life Sciences, pl. Grunwaldzki 24A, 50-363 Wrocław, Poland, tel. (+48) 71 320 17 16, e-mail: anita.biesiada@up.wroc.pl

uneven emergence of seedlings [Biniek 1994, Bralewski and Hołubowicz 2003, Janas and Grzesik 2006]. Difficult soil conditions, accompanied by the presence of pathogens in the soil, additionally contribute to the decrease in herb yield [Grassbaugh and Bennett 1998]. Both lack of sowing material uniformity and poor quality of its health, can enhance such undesirable condition [Biniek 1994]. In order to shorten germination and emergence time and, as a consequence, to obtain a good quality yield, there are applied different methods regarding the improvement in the quality of seeds sowing value. For this purpose there are used, among others, bio-stimulators, laser light, various methods of seeds conditioning, as well as a number of cultivation treatments [Bralewski and Hołubowicz 2003, Domoradzki and Korpal 2004, Li et al. 2004, Biesiada 2008, Ćwintal and Sowa 2010]. Ren et al. [2002] proved that covering seeds with 2 cm – thick sand layer could, in a significantly positive way, affect germination and emergence of *Calligonum* L. species plants. Flat covers improve soil moisture and thermal conditions [Li et al. 2004, Kurtar 2010]. They also allow to earlier emergence of healthy plants which more efficiently use available water and applied fertilizers [Moreno et al. 2001]. The aim of research, conducted in 2009–2010, was the assessment of the effect of selected cultivation treatments on the emergence, growth, yield and chemical composition of garden dill.

MATERIALS AND METODS

Field experiments were conducted in 2009–2010 in Research Station in Psary, belonging to Department of Horticulture at Wrocław University of Environmental and Life Sciences on fine clay soil of pH = 7.6, containing 1.8% of humus, as well as 60 mg P, 180 mg K and 60 mg Mg in 1 dm^3. Two-factorial experiment was established according to randomized split-plot design, in three replications. The first factor involved post-sowing flat soil covering with the use of white polypropylene textile (PP 17 $g \cdot m^{-2}$ – Agryl P17), transparent perforated foil (100 holes per m^{-2}, ø 10 mm), 2 cm thick sand layer as well as 5 cm layer of de-acidified peat moss mixed with top layer of the soil. In control object post-sowing covering was not applied. The second factor consisted of manual irrigation with two levels (with and without irrigation) in the dose of 15 $mm \cdot m^{-2}$ applied every fourth day. In order to reduce macroelements deficit, before sowing, there was introduced fertilization with ammonium nitrate (100 $kg \cdot ha^{-1}$), potassium sulfate (195 $kg \cdot ha^{-1}$) and magnesium sulfate (450 $kg \cdot ha^{-1}$). Seeds of 'Szmaragd' garden dill were soaked with Grevit 200 SL (0.5%) and then sown on 5th April in the amount of 20 $kg \cdot ha^{-1}$ onto the plots of 1 m^2 area, in 20 cm spacing, to the depth of 2 cm. In the course of plants growing, there were undertaken typical cultivation treatments, involving regular mechanical weeding and plants protection against pests and diseases, following current Program of Vegetable Plants Protection. Plants were harvested on 10th May, in their 4–5 true leaves stage and estimating the size of marketable yield took place at the same time. During growing period there was done the measurement of dill seeds emergence dynamics on running meter of a each plot, in three terms: 1st May, 5th May and 10th May, determining number of plant stands. Prior to harvesting, there were done measurements regarding plants height and then number of leaves on plants. Chemical analyses were conducted in an extract with 2% acetic acid, in air-dried fully mature leaves of garden dill [Nowosielski 1988]. There were determined Mg and P content, using colorimetric method, as well as Ca and K content according to flame photometry method. Nitrates content in fresh matter was determined potentiometrically. Research results underwent statistical analysis of variance. Significance of differences between mean values was estimated by the Tukey test at a significance level α = 0.05.

RESULTS AND DISCUSSION

Weather conditions in the years of experiment were diversified (tab. 1). In dill growing period mean air temperatures for April in both years were relatively higher than mean value for many years and only May 2010 was colder. During two years of research April was dry, especially in 2009,when there was recorded only 4.2 mm precipitation within a month. In May 2009, monthly summary precipitation was similar to mean value for many years, while in 2010 there was recorded as much as 112.5 mm precipitation.

Table 1. Mean temperatures and precipitation totals during the experimental period in Psary Experimental Station
Tabela 1. Średnie temperatury i sumy opadów w okresie badań w Stacji Doświadczalnej w Psarach

Month Miesiąc	Decades Dekady	Average monthly temperature Średnia temperatura miesiąca °C		Sum of monthly precipitation Miesięczna suma opadów mm		Mean value of monthly temperatures in the years Średnia wieloletnia temperatura miesięczna	Mean value of monthly precipitation in the years Średnia wieloletnia miesięczna suma opadów
		2009	2010	2009	2010	1970–2000	1970–2000
April Kwiecień	I	13.6	8.6	0.0	13.5	8.1	31.9
	II	12.6	10.8	4.2	7.9		
	III	15.3	13.1	0.0	5.0		
	$\bar{x}/\sum$	13.8	10.8	4.2	26.4		
May Maj	I	15.3	13.2	1.6	29.8	13.9	49.9
	II	15.7	11.6	15.6	77.2		
	III	16.5	8.5	37.0	5.5		
	$\bar{x}/\sum$	15.8	11.1	54.2	112.5		

Cultivation treatments, applied in the experiment, affected the number of emerged seedlings, as they differed especially in the initial period (fig. 1). After three weeks from seed sowing the number of emerged seedlings in the treatment without protective cover, ranged on average, from 76.8 when watering to 41.6 without irrigation. Regardless irrigation, the number of seedlings, in covered objects in that period, was twice greater than in non covered ones and differences in the number of emerging plants, according to the materials used, were not considerable. In irrigated objects the number of emerged plants, on the plots covered with perforated foil and textile, on 1th May amounted 169.6 and 179.2 respectively, on 5th May their number equaled 249.6 and 252.8, on 10th May 304.0 and 297.6, while application of sand and peat moss resulted in the following numbers: 160.0 and 163.2 (on 1st May), 224.0 and 220.8 (on 5th May), 288.0 and 297.6 (on 10th May). Where no irrigation was applied, the number of emerged plants on the plots protected with sand and peat moss were generally, by 20–34% lower than in the case of using perforated foil and polypropylene textile. Siwek [1999] stressed that soil covering with perforated foil caused acceleration of carrots emergence even by two weeks. In investigation by Li et al. [1999], soil covering with transparent foil increased both temperature and moisturein5 cm external soil layer and, as a result, accelerated emergence of wheat seedlings by 8 days in comparison to non covered control. Also Dyduch and Najda [2005] recorded that in 0–10 cm layer of mulched soil the moisture was by half higher than the one without that cover. However, Błażewicz-Woźniak [2009] did not report any significant improvement in fennel emergence, both under the influence of flat covering with polypropylene textile PP17 and mulching with textile PP50 or black foil.

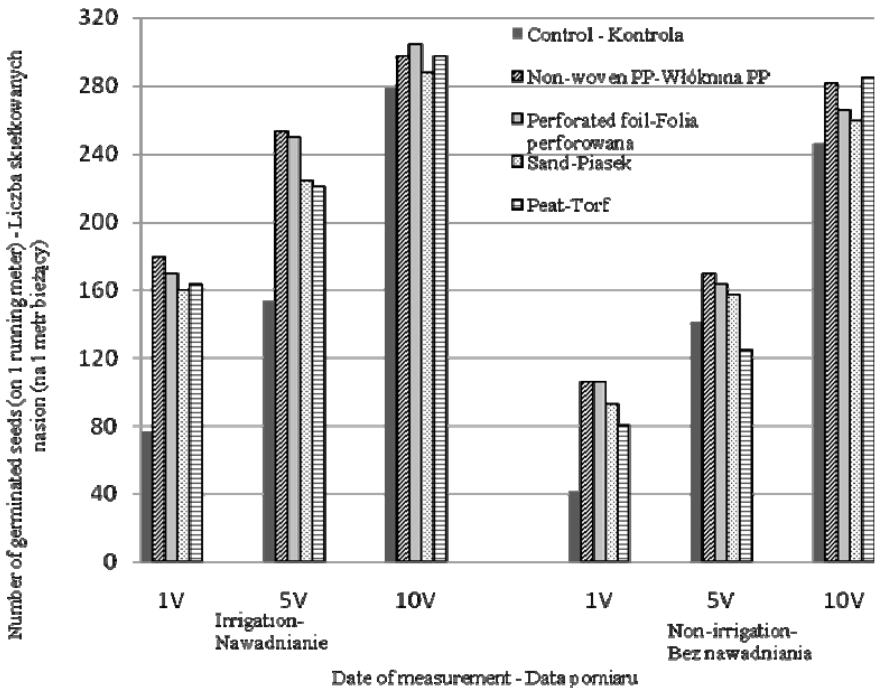

Fig. 1. The effect of stand improving methods on the emergence dynamic of garden dill (*Anethum graveolens* L.) in 2009 and 2010

Rys. 1. Wpływ metod poprawiających obsadę kopru ogrodowego (*Anethum graveolens* L.) na dynamikę wschodów w latach 2009 i 2010

The treatments applied in the experiment did significantly affect vegetative growth of garden dill (fig. 2). At harvest, the plants from regularly irrigated plots were by 4–5 cm higher than those in non irrigated object. Covering plants with perforated foil and polypropylene textile did considerably influence plants height, as their mean height in 2009 amounted 28.53 and 30.64 cm respectively, while in 2010 those parameters equaled 32.09 and 27.43 cm. In the objects with sand and peat moss mulching, plants height were similar to observed in control treatment. The number of leaves was also dependent on the factors under examination (fig. 3). Regular watering and the use of flat covers provided faster formation of dill leaves. At the moment of harvest, plants covered with perforated foil had more leaves than, those covered with polypropylene textile, while mulches involving sand and peat moss provided for a slight increase in the number of leaves that was recorded only in 2010. Błażewicz-Woźniak [2009] reported advantageous effect of soil mulching with a black foil PE and textile PP50 on growth and development of fennel, while covering those plants with textile PP17 brought about inhibited growth of fennel, which produced less leafy plants, fewer than in non covered control object.

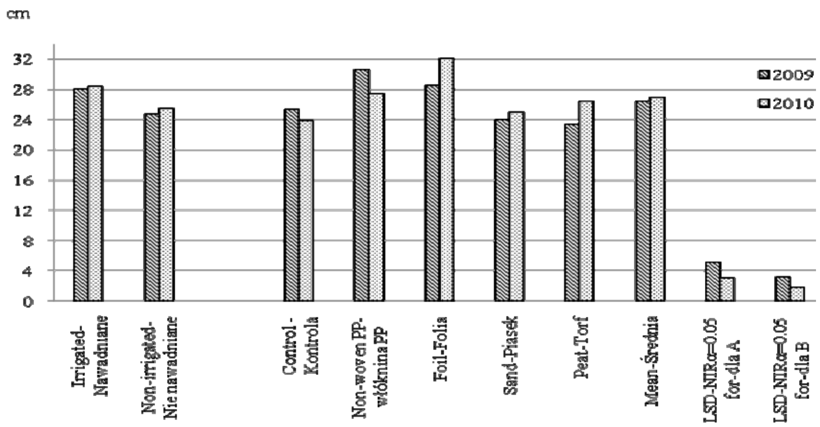

Fig. 2. The effect of stand improving methods on garden dill height (*Anethum graveolens* L.) in 2009 and 2010, factor A – covers, B – irrigation

Rys. 2. Wpływ metod poprawiających obsadę na wysokość roślin kopru ogrodowego (*Anethum graveolens* L.) w latach 2009 i 2010, czynnik A – przykrycia, B – nawadnianie

Both the use of covers and irrigation of plots did beneficially affect garden dill yield (tab. 2). Herb yield obtained from covered plots was significantly higher than in control object. Dill grown with polypropylene textile and perforated foil protection ensured the highest yield (respectively 1.70 and 1.61 kg·m^{-1}), while significantly the lowest yield characterized control object (0.91 kg·m^{-1}). It worth noticing that introduction of peat moss and sand also contributed to the increase yield, which was greater by35.2 and 70% respectively for the mulches applied, in relation to control object. Błażewicz-Woźniak [2010] recorded significant difference in fennel yielding when polypropylene textile

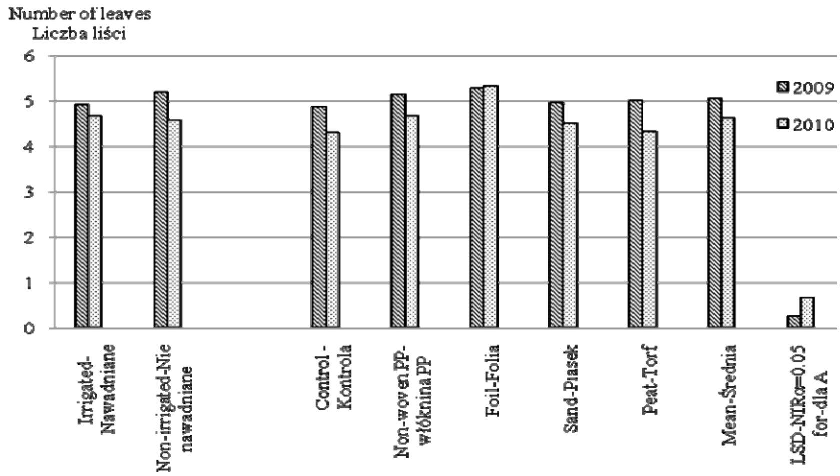

Fig. 3. The effect of stand improving methods on the number of garden dill (*Anethum graveolens* L.) leaves in 2009 and 2010, factor A – covers, B – irrigation, $LSD_{0.05}$= not significant

Rys. 3. Wpływ metod poprawiających obsadę kopru ogrodowego (*Anethum graveolens* L.) na liczbę liści w latach 2009 i 2010, czynnik A – przykrycia, B – nawadnianie, $NIR_{0,05}$= nieistotne

Table 2. The effect of emergence improving methods on marketable yield of dill (*Anethum graveolens* L.) in 2009 and 2010, ($kg \cdot m^{-1}$)

Tabela 2. Wpływ metod poprawiających wschody na plon handlowy kopru ogrodowego (*Anethum graveolens* L.) w latach 2009 i 2010, ($kg \cdot m^{-1}$)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	1.18	0.75	0.97	0.93	0.75	0.84	1.06	0.75	0.91
Non-woven PP – Włóknina PP	2.32	1.73	2.03	1.50	1.25	1.37	1.91	1.49	1.70
Foil – Folia	1.78	1.64	1.71	1.68	1.34	1.51	1.73	1.49	1.61
Sand – Piasek	1.27	1.25	1.26	1.18	1.19	1.18	1.23	1.22	1.23
Peat – Torf	1.62	1.17	1.40	1.80	1.52	1.66	1.71	1.34	1.53
Mean– Średnia	1.63	1.31	1.47	1.42	1.21	1.31	1.53	1.26	1.40
$LSD_{0.05}$ for – NIR $_{0,05}$dla									
A – covers – przykrycia			0.19			0.09			0.09
B –irrigation – nawadnianie			0.12			0.05			0.10

n – irrigated – nawadniane, b –non-irrigated – nienawadniane

PP17 and mulching with a black foil and textile PP50 were applied. Flat covering contributed to decrease in yield below the value obtained for control object, while mulching caused significant increase in fennel yield. Advantageous effect of plants covering depends mainly on cultivation term. Krężel and Kołota [2000] proved that in red beet cultivation, the use of covers made of agrotextile and perforated foil was justified only at very early terms of sowing. Similarly, Słodkowski and Rekowska [2005] obtained significant increase in yield of lamb`s lettuce cultivated under flat covers only in early-term sowing. Irrigation did considerably increase dill herb yield in both years of the present experiment; in 2009 in not covered object the increase amounted 57%, while in 2010 it was24% in relation to control. Rożek [2005 a, b] proved that irrigation enhanced of marketable yield of celeriac and celery chard by 71% and 20% respectively.

Mean content of nitrates in dill herb in both years of research ranged from 94.57 to 156.50 mg · kg^{-1} of fresh matter (tab. 3) and was very low in relation to the permissible amount assumed for this vegetable, namely 1500 mg NO_3 in 1 kg of fresh matter [Kmiecik et al. 2005]. The authors reported nitrates content in garden dill, at nitrogen fertilization applied in the dose of 30 kg · ha^{-1}, which ranged 968–1468 mg · kg^{-1} of fresh matter. In the present investigation, irrigation did contribute to diminished nitrates level in garden dill, on average by 18.7%. Rolbiecki et al. [2001], applying irrigation to potatoes, also recorded significant decrease in nitrates level in irrigated objects.

Table 3. The effect of emergence improving methods on nitrates content in dill (*Anethum graveolens* L.) in 2009 and 2010, (mg · kg^{-1} f.m.)
Tabela 3. Wpływ metod poprawiających wschody na zawartość azotanów w koprze ogrodowym (*Anethum graveolens* L.) w latach 2009 i 2010, (mg · kg^{-1} ś.m.)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	71.36	98.64	85.00	117.78	138.76	128.27	94.57	118.70	106.64
Non-woven PP – Włóknina PP	116.88	143.48	130.18	129.94	169.53	149.74	123.41	156.50	139.96
Foil – Folia	90.06	131.03	110.54	149.00	173.66	161.33	119.53	152.34	135.94
Sand – Piasek	98.97	99.41	99.19	123.70	167.46	145.58	111.33	133.43	122.38
Peat – Torf	84.04	93.96	89.00	119.61	138.52	129.07	101.83	116.24	109.04
Mean – Średnia	92.26	113.30	102.78	128.00	157.59	142.80	110.13	135.44	122.79
$LSD_{0.05}$ for– NIR $_{0,05}$dla									
A – covers – przykrycia			7.76			5.73			4.01
B – irrigation – nawadnianie			4.91			6.77			5.47

n – irrigated – nawadniane, b – non-irrigated – nienawadniane

Mean values for both years proved that application of flat covers from perforated foil and agrotextile provided for slightly higher accumulation of nitrates in the examined plant amounting 135.94 and 139.96 mg · kg^{-1} of fresh matter. Lower amounts of nitrates were determined for dill in the objects mulched with sand and peat moss, 122.38 and

109.04 mg · kg^{-1} of fresh matter respectively, while in control object nitrates quantity was the lowest and equaled 106.63 mg · kg^{-1} of fresh matter. In investigation by Biesiada [2008], kohlrabi accumulated less nitrates after the use of flat covers. Similar dependence proved Kołota and Adamczewska-Sowińska [2007]. Yet Błażewicz-Woźniak [2010], did not record any significant differences in nitrates content in fennel, neither under the influence of flat covers from agrotextile, norin the case of mulches from black foil and black agrotextile, and their values fluctuated between 12.7 and 15.8 mg · 100 g^{-1}, while in control object those values amounted 12.8 mg · 100 g^{-1}.

In 2009 the highest amount of phosphorus was recorded in control objects (0.36% d.m.), as well as after application of non-woven (0.35% d.m.) (tab. 4). In 2010 the content of this element showed elevated values in the objects covered both with synthetic covers and with natural ones. Irrigation had small effect on phosphorus content in dill leaves, especially in 2010.

Table 4. The effect of emergence improving methods on phosphorus content in dill (*Anethum graveolens* L.) in 2009 and 2010, (% d.m.)
Tabela 4. Wpływ metod poprawiających wschody na zawartość fosforu w koprze ogrodowym (*Anethum graveolens* L.) w latach 2009 i 2010, (% s.m.)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	0.33	0.38	0.36	0.19	0.18	0.18	0.26	0.28	0.27
Non-woven PP – Włóknina PP	0.38	0.33	0.35	0.25	0.27	0.26	0.31	0.30	0.31
Foil – Folia	0.36	0.32	0.34	0.20	0.22	0.21	0.28	0.27	0.28
Sand – Piasek	0.36	0.30	0.33	0.24	0.22	0.23	0.30	0.26	0.28
Peat – Torf	0.32	0.32	0.32	0.25	0.26	0.25	0.28	0.29	0.29
Mean – Średnia	0.35	0.33	0.34	0.23	0.23	0.23	0.29	0.28	0.28
$LSD_{0.05}$ for – NIR $_{0,05}$dla									
A – covers – przykrycia			n.i.			0.07			n.i.
B –irrigation – nawadnianie			n.i.			n.i.			0.07

n – irrigated – nawadniane, b – non-irrigated – nienawadniane

The use of covers provided for the increase in potassium content in both years of examination, especially in 2009 (tab. 5). The smallest quantity of potassium was determined in control object, while the biggest one featured plants from the plots where flat covers from perforated foil and polypropylene textile were applied. Nowak et al. [2005] concluded that soil moisture affected the availability of potassium for plants. In their research, irrigated plants accumulated significantly higher amounts of this element in leaves as compared to not irrigated plants. In present experiment, irrigated plants also comprised a higher content of estimated macroelement.

Table 5. The effect of emergence improving methods on potassium content in dill (*Anethum graveolens* L.) in 2009 and 2010, (% d.m.)
Tabela 5. Wpływ metod poprawiających wschody na zawartość potasu w koprze ogrodowym (*Anethum graveolens* L.) w latach 2009 i 2010, (% s.m.)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	6.27	6.00	6.13	9.68	8.73	9.21	7.97	7.36	7.66
Non-woven PP – Włóknina PP	7.69	6.44	7.07	9.61	8.97	9.29	8.65	7.70	8.17
Foil – Folia	7.03	6.61	6.82	9.62	9.03	9.32	8.33	7.82	8.07
Sand – Piasek	6.98	6.33	6.65	9.76	8.93	9.35	8.37	7.63	8.00
Peat – Torf	6.86	6.73	6.80	10.06	9.38	9.72	8.46	8.06	8.26
Mean – Średnia	6.96	6.42	6.69	9.74	9.01	9.37	8.35	7.71	8.03
$LSD_{0.05}$ for – NIR $_{0,05}$dla									
A – covers – przykrycia			n.i.			0.51			n.i.
B – irrigation – nawadnianie			0.43			0.59			0.38

n – irrigated – nawadniane, b – non-irrigated – nienawadniane

Table 6. The effect of emergence improving methods on calcium content in dill (*Anethum graveolens* L.) in 2009 and 2010, (% d.m.)
Tabela 6. Wpływ metod poprawiających wschody na zawartość wapnia w koprze ogrodowym (*Anethum graveolens* L.) w latach 2009 i 2010, (% s.m.)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	2.25	2.27	2.26	1.62	1.58	1.60	1.93	1.92	1.93
Non-woven PP – Włóknina PP	1.84	2.12	1.98	1.50	1.65	1.58	1.67	1.89	1.78
Foil – Folia	2.22	2.04	2.13	1.46	1.74	1.60	1.84	1.89	1.87
Sand – Piasek	2.43	2.17	2.30	1.60	1.53	1.56	2.01	1.85	1.93
Peat – Torf	2.04	2.39	2.21	1.47	1.57	1.52	1.76	1.98	1.87
Mean – Średnia	2.16	2.20	2.18	1.53	1.61	1.57	1.84	1.91	1.87
$LSD_{0.05}$ for – NIR $_{0,05}$dla									
A – covers – przykrycia			n.i.			0.02			n.i.
B – irrigation – nawadnianie			n.i.			0.04			n.i.

n – irrigated – nawadniane, b – non-irrigated – nienawadniane

Table 7. The effect of emergence improving methods on magnesium content in dill (*Anethum graveolens* L.) in 2009 and 2010, (% d.m.)
Tabela 7. Wpływ metod poprawiających wschody na zawartość magnezu w koprze ogrodowym (*Anethum graveolens* L.) w latach 2009 i 2010, (% s.m.)

Treatments Obiekty	2009			2010			Mean for – Średnia dla 2009–2010		
	n	b	mean średnia	n	b	mean średnia	n	b	mean średnia
Control – Kontrola	0.24	0.22	0.23	0.25	0.30	0.28	0.25	0.26	0.25
Non-woven PP – Włóknina PP	0.29	0.20	0.25	0.26	0.25	0.25	0.27	0.22	0.25
Foil – Folia	0.24	0.22	0.23	0.29	0.25	0.27	0.26	0.24	0.25
Sand – Piasek	0.24	0.22	0.23	0.25	0.25	0.25	0.24	0.24	0.24
Peat – Torf	0.24	0.26	0.25	0.23	0.25	0.24	0.24	0.25	0.24
Mean – Średnia	0.25	0.22	0.24	0.25	0.26	0.26	0.25	0.24	0.25
$LSD_{0.05}$ for – NIR $_{0,05}$dla									
A – covers – przykrycia			n.i.			0.01			n.i.
B –irrigation – nawadnianie			n.i.			n.i.			n.i.

n – irrigated – nawadniane, b – non-irrigated – nienawadniane

Mean content of calcium in dill in 2009 and 2010 did significantly differ (tab. 6). Higher quantities of this element were recorded in plants in 2009 (mean 2.18% d.m.), while lower were determined in 2010 (1.57% d.m.). In objects with sand and in control, in 2009, dill absorbed the highest quantities of Ca (2.30% and 2.26% d.m.), while the smallest ones were recorded when non-woven was introduced (1.98% d.m.).

Magnesium content in garden dill leaves in 2009 did not change under the influence of experimental factors applied, while in 2010, in the control object and covered with foil, dill leaves had higher amounts of this element (0.28% and 0.27% d.m. respectively) in comparison to the remaining objects (from 0.24% to 0.25% d.m.) (tab. 7). Irrigation did not influenced on magnesium content in dill leaves both in 2009 and 2010. Martyniak et al. [2010] also did not report significant effect of soil moisture on magnesium content in spring wheat. However, different results were published by Nowak et al. [2005], who proved that higher soil moisture contributed to the increased content of available magnesium and phosphorus, which were quickly absorbed by plants.

CONCLUSIONS

1. Both irrigation and introduction of flat covers from polypropylene agrotextile and perforated foil, as well as mulching with sand and peat moss did significantly accelerate garden dill emergence and the number of emerged plants.

2. Irrigated plants, as well as those covered with a plastic foil and agrotextile, were slightly higher and more leafy than plants from the control and mulched objects.

3. Irrigation contributed to the increase in dill herb yield, on average, by 21.4%. The highest increase in yield was ensured by the use of polypropylene textile (86.8%), while the lowest one was provided by sand mulch (35.5%).

4. Nitrates in garden dill were accumulated only to a small extend. Amount of nitrates in not irrigated objects and in those covered with plastic foil, agrotextile and mulched with sand were significantly different as compared to control object and those mulched with peat moss.

5. Irrigation contributed to increase content of potassium in dill leaves.

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WPŁYW ZABIEGÓW POLEPSZAJĄCYCH WSCHODY NA WZROST, PLONOWANIE I ZAWARTOŚĆ MAKROSKŁADNIKÓW W LIŚCIACH KOPRU OGRODOWEGO (*Anethum graveolens* L.) UPRAWIANEGO NA ZBIÓR WCZESNY

Streszczenie. Celem badań przeprowadzonych w latach 2009–2010 była ocena wpływu wybranych metod agrotechnicznych na jakość wschodów, wzrost roślin oraz plonu na skład chemiczny ziela kopru ogrodowego. Doświadczenie dwuczynnikowe założono metodą losowanych podbloków w trzech powtórzeniach. Czynnik pierwszy obejmował posiewne płaskie okrycie gleby przy użyciu białej włókniny polipropylenowej, transparentnej folii perforowanej oraz 2 cm warstwy piasku i 5 cm warstwy odkwaszonego torfu wysokiego wymieszanego z wierzchnią warstwą gleby. W obiekcie kontrolnym nie stosowano posiewnego osłaniania poletek. Drugi czynnik obejmował nawadnianie. Wyniki uzyskane w doświadczeniu wskazują, że nawadnianie przyczyniło się do wzrostu plonu ziela kopru średnio o 21,4%. Spośród zastosowanych zabiegów agrotechnicznych w postaci okryć płaskich i ściółkowania największą zwyżkę plonu zapewniło użycie osłony z włókniny polipropylenowej (86,8%). Wykazano również, że koper ogrodowy w małym stopniu gromadził azotany w liściach. Zarówno nawadnianie, stosowanie okryć płaskich z włókniny polipropylenowej i folii perforowanej, jak i ściółkowanie piaskiem i torfem ogrodowym znacząco przyspieszało wschody kopru ogrodowego.

Słowa kluczowe: płaskie okrycia, mulczowanie piaskiem i torfem, plon, kiełkowanie, nawadnianie

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