J. Elementol. 2006, 11(2): 135–141

Dorota Jadczak, Anna Błaszczuk, Ewa Rekowska

EFFECT OF COVERING ON THE CONTENT OF MACROELEMENTS IN YIELD OF BASIL (*OCIMUM BASILICUM* L.) CULTIVATED FOR A BUNCH HARVEST

Department of Vegetable Cultivation, Agricultural University of Szczecin

INTRODUCTION

The sweet basil (*Ocimum basilicum* L.), the plant originating probably from South Asia (MAZERANT-LESZKOWSKA 1985), was brought to Europe in the 14th century (KILJAŃSKA, MOJKOWSKA 1988). Nowadays, it is cultivated both in tropical zones and in temperate cli-mates of Europe, Asia and both Americas (JADCZAK, GRZESZCZUK 2005). Big producers of basil are Indonesia, Egypt, Morocco, France and Spain (REJEWSKI 1992).

The sweet basil is a herbaceous, annual plant, growing up to a height of about 60 cm (METERA, METERA 1990). There are different cultivars of basil, with leaves of colour from light-green to dark-violet (ECHEVERRY 1990) and with small, white or pink flowers.

The basil is grown from seedlings produced in a greenhouse or from seeds sown directly in a field. Under Poland's weather condition basil cultivation from seedlings yields better effects (JADCZAK, GRZESZCZUK 2005).

The basil has many valuable properties, owing to which it has a wide use in many areas. First of all, the basil is known as a cooking herb (VOLAK et al. 1987), but because of its dia-stolic, carminative, antiphlogistic and antibacterial effects it is used in phytotherapy (JADCZAK, GRZESZCZUK 2005).

Dorota Jadczak, Agricultural University of Szczecin, Janosika 8, 71-424 Szczecin, Poland.

Medicinal proprieties of basil are conditioned by occurrence such biologically active sub-stances as alkaloids, tanning agents, triterpenes, glycosides, saponins, flavonoids, and ethereal oils. These are specific chemical compounds, which show specific influence on a human or-ganism (KWAŚNIEWSKA et al. 1955, MIKOŁAJCZYK, WIERZBICKI 1987).

Furthermore, the basil is a rich source of mineral salts, especially copper, zinc, manganese, iron and cobalt salt (in total ca 9.1%) (TYSZYŃSKA-KOWNACKA, STAREK 1984). It has excellent taste and smell, which remain well after freezing or preserving in oil and vinegar (LAUGHIN 1996, HOHENBERG 1998, JADCZAK, GRZESZCZUK 2005).

MATERIAL AND METHODS

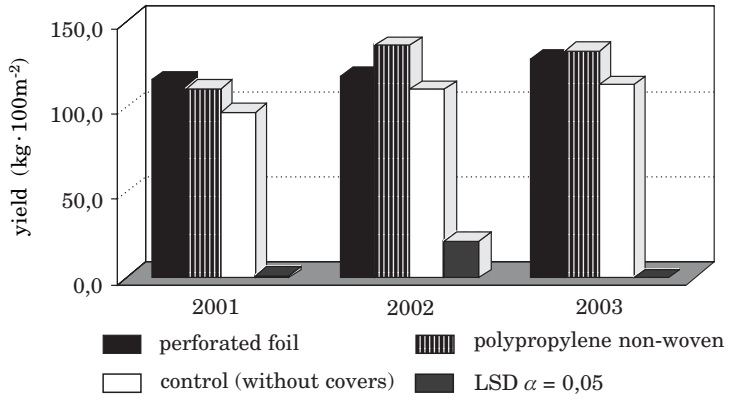
The aim of this experiment was to assess the content of macroelements in the yield of basil cultivated for a bunch harvest. The study was carried out in years 2001-2003 at the Depart-ment of Vegetable Cultivation of Agricultural University of Szczecin. The experimental mate-rial was basil plants cultivated in a field for a bunch harvest, using perforated and polypropylene unwoven cloth as plant covering. The control object was basil grown without covering. The seeds of basil (12 $kg \cdot ha^{-1}$) were sown on 25th April into rows spaced at 20 cm. Directly after sowing covers were placed. They were left on the plants for four weeks. The experiment was established in randomized blocks with four replications. The plot area was 1.92m^2 (1.2 m×1.6 m). Crop management was carried out according to the commonly accepted rec-ommendations for this species. Mineral fertilization was applied before sowing and quantified according to the results of the chemical analysis of the soil. Basil was cultivated on post-bog soil of 3rd class of the soil valuation. A single harvest of basil took place on 12th July in the first year and on 14th July - in the following two years of study. After the harvest, measure-ments of the following morphological features were taken: plant height, plant diameter, num-ber of leaves, length and width of the leaf blade. Also, the content of dry matter of the raw plant material by means of a drier-weight method was estimated. Furthermore, the content of total nitrogen with Kjeldahl method, phosphorus with colorimetric method, and potassium, sodium and calcium with flame photometry method and magnesium with flame spectropho-tometry of atomic absorption method (ASA) were evaluated. The results were subjected to analysis of variance. The means of two years were separated by Tukey's test at p=0.05.

RESULTS AND DISCUSSION

The best yield of basil was obtained when plants were grown under polypropylene un-woven cloth cover (Fig. 1). In was only in 2001 that significantly higher marketable yield was harvested from the object where plants were grown under perforated foil, but that was in comparison with the yield obtained from the control object.

Comparison of biometrical characteristics of basil plants during the harvest (Table 1) dem-onstrated that basil grown under polypropylene unwoven cloth was the highest (18.2 cm). Moreover, it was characterized by the biggest plant diameter (13.4 cm) and the largest leaves (5.9 cm long and 3.3 cm wide). ZIOMBRA et al. (2000) claim that covering basil with poly-propylene unwoven cloth has a significant influence on the yielding acceleration, but does not have any effect on the quantity of the herb yield.

Significantly higher amount of dry matter (17.5%) was found in the plants of basil grown on the control plots (without covers). The content of dry matter in the yield of plants covered with perforated foil and polypropylene unwoven cloth was 14.7% (Fig. 2).



	2001	2002	2003
Perforated foil	116.0	118.5	128.5
Polypropylene non-woven	111.0	136.4	133.1
Control (without covers)	97.0	110.6	113.2
LSD α = 0,05	1.27	21.7	0

Fig. 1. Marketable yield of basil herb according to the type of cover (kg · 100 m^{-2})

Table 1

The effect of covering on some of biometrical characteristics of basil cultivated for a bunch harvest (average from years 2001–2003)

Type of cover	Height of plant (cm)	Diameter of plant (cm)	Length of leaf (cm)	Width of leaf (cm)
Perforated foil	16.1	12.3	5.6	3.1
Polypropylene unwoven cloth	18.2	13.4	5.9	3.3
Control (without covers)	14.2	12.5	5.6	3.1

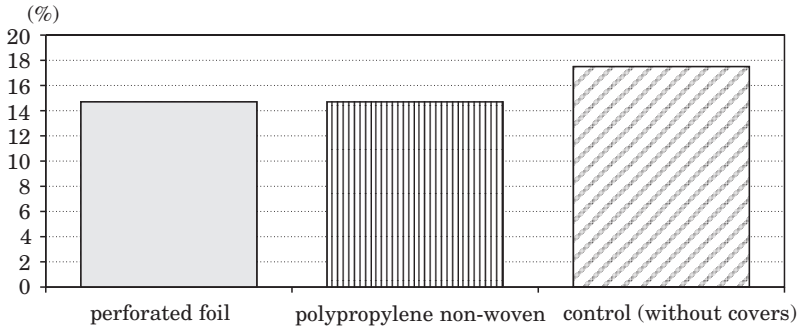


Fig. 2. The content of dry matter in the yield of basil grown for a bunch harvest according to the type of cover (%) (average from years 2001-2002)

The covers used in the trials had a significant influence on the content of macroelements in dry mass of basil yield in each year of the research, except the phosphorus.

In the first year of the study the highest concentration of nitrogen was found in plants har-vested from the control plots (3.81% d.m.) and in 2002 – in plants covered with polypropylene unwoven cloth (2.42% d.m.). Respectively, the lowest amount of nitrogen in 2001 was found in plants covered with polypropylene unwoven cloth, and in the following year – in those under perforated foil.

The highest amount of potassium in the first year of the study was found in plants grown without covering (4.55% d.m.), and the lowest - in plants covered with polypropylene un-woven cloth. In the next year the content of potassium was higher in control plants but only in comparison with the basil under perforated foil.

The control plants were characterized by the lowest content of calcium. The highest amount of this macroelement was found in basil grown under perforated foil, respectively 3.13 and 3.80% d.m. in the following years (tab. 2).

Table 2

Macroelement content in the yield of basil grown for a bunch harvest according to the type of cover (% d.m.)

Macroelement	Type of cover	2001	2002	2001-2002
N	perforated foil	3.71 b	2.18 a	2.94
	polypropylene unwoven cloth	2.46 a	2.42 c	2.44
	control (without covers)	3.81 c	2.33 b	3.07
P	perforated foil	0.44 a	0.42 a	0.43
	polypropylene unwoven cloth	0.46 a	0.39 a	0.42
	control (without covers)	0.41 a	0.43 a	0.42
K	perforated foil	4.22 b	2.52 a	3.37
	polypropylene unwoven cloth	3.15 a	2.88 b	3.01
	control (without covers)	4.55 c	2.93 b	3.74
Ca	perforated foil	3.13 c	3.80 b	3.46
	polypropylene unwoven cloth	2.52 b	3.22 a	2.87
	control (without covers)	2.30 a	3.18 a	2.74
Mg	perforated foil	0.36 b	0.19 a	0.27
	polypropylene unwoven cloth	0.35 a	0.16 a	0.25
	control (without covers)	0.41 c	0.15 a	0.28
Na	perforated foil	0.14 b	0.007 a	0.07
	polypropylene unwoven cloth	0.129 a	0.009 a	0.06
	control (without covers)	0.132 a	0.009 a	0.07

Covers used in the experiment did not have a significant effect on the magnesium content in basil harvested in 2002. However, in 2001 the highest amount of this macroelement was found in control plants (0.411% d.m.) and the lowest – in plants covered with polypropylene unwoven cloth (0.35% d.m.) – Table 2.

In the first year of the study covering basil with perforated foil had a significant influence on an increase of sodium content in the plants. In the next year of the experiment there were no significant differences in the sodium content between the plants under different type of covering.

The amounts of mineral compounds assessed in the experiment were considerably higher than those given by RUMIŃSKA 1983 (citation from TÖLGYESI 1965).

CONCLUSIONS

1. The covers tested in the experiment had a significant influence on the yielding of basil plants cultivated for a bunch harvest. The highest yield was obtained when polypropylene unwoven cloth was used.

2. Basil plants grown under polypropylene unwoven cloth were the highest (18.2 cm), had the biggest diameter (13.4 cm) and the largest leaves (5.9 cm long and 3.3 cm wide).

3. Using covers (perforated foil and polypropylene unwoven cloth) caused a decrease of dry matter content in the yield of basil, in comparison with the plants grown without covering.

4. The covers used in the study caused a decrease of nitrogen, potassium, calcium and mag-nesium in the basil yield, but had not on the sodium content.

REFERENCES

ECHEVERRY O. 1990. *Studies on the growth and phenology of Ocimum basilicum, Ocimum minimum and Ocimum gratissimum*. Universidad Nacional de Colombia.

HOHENBEG E. 1998. *Zioła lecznicze i przyprawy.* Świat Książki, Warszawa.

JADCZAK D., GRZESZCZUK M. 2005. *Bazylia*. Panacea 2:28-30.

KILJAŃSKA J., MOJKOWSKA H. 1988. *Zielnik polski*. Interpress, Warszawa.

KWAŚNIEWSKA J., SKULIMOWSKI J., TUMIŁOWICZ H. 1955. *Poradnik zbieracza ziół.* PWLiS, Warszawa.

LAUGHIN A. 1996. *Wszystko o ziołach.* Astrum, Wrocław.

MAZERANT-LESZKOWSKA A. 1990. *Mała księga ziół.* IWZZ, Warszawa.

METERA P., METERA D. 1990. *Zioła dla wszystkich*. IWZZ, Warszawa.

MIKOŁAJCZYK K., WIERZBICKI A. 1987. *Zioła.* LSW, Warszawa.

REJEWSKI M. 1992. *Rośliny przyprawowe i używki roślinne.* PWRiL, Warszawa.

RUMIŃSKA A. 1983. *Rośliny lecznicze. Podstawy biologii i agrotechniki*. PWN, Warszawa.

TÖLGYESI GY. 1965. *Beiträge zum Mineralstoffgehalt einiger Heilpflanzen.* Herba Hung., 4: 181-191.

TYSZYŃSKA-KOWNACKA D., STAREK T. 1984. *Zioła na działce i w ogródku przydomowym.* Watra, Warszawa.

VOLAK i in. 1987. *Rośliny lecznicze*. PWRiL, Warszawa.

ZIOMBRA M., FRĄSZCZAK B., ŁASZKOWSKA M. 2000. *Wpływ sposobu uprawy i terminu zbioru na plon ziela bazylii*. Ann. UMCS, Lublin, vol. 8, Suppl., 453-458.

THE EFFECT OF COVERING ON THE CONTENT OF MACROELEMENTS IN THE YIELD OF BASIL (*OCIMUM BASILICUM* L.) CULTIVATED FOR A BUNCH HARVEST

Key words: basil, covers, content of macroelements.

Abstract

The study was carried out in 2002 and 2003. The experimental material was basil plants cultivated in the field for a bunch harvest, using for plant covering perforated foil and polypropylene unwoven cloth. The control ob-ject was basil grown without covering.

The covers tested in the experiment had a significant influence on the yielding of basil cultivated for a bunch harvest. The highest yield was obtained when polypropylene unwoven cloth was used.

Basil plants grown under polypropylene unwoven cloth were the highest (18.2 cm), had the biggest diameter (13.4 cm) and the largest leaves (5.9 cm long and 3.3 cm wide). Using covers (perforated foil and polypropylene unwoven cloth) caused a decrease of dry matter content in the yield of basil, in comparison with the plants grown without covering.The covers used in the study caused a decrease of nitrogen, potassium, calcium and magnesium in the basil yield, but did not decrease phosphorus and sodium content.

WPŁYW STOSOWANYCH OSŁON NA ZAWARTOŚĆ MAKROELEMENTÓW W PLONIE BAZYLII UPRAWIANEJ NA ZBIÓR PĘCZKOWY

Słowa kluczowe: bazylia, osłony, makroelementy.

Abstrakt

Doświadczenie przeprowadzono w latach 2001-2003 w Katedrze Warzywnictwa Akademii Rolniczej w Szczecinie. Materiał badawczy stanowiła bazylia uprawiana na zbiór pęczkowy z zastosowaniem osłon z folii perforowanej i włókniny polipropylenowej.

Badane w doświadczeniu osłony miały istotny wpływ na plonowanie bazylii. Największy plon otrzymano z zastosowaniem osłony z włókniny polipropylenowej. Bazylia uprawiana pod włókniną polipropylenową były najwyższa (18,2 cm), miała największą średnicę (13,4 cm) oraz największe liście (długości 5,9 cm i szerokości 3,3 cm).

Zastosowane osłony (folia perforowana i włóknina polipropylenowa) wpłynęły na zmniejszenie zawartości suchej masy w plonie bazylii w porównaniu z jej uprawą bez osłon.

Stosowane w doświadczeniu osłony wpłynęły na zmniejszenie w plonie bazylii zawartości azotu, potasu wapnia i magnezu, natomiast nie miały wpływu na zawartość fosforu i sodu w roślinach.