STUDY REGARDING THE INFLUENCE OF VARIOUS TYPES OF MULCHING ON THE AGRO-PRODUCTIVE CAPACITY OF FOUR DIFFERENT BASIL CULTIVARS

STUDIU PRIVIND INFLUENȚA DIFERITELOR VARIANTE DE MULCIRE ASUPRA CAPACITĂȚII AGROPRODUCTIVE A PATRU CULTIVARE DIFERITE DE BUSUIOC

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Abstract. *The goal of this paper is to evaluate the effect of mulching on the yield of four basil cultivars, cultivated according to the ecological agricultural rules: Aromat de Buzau – green basil, Serafim – violet basil, Macedon – lemon-flavoured basil and a clove-flavoured basil local population. The experiment was carried out during 2018, in the experimental field of Vegetable Growing Discipline of U.S.A.M.V. Iasi. The crop was established via seedlings, at distances of 50 x 20 cm, resulting a density of 100 000 plants/ha. The obtained results showed that the factors cultivar and mulching application had a significant relevance on yield. Cultivars determined significant yield differences and mulching application determined an important increase of the yield (16.8%).*
Key words: *Ocimum basilicum* L., cultivar, mulch, yield

Rezumat. *Scopul acestei lucrări este de a evalua efectul mulcirii asupra producției a patru cultivare de busuioc cultivate după normele agriculturii ecologice: Aromat de Buzău-busuioc de culoare verde, Serafim-busuioc de culoare violet, Macedon-busuioc cu aromă de lămâie şi un cultivar cu aromă de cuişoare. Amplasarea experienței a fost efectuată în câmpul experimental al disciplinei de Legumicultură, din cadrul U.S.A.M.V. Iaşi, în anul 2018. Cultura a fost înființată prin răsad, la distanțe de 50 x 20 cm, rezultând o densitate de 100 000 plante / ha. Rezultatele obținute arată că factorii cultivar şi mulcire au avut relevanță semnificativă asupra producției. Cultivarul a determinat diferențe semnificative asupra producției, iar aplicarea mulcirii a determinat creşteri importante ale producției (16,8%).*
Cuvinte cheie: *Ocimum basilicum* L., cultivar, mulcire, producție

INTRODUCTION

The aromatic and spice plants represent a group of vegetable growing plants more and more cultivated, especially in the ecological agriculture. Basil

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(*Ocimum basilicum* L.) is one of the plants included in this group and its organic cultivation is justified mainly by the consumer's expectations (Stoleru *et al*., 2014; Onofrei *et al*., 2015; Burducea *et al*., 2016). The cultivars of this species are very different from the point of view of colour, leaf shape, height of the plant, achieved yield, aromatic compounds, antioxidant activity, content in volatile oil etc., this diversity confers multiple usages of this plant (Darrah, 1974). Basil is used in the preparation of various types of food, including the pesto sauce and the soft drinks (Putievsky and Galambosi, 1999). Due to its bioactive principles, especially, its volatile oils, and phenolic compounds, the basil is cultivated also as a medicinal plant (Lee and Scagel, 2009; Onofrei *et al*., 2017; Burducea *et al*. 2018). Ornamental value and nice smell recommend itself to be used in various folk rituals (Paton *et al*., 1999). Moreover, it is used as an accompanying plant in the ecological agriculture, preventing the attack of some pathogens (Galea *et al*., 2015; Teliban *et al*., 2016; Hamburdă *et al*., 2016).

To cultivate the basil is relatively simple: crop establishment is done by the direct sowing in the field or by seedlings; it requires little maintenance works and does not have many pathogens and pets. Some problems could be appeared because of weeds, especially in ecological agricultural, according to european rules (EU Reg. 834/2007). An effective method for weed control could be by mulching application (Stan, 2010).

Considering the above mentioned data, the goal of this study was to assess the effect of mulching application on the yield of certain different basil cultivars, cultivated according to the ecological agricultural rules.

MATERIAL AND METHOD

The research was organised in 2018 on the didactic and experimental field allocated to the Discipline of Vegetable Growing of U.S.A.M.V. Iasi. The activity was carried out on a cambic chernozem soil, averagely leached and supplied with nutritious elements, with 3% organic matter and pH = 6.5. The meteorological data recorded during vegetation period were favourably average for basil crop (tab. 1).

Table 1

The weather conditions in the vegetation period for the basil crop in 2018

Month	Decada	Average temperature (^{o}C)	Relative humidity (%)	Rainfall (mm)
May	I	19.7	62.0	5.1
	II	16.4	68.3	11.2
	III	20.2	54.3	0.0
June	I	22.2	58.5	6.6
	II	22.4	77.8	104.2
	III	19.1	77.5	92.0
July	I	20.4	72.4	11.4
	II	22.3	75.1	17.1
	III	22.7	84.3	138.9
August	I	23.5	69.6	12.0

The experimental protocol foresaw the organisation of a bifactorial experience consisting in a split plot design with three replicates the two experimental factors were:

- factor A – assortment with four grades: a1 = Aromat de Buzau (green basil); a2 = Serafim (violet basil); a3 = Macedon (lemon-flavoured basil) and a4 = clove-flavoured basil.
- factor B –mulching application with two grades: b1 = non-mulched and b2 = mulched with a standard black light density polyethylene film, 15 µm thick (LDPE 15 µm).

The sowing date for seedlings producing was done on 16.04.2018 in alveolar trays, with 2.5 x 2.5 x 5.0 cm dimensions of alveole. The planting date was on 21.05.2018, using 35 days seedling. The planting distances were of 50 cm between the rows and 20 cm between the plants in the row, resulting a density of 100 000 plants/ha.

During the vegetation period the works recommended by the scientific literature (Stan *et al*., 2003; Stoleru *et al*., 2014) were carried out. Two works were applied for combating the weeds, hoeing and weeding, in the case of the non-mulched variant, namely two weeding works, in the case of the mulched variant. The irrigation was carried out by dripping with the role of replacing the precipitations when these were insufficient, thus maintaining a constant growth of the crop (fig. 1).

During the entire vegetation period of the plants, no protection treatment against pathogenic or harming agents was carried out; moreover, no herbicides were applied, weed control being carried out manually.

The harvesting was carried out by cutting the plants 5 cm above the ground, during the mass plant blooming. It was complied with the plants vegetation period: Aromat de Buzau was the first cultivar harvested (03-04.08.2018), followed by the lemon-flavoured basil (06-07.08), the clove-flavoured basil (08-09.08) and finalising with the Serafim cultivar (10-11.08).

In order to analysed the significance of the yield the experimental data were processed via statistical and mathematical adequate methods (Săulescu and Săulescu, 1967; Jităreanu, 1999).

Fig. 1 – Aspects of the basil experience

RESULTS AND DISCUSSIONS

The yield results for the basil cultivars included in the study (tab. 2) vary from 14676.7 kg/ha, in the case of the Serafim cultivar, to 34050.0 kg/ha, in the

case of the lemon-flavoured basil, with very significant differences compared to the experimental average (24138.8 kg/ha), namely, negative differences of 9462.1 kg/ha in the case of the Serafim cultivar and positive differences of 9911.2 kg/ha in the case of the lemon-flavoured basil.

The Aromat de Buzau cultivar registered an average production of 22740.0 kg/ha, and the clove-flavoured basil a yield of 25088.3 kg/ha with insignificant negative differences, namely positive compared to the experimental average.

The production differences between the basil varieties included in the study are highly significant (80.26 % between the minimum and maximum yield value), meaning that the selection of the cultivars determines greatly the value of the production, in this case, the differences being justified by the basil cultivar.

Table 2

Comparative yield analysis according to the cultivar

Nr. crt.	Cultivar	Yield			
		kg/ha	% compared to the average	Diference compared to the average	Difference significance
1.	Aromat de Buzău	22740.0	94.21	-1398.8	-
2.	Serafim	14676.7	60.80	-9462.1	000
3.	Macedon	34050.0	141.06	9911.2	xxx
4.	Clove-flavoured basil	25088.3	103.93	949.5	-
5.	Average	24138.8	100.00	0.0	C

DL 5% = 2401.4 kg/ha; DL 1% = 3636.4 kg/ha; DL 0.1% = 5841.7 kg/ha

The yield results achieved following the mulching variants are presented in table 3.

Table 3

Yield comparative analysis according to the cultivars

Nr. crt.	Mulch type	Yield			
		kg/ha	% compared to the average	Diference compared to the average	Difference significance
1.	Non-mulched	22111.8	91.60	-2027.0	-
2.	LDPE 15 µm	26165.8	108.40	2027.0	-
3.	Average	24138.8	100.00	0.0	C

DL 5% = 677.6 kg/ha; DL 1% = 985.5 kg/ha; DL 0.1% = 1478.3 kg/ha

From the data presented it is can be noticed that the non-mulched variants resulted in a smaller yield values (22111.8 kg/ha), compared to the mulched variants with 15 µm polyethylene foil (26165.8 kg/ha), yet the differences obtained compared to the experimental average are insignificant.

The interaction of the two studied factors, variety x mulching (tab. 4) generated results varying from 13520.0 kg/ha, Serafim x non-mulched and 36800.0 kg/ha, in the case of the lemon-flavoured basil x 15 µm LDPE combination.

Very significant positive differences compared to the experimental average was registered by the lemon-flavoured basil, regardless of the mulching variants,

proving the yield potential of this cultivar. Moreover, positive differences, but distinctly significant, were also recorded by the clove-flavoured basil mulched with 15 µm LDPE.

At the opposite pole, with very significant negative differences, compared to the experimental average, it is found the red-Serafim basil, with the highest differences compared to the experimental average (43.99% in the case of the non-mulched variant and 34.41% - LDPE 15 µm) and the Aromat de Buzau non-mulched variant (15.38 %).

Table 4

Comparative results among the cultivars x mulching combination (A x B)

Nr. crt.	A x B	Yield			
		kg/ha	% compared to the average	Diference compared to the average	Difference significance
1.	Aromat de Buzău x non-mulched	20426.7	84.62	-3712.1	000
2.	Aromat de Buzău x LDPE 15 µm	25053.3	103.79	914.5	-
3.	Serafim x non-mulched	13520.0	56.01	-10618.8	000
4.	Serafim x LDPE 15 µm	15833.3	65.59	-8305.5	000
5.	Macedon x non-mulched	31300.0	129.67	7161.2	xxx
6.	Macedon x LDPE 15 µm	36800.0	152.45	12661.2	xxx
7.	Clove-flavoured basil x non-mulched	23200.0	96.11	-938.8	-
8.	Clove-flavoured basil x LDPE 15 µm	26976.7	111.76	2837.9	xx
9.	Average	24138.8	100.00	0.0	C

DL 5% = 1515.1 kg/ha; DL 1% = 2203.7 kg/ha; DL 0.1% = 3305.6 kg/ha

The other two variants registered non-significant differences compared to the experiment average, Aromat de Buzau x LDPE 15 µm, registering a positive difference of 914,5 kg/ha, while the clove-flavoured basil x non-mulched registered a negative difference of 938,8 kg/ha compared to the experience average.

As it can be observed in the above table, all the basil cultivars reacted well to mulching, achieving yield increases compared to the non-mulched variants. Thus, the mulching of basil crop can be recommended as an important technological link, if considering both the achieved yield increase, and the elimination of weed combating works and obtaining a superior quality production (herba lacking soil impurities on the leaves and weed impurities).

CONCLUSIONS

1. The yields for the *Ocimum basilicum* L. species vary a lot according to the type of cultivated basil, the largest yield being achieved by the lemon-flavoured basil, and the smallest by the violet basil.

2. Mulching the basil crop influences positively the yields achieved, all the basil cultivars in the study achieving larger yields in the case of the mulched variants compared to the non-mulched variants.

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