

THE INFLUENCE OF FERTILIZATION AND MULCHING ON THE EARLY CAULIFLOWER CROP

INFLUENȚA MULCIRII ȘI FERTILIZĂRII ASUPRA CULTURII DE CONOPIDĂ TIMPURIE

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Abstract. *The purpose of the present paper is to evaluate the influence of mulching and fertilization on the early cauliflower crop. The research was carried out in the didactic and experimental field of the Vegetable growing discipline, at Agronomy University Iasi. The experiment was of a bifactorial type, testing the influence of mulching with three graduations (unmulched-Ct, mulching with polyethylene film of 15 and 30 μm in thickness) and of fertilization with four graduations (unfertilized-Ct, chemical fertilization, organic fertilization and application of microorganisms), under the conditions of 2018 and 2019. The crop was established by using seedlings of 42 days, in strips of two rows, the distance between strips being of 80 cm and between rows of 60 cm. The distance between the plants in a row was of 25 cm, resulting in a density of about 57 thousand plants per hectare. The results obtained demonstrate the necessity of mulching and fertilizing the early cauliflower crop, the best yields being obtained in the case of the variant mulched with 30 μm foil and fertilized with chemical fertilizers.*

Key words: technological factors, yields, chlorophyll pigments

Rezumat. *Scopul lucrării de față este de a evalua influența mulcirii și a fertilizării la cultura de conopidă timpurie. Cercetările au fost efectuate în câmpul didactic și experimental al disciplinei de Legumicultură, U.S.A.M.V. Iași. Experiența a fost de tip bifactorial, fiind testată influența mulcirii cu trei graduări (nemulcit-Mt, mulcire cu folie de polietilenă de 15 și 30 μm grosime) și a fertilizării cu patru graduări (nefertilizat-Mt, fertilizare chimică, fertilizare organică și aplicarea de microorganisme) în condițiile anilor 2018 și 2019. Cultura a fost înființată prin răsad de 42 de zile, în benzi de câte două rânduri, distanța dintre benzi fiind de 80 cm, iar dintre rânduri de 60 cm. Distanța dintre plante pe rând a fost de 25 cm, rezultând o densitate de aproximativ 57 mii plante pe hectar. Rezultatele obținute demonstrează necesitatea mulcirii și fertilizării culturii de conopidă timpurie, producțiile cele mai bune fiind obținute în cazul variantei mulcite cu folie de 30 μm și fertilizată cu îngrășămintă chimice.*

Cuvinte cheie: factori tehnologici, producții, pigmenți clorofilieni

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INTRODUCTION

Among the technological measures that ensure a high and early yield in the early cauliflower crop, mulching and fertilization play a significant role (Ferdous *et al.*, 2017).

Soil mulching is one of the research topics of interest, because it has special influence both on the obtained yield (quantity, quality, precocity) and the soil (the activity of soil microorganisms, its physical and chemical properties). This influence has a beneficial role, which provides mulched lands with this character of sustainability (Stan, 2010; Depalo *et al.*, 2016). However, mulching has some disadvantages as well, expressed by the creation of a barrier for oxygen and water, creating differences between the soil temperature and that of the environment (Caruso *et al.*, 2019a).

The success of a cauliflower crop also depends on the adequate supply of water and nutrients. The fertilization can be carried out using organic or chemical fertilizers, these being the most commonly used. Lately research is aimed at the use of microorganisms with a role in soil microbiota activity and on plant growth and development (Caruso *et al.*, 2019b).

All these aspects lead to the need for in-depth research of these measures. In this context, the purpose of the present research is to evaluate the influence of mulching and fertilization on the early cauliflower crop.

MATERIALS AND METHOD

The research was organized under the experimental conditions of 2018 and 2019 years, at the Didactic Station of Agronomy University Iasi. The experiment was carried out on a soil of the chernozem medium leachate type, with a medium content of nutrients, with 3% organic substance and pH = 6.5. The weather conditions from the experimental period were favorable for this crop.

The experimental protocol dictated the organization of a bifactorial experiment, organized in split plot design, with three repetitions (fig. 1). The influence of two experimental factors was studied in the open field using an early cauliflower hybrid - Vassallo - recommended for an early crop (<https://seminte-ingrasaminte-turba.ro/product/conopida-vassallo-f1-crx-13202/>):

Factor A – mulching application with three graduations: a_1 = unmulched, mulched with a standard black light density polyethylene film, 15 μm and 30 μm in thickness (a_2 = LDPE 15 μm and a_3 = LDPE 30 μm);

Factor B - four-graduations of fertilization: b_1 = unfertilized variant - as control (Ct), b_2 = chemical fertilization with Nutrispore 30:10:10 (Ch), b_3 = organic fertilization with Orgevit (O), b_4 = application of microorganisms, Micoseeds MB (M).

In both experimental years, the crop was established by using seedlings of 42 days, on April 12th, in strips of two rows each, at distance of 80 cm and between rows of 60 cm. The distance between the plants in a row was of 25 cm, resulting in a density of about 57 thousand plants/hectare (Popescu and Zăvoianu, 2011). The work carried out during the vegetation period was according with specialized literature (Stan and Munteanu, 2001; Zăvoianu, 2010; Ardelean, 2013) consisted of irrigation, (done by dripping), weeding (manually) and two fertilizer application. The first round of fertilization was done before planting - the starter fertilization, with 200 kg Nutrispore,

200 kg Orgevit, and with 60 kg Micoseeds MB, respectively. The second round of fertilization, the root-phase fertilization, was applied out three weeks after planting, using the same fertilizer doses.

Performance of experimental variants was done by evaluation of the yield (kg/ha) and the total chlorophyll pigments (CCI - chlorophyll content index).

The harvest of the yield was done at proper commercial stage of the curd and the chlorophyll contents were achieved before harvesting, by using the CCM-200 plus (Chlorophyll Content Meter).

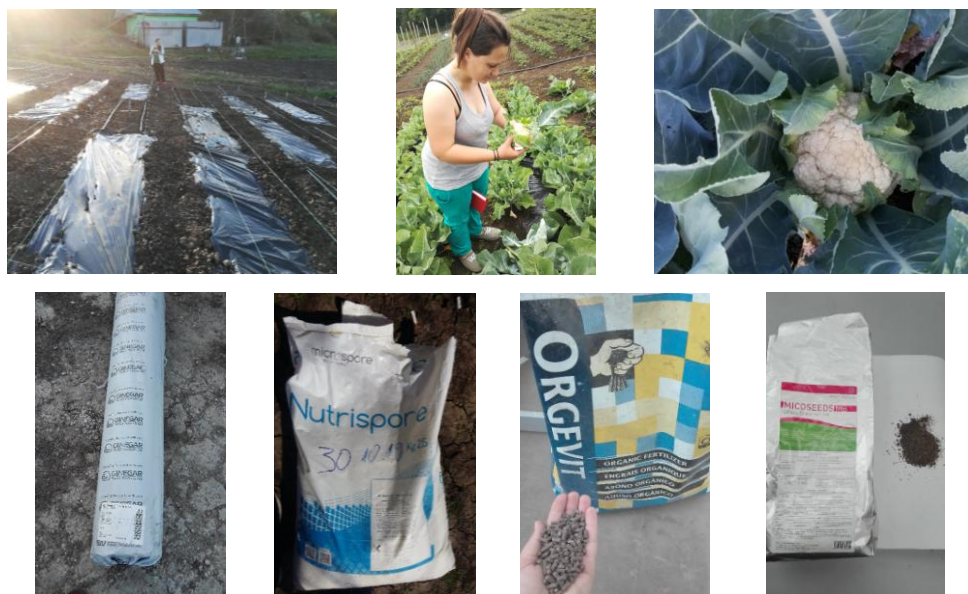


Fig. 1 Aspects from the cauliflower experiment

The experimental data were processed by appropriate statistical-mathematical methods (Jitareanu, 1999; Leonte and Simioniuc, 2018). The least significant differences (LSD) test was used for the yields, and the Tukey test for chlorophyll content.

RESULTS AND DISCUSSIONS

A. Influences on the yield

The results obtained regarding the influence of mulching on the yield are presented in table 1.

The best results were obtained in the case of mulching with 30 μm foil (22586 kg/ha), with an yield increase of 3976.2 kg/ha (21.37%), compared to the unmulched (control) variant, while the variant mulched with 15 μm foil achieved an yield of 21613 kg/ha, with an yield increase of 3002.8 kg/ha (16.14%), compared to the control variant (18610 kg/ha).

In both cases, the yield differences are positive, statistically covered at a significant level, compared to the unmulched control variant.

Table 1

Results obtained regarding the influence of mulching on the cauliflower yield

No. crt.	Mulch type	Yield			Difference significance
		kg/ha	% compared to the Control	Difference compared to the Control	
1.	Unmulched	18610	100.00	0.0	Ct
2.	LDPE 15 μ m	21613	116.14	3002.8	*
3.	LDPE 30 μ m	22586	121.37	3976.2	*

LSD 5% = 2537.1 kg/ha; LSD 1% = 4207.2 kg/ha; LSD 0.1% = 7857.8 kg/ha

Regarding the influence of the fertilization on the early cauliflower yield (tab. 2), the highest yield was obtained in the case of the variant fertilized with Nutrispore 30:10:10, which ensured an yield increase of 13852.4 kg/ha, compared to the unfertilized variant.

Table 2

Results obtained regarding the influence of fertilization on the cauliflower yield

No. crt.	Treatment	Yield			Difference significance
		kg/ha	% compared to the Control	Difference compared to the Control	
1.	Unfertilized	15685.7	100.00	0.0	Ct
2.	Ch	29538.1	188.31	13852.4	***
3.	O	20314.3	129.51	4628.6	***
4.	M	18206.9	116.07	2521.2	*

LSD 5% = 2356.9 kg/ha; LSD 1% = 3232.3 kg/ha; LSD 0.1% = 4399.6 kg/ha

From a statistical point of view, the variants treated with different fertilizers achieved yield increases with different degrees of significance, such as: the chemically and organically fertilized variants have presented very significant positive differences, compared to the unfertilized variant (88.31%, and 29.51% respectively), while the variant with microorganisms, registered significant positive differences (16.07%).

Regarding the combined influence of mulching and fertilization (tab. 3), the results highlight the positive influence of the two experimental factors on the early cauliflower yield. The variants in which the mulching and the chemical or organic fertilization were performed simultaneously produced very significant positive differences, compared to the unmulched and unfertilized control variant. Also, the unmulched, but fertilized variant with chemical fertilizers, produced very significant positive results.

The application of microorganisms determined distinctly significant positive differences, in both variants, where soil mulching was performed.

Results regarding the influence of the mulching x fertilization combination on the cauliflower yield

No. crt.	Variant	Yield			Difference significance
		kg/ha	% compared to the Ct	Difference compared to the Ct	
1.	Unmulched x unfertilized	13392.1	100.00	0.0	Ct
2.	Unmulched x Ch	28500.0	212.81	15107.9	***
3.	Unmulched x O	18328.6	136.86	4936.5	*
4.	Unmulched x M	14219.0	106.18	827.0	-
5.	LDPE 15 μ m x unfertilized	16328.6	121.93	2936.5	-
6.	LDPE 15 μ m x Ch	28901.6	215.81	15509.5	***
7.	LDPE 15 μ m x O	21257.1	158.73	7865.1	***
8.	LDPE 15 μ m x M	19963.5	149.07	6571.4	**
9.	LDPE 30 μ m x unfertilized	17336.5	129.45	3944.4	-
10.	LDPE 30 μ m x Ch	31212.7	233.07	17820.6	***
11.	LDPE 30 μ m x O	21357.1	159.48	7965.1	***
12.	LDPE 30 μ m x M	20438.1	152.61	7046.0	**

LSD 5% = 4082,3 kg/ha; LSD 1% = 5598,6 kg/ha; LSD 0.1% = 7620,3 kg/ha

B. Influences on the chlorophyll content

The results regarding the content of chlorophyll pigments, presented in fig. 2, ranges from 30.2 CCI in the unmulched variant fertilized with Microseeds MB, to 57.2 CCI in the version mulched with 30 μ m polyethylene film, which was chemically fertilized.

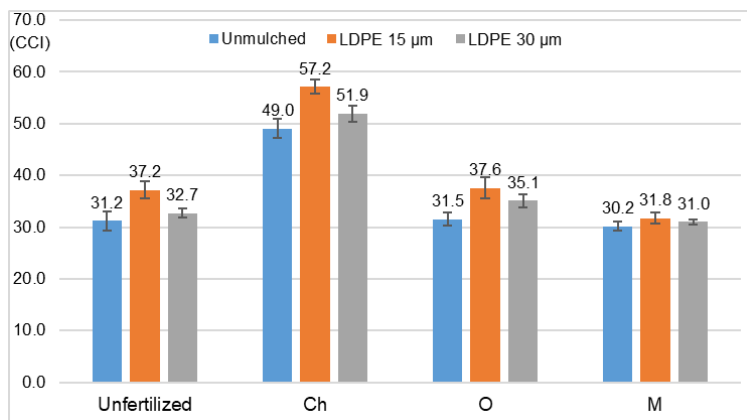


Fig. 2 Results regarding the chlorophyll pigments content in the early cauliflower crop

The chemical fertilization produced the highest values of the CCI, but the lowest values were recorded in the variants fertilized with microorganisms. Regarding mulching, the highest values were recorded in the variants mulched with 15 μ m foil, and the lowest values of the CCI coefficient are recorded in the unmulched variants.

CONCLUSIONS

1. The results obtained recommend the use of mulching and fertilization on the early cauliflower crop, fertilization having the primary role in achieving high yields.

2. The best results were obtained in the case of the chemically fertilized variants, which produced the highest yield increase, regardless of the mulching variant used.

3. The highest values of the CCI index are correlated with the highest productions registered in the variants fertilized with chemical fertilizers.

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