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THE INFLUENCE OF TEMPORARY PROTECTION ON PRODUCTION PRECOCITY OF EGGPLANTS CULTIVATED ON SANDY SOILS IN SOUTHERN OLTENIA

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Abstract

In order to increase the production precocity of eggplants, different cultivation methods were studied: 1 - unprotected crops; 2 - soil mulching with polyethylene; 3 - protected plants with polyethylene tunnel; 4 - protected plants with polyethylene tunnel and soil mulching with polyethylene; 5 - protected plants with agryl type foil and 6 - protected plants with agryl and soil mulching with polyethylene .The protection system was maintained until around 20 of May, when the air temperature reached the threshold of 30^0C. The methods of protection employed created different microclimate conditions that influenced the different processes of growth and development with implications on early yield. Considering the precocity, only the variant protected with agryl type foil and soil mulched with polyethylene was harvested before 15 of June. During 16-30 of June variant protected with agryl and mulched harvested 5 t/ha, while variant only protected with agryl harvested 3.5 t/ha. In the unprotected variants the first harvests were obtained between 1-15 of July. Through the mulching of soil with polyethylene the precocity increases regardless the method of plants protection.

Key words: *eggplants, precocity, protection, Agryl*

INTRODUCTION

Eggplants grow and develop normally at optimum temperatures of 25-30^{o}C and can withstand temperatures of 45^o C. The grow stops at temperatures below 10^0 C. The plants are destroyed by frost and affected by cold periods without frost (Ceausescu et al., 1980). Air currents are unfavourable for eggplants which require protecting measures of culture. Insufficient light determines stagnation of growth, flowers abortion, and related fruits to remain small. Eggplants are demanding water plants; the optimal level of water supply of the soil is 70% at depth of 50 cm (Marinica Gh., 1989). Getting early yields from eggplant implies using of early varieties (Toma V. et al., 1999) or crops' protection (Voican V., and Lacatus V., 1998). For the greenhouses culture of eggplant it should be used specifically adapted varieties (Pochard E., 1974). To increase precocity in eggplants field crops vegetable seedlings has to be planted much earlier than the optimal time and therefore the young plants are exposed to many risky factors. The normal metabolic processes in plants are performed only if the environmental conditions for each species are assured. Removal or reduction of undesirable effects occurring in the early part of the period from vegetation can be achieved by applying technologies adapted to the cultural area. So far, it have been carried out researches concerning protecting the culture of eggplant on all over the vegetative period.

In this paper temporary protection of eggplant crops in order to avoid unwanted effects occurred in the early part of vegetation period, to improve plants growth and development and, thus, to increase precocity was studied. Plants protection is not necessary during June, July and August, when heat surplus in the studied area is recorded.

Temporary protection of the eggplant culture is an important mean of increasing the precocity, contributing at market fresh products supply and capitalizing the efficiency of specific climate conditions of the sandy soils area of southern Oltenia.

MATERIALS AND METHODS

Research has been carried out during 2011-2013 at CCDCPN Dăbuleni, Southern Oltenia, on a sandy soil with less than 1% humus, 0.06-0.11 ppm total nitrogen, 55-60 ppm potassium and 86-100 ppm phosphorus content. The experiment with eggplant crops had the following variants: V1 - unprotected crops – control; V2 - soil mulching with polyethylene; V3 - protected plants with polyethylene tunnel; V4 - protected plants with polyethylene tunnel and soil mulching with polyethylene; V5 - protected plants with Agryl type foil and V6 - protected plants with Agryl and soil mulching with polyethylene. Experience was located in the experimental field in 4 randomized blocks. *Aragon* F_1 was used in the experiment. Planting in the field was done around 15 of April, with 15 days earlier than the optimal date of eggplant planting in area. The system of plants protection was installed at the same time with planting and maintained until 20 of May, when no longer risk of temperatures below the biologic threshold for eggplant arise.

The height of plants at the time of protection system removal, total yield and yield dynamics were determined. The obtained results were calculated and statistically analysed.

RESULTS AND DISCUSSIONS

Cover the ground with polyethylene mulch determined soil heating, kept soil moisture, and contributed to the increase of plants height with 6 cm. Protecting plants with polyethylene tunnel has accelerated the growth, the plants register 24.3 cm, with 12.1 cm more than in the unprotected plants variant. Plants raised under protection of Agryl measured 24.3 cm height, with 14.3 cm more than the unprotected ones. The resulted microclimate by protecting plants of eggplant has influenced the growth dynamic of plants. At removal time of protection system the plants height was comprised between 10.0 - 29.2 cm (Table 1). The porous nature of Agryl allows the penetration of air inside and create a favourable microclimate for the eggplants. Also, by adding polyethylene mulch plants growth is favoured too. Plants with mulch and tunnel of polyethylene had the height of 25.9 cm, and plants protected with mulch and Agryl recorded the largest increase (29.2 cm).

Table 1. The plant height of eggplant at the protection system removal

Variant	Plants height (cm)	Plants height (%)	Difference (cm)	Significance
Unprotected crops	10.0	100	Mt.	
Soil mulching with polyethylene	16.0	160	+6.0	*
Protected plants with polyethylene tunnel	22.1	221	+12.1	***
Polyethylene tunnel and polyethylene mulch	25.9	259	+15.9	***
Protected plants with Agryl	24.3	243	+14.3	***
Protect with Agryl and polyethylene mulch	29.2	292	+19.2	***

LSD 5% = 5.37 cm
LSD 1% = 7.63 cm
LSD 0.1% = 11.06 cm

The protection of plants has accelerated the growth development and advancing the eggplant production. The first harvest was performed at different data (Table 2). By 15th of June, it have been harvested eggplants only in protective conditions (polyethylene mulch and Agryl). The average production obtained up to this time was of 1 t/ha. During the period 16-30 June, the culture protected with mulch and Agryl has been harvested and it was obtained a production of 5.1 t/ha. Only Agryl protection conduct to an harvested yield of 3.5 t/ha, and for the protected culture with polyethylene tunnel and mulch it has been harvested 1.9 t/ha. The protected culture only with polyethylene tunnel and only with polyethylene mulch the harvest recorded was of 2 t/ha.

First harvest for the unprotected crop have been done during the 16-30 June period, because of the low temperatures which determined extending vegetation period and a delay in obtaining the production. Although the mulch protects only the root of the plant, soil

mulching with polyethylene contributed to both yields and precocity increases at eggplant because the mulch heats the ground well, it keeps the moisture in the soil, and minerals substances are not lost through leaching.

Table 2. Dynamics of eggplant yield depending on the method of protection

Variant	The yield of eggplant (t/ha) obtained in the period:							
	Up to 15 of June	16-30 June	1-15 July	16-31 July	1-15 August	16-31 August	1-15 September	16-30 September
V1	-	-	9.0	15.7	11.8	7.2	3.2	1.5
V2	-	2.2	9.5	18.1	10.9	7.4	2.9	1.4
V3	-	2.2	8.7	16.5	11.8	11.1	2.9	1.5
V4	-	3.0	10.0	17.0	14.4	8.6	3.2	1.8
V5	-	3.5	11.6	15.3	12.2	8.5	3.8	1.7
V6	1.0	5.1	12.3	18.2	12.2	9.1	2.8	1.1

It is known that polyethylene let the solar radiation to penetrate easily causing the increase of temperature inside. In the days with high solar radiation temperature inside the shelters may reach high values against the requirements of the plants. Very high temperatures increases the transpiration process and reduced the accumulation of carbohydrates in plant due to a respiration intensification process. This explains the delay of fruits harvested at protected eggplants with polyethylene tunnels. In order to the maintain the high production, the Agryl was kept also in the 1-15 July period. The yields reached to 11.6 t/ha in the variant protected with Agryl and 12.3 t/ha in the variant protected with Agryl and mulched with polyethylene. In the other variants yields varied between 8.7-10 t/ha. During 16-31 of July, the obtained yields varied between 15.3-18.2 t/ha. Up to the end of vegetation period the harvests of eggplants have dropped gradually and the differences were small between variants. Total yield of eggplant was influenced by the method of protection (Table 3).

Table 3. The yield of eggplant depending on the method of protection

Variant	Yield		Difference (t/ha)	Significance
	t/ha	%		
Unprotected crops – control	48.4	100	Mt.	
Soil mulching with polyethylene	52.4	108	+4.0	
Protected plants with polyethylene tunnel	54.7	113	+6.3	*
Polyethylene tunnel and polyethylene mulch	58.0	120	+9.6	**
Protected plants with Agryl	56.6	117	+8.2	*
Protect with Agryl and polyethylene mulch	61.8	128	+13.6	***

LSD 5% = 5.50 t/ha
LSD 1% = 7.82 t/ha
LSD 0.1% = 11.33 t/ha

The smallest eggplant yield (48.4 t/ha) was obtained in unprotected variant. Compared to unprotected variant in all other variants yield increases between 2.5-8.5 t/ha were achieved. In the variant with polyethylene mulched soil the yield was of 52.4 t/ha, recording an increase of 4.0 t/ha compared to the control. Protection with polyethylene tunnel determined a statistically significant yield increase of 6.3 t/ha compared to the control. Adding polyethylene mulch under the polyethylene tunnel increased the eggplant yield at 58.0 t/ha determining a significantly distinct yield difference of 9.6 t/ha compared to the control. By covering plants with Agryl it was obtained a production of 56.6 t/ha, and by adding mulch under Agryl it has been registered an increase the production with 8.2 t/ha.

The highest eggplant yield was obtained in conditions of protection with Agryl and soil mulching with polyethylene. The yield was of 61.8 t/ha, with a very significant increase of 13.6 t/ha compared to the control.

CONCLUSIONS

Microclimate created by protecting crops ensures an increase in plants' height. The largest increase in plants' height was registered in conditions of protecting with mulch and Agryl and it was about 29.2 cm, with 19.2 cm more than in the unprotected plants.

The protection methods used have helped in creating outstanding microclimate conditions with the influence on both precocity and total yield of eggplants.

By protecting the plants with polyethylene mulch and Agryl the first eggplant fruits can be harvested before 15 of June, with 15-20 days earlier than in unprotected conditions.

The biggest yield (61.8 t/ha) was obtained in conditions of protecting plants with Agryl and mulching soil with polyethylene. Adding mulch to protect plants under polyethylene tunnel or Agryl increases the precocity and total yield of eggplants.

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