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BARTOSZ MARKIEWICZ, ANNA GOLCZ

Department of Horticultural Plants Nutrition
The August Cieszkowski Agricultural University of Poznań

EFFECT OF THERMAL CONDITIONS AND SUBSTRATE TYPE ON THE YIELDING OF EGGPLANT (*SOLANUM MELONGENA* L.)

Summary. In the years 2003-2004, from May to September, vegetation experiments were carried out with eggplant 'Epic F_1' and 'Solara F_1' cultivars in an unheated foil tunnel. Plants were grown in two substrates: raised peat and pine bark with low-moor peat (v:v 1:1). It was found that air temperature during eggplant vegetation and the applied substrate type had a significant effect on total yield and the number of fruits.

Key words: eggplant, type of substrate, total yield, number of fruits, air temperature

Introduction

Eggplant has the greatest thermal and soil requirements among vegetables from *Solanaceae* family (SCHLAGHECKEN 1975). The optimum eggplant growth temperature is 18-30°C (DOBRZAŃSKA 1987, GAJEWSKI and GAJC-WOLSKA 1998). During cultivation, the temperature should be maintained during day time at the level of 20-25°C, and the night at 17-20°C (ULIŃSKI and GLAPŚ 1988) and can not be lower than 16°C (SIWEK 2004). CEBULA (1993) recommends 22-30°C as the optimum temperatures for eggplant growing. In temperature below 15°C, plant growth is impeded and flowers and fruits buds fall down (DOBRZAŃSKA 1987, ULIŃSKI and GLAPŚ 1988, CEBULA 1993). Optimum substrate temperature should be higher than 20°C, because a lower one in the range from 17 to 19°C causes a rapid lowering of the growth (RYLSKI et AL. 1976), while at substrate temperature of 13°C, the uptake of water and nutritive components decreases (CORNILLON 1984). In studies on the cultivation of eggplant under covers, there dominate organic substrates and particularly peat substrate (BUCZKOWSKA and KOWALSKA 2000, CEBULA 1996, CEBULA and AMBROSZCZYK 1999). Eggplant can be

also grown in raised peat substrates and pine bark mixed with low-moor peat (GAJEWSKI and GAJC-WOLSKA 1998).

The objective of our work was the determination of the effect of air temperature and substrate type on the yielding of eggplant grown in organic substrates.

Material and methods

Vegetation experiment with eggplant growing in an unheated foil tunnel was carried out on substrates in the years 2003-2004 from May to September in the Marcelin Experimental Station belonging to The August Cieszkowski Agricultural University of Poznań. Two cultivars of eggplant: 'Epic F_1' and 'Solara F_1' were applied. Plants were grown in rings of 6 dm^3 volume, in two types of substrates: raised peat and pine bark with low-moor peat (v:v 1:1).

During vegetation, cultivation treatments and plant protection treatments against pests were applied. Top dressing was used maintaining the proportion of N:P:K 1:0.9:1.7 on the basis of soil analysis carried out by the universal method of NOWOSIELSKI (1988).

Fruit harvest was carried out several times in the phase of harvest maturity and the total yield and the number of fruits were determined.

On the basis of the data obtained from the Meteorological Station Poznań Ławica data referring to the temperature during vegetation experiments were recorded (KĘDZIORA 1995).

Results and discussion

There exists a significant effect of temperature on the yielding of eggplant. This fact has been manifested by the results obtained in the particular years of studies. A higher total yield and fruit number were obtained in 2003. This tendency referred to both studied cultivars and to the substrates applied in the experiment.

In 2004, the mean day-and-night temperature in the vegetation period was 17.9°C and it was lower by about 2°C in comparison with the year 2003 (19.6°C) (Fig. 1). In that year, the obtained yielding parameters were lower which finds were confirmed in the results of DOBRZAŃSKA (1986), who announced in her recommendations that eggplant requires in the vegetation period a mean day-and-night temperature of above 18°C.

The mean total yield in 2004 (3.93 kg/m^2) was lower by about 36% (Table 1), and the mean number of fruits (11.68 pcs per 1 m^2) was lower by about 24% (Table 2) in comparison with the year 2003 (6.17 kg/m^2 and 15.32 pcs per 1 m^2). The obtained results differed significantly.

High requirements of eggplant in reference to temperature find a confirmation in the studies by KOWALSKA and BUCZKOWSKA (2003). These authors obtained significant differences between the particular years of studies (1998-2000) in the commercial yield of fruits during the cultivation of eggplant in an unheated foil tunnel.

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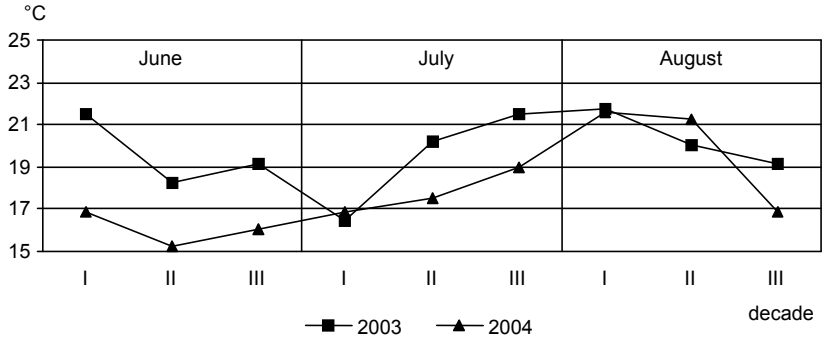

Fig. 1. Mean day and night temperatures during eggplant vegetation in the years 2003-2004
Rys. 1. Średnie temperatury dobowe podczas wegetacji oberżyny w latach 2003--2004

Table 1. Total yield of eggplant fruits in the years 2003-2004 (kg/m^2)
Tabela 1. Plon ogólny owoców oberżyny w latach 2003-2004 (kg/m^2)

Substrate (A)	Year (B)	Cultivar (C)		Mean (A × B)	Mean (A)
		'Epic F_1'	'Solara F_1'		
Raised peat	2003	6.35 d	7.92 e	7.14 d	5.87 b
	2004	3.85 b	5.35 c	4.60 b	
	Mean (A × C)	5.10 c	6.63 d		
Pine bark with low-moor peat	2003	5.29 c	5.14 c	5.21 c	4.24 a
	2004	2.60 a	3.93 b	3.26 a	
	Mean (A × C)	3.94 a	4.53 b		
Mean (C)		4.52 a	5.58 b		
Mean (B × C)		5.82 c	6.53 d		
		3.22 a	4.64 b		
Mean (B)		6.17 b			
		3.93 a			

Means marked by the same letters do not differ significantly at the level of $\alpha = 0.05$.

The total yield of fruits in case of plants grown in raised peat was 3.85 to 7.92 kg/m^2, while plants grown in a mixture of pine bark with low-moor peat brought a smaller total yield amounting from 2.60 to 5.29 kg/m^2. The range of the obtained yield was slightly wider than in that obtained by CEBULA (1993) who reported that in his eggplant growning under cover, he obtained from 5 to 7 kg/m^2. Substrate type applied in the cultivation had a significant effect on the number of fruits which in case of plants grown in raised

Table 2. Number of eggplant fruits per 1 m^2 in the years 2003-2004
Tabela 2. Liczba owoców oberżyny na 1 m^2 w latach 2003-2004

Substrate (A)	Year (B)	Cultivar (C)		Mean (A × B)	Mean (A)
		'Epic F_1'	'Solara F_1'		
Raised peat	2003	13.39 cd	20.98 f	17.19 c	15.34 b
	2004	9.61 b	17.37 e	13.49 b	
	Mean (A × C)	11.50 b	19.17 d		
Pine bark with low-moor peat	2003	12.92 cd	13.98 d	13.45 b	11.66 a
	2004	7.06 a	12.67c	9.86 a	
	Mean (A × C)	9.99 a	13.32 c		
Mean (C)		10.75 a	16.25 b		
Mean (B × C)		13.16 b	17.48 d		
		8.34 a	15.02 c		
Mean (B)		15.32 b			
		11.68 a			

Means marked by the same letters do not differ significantly at the level of $\alpha = 0.05$.

peat was from 9.61 to 20.98 pcs per 1 m^2, and in plants grown in a mixture pine bark with low-moor peat, the obtained results was from 7.06 to 13.98 pcs per 1 m^2. Fruits of the assessed cultivars differed regarding the yield and the number of fruits. Independent of the substrate type, a significantly higher total yield of fruits and fruit number was obtained from the cultivar 'Solara F_1' in comparison with cultivar 'Epic F_1'.

Conclusions

1. Air temperature during the vegetation of eggplant had a significant effect on the total yield and the number of fruits.
2. Type of the substrate used for eggplant cultivation had a significant effect on plant yielding. The highest total yield and the total number of fruits was obtained when plants were grown in raised peat.
3. 'Solara F_1' was distinguished by a higher total yield and fruit number in comparison with 'Epic F_1' cultivar.

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WPŁYW WARUNKÓW TERMICZNYCH ORAZ RODZAJU PODŁOŻA NA PLONOWANIE OBERŻYNY (*SOLANUM MELONGENA* L.)

Streszczenie. W latach 2003-2004 od maja do września przeprowadzono doświadczenie wegetacyjne z uprawą oberżyny odmian 'Epic F_1' i 'Solara F_1' w nieogrzewanym tunelu foliowym. Rośliny uprawiano w dwóch podłożach: substracie torfowym oraz mieszaninie kory sosnowej i torfu niskiego (v:v 1:1). Wykazano, że temperatura powietrza w czasie wegetacji oberżyny oraz rodzaj zastosowanego podłoża miały istotny wpływ na plon ogólny oraz liczbę owoców.

Słowa kluczowe: oberżyna, rodzaj podłoża, plon ogólny, liczba owoców, temperatura powietrza

Corresponding address – Adres do korespondencji:
Bartosz Markiewicz, Katedra Nawożenia Roślin Ogrodniczych, Akademia Rolnicza im. Augusta Cieszkowskiego, ul. Zgorzelecka 4, 60-198 Poznań, Poland, e-mail: bmar@au.poznan.pl

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