Sweet Potato [*Ipomoea batatas* (L.) Lam] Yield Influenced by Seedlings and Mulching

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Summary

Sweet potato [*Ipomoea batatas* (L.) Lam] needs a yearly minimum of three month with air temperatures above 15° C for its growth and development. For the purpose of achieving the highest possible sweet potato yield during a relatively short vegetation period in continental part of Croatia, a trial with differently produced seedlings and polyethylene (PE) mulch was set up. A trial was set up to study the production of seedlings from dormant sweet potato root sprouts by standard methods, and the most recent method of seedling production in containers, along with testing black PE-film mulched soil, and uncovered soil.

The method of seedlings production had significant effect on the yield. Higher mass of marketable roots was achieved by growing seedling with a substrate lump about the root, as compared to the seedlings produced by traditional procedure. Compared to the uncovered soil, a significantly higher yield of marketable roots was obtained with black PE-film mulch.

Key words

Ipomoea batatas L, seedlings, PE-film mulch

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Introduction

Sweet potato [*I. batatas* (L.) Lam] is a vegetable species of high energetic value, whose thick tuberous roots are used as food. Their yield is influenced by several factors, such as soil, water, fertilization, heat, etc. One of the major factors for rapid plant formation and early formation of its thick roots is the method of propagation. Sweet potato may be propagated by seed, vegetative cuttings, and tissue culture (Shultheis et al., 1994). Commercial production most commonly involves planting seedlings grown from dormant root sprouts or planting top cuttings (Lewett, 1993). Due to the relatively short period when production in the open field is possible in the continental part of Croatia, seedlings with a root mass as large as possible should be produced in a short time. Aimed at improving the growing technology, a trial was set up to study the production of seedlings from dormant sweet potato root sprouts by the standard method (Granberry and McLaurin, 1990) and by the more recent method of seedling production in containers (Ching, 2000), along with testing the effect of black polyethylene (PE) film mulch.

Material and methods

The trial was set up in 2003 at the experimental field of the Vegetable Crops Department, Faculty of Agriculture, in Zagreb. The two-factor trial was laid out according to the randomized block scheme method with four replications. The factor «seedlings» was split in two levels: seedlings obtained directly from dormant sweet potato root sprouts (S) and seedlings obtained by transplanting young root slips into the container (K). The factor «mulch» had also two levels: black PE-film mulched soil (PE) and uncovered soil (T). Seedling production started in March, when roots weighing 200-250 g were placed into the greenhouse at the temperature of 25-28 °C to activate the dormant sprouts. Roots were partially covered with eco-Brill substrate and moistened when required. Young slips started to emerge some 20 days after the beginning of substrate moistening. At the stage when the first two leaves developed, the foreseen number of slips were separated from the root and transplanted into polystyrene containers with 40 reverse-pyramid shaped pots of 100 ml, filled with eco-Brill substrate. About thirty days after planting, seedlings with a lump of substrate were ready for planting, and so were the seedlings obtained directly from dormant sprouts. Seedlings were planted in the open field on 20 May 2003, at a spacing of 1.5 m x 0.3 m (2.2 p/m^2), 25 plants per plot. The crop was grown without irrigation (except immediately upon planting), fertilization and plant protection agents. Harvesting was done on 16 September, with recording the number and mass of thick tuberous roots (roots weighing less than 100 g were considered unmarketable). The results were treated by the method of analysis of variance (ANOVA) and means were compared using "t"- test.

Results and discussion

The method of seedling production had a significant effect on the yield of marketable sweet potato roots. It can be seen from Table 1 that a significantly higher yield of marketable roots (2.183 kg m^{-2}) was achieved by growing seedlings with a substrate lump about the root (K), as compared to the seedlings produced by the traditional procedure (S, 1.505 kg m^{-2}). This was the result of the larger root mass, which enabled unobstructed and faster plant growth and development from the very beginning of open-field production. Compared to uncovered soil, a significantly higher yield of marketable roots was obtained with black PE film mulch (1.155 vs. 2.533 kg m^{-2}). This is in agreement with the results reported by Hochmut and Howell (1983), Novak et al. (2003), and Orzolek and Lamont (2002), who mentioned that higher yields were obtained on mulched soil because of higher temperatures in the root zone at the initial development stage. The highest yield of marketable roots (2.885 kg m^{-2}) was achieved

Table 1. Yield of marketable sweet potato roots, kg m^{-2}

Combination of factors	T	PE	Average factor seedlings
S	0.829	2.180	1.505
K	1.481	2.885	2.183*
Average factor mulch	1.155	2.533**	

GD mulch = **, GD seedlings = *, GD interactions = n.s.

Table 2. Number of marketable roots per plant

Combination of factors	T	PE	Average factor seedlings
S	1.5	2.4	1.9
K	2.4	3.6	3.0*
Average factor mulch	1.9	3.0**	

GD mulch = **, GD seedlings = *, GD interactions = n.s.

Table 3. Number of unmarketable roots per plant

Combination of factors	T	PE	Average factor seedlings
S	2.2	1.4	1.8
K	2.2	1.8	2.0
Average factor mulch	2.2	1.6	

GD mulch = n.s., GD seedling = n. s.

on plots of seedlings with substrate lumps mulched with black PE-film; however, this interaction was not statistically verified. The studied factors had comparable effects on the mass of marketable roots per plant as well as on the yield of marketable roots per unit area.

A significantly larger number of marketable roots per plant was also achieved by growing seedlings with a substrate lump, and with soil mulching with PE-film; however, their interaction (3.6 roots/plant) was not statistically significant.

A statistically comparable number of unmarketable roots per plant was obtained by both methods of seedling production, and irrespective of mulch application (Table 3), which means that this trait was not significantly affected by the factors studied.

Conclusions

The method of sweet potato seedling production has a significant effect on the yield, and on the number of thick tuberous roots per plant. Seedlings with a substrate lump grown in containers gave significantly higher values compared to seedlings produced directly from dormant sprouts. The studied traits were also significantly positively influenced by soil mulching with black PE-film compared to uncovered soil culture.

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