EFFECT OF FERTILIZER RATE ON ROOT SYSTEM DEVELOPMENT OF SWEET PEPPER VARIETIES AND HYBRIDS

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https://doi.org/10.5281/zenodo.10077877

Abstract. The article presents information on the development of the root system when the Marjona variety and the Zombello F_1 hybrid of sweet pepper are grown in the conditions of film greenhouses in the meadow gray soils of Samarkand region, Samarkand district, with different fertilizer rates.

Key words: Meadow gray soil, film greenhouse, sweet pepper Marjona variety, Zombello F_1 hybrid, fertilizer rates, root mass, root size.

Introduction. In Uzbekistan, sweet pepper is grown in film greenhouses in several cycles. In unheated spring greenhouses, it is grown in a spring-summer rotation, in which seedlings are planted in greenhouses in mid-March and completed in July-August. During this cycle, the fastest growing varieties are grown and seedlings that have produced 4-5 true leaves in 55-60 days are planted. In this case, the harvest starts from the middle of May (V.I. Zuyev and others, 2018).

Sweet pepper fruits contain 7-12% dry matter, including 4.1-7.4% sugar (mainly fructose and sucrose) and 1.3-2.6% protein. That is why sweet pepper is a valuable vegetable crop. Its high nutritional value is significant due to the presence of vitamins (A, B_1, B_2, B_3, C, P) and mineral salts useful for human health (calcium, phosphorus, iron and others).

According to the amount of vitamin C (ascorbic acid) contained in its fruits, sweet pepper surpasses all vegetables. Its fruits contain from 50 to 270 mg of vitamin C per 100 g of dry weight at technical maturity, and from 170 to 450 mg at biological maturity. Sweet pepper fruits contain 12.6 mg% of carotene (provitamin A). They accumulate a significant amount of rutin (vitamin P) and group B vitamins (thiomin, riboflavin, folic acid). Sweet pepper fruits are eaten fresh, processed and cooked as a vegetable crop (F.F.Rasulov, 2021).

Our research shows that when applied to sweet pepper crop fertilizer rates $N_{100}P_{70}K_{50}$ (control), $N_{120}P_{84}K_{60}$, $N_{140}P_{98}K_{70}$ and $N_{160}P_{112}K_{80}$ kg/kg, plant productivity is significant. (Kholmuminov Sh.E, Amanturdiyev I.X, 2022).

Materials and methods. Taking into account the above, in the years 2022-2023, in the meadow gray soils of the farm "Halimova Iroda", Samarkand region, Samarkand district, sweet pepper Marjona variety and Zombello F_1 hybrid in different fertilization rates in greenhouse conditions. We conducted a field experiment to study the effect on root mass and volume when grown.

As the research object, meadow gray soils, sweet pepper variety Marjona and Zombello F_1 hybrid, and different rates of mineral fertilizers (NPK) were taken.

Field experiments were conducted under the conditions of a film greenhouse based on the following experimental systems. The experiment was carried out in 4 variants, 4 repetitions, the total area of 112 m^2, 50-55-day-old seedlings of sweet pepper, which produced 4-5 true leaves, were planted on March 1 in a planting scheme of 60x30 cm (Azimov B.J., Azimov B.B, 2002) .

The obtained results and their analysis. When the fertilizer is used in the cultivation of sweet pepper, it first affects the root system of the plant and, through the root, the upper part of the earth. The results of the experiment show that the fertilizer rates have a significant effect on the change in root mass and volume of the Marjona variety and the Zombello F_1 hybrid of sweet pepper (Table 1-2).

Marjona cultivar and Zombello F_1 hybrids of sweet pepper were studied under different fertilizer rates under film greenhouse conditions. root mass in the layer was 19.1-19.6 grams. It was found that the fertilizer rate was 26.3-27.0 grams in the variant with an increase of $N_{160}P_{112}K_{80}$ kg/kg. A relatively high root mass of 24.7-25.1 grams, i.e., was observed in the version where the mineral fertilizer norm $N_{140}P_{98}K_{70}$ kg/ha was used.

Table 1

Formation of root mass when sweet pepper cultivars and hybrids are grown in film greenhouses at different rates of fertilizer (2022-2023 years)

T/r	Fertilizer rate	In the soil layer of 0-20 cm of one plant root mass, gr					
		Measurement periods, after planting					
		22-23.04 (15-16 days)	7-8.05 (30-31 days)	22-23.05 (45-46 days)	6-7.06 (60-61 days)	21-22.04 (75-76 days)	6-7.07 (90-91 days)
Marjona variety							
1.	N_{100} P_{70} K_{50} (st)	7,5	8,8	10,8	14,0	17,4	19,1
2.	N_{120} P_{84} K_{60}	7,5	8,9	10,9	15,4	20,1	22,6

3.	N_{140} P_{98} K_{70}	7,6	9,1	11,4	16,9	22,2	24,7
4.	N_{160} P_{112} K_{80}	7,7	9,3	11,8	19,0	23,9	26,3
Zombello F_1							
1.	N_{100} P_{70} K_{50} (st)	7,5	8,9	11,0	14,3	17,9	19,6
2.	N_{120} P_{84} K_{60}	7,7	9,1	11,3	15,9	20,5	23,2
3.	N_{140} P_{98} K_{70}	7,7	9,2	11,8	17,3	22,7	25,1
4.	N_{160} P_{112} K_{80}	7,8	9,4	12,3	19,6	24,4	27,0

The root volume of one bush of sweet pepper varied in the range of 20.1-28.2 cm^3 at different rates of fertilizers of Marjona variety and Zombello F_1 hybrids studied in the experiment. The highest root volume was determined in both studied cultivars and hybrids (27.4-28.2 cm^3) in the variant with $N_{160}P_{112}K_{80}$ kg/ha fertilizer. In our experiments, the smallest root size was observed in the studied Marjona variety and Zombello F1 hybrids, in the control variant, in the variant with $N_{100}P_{70}K_{50}$ kg/ha fertilizer.

It was found that the development of root mass and volume of sweet pepper varieties and hybrids was observed in 61-60 and 75-76 days, and it was relatively weakened in the following periods. Sweet pepper Zombello F_1 hybrid $N_{160}P_{112}K_{80}$ kg/ha, the root mass of one plant was 7.8 grams on 15-16 days after planting in the 0-20 cm soil layer, 30-31 days – 1.6; 45-46 days – 4.5; 60-61 days – 11.8; It was found that on the 75th-76th day - 16.6 and on the 90th-91st day - 19.2 grams. The volume of the root is 8.9 cm^3, 2.4; 4.6; 12.0; It was found to be higher by 16.7 and 19.3 cm^3.

It was found out from the conducted research that 80-85 percent of the sweet pepper root is formed in the 0-20 cm layer of the soil. The remaining 15-20 percent is located below the 20 cm layer of the soil.

Table-2

Changes in root volume when sweet pepper cultivars and hybrids are grown in greenhouses at different rates of fertilizer (2022-2023 years)

T/r	Fertilizer rate	In the soil layer of 0-20 cm of one plant root volume, cm^3					
		Measurement periods, after planting					
		22-23.04 (15-16 days)	7-8.05 (30-31 days)	22-23.05 (45-46 days)	6-7.06 (60-61 days)	21-22.04 (75-76 days)	6-7.07 (90-91 days)
Marjona variety							
1.	N_{100} P_{70} K_{50} (st)	8,4	10,5	11,9	15,3	18,2	20,1
2.	N_{120} P_{84} K_{60}	8,5	10,7	11,9	16,6	21,3	23,5
3.	N_{140} P_{98} K_{70}	8,6	10,8	12,6	18,0	23,4	25,5

4.	N_{160} P_{112} K_{80}	8,7	11,0	12,9	20,2	25,1	27,4
Zombello F_1							
1.	N_{100} P_{70} K_{50} (st)	8,5	10,7	12,8	16,0	19,1	20,9
2.	N_{120} P_{84} K_{60}	8,6	11,0	12,2	17,1	21,7	24,1
3.	N_{140} P_{98} K_{70}	8,7	11,2	13,0	18,4	24,0	26,1
4.	N_{160} P_{112} K_{80}	8,9	11,3	13,5	20,9	25,6	28,2

Conclusions. The development of the root system of sweet pepper studied in the conditions of a film greenhouse on the meadow gray soils of the Samarkand region, that is, its mass and size depends on the fertilizer standards, and the highest root mass is 26.3- 27.0 grams and the root volume was 27.4-28.2 cm^3, located in the 0-20 cm layer of the soil, when $N_{160}P_{112}K_{80}$ kg/ha fertilizer standards were used.

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