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Method of Growing Tomato on Small-Volume Soils in Greenhouses in Syrdarya Region

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Abstract: One of the main achievements in growing tomatoes in film greenhouses is low equipment costs, a reduction in water consumption by 50-60%, a reduction in fertilizer consumption by 40-45%, a reduction in labor costs by 40-50%, a significant reduction in pests, and weed control. The yield of greenhouse tomatoes increases by 20-25%.

Introduction

Winter glazed greenhouses differ significantly in material and metal consumption. The reserves for a significant reduction in these parameters due to the use of factory-made lightweight steel profiles are almost exhausted. All this prompted us to look for new ways to reduce metal consumption by changing the elements of systems and designs of greenhouses, in particular their technological equipment.[7, 8, 10]

This article presents the results of a study conducted in film greenhouses with drip irrigation on low-volume soils.

One of the important factors in increasing crop yields under irrigation conditions is the method of supplying water and nutrient solution to plants in the right volumes and in the optimal time.

Violation of the water regime negates the effectiveness of all other agrotechnical measures, especially for protected ground structures. Currently, it has been established that the most rational irrigation method is drip irrigation, which has a number of advantages over the conventional (furrow) irrigation method.

1. The amount of irrigation water is reduced.
2. The amount of applied mineral fertilizers is reduced by 30-40%, and labor costs – by 50%
3. The assimilation of mineral fertilizers by plants increases from 20 to 80%, so they are introduced in dissolved form.

2.Methodology and materials

The research has been carried out according to the VIR vegetable growing technique. ("Temporary guidelines for programming cucumber and tomato harvest in winter greenhouses of the Leningrad region."L.,1980.). [2,9].

Film greenhouses, tomato seeds, seedlings of various tomato varieties, mineral soluble fertilizers, hoses for drip irrigation.

3.Results

In film greenhouses on low-volume soils (coconut shavings substrate) in the winter-spring turnover of 2020-2022, tomatoes of foreign and local selection were grown in the amount of 35 varietals, the most common hybrid of Dutch breeding F_1 Videtta and the local hybrid F_1 Saykhun from small-fruited cherry Marvarid were taken for control among large-fruited ones. Tomato seeds were sown in the first decade of December in plastic cassettes, and seedlings were planted in the third half of January with 45-day seedlings [1,6].

Fertilizing by the drip irrigation system began to be carried out 10 days after disembarkation with an interval of 3-4 days, also according to the recommendations of the laboratory. Agrochemical analysis was carried out every 10 days.

The humidity regime before the beginning of fruit formation was maintained at 70-75% of HL, then increased to 80-85% of HL, in connection with which calculations of doses and exposure of irrigation water supply were carried out. [3,4].

1. At the beginning of the growing season, tomatoes

   N:P:K 1:0,6:1,3

   1,7-2,0 g/l

2. In the phase of flowering and production

   N:P:K 1:0,8:1,5

   2,5-2,7 g/l

3. In the phase of fruiting, ripening

   N:P:K 1:1:1,8

   3-3,5 g/l

The exposure of the nutrient solution supply was timed to the temperature conditions, the degree of illumination and depending on the age of the plants.

The main condition for the normal growth and development of vegetable crops, their high productivity is the regular supply of plants with water and nutrients.

Nutrient solutions in their composition should contain all the necessary elements in such quantities and ratios that would ensure the normal growth and development of plants.

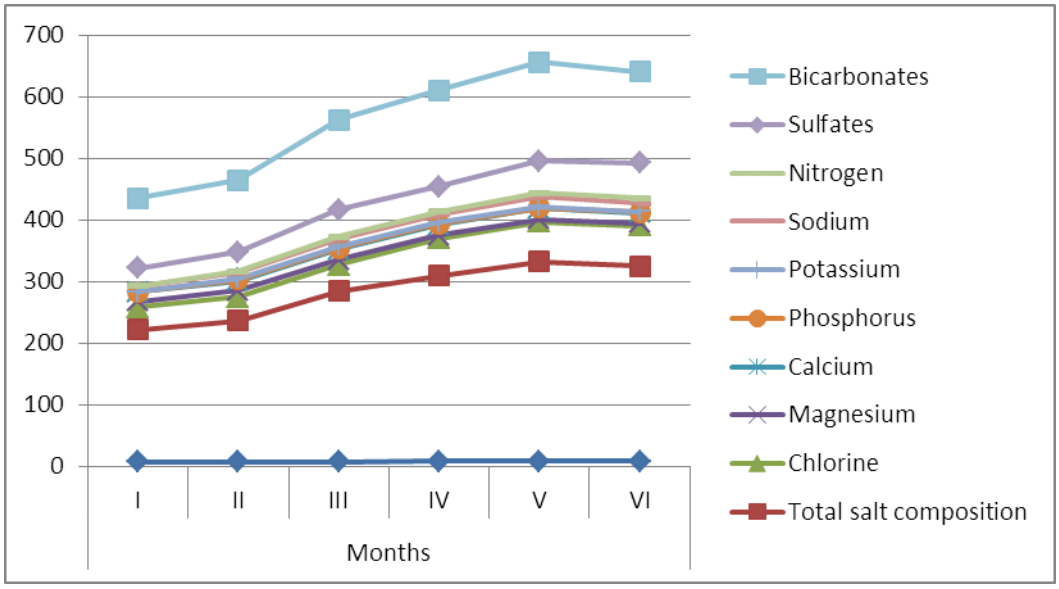
The concentration of nutrients and their ratio in the nutrient solution depend on the culture and the phase of growth and development, temperature and illumination. The nutritional needs of plants were determined according to the agrochemical analysis of the root habitat, irrigation water and nutrient solution.

In addition to root nutrition, foliar top dressing should be carried out, they are especially effective in poor illumination of greenhouses, cloudy weather, low temperature of substrates and high salt content in them.

During the growing season, we carried out 3 foliar fertilizing, the consumption of the solution per treatment is 2.0-2.5 thousand liters / ha.

The water used for irrigation and preparation of nutrient solution contains various natural salts. (Diagram 1)

Diagram 1 Salt composition of irrigation water in the greenhouse farm “Bakhmal Lider - Chorvador”, mg/l

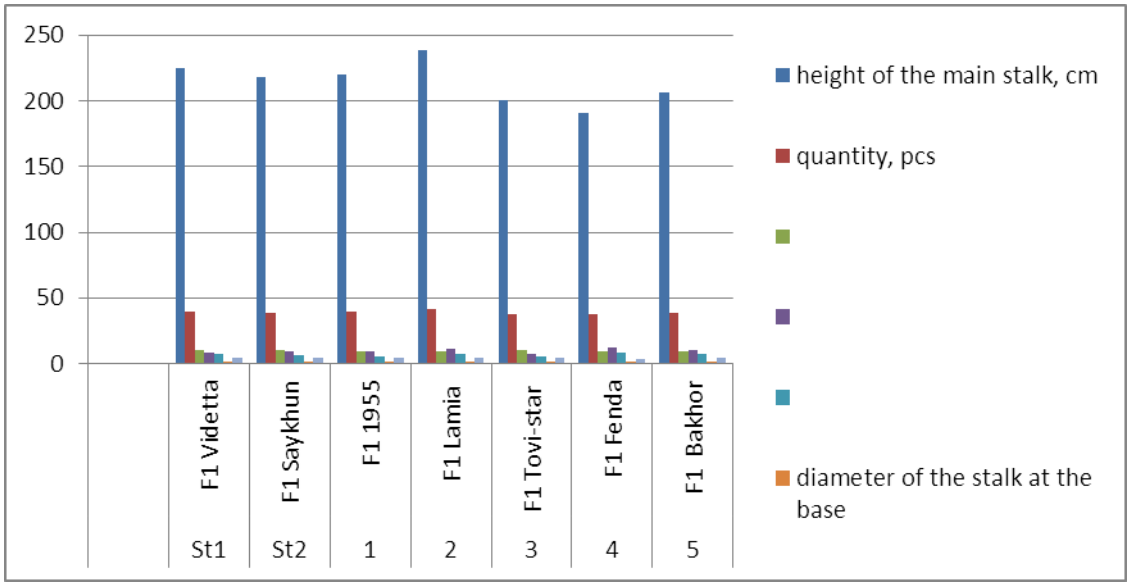


Basically, irrigation water in Uzbekistan has a slightly alkaline reaction (pH 7.4-8.5) due to the content of carbonates in it.

The chemical composition of irrigation water, as can be seen from Table 1. undergoes changes mainly by season, therefore it is recommended to analyze water at least 4 times a year for all the above indicators.

One of the indicators characterizing the prospects of the variety (hybrid) is the growth of vegetative organs of plants and, first of all, the height of the main stem, the number of leaves, the number of brushes, flowers, fruits.

These data indicate that, other things being equal, on the 120th day of mass germination, the following cultivars had the highest plant height (histogram 1)



Histogram 1 Biometric measurements of the most promising tomato varieties on the 120th day from mass germination. (2020-2022)

Thus, it can be concluded that strict control over nutrition in the winter-spring turnover allowed to obtain a tomato harvest from 12.7 to 19.3 kg / sq.m. Table 1 shows the dynamics of the tomato harvest by month in the most distinguished 5 varieties in terms of yield and disease resistance in comparison with St1 F1 Videtta and St2 F1 Saykhun. Planting scheme $\frac{120+80}{2}$ x 40 см formation in one stalk, with a garter to the trellis.

Table 1 Dynamics of the harvest of the selected tomato varieties in 2020-2022

№	Varietals	Harvest kg/sq.m		Months				
		common	commodity	April	May		June	
				15-30	1-15	16-31	1-15	16-30
St_1	F_1 Videtta	17,6	16,75	1,15	2,3	3,5	5,3	4,5
St_2	F_1 Saykhun	17,5	17,1	0,9	2,05	4,8	6	3,35
1	F_1 Bakhor	18,2	17,65	1,05	2,1	4,4	6,2	3,9
2	F_1 1955	15,8	15,2	0,75	1,85	3,5	4,9	4,2
3	F_1 Lamia	18,8	18,2	1,1	2,3	4,6	5,9	4,3
4	F_1 Tovi-star	17,1	16,5	1	2,5	4,35	4,5	4,15
5	F_1 Fenda	19,3	18,4	1,3	3,2	4,75	5,5	3,65

Table 2 shows the yield and quality of tomato fruits by biochemical composition – for the content of dry matter, sugars, ascorbic acid. On average, all the selected varietals had large fruits from 125-188 grams.

Table 2 The yield and quality of tomato fruits in the selected tomato varieties in winter-spring turnover in 2020-2022

	Varietals	Commodity harvest kg/sq.m	К St_1 и St_2 %	average weight of the fruit, g	Dry substance%	Total sugar,%	Ascorbic acid mg /%	Nitrogen nitrate mg/kg of raw fruit weight
St_1	F_1 Videtta	16,75	100	135	5,3	3,16	23,2	84,5
St_2	F_1 Saykhun	17,1	100	150	5,4	3,95	24,1	79,8
1	F_1 Bakhor	17,65	105-103	132	5,4	3,72	23,6	80,1
2	F_1 1955	15,2	91-98	185	5,2	3,6	24,4	79,3
3	F_1 Lamia	18,2	109-106	150	5,6	3,6	23	74,4
4	F_1 Tovi-star	16,5	99-96	125	5,5	3,55	22,2	79,1
5	F_1 Fenda	18,4	109-108	188	5,4	3,44	23,4	75,8

According to the biochemical composition of tomato fruits, F_1 Saykhun was distinguished, the dry matter content was 5.4%, sugar 3.95%, ascorbic acid 24.1 mg/% and the accumulation of nitrate nitrogen was noted at the level of 79.8 mg/kg of the raw weight of the fruit. The smallest amount of total sugar is 3.16%, ascorbic acid is 13 mg/% and the greatest accumulation of nitrate nitrogen is 34.5 mg/kg in St_1 F_1 Videtta.

In general, the content of nitrate nitrogen in all studied tomato varieties was noted at the level of 79.8-84.5 mg/kg of products, with a maximum permissible concentration of NO_3 in greenhouse tomatoes of 150 mg/kg[5].

4.Conclusion

Thus, as a result of our research, the following conclusions can be drawn.

1. Compliance with these parameters has significantly increased the yield and quality of tomatoes
2. The amount of irrigation water is reduced by 50-60 %
3. The amount of applied mineral fertilizers is reduced by 30-40%, labor costs by 50%, while the assimilation of mineral fertilizers increases from 30% to 80%, since they are introduced in dissolved form.

4. The structure and fertility of the soil is preserved, its water-air regime of the root layer is not disturbed.
5. One of the advantages of growing tomatoes in film greenhouses is the technology of using 2-layer film coatings, which allows you to keep the heat inside the greenhouses due to daytime solar heat, plus emergency (heater) heating during cold nights in winter-spring turnover.
6. Optimal microclimate in greenhouses is maintained
7. The water temperature in the root layer is maintained at a constant temperature.
8. The incidence of vegetable crops is reduced to a minimum.
9. The fight against pests and diseases, weeds is facilitated.

References

1. Bakuras N.S., Lutsenkova K.K. “Teplichnoe ovoshchevodstvo Uzbekistana” (“Greenhouse vegetable growing of Uzbekistan”). T.1985.
2. Vendilo G., Gluntsov N. “Vremennye metodicheskie rekomendatsii po programmirovaniyu urojaya ogurtsa i tomata v zimnix teplitsax Leningradskoy oblasti” (“Temporary guidelines for programming cucumber and tomato harvest in winter greenhouses of the Leningrad region.”) L., 1980
3. Luchinina Ye.G., Lyan Ye.E “Perspektivnost vyrashchivaniya tomata na maloobyomnyx gruntax pri kapelnom oroshenii” (“The prospects of growing tomatoes on low-volume soils with drip irrigation”) Gene pool of agricultural crops. T. 2010.
4. Lyan E.E. et al. “Recommendations for the care of crops in the greenhouse”, 2018.
5. Nuritdinov A.I., “Kachestvo ovoshchey i intensifikatsiya selskoxozyaystvennogo proizvodstva” (“Quality of vegetables and intensification of agricultural production”) T.1988
6. Kim D.V. “Annual Report”, 2022.
7. Shibzukhov Z.S., Kurzhieva F.M. Growth and development of tomato when grown using hydroponics // International scientific and practical Internet conference dedicated to the 25th anniversary of the Caspian Scientific Research Institute of Arid Agriculture. 2016. pp. 2130-2132
8. Sokolova E.V., Korobeynikova O.V., Merzlyakova V.M. Features of growth and yield of tomato hybrids in the Udmurt Republic / Bulletin of the Izhevsk State Agricultural Academy. 2022. No. 1 (69). pp. 21-25.
9. Titova L.V., Inozemtseva M.V. Phenology of development of indeterminate varieties and hybrids of tomato when grown in winter greenhouses / Science and Education. 2022. T. 5. No. 1
10. Tsygikalo S.S. On the assessment of new tomato hybrids for extended culture of winter greenhouses // in the collection: VEGETABLE GROWSING - FROM THEORY TO PRACTICE. Collection of articles based on materials from the regional scientific and practical conference of young scientists. Rep. per issue R.A. Gish. 2018. pp. 49-53