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RESEARCH REGARDING THE INFLUENCE OF THE HYBRID AND THE NUMBER OF STEMS ON THE FIELD PRODUCTION OF TOMATO PLANTS

Gheorghiţa HOZA

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Bld., District 1, 011464, Bucharest, Romania

Corresponding author email: hozagh@yahoo.com

Abstract

The tomato crop started near Bucharest city, in a favourable area for vegetable growing, using 3 tomato crossbreeds, pruned with one and two stems in order to study their behaviour from the vegetative and fruit forming point of view. The biological material used for this particular experiment was 3 indeterminate, disease-resistant tomato hybrids, with fruits of roughly 150g, round and regular. The plants were pruned with two stems, the first one being the main and the second being formed from the first shoot located at the base of the plant. The crop was propped on trellis, with 5 clusters and mulched with agro textile material; the planting scheme was 100cm/40cm for variants pruned with two stems and 80cm/40 for variants pruned with one stem. The results showed that all studied hybrids had a satisfactory vegetative growth, proved by the height of the plants and their leaves, for both the main and the second stem. In what regards the formation of fruits, the plants with two stems provided a larger quantity. Thus, the number of fruits per plant was almost double for variants with two stems, the average fruit weight registered similar values for both treatments, but a considerably higher fruits yield was noted for Veneţia F1and Rhuen F1 hybrids.

Key words: *tomato, hybrids, two stems, yield.*

INTRODUCTION

Tomato cropping is possible in various systems due to the satisfactory results obtained when technological optimization is used. Tomato pruning with multiple stems is one of these improvements, which leads to cost reduction for the planting material, hence 20% less plants per hectare in comparison with one stem crops (Hoza, 2011). This pruning system is widely used in a protected environment, in extended cycle as far as our country is concerned, but it can also be practiced in farm field. Usually, tomato plants are pruned with one stem, however they can also be pruned with 2-3 stems for commercial crops and 4 stems for decorative purposes, in which case plants are propped variously. Research regarding the tomato plants cropped at varied densities, namely 60cm/40cm and 60cm/50cm respectively, pruned with 1,2 or 3 stems proved that a higher distance between plants on the row combined with 2 stems pruning, conducted to the highest total and marketable yield (Ara et all., 2007). Other experiments show that plants pruned with 2 stems and 6 fruits per cluster or 2 stems and no fruit pruning gave a significantly higher marketable and total yield; the 3 plants/m^2 density issued in a considerably higher marketable crop in comparison with the 2,5 or 2 plants/m^2 density and the results proved that the tomato yield and the fruit quality can be influenced by the number of stems and the plant density, while fruit pruning proved little effect on the aforementioned features (Maboko et al., 2011). Moreover, pruning tomato plants with 2 stems proves to have a significant positive influence on the crop quality and plant health (Kanyomeka and Shivute, 2005).

MATERIALS AND METHODS

The research was conducted near Bucharest city, in very favourable climatic conditions for tomato crops. The experiment was outlined in two straps, with two exponents (Table 1):
-Exponent A, represented by hybrids, with 3 graduations
-Exponent B, represented by the number of stems, with 2 graduations
The planting was made in simple rows at 80cm/40cm for variants pruned with one stem and a leading density of 3.1 pl/m^2 and

100cm/40cm for variants pruned with two stems and a leading density of 2,5 pl/m^2, with transplanted seedling. The crop was subjected to specific maintenance work, the field was mulched with agrotextile material, with 5 clusters and plants were propped by metallic trellis on1,8 m height. At variants pruned with two stems, the second stem was formed from the first shoot located at the base of the plant which was V propped on band. During the vegetation period, data was collected regarding the growth of the plants, flower formation, fruit binding, resulted yield and fruit size.

Table 1. The scheme of the experiment

A Exponent	B Exponent	
Veneţia F_1	V_1 (Mt) - Veneţia F1, one stem	V_2 – Veneţia F1, two stems
Fournaise F_1	V_3 – Rhuen F1, one stem	V_4 – Rhuen F1, two stems
Ruen F_1	V_5 – Fournaise F1, one stem	V_6 – Fournaise, F1 two stems

RESULTS AND DISCUSSIONS

Tomato pruning with two stems represents an alternative for growers in what regards the reduction of plants on the cropping field without the fruits yield being affected. From research it is clear that from the vegetative growth point of view, there were no significant differences between the variant pruned with one stem and the other pruned with two stems, as long as the appropriate and regular agro-technological procedures were conducted equally (Table 2 and 3).

Table 2. The height of the main stem

Variant	V_1 (Mt) Veneţia F1 one stem	V_2 Veneţia F1 two stems	V_3 Rhuen F1 one stem	V_4 Rhuen F1 two stems	V_5 Fournaise F1, one stem	V_6 Fournaise F1 two stems
H (cm)	102.5	100.3	95.7	82.8	101.6	81.3

Table 3. The height of the shoot stem

Variant	V_2 Veneţia F1 two stems	V_4 Rhuen F1 two stems	V_6 Fournaise F1 two stems
H (cm)	99.0	93.1	87.7

In what regards the distance between clusters, it was observed that differences of some centimeters between the variant pruned with one stems and the ones pruned with two stems did not affect the fructification process.

The Veneţia F1 hybrid registered the highest regularity, the differences noted being under 1,5 cm (Table 4 and 5).

Table 4. The synthesis of results regarding the average distance between clusters on main

Variant	Average distance between clusters			
	1 - 2	2 - 3	3 - 4	4 - 5
V_1 (Mt) – Veneţia F1 one stem	13.5	13.9	15.2	15.5
V_2 - Veneţia F2 two stems	14.1	13.3	15.1	13.9
V_3 - Rhuen F1 one stem	7.4	9.4	10.4	10.1
V_4 – Rhuen F1 two stems	11.1	13.6	15.1	17.4
V_5 – Fournaise F1 one stem	12.8	12.5	16.6	15.4
V_6 – Fournaise F1 two stems	8.4	11.0	14.2	8.6

Table 5. The synthesis of results regarding the average distance on the second stem

Variant	Average distance between clusters			
	1 - 2	2 - 3	3 - 4	4 - 5
V_2 - Veneţia F1 two stems	14.4	13.5	14.8	13.8
V_4 – Rhuen F1 two stems	11.7	14.0	14.7	16.9
V_6 – Fournaise F1 two stems	9.6	11.4	12.6	9.4

The process of fruit forming was developed in optimal conditions, for both one stem and two stems plants. Thus, it was noted that Veneţia F1 hybrid fructified on clusters similarly for both cases. However, on the second stem, on clusters 1 and 2, the number of fruits was slightly higher probably due to the optimization of environmental conditions. For other hybrids, the differences observed were smaller. The total number of fruits on the main stem was contiguous for studied hybrids, but Veneţia F1 and Rhuen F1 produced 2-3 more fruits when they were pruned with two stems (Table 6). The second stem showed a high regularity of fruits formation on each cluster and the total number of fruits was conformable with the one on the main stem (Table 7).

Table 6. The synthesis of results regarding the average number of fruits formed on the main stem

Variant	Average number of fruits formed on cluster					Total number of fruits
	1	2	3	4	5	
V_1 (Mt) – Veneţia F1 one stem	3.3	3.4	4.8	5.2	5.2	21.9
V_2 - Veneţia F1 two stems	5.3	5.4	4.8	4.8	4.9	25.2
V_3 - Rhuen F1 one stem	4.2	3.6	4.9	4.6	4.5	21.8
V_4 – Rhuen F1 two stems	4.2	3.7	4.7	5.3	5.6	23.5
V_5 – Fournaise F1 one stem	4.7	4.4	4.7	5.1	5.1	24.0
V_6 – Fournaise F1 two stems	4.5	5.0	4.1	5.2	5.0	23.8

Table 7. The synthesis of results regarding the average number of fruits formed on the second stem

Variant	Average number of fruits formed on cluster					Total number of fruits
	1	2	3	4	5	
V_2 - Veneţia F1 two stems	4.9	4.8	4.6	4.4	3.9	22.6
V_4 – Rhuen F1 two stems	3.9	3.6	4.1	4.9	4.7	21.2
V_6 – Fournaise F1 two stems	4.3	4.7	3.8	4.7	4.3	21.8

Integrating the number of fruits formed on stems, it was ascertained that the second stem produced lower figures, namely 2-3 less fruit than the main stem, but overall, the total number of fruits obtained was almost double for variants pruned with two stems.

Table 8. The synthesis of results regarding the average number of fruits formed on plant

Variant	Average number of fruits		Total number of fruits
	Main stem	Second stem	
V_1 (Mt) – Veneţia F1 one stem	21.9	-	21.9
V_2 - Veneţia F1 two stems	25.2	22.6	47.8
V_3 – Rhuen F1 one stem	21.8	-	21,.8
V_4 – Rhuen F1 two stems	23.5	21.2	44.7
V_5 – Fournaise F1 one stem	24.0	-	24.0
V_6 - Fournaise F1 two stems	23.8	21.8	45.6

The number of fruits was compassed between 21,8 and 25,2 on main stem and 21,2 and 22,6 on shoot stem.

In what regards the average weight of fruits, there were no significant differences between fruits obtained on the main stem and the ones from the second stem. However, it was observed that fruits formed on the shoot stem were slightly smaller than the ones from the main stem (Table 9).

Pruning plants with two stems brings a roughly yield doubling on plant level (Table 10). This proves to be a great advantage because considering other features studied, such as the number of fruits and their size, it is very contiguous for both stems. The highest tomato yield was obtained on Veneţia F1 hybrid pruned with two stems, 5,2 kg/pl, followed by Fournaise F1 with 4,9 kg/pl and Rhuen F1 with 4,7 kg/pl.

Table 9. The synthesis of results regarding the average weight of fruits

Variant	Average weight of fruits on main stem (g)	Average weight of fruits on second stem (g)	Average weight of fruits on plant (g)
V_1 (Mt) – Veneţia F1 one stem	113.9	-	113.9
V_2 –Veneţia F1 two stems	109.1	108.4	108.8
V_3 – Rhuen F1 one stem	120.5	-	120.5
V_4 - Rhuen F1 two stems	106.2	103.9	105.0
V_5 – Fournaise F1 one stem	112.4	-	112.4
V_6 -Fournaise F1 two stems	107.7	105.3	106.5

Statistically analysing the fruit quantity on plants pruned with one and two stems, it was ascertained that those pruned with two stems provided a higher yield per plant and per farming area (Table 10).

Table 10. Statistic interpretation of results regarding the influence of the number of stems on tomato yield

Variant	Yield							
	kg/pl	%	Gap	Meaning	kg/m²	%	Gap	Meaning
V_1 (Mt) – Veneţia F1 one stem	2.5	100	-	Mt	7.8	100	-	Mt
V_2 –Veneţia F1 two stems	5.2	208	2.7	xxx	13.0	166.6	5.2	xxx
V_3 – Rhuen F1 one stem	2.6	104	-	NS	8.0	102.6	-	NS
V_4 – Rhuen F1 two stems	4.7	188	2.1	xxx	11.8	151.3	3.8	xxx
V_5 – Fournaise F1 one stem	2.7	108	-	NS	8.3	106.4	-	NS
V_6 - Fournaise two stems	4.9	196	2.2	xxx	12.2	156.4	3.9	xxx

DL 5% = 0,3 kg/pl; DL 1% = 0,44 kg/pl; DL 0,1% = 0,63 kg/pl
DL 5% = 1,18 kg/sqm; DL 1% = 1,69 kg/sqm; DL 0,1% =2,44 kg/sqm

CONCLUSIONS

The research conducted on tomato plants pruned with one and two stems can be followed by the next conclusions:

The number of seedlings used to start the crop was reduced with 20% by increasing the distance between rows up to 100 cm;

The quantity of fruits per plant significantly grew on variants pruned with two stems, F1 Veneţia F1 hybrid even reaching roughly twice as many fruits for that particular treatment;

The yield per farming area increased due to higher yield per plant, even though the number of plants was reduced by 20%;

The size of the obtained fruits was appropriate for the hybrids used;

The number of fruits and their size was slightly smaller on the second stem for all studied hybrids;

Plants proved a highly satisfactory vegetative growth, which lead to a similar fruit binding.

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