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EVALUATION OF THREE PRODUCTION SYSTEMS TOMATO CORN, TOMATO-ANTAPHID MESH AND TOMATO PADDED

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Abstract: This research was carried out in the municipality of Totolapa, Chiapas, Mexico, in the plot called el Sauz. The best tomato yield of three tomato-corn-mulch, tomato-anti-aphid mesh, and tomato-mulch production systems was evaluated. A completely randomized block design with three replications was used. The variables evaluated were: number of flower buds, number of flowers, number of fruits/plant, and total yield/plot. The results indicate that, in this investigation, the tomato-mulch system recorded the highest number of flower buds 19.03 buds/plant and the tomato-anti-aphid mesh system obtained the highest number of flowers 45.80/plant; on the other hand, the tomato-maize mulch production system recorded the highest number of 16.70 fruits/plant in the fifth sampling and in the eighth sampling the tomato-anti-aphid mesh production system obtained the highest number of 79.20 fruits/plant. Also, the best system and with the best total yield was the tomato-anti-aphid mesh system with 5,726 kg/ha, followed by the tomato-corn-mulch system with 3,740 kg/ha and the tomato-mulch system with 2,673 kg/ha. The best production system was tomato-anti-aphid mesh.
Keywords: System, padding, corn, tomato-anti-aphid mesh.

INTRODUCTION

The tomato (*Lycopersicum esculentum* L.) Currently it is grown for fresh and industrialized consumption, within world horticulture, tomato cultivation is one of the items with the greatest economic dynamism, it is considered one of the most important vegetables in many countries of the world, due to the countless by-products obtained from it, and the economic benefits it brings (Alvarado-Portilla, 2020). Which can be cultivated in various ways and the harvest can be planned according to its objective, being able to find productions destined for industrial processes or for fresh consumption, the latter being the one with the greatest productive diversification, due to the fact that the tomato can be cultivated in a high range of conditions throughout the year.

The tomato is the most important vegetable at a national and international level, due to its wide consumption (Pérez, 2013)), the harvested area and the economic value of the production. During the last years, this vegetable has increased its annual production mainly due to the increase in yield and to a lesser extent due to the increase in cultivated area. In addition to the economic and social importance of tomato in the production systems of the world, this vegetable has an increasing nutritional relevance, since they are an important source of vitamins, minerals and proteins for human health (Villarreal, 2009).

The production of tomato crops for fresh consumption today has many phytosanitary problems that are difficult to solve in a practical way, due to this more complex strategies have been implemented such as temporary polyethylene plastic greenhouses, or under anti-aphid mesh with the intention to protect the crop in the early stages of growth and development from both natural and biotic climatic conditions. For this reason, this research was carried out where three production systems of tomato-corn-mulch, tomato-anti-aphid mesh, and tomato-mulch were evaluated in order to evaluate in which of the three systems it would be better obtained. result in terms of increased fruit yields.

MATERIALS AND METHODS

This investigation was carried out in the municipality of Totolapa, Chiapas, Mexico, in the parcel called El Sauz owned by Mr. Carmen Fonseca Ballinas with the following geographic coordinates: 16º, 54'44" north

latitude and -92º, 68'11" west longitude. The town is located at an altitude of 620 meters above sea level, the climate is warm sub-humid, with an annual rainfall range of 900-1,500 mm and an annual temperature of 22-28º C (INEGI, 2005).

A completely randomized block design was used with three treatments: tomato-corn-mulch, tomato-anti-aphid mesh, and tomato-mulch with three replications. Each production system had a total of 680 plants, leaving 1.20 cm of street between beds and 40 cm between plants. The experimental plot had a dimension of 19 X 20 m, with a total area of 380 m2. The preparation of the land consisted of three raking steps in order to remove the soil layers to loosen it and incorporate the harvest residues for a better growth and development of the tomato plants. The ridges measured 80 cm wide by 6 m long and 40 cm high, leaving 1.20 m of separation between ridges, in total 15 ridges were prepared by repetitions.

The hybrid maize DK-357 was planted in the corresponding experimental plots, first the maize was planted at a distance of 20 cm between plants in each mulch row and when the maize was emerging, the tomato was transplanted. Seedlings of the Serengeti hybrid with determinate growth were used for tomato planting. The transplant was carried out manually, in the ridges covered with silver-colored plastic, holes were made at a distance of 40 cm between holes. Tomato seedlings were planted at a distance of 40 cm between plants and 1.20 cm between ridges.

Sampling was carried out nine days after tomato transplantation, every eight days 10 plants were randomly sampled for each production system, in total 30 plants were sampled per production system. Data collection was carried out for nine weeks, and the data obtained were analyzed with the statistical package Menu of the University of Nuevo León. to perform the analysis of variance of the variables studied and the comparison of means with the Tukey test (Tukey, 1949) with a confidence level of α= 0.05.

RESULTS AND DISCUSSION

In the fourth sampling of tomato flower buds, the tomato-mulch system registered highly significant statistical differences (P>0.015) with the highest number of flower buds 19.03, following in importance the tomato-corn-mulch system 14.53 and the tomato-mesh system. antiaphid 13.33 flower buds/tomato plant, respectively (Table 1). The tomato-mulch system obtained a greater number of flower buds because it received a greater amount of sunlight, having a marked effect on the production of flower buds/ tomato plant with respect to the tomato-corn-mulch production system. they shaded the tomato plants, which caused fewer flower buds and the same thing happened with the tomato-anti-aphid mesh system that shaded the system and more heat to the tomato plants, causing negative effects on the formation of buds floral.

Production systems	Number of flower buds
Tomato-padded	19.03a
Tomato-corn-padded	14.53b
Tomato-anti-aphid mesh	13.33b

The means in the column with the same letter are not significantly different (P≥0.05%), Tukey's multiple range test (1949).

Table 1. Number of flower buds per tomato plant in the production systems in the fourth sampling.

In the seventh sampling, highly significant statistical differences (P>0.009) were detected in the tomato-anti-aphid mesh system 45.80 flowers compared to the tomato-mulch and tomato-corn-mulch system 30.53 and 27.20

flowers/plant, respectively (Table 2). The highest number of flowers was for the tomato-anti-aphid mesh system because the tomato crop was protected, which prevented the flowers from falling by the wind.

Production systems	Number of flowers
Tomato-anti-aphid mesh	45.80a
Tomato-padded	30.53b
Tomato-corn-padded	27.20b

The means in the column with the same letter are not significantly different (P≥0.05%), Tukey's multiple range test (1949).

Table 2. Number of flowers per tomato plant in the production systems in the seventh Sampling.

It can be seen in (Table 1), that the tomato-mulch production system obtained the highest number of flower buds of 19.03/tomato plant; however, in the seventh sampling, the tomato-anti-aphid mesh production system registered 45.80 flowers/tomato plant, this was due to the fact that the tomato crop was protected, which prevented the buttons and flowers from falling by the wind. The tomato-maize-mulch system had the lowest number of flowers, due to strong shading by the maize.

In the fifth sampling, the number of fruits/tomato plant was counted, the results indicate highly significant statistical differences (P>0.016) between systems (Table 3) where it is shown that the tomato-padded corn production system had the highest number of fruits 16.70/plant, followed by the tomato-anti-aphid mesh and tomato-mulch systems with 11.80 and 11.53 fruits per tomato plant, respectively.

Production system	Number of fruits/plant
Tomato-corn-padded	16.70a
Tomato-anti-aphid mesh	11.80b
Tomato-padded	11.53b

The means in the column with the same letter are not significantly different (P≥0.05%), Tukey's multiple range test (1949).

Table 3. Number of fruits per tomato plant in the production systems in the fifth sampling.

The tomato-corn-mulch production system as observed in (Table 3), produced more fruits per tomato plant, these results coincide with those of Escandón (2012), which indicates that the tomato-corn-mulch system is obtained a better production and healthier fruits, therefore, the cultivation of corn serves as a barrier against pests and diseases, which prevents the abortion of fruits so that the tomato plants do not have any nutritional deficiency and can better carry out the photosynthetic process and thus complete their vital functions to produce better fruits.

In the eighth fruit/plant sampling, highly significant statistical differences (P>0.000) were recorded between production systems, where the tomato-anti-aphid mesh system obtained the highest number of fruits 79.20 followed by the tomato-corn-mulch system 66.25 fruits and the tomato-mulch system 57.36 fruits/tomato plant (Table 4). These results agree with those of SAGARPA (2012), which indicates that the tomato-anti-aphid mesh system increases yields and improves the quality of fruits, since they grow clean, healthy and uniform, because the anti-aphid mesh reduces the amount of solar radiation. incident. Also, it is important to indicate that light influences the quality of tomato fruits, for example, it has been observed that light affects the quality of fruits, such as: texture, firmness, appearance (García, 2017) and oxidizing compounds. and antioxidants (Alba et al., 2000).

Production systems	Number of fruits/plant
Tomato-anti-aphid mesh	79.20a
Tomato-corn-padded	66.25b
tomato-padded	57.36c

The means in the column with the same letter are not significantly different (P≥0.05%), Tukey's multiple range test (1949).

Table 4. Number of fruits per tomato plant in the production systems in the eighth sampling.

The total yield in weight of tomato fruits/plot registering significant statistical differences (P>0.015) was higher for the tomato-anti-aphid mesh system 5,726 kg, followed in importance by the tomato-corn-mulch system 3,740 kg and the tomato-mulch system 2,673 kg/plot.

CONCLUSIONS

The results obtained in the present investigation indicate that the best tomato yield was for the tomato-anti-aphid mesh system with 5,726 kg/ha, what influenced this yield was the vegetative development of the tomato, the number of fruits and the weight of the seeds. tomatoes/plant. It is important to take into account that the tomato-anti-aphid mesh production system must be protected in the most susceptible vegetative stages to avoid problems of water, nutrition, pest insects, weeds and diseases.

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