

THE INFLUENCE OF THE HYBRID ONEARLY TOMATOES PRODUCTION

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Key words: *Gravitet F1, Magnus F1, Paris F1, Prekos F1*

ABSTRACT

In greenhouses solarium type for early productions are used tomato hybrids with semi-determined growth (5 floors fructification) or undetermined growth, but the plants are stagnated in growth after 4-5 fructifications floors. In this regard, it was studied the behavior of some tomato hybrids for early crop in solarium, in Izbiceni vegetable basin, in southern Romania. The tomato hybrids were: Gravitet F1, Magnus F1, Paris F1, Prekos F1. In the experience they have made observations about the way of growth of plants, the productive potential of hybrids and biochemical analyzes were performed on the fruits (total soluble dry, total soluble solids, titratable acidity and vitamin C content). From the point of view of growth, all hybrids had semi-determined growth after 5 floors of fructification occurs growth stagnation. The best yields were registered at Magnus F1 and Gravitet F1 hybrids and Prekos F1 and Paris F1 hybrids recorded lower productions, but in optimum temperatures conditions at limit, had a good early fructification they compensated by sales to advantageous prices.

INTRODUCTION

In order to obtain higher yields and higher nutritional quality, breeders explore genetic variability and select the genotypes with qualities appropriate to the current requirements. In recent years, consumer's demand for quality fruits is growing, both in terms of appearance and fruit firmness, organoleptic and nutritional characteristics but also for those related to industrialization, which require the creation of some cultivars with special adaptations.

Tomatoes (*Solanum lycopersicum* L.) are among the most cultivated horticultural species in the world.

In Romania, since 2007, the areas cultivated with tomatoes increased from 46.000 ha to 51.800 ha in 2011 and in 2014 showed a slight decrease, being 44.0 thousand hectares, with total production between 640.8 thousand tons in 2007 and 711.0 thousand tons in 2014 (Statistical Yearbook of Romania, 2007-2013). Tomatoes production comes primarily from small farmers, with areas of greenhouses between 100 and 2000 sqm and they are interested in new hybrids with high productive potential at low temperature conditions, in early spring with resistance to disease and damages (Draghici et al., 2012). The variety and production technology influences the quality characteristics of the tomatoes (Doltu et al., 2013). It is also necessary to develop technologies that are not expensive and can be made with cheap materials and handy, but at the same time, to ensure a good productivity both quantitative and qualitative (Draghici et al., 2013). In this regard studies have been conducted by various authors on the improvement of technological sequences that do not involve high financial costs. Thus, Sima et al., (2009) sustain that for obtaining stable production of tomato are involved several factors, such as culture and fertilization system. Application of some biostimulators influences growth and development

oftomatoseedlingsandplants, widening the variety of fertilizersbasedonnaturalcomponents(Dinuetal., 2009). Also, were used foliar fertilizing products in tomato culture in order to increase the fructification capacity and fortification and improving fruit quality (Hoza, 2010). Foliar fertilizationbased onboronhasa favorable effecton tomatobecauseitstimulatestherapidgerminationofpollenandincombination withpolyphenolsextractedfromtheseedsof *Vitisvinifera*influencepositively the vegetativegrowthand production(Dinuetal., 2013).Introducing the zeolite in the substrate of tomatoes culture grown in greenhouses contributes to obtaining higher average productions (Berar et al., 2011). Also, the additional CO₂ fertilization for growing greenhouse tomatoes intensifies the process of photosynthesis and thus improves the quality of fruits (Marinescu et al., 2003).

Infamily farms, the interest forearlytomatohybridsisgrowing, especially for thosewithsemi-determined growth(4-5floors of fructification). Inthis regard,the objective of thisstudy wasthe behaviorof some extra-early tomatohybridswithsemi-determined growth,forcropinthe greenhouse solarium, in conditions of optimum temperature at the limit.

MATERIALS AND METHODS

The experience has been placed in greenhouse solarium type in Izbiceni, Olt county, in the years 2014-2015.

The biological material was represented by four hybrids of tomatoes: Paris F₁, Prekos F₁, Magnus F₁ and Gravitet F₁, which are characterized by good earliness and adaptability to growing conditions in greenhouse solarium type. These hybrids were studied under optimum temperature conditions at limit.

In greenhouse solarium type planting was carried out at the end of February, after the following scheme 40+60+40/35 cm, respecting the specific technology in protected areas.

Tomato crop was destined for extra-early production. The greenhouse solarium was thermic heated and the average temperature was maintained at 18-20⁰C, due to the double protection of cultural space and high costs in the months February to April.

To achieve the objectives were conducted quantitative and qualitative productivity determinations and the date of harvest was recorded. The commentson characterizing the elements of fructificationwere madeonthe fourth flooroffructification, and as a controlit was taken Prekoscultivar, preferredby consumers and intensively grown inthe vegetable basinIzbiceni, Olt county.

To assess the quality of vegetables was determined the total soluble dry, total soluble solids, titratable acidity and vitamin C content.

The experiment was arranged in a complete randomized block design with three replications. The datas obtained were statistically interpreted and the analysis of variance was performed using Anova.

RESULTS AND DISCUSSIONS

In table 1 it is presented the Analysis of Variance test results for the characteristics measured in the experiment at tomatoes.

Table 1.

Analysis of Variance test results for the characteristics measured in the experiment

Source of Variation	Df	SS	MS	F
Average no. of flowers/inflorescence	3	0.59	0.14	69.09
Total no. of fruits/plant	3	1.81	0.45	62.04
Fruit/plant weight (kg)	3	0.34	0.08	2.37
Average fruit weight (g)	3	863.96	215.99	4.51
Production kg/m ²	3	9.09	2.26	4.19
TDM	3	0.56	0.14	2.98
DSM	3	0.30	0.075	31.97
Acidity (%malic acid)	3	0.01	0.083	3.63
Vitamin C	3	0.36	0.09	35.7

In this study, for the characterization of elements which determine the plant productivity, it was recorded the number of flowers/blossom, the total number of fruits/plant, weight of fruit/plant and the average weight of the fruit (Table 2). Thus the average number of flowers in blossom was between 4.25 at Prekos F₁ and 9.37 Magnus F₁. Significantly it is presented the process of early floral organogenesis at Prekos F₁ hybrid. Similar results were obtained at other hybrids of tomatoes, between 6-9 flowers blossom (Drăghici et al., 2013).

Table 2.

Characterization of productivity elements at the hybrids studied					
Parameter	Prekos F1- Control	Paris F1	Magnus F1	Gravitet F1	LSD 0.05
Average no. of flowers/inflorescence	4.25c	7.37b	9.37a	8.62a	1.05
Total no. of fruits/plant	6.87d	15.87°	10.25c	12.37b	1.32
Fruit/plant weight (kg)	1.68ab	1.8ab	2.3a	2.28a	0.56
Average fruit weight (g)	100.2b	110.3b	145.1a	140.2a	29.15
Production kg/m ²	8.8b	9.2b	13.0a	12.5a	2.98
TDM (%)	6.8ab	6.5b	7.3a	7.5a	0.73
DSM (%)	6ab	5.9b	6.5ab	6.7a	0.53
Acidity (%malic acid)	0.39a	0.26b	0.33ab	0.4a	0.008
Vitamin C	19.2c	18.4d	21.3b	22.1a	0.58

Means followed by the same letter in each row are not significantly different according to LSD Test at $p \leq 0.05$ level.

The number of fruits per plant depends on the type of plant and the technology applied. The results of analysis of variance for this trait showed that the total number of fruit/plant, for the hybrids in the study ranged from 6.87 at Prekos F₁ hybrid to 15.87 Paris F₁ hybrid.

In the study, were analyzed also other elements of productivity such as the average weight of the fruits and the total fruit weight/plant (Table 2.). Thus, the average weight of a fruit ranged from 100.2 at Prekos F₁ to 145.8 g at Gravitet F₁, registering a significant positive difference compared to the other hybrids for the significance level LSD of 5%. After some authors, the tomato fruit weight ranged from 120 g to 185 g (Drăghici et al., 2013; Doltu et al., 2013).

Fruit weight per plant at the hybrids studied varied from 1.2 kg to 2.3 kg/plant. Magnus F₁ and Gravitet F₁ hybrids resulted in significant differences compared to the other hybrids. The lowest value was recorded at Prekos F₁ hybrid and the highest value at Gravitet F₁ and Magnus F₁ hybrids (Table 2).

Tomatoes harvesting was carried out in stages as the fruits had reached maturity consumption. The first crops were at Paris F₁ and Prekos F₁ hybrids on 8th of May, it was followed by a second crop on the same hybrids on 14th of May and 18th of May and starting with 2nd of June harvesting was done for all the hybrids. For Paris F₁ and Prekos F₁ hybrids harvesting ended on 2nd of June and for the other two hybrids the harvesting ended on 17th of June. In this situation it can be deduced the excellent behavior (a good early fructification) of the first two hybrids (Paris F₁ and Prekos F₁) under optimum temperature conditions at limit.

The results of analysis of variance for this trait showed that exists significant differences between hybrids. Thus, the early production of tomatoes obtained at the studied hybrids can be considered to fall within optimal parameters, ranging between 8.8 to 13.5 kg/sqm. It appears that the best production was recorded at Magnus F₁ hybrid of 13 kg/sqm followed downwards by Gravitet F₁ hybrid with 12.5 kg/sqm and with significant positive differences towards the witness at LSD 5% of 2.92 kg/sqm. Prekos F₁ hybrid recorded the lowest production of 8.8 kg/sqm (Table 2. Figure 1).

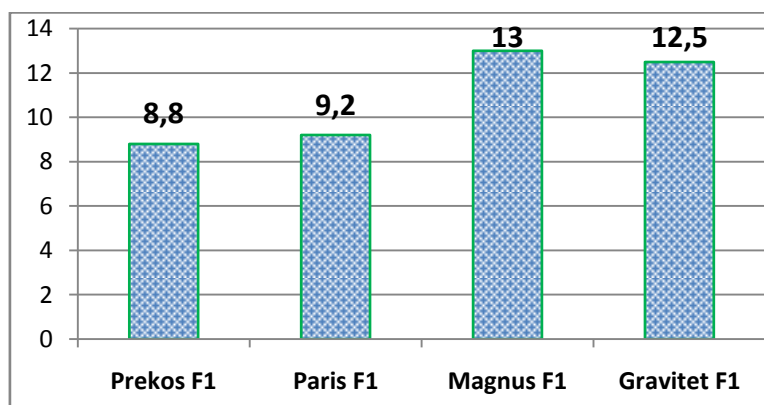


Fig. 1. The production of tomato (kg/m²) of the tomato hybrids studied

The quality of tomato fruits is determined among others by the following biochemical components: total dry matter (TDM), soluble dry matter (SDM), vitamin C and fruit sugar. Harvesting of tomatoes during maturation period influences the level of accumulation of biochemical compounds and acidity, density and color of the fruit. Mainly for commercialization the fruits are appreciated for their sensorial traits especially for taste and color.

In the industry for manufacturing the tomato juice are used tomatoes with dry matter greater than 4%. On average, at the studied hybrids the proportion of total dry matter from fruits ranged from 6.5% (Prekos F₁) and 7.5% (Gravitet F₁) and dry soluble matter between 6.0% (Prekos F₁) and 6.7% (Gravitet F₁).

Acidity is an important property for food quality assessment as it directly contributes to the formation of taste and for some products is an indicator of their freshness. Thus the acidity for the studied hybrids ranged between 0.26 and 0.40% malic acid. In some fruits of tomatoes cherry type, acidity varies between 0.43% and 0.99% (Costache et al., 2011).

The accumulation of vitamin C in tomato fruits it is an important objective in breeding this species. Significantly is presented the content in vitamin C for Magnus hybrid with 21.3 mg/100g fresh matter and followed by Gravitet F₁ with 22.1 mg/100g fresh matter and the lowest value was recorded at Prekos F₁ hybrid with 18.4 mg/100g fresh matter (Table 2). Costache et al. (2011), reported an ascorbic acid in tomatoes fruits of 25.2 mg/100g fresh matter and Sima et al. (2009) found that vitamin C content was between 20.42 – 24.28 mg/100g fresh matter.

CONCLUSIONS

The research conducted on the hybrids of tomatoes grown in extra-early culture in Greenhouse Solarium type. led to the following conclusions:

- In the microclimate conditions ensured in solarium. the earliest hybrids were Paris F₁ and Prekos F₁. the first harvest for these hybrids started on May. 8th;
- All hybrids showed semi-determined growth. after 5 floors of fructification occurred stagnation in growth;
- Best productions were registered at the hybrids Magnus F₁ and Gravitet F₁. and the lowest yields were recorded at Prekos F₁ and Paris F₁;
- For Prekos F₁ and Paris F₁ hybrids. even if yields were lower. they compensated by the favorable price and earliness. that is why these hybrids are preferred by consumers.

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