

GENOTYPE X ENVIRONMENT INTERACTION OF SOME TOMATO HYBRIDS UNDER KASHMIR CONDITIONS

Ummyiah, H. Masoodi

ABSTRACT

To evaluate seventeen hybrids of tomato (*Solanum lycopersicum* Mill.) field experiments were carried out for their stability at three locations in Kashmir valley during kharif 2011 and 2012 i.e. six environments. Significant differences were observed among all the hybrids for eight quantitative characters. As per the model of stability analysis by Eberhart and Russel (1966), the pooled analysis of variance for stability of hybrids for the quantitative traits over six environments revealed significant differences among the genotypes and environments for all the traits studied. The interaction component genotype \times environment was also significant for all the traits. The hybrids stable for yield and most of the traits were TO-687, Indam-531, Rambo, PS-255, Maharaja and Swaraj-1516. This implied that these hybrids contributed less to the genotypic \times environment interaction. Therefore, the hybrids TO-687, Indam-531, Rambo, PS-255, Maharaja and Swaraj-1516 could be recommended to the farmers of Kashmir for cultivation. As per the quality parameters analysis, Shalimar Tomato Hybrid-1 (3.187 mg/100g) among all hybrids had the highest lycopene content, Arth-3 (6.230 mg/100g) had the highest total carotenoids, the highest Vitamin C content was found in PS-255 (30.913 mg/100g). Samrat-1861 had the highest dry matter (4.100 %), Shalimar Tomato Hybrid-1 had the highest mean for TSS (6.507 °B), PS-255 (2.730) had the highest juice/pulp ratio and the highest acidity (0.510 %) as well, specific gravity was highest in Arth-3 (0.977). The hybrids TO-687, Indam-531 and Rambo showed suitability for fresh market, PS-255, Maharaja and Swaraj-1516 for both processing as well as fresh market purposes.

CONTACT

Dr Ummyiah H.Masoodi
Division of Vegetable Science, Sher-e-Kashmir
University of Agricultural Sciences
and Technology of Kashmir, Shalimar,
Srinagar- 191121

INTRODUCTION

In view of the importance, the tomato crop has got from production and industrial point of view and to meet the ever-increasing demand for this vegetable, there is a need for development of genotypes with improved yield and quality. Yield stability across divergent environments is of major concern to plant breeders. There is a necessity to evaluate and screen the potential genotype giving consistent performance over different years and to select the genotypes on the basis of stability parameters for important yield and maturity attributes. The performance of genotypes varies from year to year and region to region. Therefore, it becomes essential to search out the hybrid not only having high yield potential but also stable performance under varying environmental conditions. Therefore the present investigations was undertaken to study the effect and magnitude of genotype-environment interactions and for selecting stable genotypes. The stable genotypes thus identified may subsequently be used for cultivation on wide range of environments.

METHODS AND MATERIALS

The present investigation was carried out during kharif 2011 and 2012 at three locations in Kashmir valley to evaluate seventeen tomato hybrids. The experiment was laid in a randomized block design with three replications at each location. Each experimental plot consisted of 4 rows each having 3 plants at a spacing of 60 x 45 cm. The experimental fields were well prepared and standard recommended package of practices followed to raise a good crop.

Quality analysis

Observations were recorded on lycopene content (mg/100g), total carotenoids (mg/100g), vitamin C content of fruits (mg/100g), dry matter of fruits (%), total soluble solids (oB), juice/pulp ratio, acidity (%), specific gravity, firmness and fruit color.

Statistical analysis

Using Eberhart and Russel model of stability analysis (1966), two parameters were obtained, b_1 and S^2d , (regression coefficient and mean squares of deviation from regression, respectively) of the performance on environmental indices. The experimental data collected was subjected to the above mentioned statistical and biometrical analysis with the help of the software developed by Indostat Ltd., Hyderabad.

RESULTS AND DISCUSSION

Analysis of variance for stability analysis

The analysis of variance for stability analysis carried out in tomato hybrids for eight different quantitative characters viz. plant height (cm), days to first fruit picking, fruit length (cm), fruit diameter (cm), number of fruits per plant, average fruit weight (g), yield per plant (kg) and yield per ha (t), revealed that mean sum of squares due to genotypes were significant for all the traits studied indicating presence of large amount of variability in the material chosen for the study. The mean sum of squares due to environments was also significant for all the traits indicating the validity of conduct of experiment in these environments. The interaction component genotype \times environment was significant for all the traits indicating considerable response of the genotypes to different environments. The considerable response of genotypes when grown in different environments has also been reported by Dhaduk *et al.* (2004) and Dhalwal *et al.* (2004).

Stability analysis

According to Eberhart and Russel (1966), a genotype is said to be stable when regression coefficient (b_1) is equal to one and deviation from regression (S^2d) as close to zero as possible with high mean performance.

Of the 17 hybrids Swaraj-1516 was found to be stable for as many as 5 characters (Plant height, fruit length, number of fruits per plant, fruit yield per plant, fruit yield per ha) followed by TO-687 stable for days to first fruit picking, fruit length, average fruit weight, Indam-531 for plant height, days to first fruit picking, number of fruits per plant, PS-255 for days to first fruit picking, fruit length, fruit diameter and Rambo for plant height, fruit diameter, number of fruits per plant (3 characters each). Shalimar Tomato Hybrid-1 was stable for plant height, fruit diameter; Shalimar Tomato Hybrid-2 for plant height, number of fruits per plant; NS-2535 for plant height, days to first fruit picking; Arth-3 for plant height, fruit diameter; Bhaskar Improved for fruit length, number of fruits per plant and Maharaja for fruit length, fruit yield per ha (2 characters each). The hybrid stable for yield per plant was Swaraj-1516 and for yield per ha were Maharaja and Swaraj-1516. Maharaja was also stable for fruit length and Swaraj-1516 was also stable for plant height, fruit length and number of fruits per plant.

Based on the present study, the hybrids TO-687, Indam-531, Rambo, PS-255, Maharaja and Swaraj-1516 being stable for most of the yield attributing traits could be recommended to farmers for cultivation under Kashmir valley conditions.

Quality analysis

As per the quality parameters analysis, Shalimar Tomato Hybrid-1 (3.187 mg/100g) among all hybrids had the highest lycopene content, Arth-3 (6.230 mg/100g) had the highest total carotenoids, the highest Vitamin C content was found in PS-255 (30.913 mg/100g). Samrat-1861 had the highest dry matter (4.100 %), Shalimar Tomato Hybrid-1 had the highest mean for TSS (6.507 °B), PS-255 (2.730) had the highest juice/pulp ratio and the highest acidity (0.510 %) as well, specific gravity was highest in Arth-3 (0.977). The hybrids TO-687, Indam-531 and Rambo showed suitability for fresh market, PS-255, Maharaja and Swaraj-1516 for both processing as well as fresh market purposes.



TO-687



RAMBO



MAHARAJA



INDAM-531

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