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Evaluation of F_7 Generation Brinjal (*Solanum melongena* L.) Crosses for Uniformity and Stability

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ABSTRACT: The present investigation was carried out to identify uniform and stable populations in 17 F_7 plant progenies selected from F_6 generation and to isolate the segregants. The experiment was taken up in a Randomised Block Design with two replications at College of Horticulture, Dr. YSRHU, Venkataramannagudem during *Rabi,* 2022-23. 17 F_7 progeny populations were evaluated for homogenous and homozygous nature for all the fifteen qualitative characters. Analysis of variance was done for overall population of each progeny. Out of seventeen F_7 progenies, 10 progenies were found to behomozygous and homogenous for all the quantitative characters.

Keywords: Brinjal, F_7 generation, uniformity, stability.

INTRODUCTION

Eggplant (*Solanum melongena* L.) is a perennial vegetable with chromosome number 2n = 2x = 24 and belonging to family Solanaceae. India is the primary center of brinjal (Vavilov, 1951). It is often referred to as the poor man's vegetable due to its high production potential and consumer availability. It is widely grown in our country, which covers an area of 744 thousand hectares and has an annual production of 12.76 MT and a productivity of 19 tonnes per hectare (NHB, 2021-22). When compared to tomatoes, brinjal has a higher nutritional value (Choudhary 1976). It has 122 IU of vitamin A, 12mg of vitamin C, 18mg of calcium, 47mg of phosphorous, 0.9mg of iron, 1.4mg of protein and 4g of carbohydrates per 100g of weight (Thambhuraj and Singh 2003). Consumer demand for uniform, stable, and high-quality produce is increasing all the time, so farmers must produce market-demanded produce while also cultivating genotypes that are high yielding and resistant to biotic and abiotic stresses. Pure line selection, hybridization followed by pedigree/bulk selection, and heterosis breeding (F_1 hybrids) are the best methods for achieving uniformity. However, in often cross-pollinated crops such as brinjal, pure lines are generally preferred by farmers due to the ease of seed production. For developing high-yielding genotypes in solanaceous vegetables, hybridization followed by selection is a widely used method. There are many high-yielding brinjal varieties, such as Pusa Purple Long, Pusa Purple Cluster, PusaKranti, Pusa Bhairav, PusaShymala, Pusa Anmol, ArkaShirish, And ArkaSheel, ArkaKeshav, ArkaNidhi, ArkaNeelkanth, ArkaKusumkar and other varieties were developed through hybridization and pedigree selection.

MATERIAL AND METHODS

Among the vegetables, brinjal is having a high potential for exploitation. The main thrust of most of the plant breeding programmes is to increase the yielding ability of crop plants. In a view of very high local preferences for shape, taste, there are specific genotypes suited for specific locality. It is not possible to have one common cultivar to suit different localities and local preferences. It is therefore required to improve the yield potential of available land races through hybridization, may yield good hybrids or varieties (Kumar *et al.,* 2013). Hybridization creates new recombinants by combining the traits from genetically diverse parents. Parental lines having high general combining ability (GCA) for economically important characters i.e., the traits controlled by additive gene action are crossed and F_1 generation was raised. Here, Seven top performing F_1s whose parents are having high GCA values were selfed with the objective of isolating of new high yielding recombinants through selection and F_3generation was raised from top ten per cent of F_2 plants and again F_4 plants were raised from selected F_3 plants and the selection procedure continued upto F_6 generation to assess variability (Phenotypic Coefficient of Variation and Genotypic Coefficient of Variation) genetic

advance, genetic gain, character association, direct and indirect effect of various traits on yield and selection indices were constructed in each generation to reveal the effectiveness and direction of selection. Across the seven crosses of F_6generation, superior plants were selected and selfed to get the F seed. Selection of the desirable plants was done from F_2 generation onwards and the selected plants were selfed in consecutive generations until homozygosity is reached. Final selection of homozygous lines ends with isolation of new superior pure lines with novel character combinations. This procedure has a good chance of isolating transgressive segregants as well (Briggs and Allard 1953; Singh, 2002).

In the present experiment, it was studied to identify uniform and stable populations in a Randomised Block Design with seventeen F_7 plant progenies. Here, each plant progeny was taken as single treatment hence we have 17 treatments and two replications conducted at College of Horticulture, Dr. YSRHU, Venkataramannagudem during *Rabi*, 2022-23. Seventeen F_7 plant progenies were evaluated for all the parameters *viz.*, plant height (cm), number of primary branches, number of flowers per inflorescence, days to 50 per cent flowering, fruit length (cm), fruit girth (cm), fruit length to fruit girth ratio, number of fruits per cluster, average fruit weight (g), number of fruits per plant, days to first harvest, fruit yield per plant (kg), days to final harvest, number of seeds per fruit, test weight of seed (g). Populations with non significant values (for the said characters) were considered as homozygous and homogenous populations whereas, populations with significant values were considered as segregating populations and were not promoted for further studies.

RESULTS AND DISCUSSION

Analysis of variance (Table 1) was done for all fifteen quantitative characters (above mentioned characters). Out of seventeen F_7 progenies, 10 progenies like T_1, T_2, T_3, T_6, T_7, T_{10}, T_{11}, T_{13}, T_{16} and T_{17} showed the homozygous and homogenous nature for all the above mentioned quantitative characters. Variation was observed in four progenies for two characters they include T_5, T_9, T_{12}, and T_{14}. T_5 showed variation for characters like number of flowers per inflorescence, fruit yield per plant whereas, T_9 and T_{12} showed variation for the characters plant height (cm), number of primary branches. Variation for these vegetative parameters in these populations might be due to management practices and environment. Variation for the characters, fruit yield per plant, number of fruits per plant was observed in T_{14}. T_8 and T_{15} showed variation for characters like number of primary branches, number of fruits per plant, Fruit yield per plant (kg). Variation was observed for four characters like plant height, number of primary branches, number of fruits per plant, Fruit yield per plant (kg) in T_4.

Table 1: Analysis of Variance (ANOVA) and mean sum of squares for various quantitative characters in seventeen F_7 plant progenies of brinjal.

Treatments	Plant height	No. of primary branches	No. of flowers per inflorescence	Days to 50 per cent flowering	Fruit length (cm)	Fruit girth (cm)	Fruit length to fruit girth ratio	Number of fruits per cluster	Average fruit weight (g)	No. of fruits per plant	Days to first harvest	Fruit yield per plant (kg)	Days to final harvest	No.of seeds per fruit	Test weight of seed (g)
T_1	NS 2.204	NS 0.024	NS 0.043	NS 1.712	NS 0.002	NS 0.118	NS 0.003	NS 0.013	NS 4.889	NS 7.590	NS 6.512	NS 0.006	NS 14.602	NS 17.623	NS 0.003
T_2	NS 0.056	NS 0.017	NS 0.150	NS 2.740	NS 0.080	NS 3.039	NS 0.000	NS 0.010	NS 3.089	NS 1.663	NS 0.920	NS 0.007	NS 19.943	NS 56.120	NS 0.016
T_3	NS 1.750	NS 0.024	NS 0.008	NS 1.776	NS 0.007	NS 0.209	NS 0.000	NS 0.004	NS 3.536	NS 1.297	NS 7.490	NS 0.043	NS 4.126	NS 22.286	NS 0.016
T_4	* 4.874	* 0.034	NS 0.006	NS 1.099	NS 0.037	NS 0.100	NS 0.000	NS 0.040	NS 0.523	* 1.179	NS 2.033	* 0.006	NS 5.429	NS 21.303	NS 0.005
T_5	NS 3.772	NS 0.027	* 0.021	NS 0.410	NS 0.022	NS 0.408	NS 0.000	NS 0.011	NS 12.573	NS 2.135	NS 1.285	* 0.002	NS 6.202	NS 42.970	NS 0.005
T_6	NS 3.052	NS 0.029	NS 0.009	NS 1.749	NS 0.018	NS 0.189	NS 0.000	NS 0.036	NS 3.426	NS 1.265	NS 0.636	NS 0.632	NS 4.616	NS 21.454	NS 0.017
T_7	NS 4.848	NS 0.024	NS 0.007	NS 0.201	NS 0.979	NS 0.148	NS 0.000	NS 0.043	NS 6.912	NS 1.300	NS 1.920	NS 0.598	NS 4.046	NS 22.258	NS 0.003
T_8	NS 2.031	* 0.122	NS 0.013	NS 1.593	NS 0.067	NS 0.005	NS 0.000	NS 0.009	NS 6.456	* 4.098	NS 3.314	* 0.003	NS 5.04	NS 45.886	NS 0.003
T_9	* 3.261	* 0.090	NS 0.002	NS 0.239	NS 0.983	NS 0.141	NS 0.000	NS 0.010	NS 3.339	NS 1.554	NS 1.599	NS 0.003	NS 2.446	NS 17.192	NS 0.007
T_{10}	NS 3.875	NS 0.057	NS 0.004	NS 1.677	NS 0.007	NS 0.408	NS 0.000	NS 0.009	NS 3.989	NS 1.091	NS 1.020	NS 0.002	NS 4.430	NS 30.676	NS 0.011
T_{11}	NS 5.796	NS 0.056	NS 0.009	NS 0.323	NS 0.033	NS 0.773	NS 0.000	NS 0.009	NS 2.826	NS 1.507	NS 0.115	NS 0.002	NS 4.232	NS 26.718	NS 0.039
T_{12}	* 2.477	* 0.034	NS 0.032	NS 1.852	NS 0.0085	NS 0.431	NS 0.001	NS 0.004	NS 2.189	NS 1.894	NS 0.367	NS 0.007	NS 6.707	NS 73.333	NS 0.006
T_{13}	NS 1.653	* 0.033	NS 0.030	NS 2.075	NS 0.0586	NS 0.004	NS 0.000	NS 0.001	NS 2.414	NS 3.164	NS 0.702	NS 0.005	NS 7.151	NS 48.800	NS 0.004
T_{14}	NS 1.145	NS 0.179	NS 0.009	NS 2.002	NS 0.035	NS 0.014	NS 0.000	NS 0.065	NS 2.140	* 7.590	NS 0.301	* 0.001	NS 11.330	NS 22.765	NS 0.007
T_{15}	* 0.487	NS 0.065	NS 0.059	NS 1.670	NS 0.032	NS 1.784	NS 0.000	NS 0.046	NS 1.884	* 3.701	NS 1.782	* 0.043	NS 7.230	NS 21.300	NS 0.005
T_{16}	NS 2.368	NS 0.054	NS 0.009	NS 2.070	NS 0.060	NS 0.430	NS 0.000	NS 0.010	NS 6.062	NS 3.152	NS 0.823	NS 0.082	NS 5.202	NS 16.582	NS 0.005
T_{17}	NS 0.999	* 0.034	NS 0.132	NS 1.799	NS 0.016	NS 1.456	NS 0.000	NS 0.001	NS 2.281	NS 3.012	NS 1.601	NS 0.067	NS 19.102	NS 49.499	NS 0.019

CONCLUSIONS

From the present study, it could be concluded that the superior seventeen F_7 plant progenies selected fromF_6 generation of brinjal were evaluated for uniformity, stability. The populations showing homozygous and homogenous nature were promoted for F_8generation for further studies. Populations that were showing variation in yield contributing characters were isolated and were

discarded. Treatments of totally 12 populations *viz*, T_1, T_2, T_3, T_6, T_7, T_9, T_{10}, T_{11}, T_{12}, T_{13}, T_{16} and T_{17} were selected for further studies as they were showing non significant values for all the fifteen quantitative characters (above mentioned characters) whereas, T_9 and T_{12} showed variation for the characters, plant height (cm) and number of primary branches. The variation for these vegetative parameters in these population might be due to management practices and environment. Hence these plant populations were considered.

FUTURE SCOPE

Uniform and stable lines are preferred by the farmers and consumers. Therefore, these promising $12F_8$ populations showing homozygous and homogenous nature were selected and can be promoted for further multi locational trails to study their performances at different locations.

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