STUDIES OF SPECIFIC COMBINING ABILITY FOR YIELD AND ITS CONTRIBUTING TRAITS IN EGG PLANT (*Solanum melongena* L.)

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ABSTRACT

The present investigation entitled 'Line x testes analysis for combining ability in egg plant (*Solanum melongena* L.) was conducted in order to obtained information on specific combining ability of crosses during *Kharif* season at vegetable Research Station, Kalyanpur, C.S.A. University of Agriculture and technology, Kanpue. The estimates of specific combining ability variances are translated into genetic variance to understand the nature and magnitude of gene action and provide a guideline for selecting crosses for better cultivars. In general, contribution of females was lower than males and females x males. The cross-combination ACC 5114 x AB 1 was superior specific combiner over the generations for early flowering, ACC 2623 x KS 224 with regard to earliness, ACC 2623 x T 3 for dwarfness and KS 247 X T 3 for plant spread as compact habit of plant in both the generations. Cross KS 247 X AB 1 was exhibited significant positive value of sca effects for number of branches per plant and number of fruits per plant followed by KS 227 X KS 224 for fruit weight, KS 219 x AB 1 for Yield per plant over the generations. Its estimates the additive genetic effects to fixed the hybrid vigour in crosses.

KEYWORDS: Egg Plant, Parents' Contribution, Specific Combining Ability

Egg plant (*Solanum melongena* L., 2n=24) is well known as brinjal, belonging to family solanaceae, is an important vegetable crop grown throughout the India. It is cultivated for it immature fruits which are used in various forms as cooked vegetable. Egg plant is popular among people of all social classes, more appropriate to call it the vegetable of the mosses (Patel and Sarnaik, 2003). Brinjal is probably a native of India and is believed to originated in Indo-Burma region and China may be the secondary centre of origin (Vavilov, 1928). Brinjal is considered as rich sources of protein, fibres, calcium, iron, potassium, magnesium, phosphorus and sodium (Agoreyo *et al.,* 2012; Nyadanu and Lowor, 2015). Spargue and Totum (1942) were first proposed to the concept of combining ability in corn. Those are advocated that the general combining ability is the average performance of parents in a series of hybrid combinations, where as specific combining ability as the deviation of a particular cross from the average performance in a series of crosses. The general combining ability variance show additive variances as well as additive inter-allelic interaction, while the specific combining ability variances indicates to those of additive x additive, additive x dominance and dominance x dominance epistatic variances (Griffing, 1956). The study of specific combining ability helps in selection of superior cross combination. Therefore, the present investigation was conducted with the of identify specific combining ability of crosses for obtaining superior hybrid cultivar with excellent quality and high yield.

MATERIALS AND METHODS

The experiment on 'Line x tester analysis for combining ability in egg plant (*Solanum melongela* L) was conducted during 2001-02, 2002-03 and 2003-04 in *Kharif season* at Vegetable Research Station, Kalyanpur, C.S.A. University of Agriculture and Technology, Kanpure. The experimental materials comprised 15 lines used as female parents, 4 testers used as male parents, 60 F_1s and 60 F_2s in Randomized Block Design with three replications. The parents had 2 rows, whereas F_1s and F_2s each had 3 rows of 3m length with 60cm spacing of row to row and plant to plant in each replication. The necessary practices were followed to grow successful crop. The data recorded on days to 50% flowering (DF), days to marketable maturity (DMM), plant height (PH), number of branches per plant (NB/P), number of fruits per plant (NF/P), length of fruit (LF), width of fruit (WF), fruit weight (FW), plant spread (PS) and yield per plant(Y/P). Were selected at random of five plants from each parent and F_1s and F_2s in each replication. The additive and non-additive variance were computed according to Nyadanu *et al*. (2012). Estimates of general and specific combining ability variances were worked out as per given by Kampthorne (1957).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion has been summarized. The contribution of males and females x makes were more than females (Figure 1). The maximum contribution of males was recorded for plant spread, fruit weight, width of fruit in both the generation; yield per plant, number of branches per plant, days to flowering, number of fruits per plant in F_1 and length of fruit in F_2 generation. The maximum contribution of females was recorded plant height, days to marketable maturity, days to flowering in both the generation. The maximum contribution females and males was observed in days to flowering, days to marketable maturity, number of

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branches per plant, length of fruit and width of fruit in F_1 and F_2 generation and yield per plant, number of branches per plant, number of fruits per plant, width of fruit and length of fruit in F_1 generation only. Generally, the sca effects did not contribute considerably in the improvement of self-pollinated crops, except where commercial utilization of heterosis is feasible. However, in the population of homozygous lines breeders' interest is usually confined upon transgressive segregation shown in the crosses. The good specific combiners are presented in Table 1. In order to select out best specific combiners which may result desirable segregants in segregating generations it because necessary to select such derivatives as are desirable from F_1 to F_2 generation. The cross combinations recorded highly significant and desirable sca effects common in both the generations were ACC 5114 X AB 1 and KS 250 X T 3 for days to flowering; ACC 2623 X KS 224 and ACC 5114 X AB 1 for days to marketable maturity; ACC 8204 X AB 1, ACC 2623 X T 3, KS 219 X T 3, ACC 8207 X KS 224, ACC 5114 X DBR 8 and KS 253 X DBR 8 for plant height; KS 227 X AB 1, ACC 8206 X T 3 and KS 219 X AB 1 for number of branches per plant; KS 227 X AB 1, ACC 8206 X T 3,

KS 228 X AB 1, KS 263 X AB 1, KS 250 X KS 224, ACC 8206 X AB 1, KS 253 X T 3, KS 247 X T 3 and KS 219 X AB 1 for number of fruits per plant; KS 247 X KS 224, KS 250 X DBR 8, KS 253 X KS 224 and KS 233 X T 3 for fruit weight; KS 247 X T 3 for plant spread and KS 219 X AB 1, KS 263 X AB 1, KS 228 X AB 1, KS 233 X T 3, KS 227 X Ab 1, KS 262 X DBR 8, KS 253 X AB 1, KS 235 X KS 224, KS 227 X T 3, KS 250 X KS 224, ACC 5114 X KS 224 and ACC 8206 X T 3 for yield per plant. All these common crosses over the generations are indicative of additive X additive type of gene interactions for the expression of different characters. Crosses KS 219 X AB 1, KS 247 X T 3, KS 263 X AB 1, KS 250 X KS 224 and ACC 8206 T 3 besides being good specific combiners for yield per plant were superior over the generations for most important yield trait, i.e., number of fruits per plant. Most of the crosses for different characters, having high sca in F_1, failed to repeat its performance in F_2 reflecting the presence of dominance and epistatic types of gene action. These results are in conformity, with those of Kele *et al.* (1992), Dubley and Moll (1996), Singh *et al.* (2003), Suneetha and Kathiria (2006) and Umaretiya *et al.* (2008)
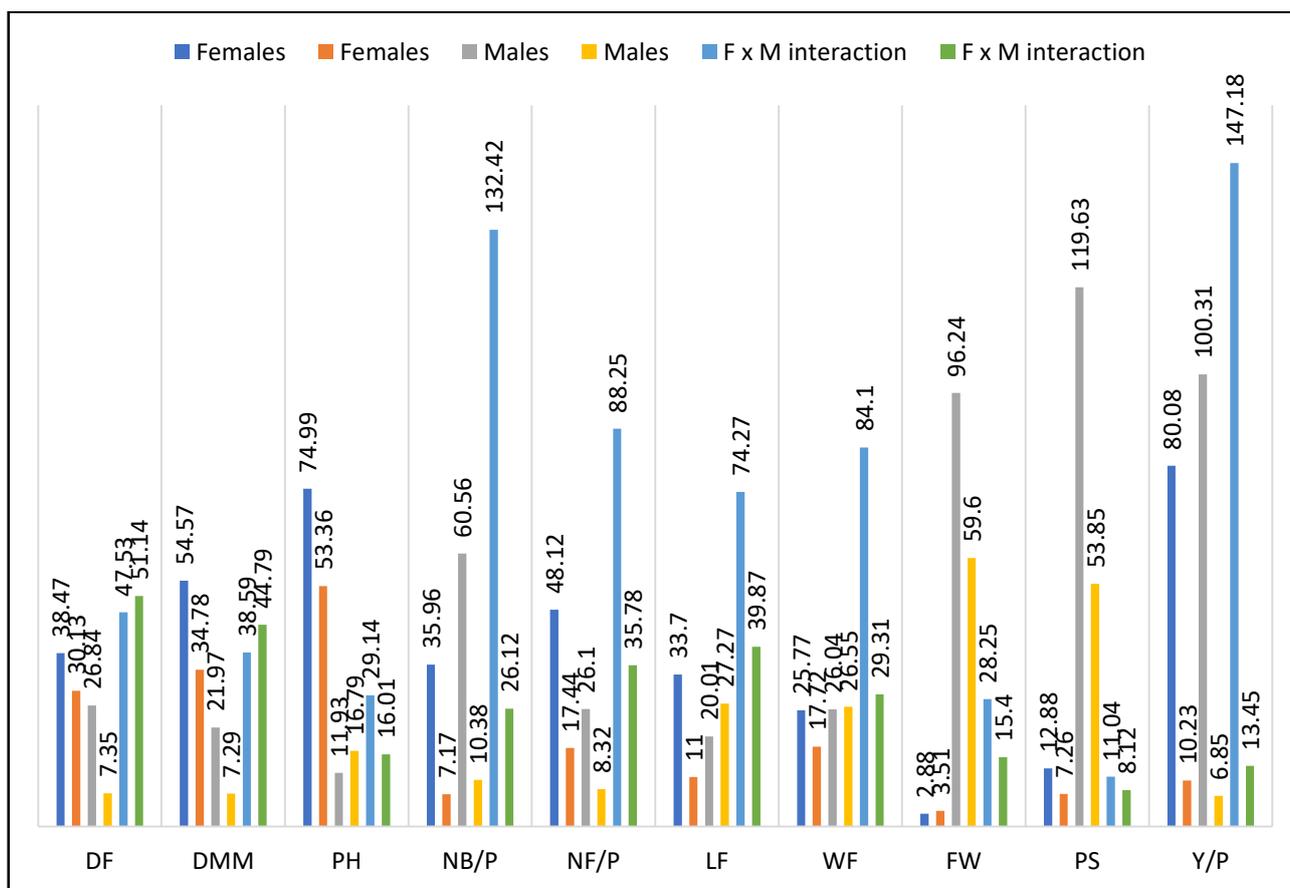

Figure 1: Proportional distribution of females, males and f & m interaction in superior crosses

Table 1: Proportional contribution of females, males and f x m interaction for superior crosses with significant specific combiners in egg plant

Traits	Significant specific combiner crosses		Common crosses based on good sca effects in F_1 and F_2
	F_1	F_2	
Days to 50% flowering	KS 247 X DBR 8 (-5.22**), KS 253 X KS 224 (-.4.27**), ACC 5114 X AB 1 (-4.02*), KS 233 X T 3 (-3.74*), KS 250 X T 3 (-3.66*), ACC 2623 X KS 224 (-3.61*), KS 263 X T 3 (-3.49*, KS 227 X T 3 (-3.24*), KS 235 X DBR 8 (-3.13*)	ACC 8206 X KS 224 (-6.84**), KS 227 X DBR 8 (6.23**), KS 263 X T 3 (-5.67**), KA 250 X T 3 (-3.83*), ACC 5114 X AB 1 (-3.59*)	ACC 5114 X AB 1, KS 250 X T 3
Days to marketable maturity	ACC 2623 X KS 224 (-7.46**), KS 227 X T 3 (-7.11**), KS 247 X DBR 8 (-4.98**), KS 235 X KS 224 (-4.38**), KS 247 X AB 1 (-4.29**), KS 233 X T 3 (-4.11**), ACC 5114 X AB 1 (-3.37*), KS 262 X T 3 (-3.27*)	ACC 8204 X KA224 (-8.26**), ACC 2623 X 224 (-7.12**), KS 253 X AB 1 (-5.62**), ACC 5114 X AB 1 (-5.12**), KS 263 X T 3(-5.01**), KS 250 X T 3 (-4.67**), ACC 8207 X KS 224 (-4.37**), KS 228 X KSS 224 (-4.12**), KS 233 X KS 224 (-3.46*)	ACC 2623 X KS 224, ACC 5114 X AB 1
Plant height	ACC 8204 X AB 1 (-12.19**), AAC 2623 X T 3 (-9.82**), KS 247 X DBR 8 (-7.73**), KS 219 X T 3 (-7.69**), KS 219 X KS 224 (-4.36**), AAC 5114 X DBR 8 (-4.14**), KS 235 X KS 224 (-4.04*), KS 263 X DBR 8 (-3.98*), KS 253 X DBR 8 (-3.80*), KS 262 X T 3 (-3.52*), KS 228 X DBR 8 (-3.42*), KS 235 X AB 1 (-3.29*)	ACC 8204 X AB 1 (-8.00**), ACC 5114 X DBR 8 (-7.92**), KS 253 X DBR 8 (-6.12**), ACC 2623 X T 3 (-5.45**), KS 219 X T 3 (-5.08**), AAC 8207 X KS 224 (-4.28**), KS 227 X KS 224 (-3.65**)	ACC 8204 x AB 1, ACC 2623 X T 3, KS 219 X T 3, ACC 8207 X KS 224, ACC 5114 X DBR 8, KS 253 X DBR 8
Number of branches per plant	KS 263 X AB 1 (2.64**), KS 227 X AB 1 (2.37**), ACC 8204 X T 3 (1.89**), ACC 8206 X T 3 (1.84**), KS 228 X AB 1 (1.75*), KS 219 X AB 1 (1.69*), ACC 8207 X T 3 (1.69*)	KS 250 X KS 224 (2.22**), KS 227 X AB 1 (1.67*), KS 219 X AB 1 (1.49*), ACC 8206 X T 3 (1.41*)	KS 227 X AB 1, ACC 8206 X T 3, KS 219 X AB 1
Number of fruits per plant	KS 227 X AB 1 (1.66**), ACC 8206 X T 3 (7.11**), KS 228 X AB 1 (6.18**), KS 263 X AB 1(6.16**), KS 233 X T 3 (5.92**), KS 250 X KS 224 (5.52**), KS 262 X DBR 8 (4.99**), ACC 8204 X AB 1 (4.94**), ACC 2623 X T 3 (4.15*), ACC 5114 X DBR 8 (3.92*), KS 253 X T 3 (3.64*), KS 247 X T 3 (3.44*), KS 219 X AB 1 (3.42*)	KS 247 X T 3 (6.61**), KS 227 X AB 1 (6.50**), ACC 8204 X AB 1 (6.48**), KS 219 X AB 1 (4.95*), KS 263 X AB 1 (4.95**), ACC 8206 X T 3 (4.73**), KS 228 X AB 1 (4.40**), KS 253 X T 3 (4.31**), KS 250 X KS 224 (3.40*)	KS 227 X AB 1, ACC 8206 X T 3, KS 228 X AB 1, KS 263 X AB 1, KS 250 X KS 224, ACC 8206 X AB 1, KS 253 X T 3, KS 247 X T 3, KS 219 X AB 1
Length of fruit	KS 263 X T 3 (-1.71**), ACC 5114 X KS 224 (-1.29*), KS 262 X AB 1 (-1.20*)	-	-
Width of fruit	ACC 2623 X T 3 (1.53**), KS 263 X AB 1 (1.49**), KS 233 X T 3 (1.28*), KS 235 X T 3 (1.25*), ACC 8207 X DBR 8 (1.13*)	-	-
Fruit weight	KS 263 X AB 1 (10.50**), KS 219 X AB 1 (9.96**), KS 247 X KS 224 (9.13**), KS 250 X DBR 8 (7.95**), ACC 8204 X T 3 (7.56**), KS 253 X KS 224 (7.24**), KS 228 X AB 1 (6.72**), ACC 2623 X T 3 (6.56*)	KS 233 X T 3 (10.08**), KS 247 X KS 224 (9.66**), KS 250 X DBR 8 (7.42*), KS 253 X KS 224 (6.06*)	KS 247 X KS 224, KS 250 X DBR 8, KS 253 X KS 224, KS 233 X T 3
Plant spread	KS 227 X AB 1 (-0.08**), KS 247 X T 3 (-0.07**), KS 263 X T 3 (-0.06**), KS 219 X DBR 8 (-0.06**), KS 233 X T 3 (-0.04*), KS 228 X T 3 (-0.04*), KS 219 X KS 224 (-0.04*), KS 228 X DBR 8 9-0.04*)	KS 247 X T 3 (0.09**), KS 235 X AB 1 (-0.07**)	KS 247 X T 3
Yield per plant	KS 219 X AB 1 (0.67**), KS 263 X AB 1 (0.61**), KS 228 X AB 1 (0.59**), KS 233 X T 3 (0.56**), KS 227 X AB 1 (0.51**), KS 262 X DBR 8 (0.45**), KS 253 X AB 1 (0.41**), ACC 2623 X T 3 (0.37**), KS 250 X AB 1 (0.36**), KS 235 X KS 224 (0.32**), KS 247 X T 3 (0.31**), KS 219 X T 3 (0.28**), KS 235 X T 3 (0.28**), ACC 8207 X T 3 (0.26**), KS 250 X KS 224 (0.26**), ACC 5114 X KS 224 (0.22*), ACC 8206 X T 3 (0.21*)	KS 219 X AB 1 (0.41**), KS 247 X T 3 (0.31**), KS 263 X AB 1 (0.29**), ACC 8206 X T 3 (0.28**), KS 227 X AB 1 (0.27**), KS 228 X AB 1 (0.26**), KS 235 X KS 224 (0.24**), KS 233 X T 3 (0.18**), KS 253 X AB 1 (0.18**), KS 250 X KS 224 (0.18**), KS 262 X DBR 8 (0.16*), ACC 5114 X KS 224 (0.16*)	KS 219 X AB 1, KS 263 X AB 1, KS 228 X AB 1, KS 233 X T 3, KS 227 X AB 1, KS 262 X DBR 8, KS 253 X AB 1, KS 235 X KS 224, KS 247 X T 3, KS 250 X KS 224, ACC 5114 X KS 224, ACC 8206 X T 3

CONCLUSION

The present studies entitled 'Line X tester analysis for combining ability in egg plant (*Solanum melongena* L.)' was carried out to know the contribution of females, males and females X males and specific combining ability involving fifteen lines (females) and four testers (males). The males contributed maximum in comparison to females for plant spread fruit weight and width of fruit in both the generations. For plant height, days to marketable maturity, number of fruits per plant and days to flowering maximum contribution were showed by females than males in both the generations. The study of sca effects also revealed that none of the crosses were good specific combiners for all the characters in both the generations. Most of the crosses which did well in F_1 failed to do so in F_2 and vice versa. On the basis of gene actions, it is felt that improvement in egg plant may be made by adopting pedigree selection with intermating in early segregating populations; and biparental mating followed by recurrent selection procedure.

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