Results and Discussion

1. Vegetative Characters :

1.1. Plant height :

The results presented in Tables 2 and 3 indicate significant differences among different parental genotypes and hybrids concerning plant height. Plants of cultivar Violetta Lunga had the highest plant height (148.2 cm) followed by Balady Long Purple (139.6 cm), Black Beauty (125.6 cm), Balady Long White (118.6 cm), Belleza Nera (112.6 cm), and Baker (66.2 cm). Non of the hybrids exceeded the tallest cultivar, i.e., Violetta Lunga. However, the F_1 hybrid Balady Long White X Violetta Lunga was not significantly different from the tallest parent (Table 2). Such differences in plant height among plants of the different parental cultivars and hybrids can be useful in eggplant breeding programs. The genetic differences in plant height among eggplant genotypes were also recorded by **Harbans and Nandpuri (1974), Vadivel and Bapu (1989a), Vadivel and Bapu (1990a), Chezhian *et al.* (2000), Prasad and Singh (2003) and Mahaveer *et al.* (2004).**

The results presented in Table 3 show significant general and specific combining ability effects which indicate the presence of both additive and non-additive type of gene actions. However, the calculated ratio of GCA/SCA was 13.58, i.e., more than unity, which indicates that the additive type of gene action was more important in the inheritance of this character. These results agreed with that of **Srivastava and Bajpai (1977), Borikar *et al.* (1981) and Singh and Singh (2004)** who reported

Table (2): Means of plant height and number of branches per plant of different parental genotypes and its F_1 hybrids evaluated in the field.

Genotypes	Measurements	
	Plant height (cm)	Number of branches/ plant
Balady Long Purple	139.6	10.0
Balady Long Purple × Black Beauty	134.2	14.2
Balady Long Purple × Balady Long White	132.4	12.0
Balady Long Purple × Belleza Nera	135.2	12.0
Balady Long Purple × Violetta Lunga	138.4	10.6
Balady Long Purple × Baker	119.8	10.6
Black Beauty	125.6	13.8
Black Beauty × Balady Long White	114.2	12.0
Black Beauty × Belleza Nera	117.4	13.0
Black Beauty × Violetta Lunga	131.2	14.2
Black Beauty × Baker	112.8	14.6
Balady Long White	118.6	14.6
Balady Long White × Belleza Nera	123.6	14.8
Balady Long White × Violetta Lunga	144.2	14.2
Balady Long White × Baker	109.2	14.0
Belleza Nera	112.6	13.4
Belleza Nera × Violetta Lunga	138.2	14.4
Belleza Nera × Baker	118.2	11.8
Violetta Lunga	148.2	10.2
Violetta Lunga × Baker	111.0	13.6
Baker	66.2	12.2
L.S.D 5%	6.19	1.50
L.S.D 1%	8.21	1.99

Table (3): Mean square values of plant height and number of branches per plant for the different sources of variance

Sources of variance	d.f	Plant height	No. of branches /plant
Genotypes	20	1549.16**	12.47**
Parents	5	4147.81**	18.43**
Hybrids	14	659.56**	10.48**
Parents Vs Hybrids	1	1010.31**	10.50**
Error	80	24.23	1.42
General combining ability (GCA)	5	1015.12**	4.94**
Specific combining ability (SCA)	15	74.73**	1.68**
Error	80	4.84	0.28
GCA / SCA		13.58	2.94

the importance of additive gene action .In addition, the involvement of both the additive and non-additive gene actions in the inheritance of plant height in eggplant was reported by **Narendra and Ram (1989), Chezhian *et al.* (2000), Aswani and Khandelwal (2005), Biradar *et al*. (2005) and Ahmed *et al.* (2006).**On the other hand, the non-additive type of gene action was found to be predominant in the inheritance of this character **(Singh *et al.*, 1979; Singh and Mital, 1988; Biswajit *et al.*, 2004).**

The highest values of general combining ability effect were associated with the parental cultivars Violetta Lunga (11.97) and Balady Long Purple (9.45), while the lowest value (-20.02) was associated with the parental cultivar Baker (Table 4). It is worth mentioning that the desirable plant height depends on the purpose of cultivating a certain cultivar. For example, in case of condensed cultivation or intercropping, the short plants will be more suitable for this kind of cultivation. Based on this fact, the parental cultivar Baker will be a good combiner for forming hybrids with short plants, while parental cultivars Violetta Lunga and Balady Long Purple will be good combiners in forming hybrids with relatively tall plants.

The highest specific combining ability effects were associated with F_1 hybrids Belleza Nera X Baker (15.58), Black Beauty X Baker (9.78) and Balady Long White X Violetta Lunga (9.20), (Table 5). Such F_1 hybrids will give tall plants. On the other hand, the lowest specific combining ability effects were associated with F_1 hybrids Black Beauty X Balady Long White (-8.50) and Balady Long Purple X Violetta Lunga (-6.40). Such F_1 hybrids will give short plants.

Table (4): General combining ability effects (g_i) for plant height and number of branches per plant for the different parental genotypes.

Genotypes	Measurements	
	Plant height	No. of branches/ plant
Balady Long Purple	9.45	-1.33
Black Beauty	-0.32	0.69
Balady Long White	-0.35	0.77
Belleze Nera	-0.72	0.34
Violetta Lunga	11.97	-0.33
Baker	-20.02	-0.13
L.S.D 5%	1.41	0.34
L.S.D 1%	1.87	0.45

Table (5): Specific combining ability effects (S_{ij}) of the different F_1 hybrids for plant height and number of branches per plant .

Genotypes	Measurements	
	Plant height	No. of branches /plant
Balady Long Purple × Black Beauty	1.70	1.97
Balady Long Purple ×Balady Long White	-0.07	-0.30
Balady Long Purple × Belleza Nera	3.10	0.12
Balady Long Purple × Violetta Lunga	-6.40	-0.60
Balady Long Purple × Baker	7.00	-0.80
Black Beauty × Balady Long White	-8.50	-2.32
Black Beauty × Belleza Nera	-4.92	-0.90
Black Beauty × Violetta Lunga	-3.82	0.97
Black Beauty × Baker	9.78	1.17
Balady Long White × Belleza Nera	1.30	0.82
Balady Long White × Violetta Lunga	9.20	0.90
Balady Long White × Baker	6.20	0.50
Belleza Nera × Violetta Lunga	3.58	1.52
Belleza Nera × Baker	15.58	-1.27
Violetta Lunga × Baker	-4.32	1.20
L.S. D 5%	3.88	0.94
L. S. D 1%	5.15	1.25

The analysis of homogeneity of Wr-Vr over arrays indicated the validity of Jinks- Hayman's genetic assumptions (Table 6). A further prove for the validity of these assumptions was indicated by the regression coefficient (b) for the Wr- Vr which was significantly different from zero and, in the same time, it was not significantly different from unity (Table 6 and Figure 2). This indicated the absence of appreciable epistatic interaction.

The intercept (a) of the regression line of Vr-Wr was 140.2251 which indicated that the regression lines intersected the Wr axis above the origin (Table 6). This indicated the presence of partial dominance. The mean of (N^2 progeny- parental mean) was + 5.722206 (Table 6), which indicated that the partial dominance was toward tall parents. In addition, the sign of h, which measures the direction of dominance, was positive (+128.1714), (Table 7). This result indicated that dominance acted in the direction of the tall parent. Moreover, the degree of dominance, averaged over all loci, measured by $(H_1/D)^{½}$ was 0.6139228 (Table 7). This can be considered as a further prove that the partial dominance was toward tall plants. On the other hand, complete dominance for tallness in eggplant was recorded by **Choudhuri (1977).** Moreover, over-dominance was recorded for plant height in eggplant by **Biswajit *et al.* (2005a).**

The relative values of the Vr and Wr (Table 6 and Figure 2) showed that the parental cultivars Balady Long Purple and Black Beauty had the lowest values which indicated that these parental cultivars contained the most dominant genes. On the other hand, the parental cultivar Baker had the highest Vr-Wr

Table (6):Manual plotting for parabola limits and regression line, calculated statistics and tested hypothesis in the diallel eggplant crosses for plant height according to Jinks-Hayman analysis

Parents	Vr	Wr- Parabola	Wr-Regression
Balady Long Purple (P1)	50.63906	204.95902	186.55490
Black Beauty (P2)	82.23281	261.18405	215.46014
Balady Long White (P3)	164.49063	369.39813	290.71814
Belleza Nera (P4)	106.83281	297.69839	237.96677
Violetta Lunga (P5)	174.17343	380.11508	299.57697
Baker (P6)	400.91251	576.69861	507.02136
Calculated statistics	**Value**		
Regression Coefficient (b)	0.9149036		
Intercept (a)	140.2251		
Parental Mean	118.4667		
Mean of N^2 progeny	124.1889		
Mean of N^2 progeny – parental Mean	5.722206		
Variance of Parents (VoLo)	829.5609		
Variance of the Mean of Arrays (VoL_1)	106.0203		
Mean covariance of Arrays with Non-Recurring Parents ($WoLo_1$)	289.5497		
Mean variance of Arrays (V_1L_1)	163.2135		
Tested Hypothesis	**Calculated $t._{0.05}$**	**Significance^K**	
Ho: Wr - Vr is homogenious	0.6113391	ns	
Ho: b=o(not significantly different from zero)	9.118238	**	
Ho: b=1(not significantly different from unity)	0.8480997	ns	

k ns = Not significant

**= Significant at 1% level of significance

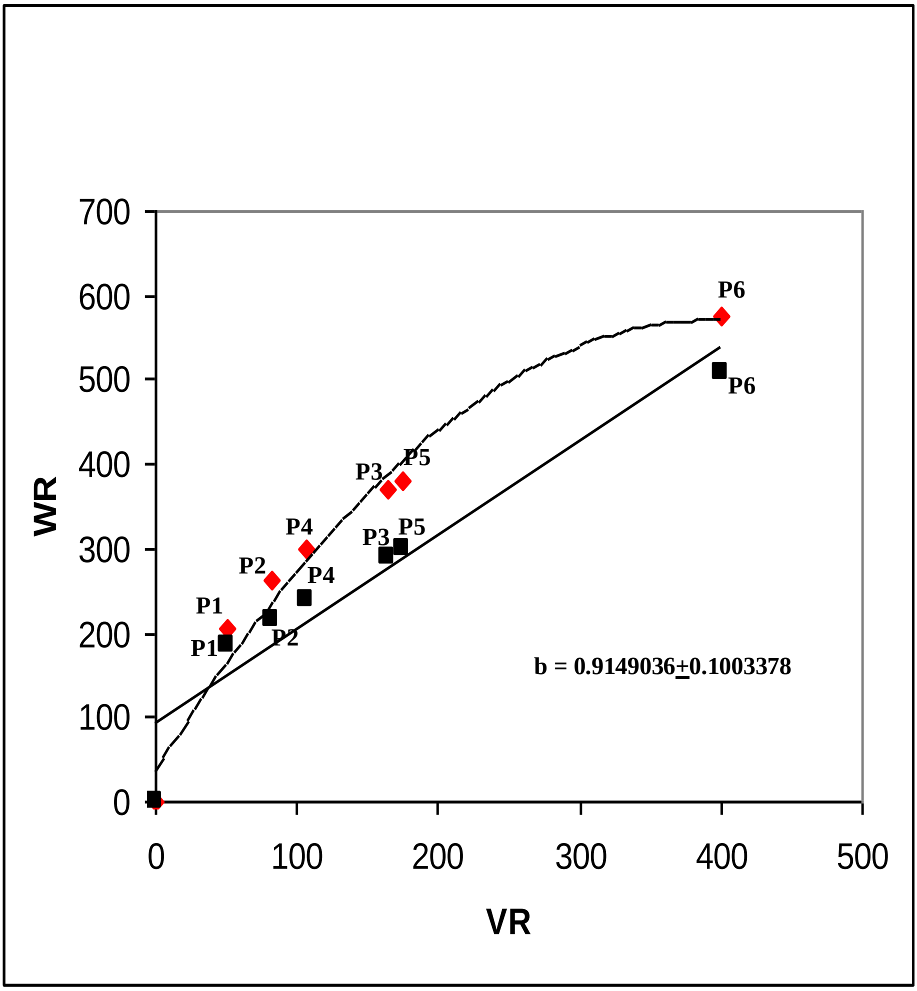

Fig. (2): Variance (VR) and covariance (WR) graph of plant height in F1 generation of eggplant germplasm (P1= Balady Long Purple, P2= Black Beauty, P3= Balady Long White, P4= Belleza Nera, P5 = Violetta Lunga and P6= Baker).

Table (7): Estimates of genetic components of variation and heritability values for plant height according to Jinks – Hayman analysis

Components	Plant height
D	824.5151 **
H_1	310.7607 **
H_2	218.6813 **
F	494.1952 **
h	128.1714 **
$(H_1 / D)^{1/2}$	0.6139228
$H_2/4 H_1$	0.1759242
$((4D H_1)^{1/2} + F) / ((4DH_1)^{1/2} - F)$	2.90742
h_{bs}	98.14%
h_{ns}	77.96%

** = Significant at 1% level of significance values and, hence contained the most recessive genes. Moreover, the values of Vr and Wr associated with the parental cultivars Balady Long Purple and Black Beauty were close to each other (Table 6 and Figure 2) which indicated that these parental cultivars have similar genotypes concerning the studied character. On the other hand, the parental cultivar Baker, which had a unique high value of Vr- Wr, had a distinguished genotype concerning plant height. Such informations are of great value especially in the stage of selecting parental eggplant cultivars which will inter in a certain breeding program.

The ratio, $H_2/4H_1$ which is used to estimate the average frequency of negative versus positive alleles in the parents was 0.1759242 (Table 7). Since this value was less than 0.250, this result indicated the unequal distribution of alleles which decreased the expression of plant height and that which increased it over the related loci. In addition, the ratio $((4DH_1)^{½}+F)/((4DH_1)^{½}–F)$ which measures the total numbers of dominant to recessive alleles in all parents was >1, i.e., 2.90742 (Table 7). This result indicated that the six parents used in the present study carried more dominant than recessive alleles. This conclusion was supported by the positive value of F, i.e., + 494.1952 (Table 7), which indicated that there were more dominant than recessive alleles in the parents used in the present study.

The results presented in (Table 7) showed very high broad sense heritability (98.14%) and high narrow sense heritability (77.96%) which indicated that the additive gene action had important role in the inheritance of this character. These results agreed with those of **Mehrotra and Dixit (1973), Harbans and Nandpuri (1974), Borikar *et al.* (1981), Singh and Singh (1981) and Chung *et al.* (2003),** who reported high heritability for plant height. These results indicated that selection in segregating generations on individual plant basis will be effective in eggplant breeding programs to improve this character. **Mahaveer *et al.* (2004)** reached same conclusion and indicated the potential of improving plant height in eggplant through simple selection in segregating generations.

1.2. Number of branches per plant :

The results presented in Tables 2 and 3 indicate significant differences among different parental genotypes and hybrids concerning number of branches per plant. Plants of cultivar Balady Long Purple had the lowest number of branches per plant (10.0) followed by Violetta Lunga (10.2), while plants of cultivar Balady Long White had the highest number of branches per plant (14.6). The differences observed among eggplant genotypes can be explained by the findings of **Vadivel and Bapu (1990a),** who mentioned that number of branches/plant in eggplant exhibited high phenotypic and genotypic variances. However, **Mahaveer *et al.* (2004)** reported low genotypic coefficient of variation for number of primary branches/plant. Such differences could be due to using different genotypes and/or using different criterion in measuring branching. The F_1 hybrid Balady Long White X Belleza Nera (14.8) slightly exceeded the cultivar Balady Long White which had the highest number of branches per plant, while the F_1 hybrid Black Beauty X Baker was equaled to it. In addition the

F_1 hybrids Belleza Nera X Violetta Lunga, Balady Long Purple X Black Beauty, Black Beauty X Violetta Lunga, Balady Long White X Violetta Lunga and Balady Long White X Baker were not significantly different from Balady Long White concerning the studied character (Table 2) .

The results presented in Table 3 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive types of gene actions. The involvement of both the additive and non-additive type of gene actions in the inheritance of number of branches per plant in eggplant has been reported **(Dharmegowda, 1977; Narendra and Ram, 1989; Padmanabham and Jagadish, 1996; Kaur *et al.*, 2001a).** However, the calculated ratio of GCA/SCA was 2.94, i.e more than unity, which indicates that the additive type of gene action was more important in the inheritance of this character. This results was confirmed by the findings of **Singh *et al.* (1979) and Borikar *et al.* (1981)**, who found that the additive gene action was more important in the inheritance of this character .However, the pre-dominance of the non-additive type in the inheritance of this character was reported by **Peter and Singh (1974) and Srivastava and Bajpai (1977).** However, this could be due to the influence of environment and/or using different eggplant genotypes **(Warade, 1986; Baig and Patil, 2002).**

The highest values of general combining ability effect were associated with the parental cultivars Balady Long White (0.77) and Black Beauty (0.69), while the lowest value (-1.33) was associated with the parental cultivar Balady Long Purple

(Table 4). These results indicate that the parental cultivars Balady Long White and Black Beauty will be good combiners in forming hybrids with relatively high number of branches per plant .

The highest specific combining ability effects were associated with F_1 hybrids Balady Long Purple X Black Beauty (1.97), Belleza Nera X Violetta Lunga (1.52) and Violetta Lunga X Baker (1.20), (Table 5). Such F_1 hybrids will give plants with high number of branches. On the other hand, the lowest specific combining ability effects were associated with F_1 hybrids Black Beauty X Balady Long White (-2.32) and Belleza Nera X Baker (-1.27). Such F_1 hybrids will give plants with low number of branches per plant.

The results presented in Table 8 showed that Wr-Vr was not uniform which indicated absence of one of the assumptions required for validity of Jinks- Hayman analysis for number of branches per plant.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis. The results presented in Table 9 showed high broad sense heritability (91%) and above intermediate narrow sense heritability (49%) which indicated the important role of the additive gene action in the inheritance of this character. These results agreed with that of **Mehrotra and Dixit (1973), Harbans and Nandpuri (1974), Prasad and Prakash (1974) and Borikar *et al.* (1981)**, who recorded heritability estimates for number of branches per plant which ranged from intermediate to low. On the other hand, low

Table (8): Tested hypothesis in the diallel eggplant crosses concerning number of branches per plant, for validity of Jinks-Hayman analysis

Tested Hypothesis	Calc. $t_{0.05}$	Signif. [k]
Ho: Wr- Vr is homogenious	3.387188	**
Ho:b=0 (not significantly different from zero)	5.887599	**
Ho:b=1(not significantly different from unity)	- 2.194048	ns

[K] ns = Not significant

** = Significant at 1% level of significance

Table(9): Broad and narrow sense heritability estimates calculated using Griffing analysis for number of branches per plant .

Characters	Heritability %	
	Broad sense (h^2_{bs})	Narrow sense (h^2_{ns})
Number of branches /plant	**91%**	**49%**

estimates of heritability for number of branches per plant were recorded by **Gill *et al.* (1976) and Mahaveer *et al.* (2004)**. Such differences could be attributed to using different criteria for measuring branching (i.e., number of primary, secondary or total number of branches/plant). In addition, it is worth mentioning here that the estimated additive and non- additive genetic variances are prone to change with the different environments **(Baig and Patil, 2002)** and consequently this will result in obtaining different estimates for heritability. These results indicated that selection on individual plants basis will be effective in eggplant breeding programs to improve this character.

2. Yield and some of its components :

2.1. Number of days to first flower bud anthesis :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning number of days from transplanting to first flower bud anthesis. Plants of cultivar Violetta Lunga had the lowest number of days from transplanting to first flower bud anthesis (43.6 days) followed by Baker (43.8 days), Balady Long White (51.4 days), Balady Long Purple (54.6 days), Black Beauty (56.2 days). On the other hand, the cultivar Belleza Nera had the highest number of days from transplanting to first flower bud anthesis (59.0 days). Non of the hybrids had number of days to first flower bud anthesis lower than that of the better parent (Violetta Lunga).Also non of the F_1 hybrids had higher value than that of the parent with the highest value concerning this character, i.e., Belleza Nera (Table 10). The importance of

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genotypic variations among eggplant germplasm in breeding programs to improve this character has been reported **(Harbans and Nandpuri, 1974; Singh, S.N. *et al.*, 1978; Dharmegowda *et al.*, 1979a; Bhutani *et al.*, 1980; Vadivel and Bapu, 1989a; Gulam *et al.*, 1999; Prasad and Singh, 2003; Illangakoon *et al.*, 2004; Mahaveer *et al.*, 2004).**

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. However, the calculated ratio of GCA/SCA was 7.85, which indicates that the additive type of gene action was more important in the inheritance of this character. The involvement of both the additive and non-additive type of gene actions in the inheritance of number of days to first flowering has been reported **(Bhutani *et al.*, 1980; Sidhu *et al.*, 1980; Padmanabham and Jagadish, 1996; Kaur *et al.*, 2001,a; Biswajit *et al.*, 2004; Aswani and Khandelwal, 2005).** In addition, the predominance of additive gene action in the inheritance of this character was reported by **Srivastava and Bajpai (1977)**. On the other hand, the predominance of non-additive type of gene action over the additive type has been reported **(Peter and Singh, 1974; Singh *et al.*, 1979; Singh and Mital, 1988; Bendale *et al.*, 2005; Rai *et al.*, 2005).**

The lowest values of general combining ability effect were associated with the parental cultivars Baker (-3.17) and Violetta Lunga (-2.72), while the highest value (2.72) was associated with the parental cultivar Black Beauty (Table 12). Based on these results, the parental cultivar Baker and Violetta

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Lunga will be good combiners for forming hybrids with low number of days from transplanting to first flower bud anthesis.

The lowest specific combining ability effects were associated with F_1 hybrids Belleza Nera X Violetta Lunga (-3.06), Black Beauty X Belleza Nera (-2.91) and Balady Long White X Baker (-2.04). Such F_1 hybrids will give plants with low number of days from transplanting to first flower bud anthesis (Table 13).

The analysis of homogeneity of Wr-Vr over arrays indicated the validity of Jinks- Hayman's genetic assumptions (Table 14). A further prove for the validity of these assumptions was indicated by the regression coefficient (b) for the Wr-Vr which was significantly different from zero and, in the same time, it was not significantly different from unity (Table 14 and Figure 3). This indicated the absence of appreciable epistatic interaction.

The intercept (a) of the regression line of Vr-Wr was 1.848421 which indicated that the regression line intersected the Wr axis above the origin (Table 14). This indicated the presence of partial dominance. This result agreed with that of **Biswajit *et al.* (2005a),** who reported partial dominance for number of days to first flowering in eggplant. However, different nature of dominance was recorded by **Peter and Singh (1973),** who reported that number of days to first flowering was controlled by over-dominant genes. In addition, **Hani *et al.* (1977)** reported dominance and over-dominance for this character. Such differences could be due to the involvement of different eggplant genotypes with different genes controlling this character. The

Table(14): Manual plotting for parabola limits and regression line, calculated statistics and tested hypothesis in the diallel eggplant crosses for number of days from transplanting to first flower bud anthesis according to Jinks-Hayman analysis

Parents	Vr	Wr-Parabola	Wr-Regression
Balady Long Purple (P1)	1.22773	7.17460	3.18855
Black Beauty (P2)	1.55195	8.06650	3.54245
Balady Long White (P3)	10.16602	20.64529	12.94509
Belleza Nera (P4)	18.55957	27.89520	22.10703
Violetta Lunga (P5)	15.03047	25.10336	18.25486
Baker (P6)	14.17637	24.37969	17.32257
Calculated statistics		**Value**	
Regression Coefficient (b)		1.091545	
Intercept (a)		1.848421	
Parental Mean		51.43333	
Mean of N^2 progeny		51.76111	
Mean of N^2 progeny – parental Mean		0.3277741	
Variance of Parents (VoLo)		41.92676	
Variance of the Mean of Arrays (VoL_1)		5.406641	
Mean covariance of Arrays with Non-Recurring Parents ($WoLo_1$)		12.89343	
Mean variance of Arrays (V_1L_1)		10.11869	
Tested Hypothesis		**Calc. $t_{0.05}$**	**Signif.[K]**
Ho: Wr - Vr is homogenious		0.8781769	ns
Ho:b=o (not significantly different from zero)		4.590913	**
Ho:b=1(not significantly different from unity)		- 0.3850291	ns

k $_{ns}$ = Not significant

**= Significant at 1% level of significance

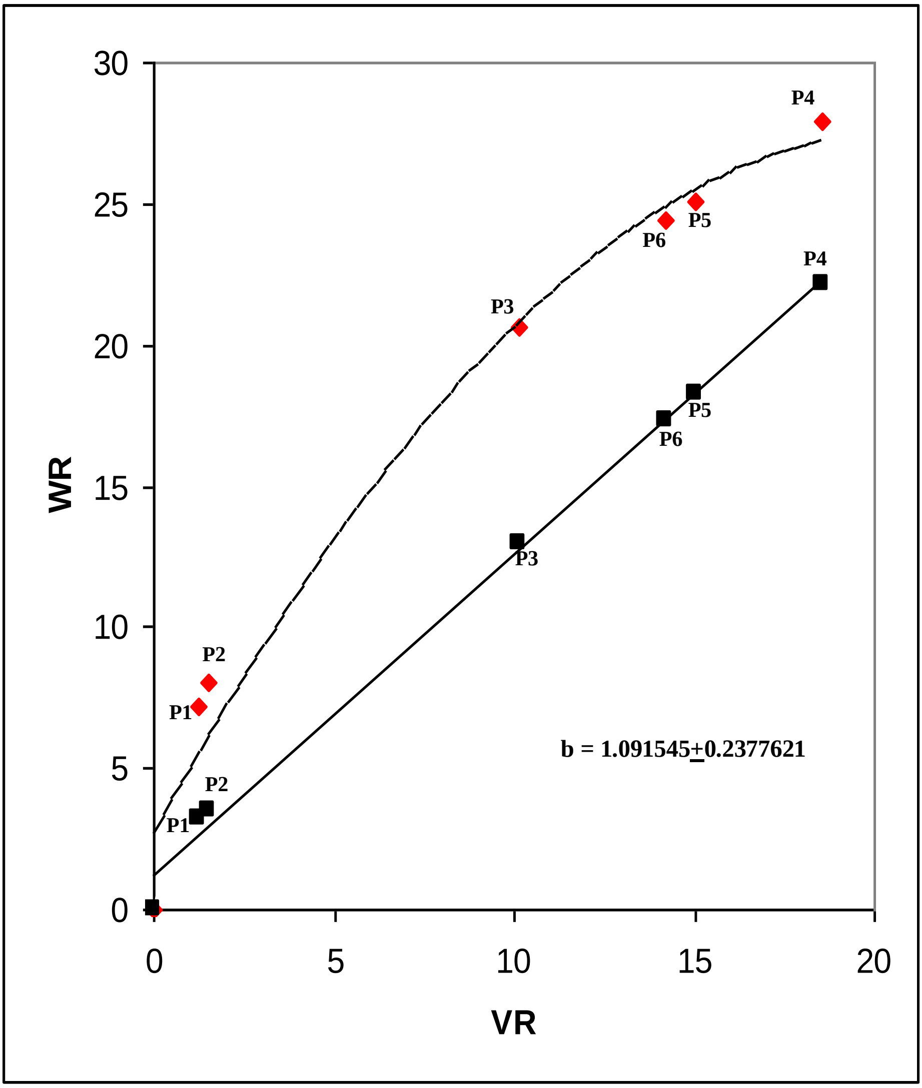


Fig. (3): Variance (VR) and covariance (WR) graph of number of days from transplanting to first flower bud anthesis in F1 generation of egg plant germplasm (P1 = Balady Long Purple, P2 = Black Beauty, P3 = Balady Long White, P4 = Belleza Nera, P5 = Violetta Lunga and P6 = Baker).

mean of (N^2 progeny-parental mean) was + 0.3277741 (Table 14), which indicated that the partial dominance was toward the plants which had relatively higher number of days from transplanting to first flower bud anthesis. In addition, the sigh of h, which measures the direction of dominance, was positive (+ 0.0969473), (Table 15). This result indicated that the dominance acted in the direction of the parents with high number of days from transplanting to first flower bud anthesis. Moreover the degree of dominance, averaged over all loci, measured by $(H_1/D)^{½}$ was 0.8410009 (Table 15). This can be considered as a further prove that the partial dominance was toward the plants that had relatively high number of days from transplanting to first flower bud anthesis.

The relative values of the Vr and Wr (regression), (Table 14 and Figure 3) showed that the parental cultivars Belleza Nera, Violetta Lunga, Baker and Balady Long White had the highest values (i.e., 18.55957 and 22.10703, 15.03047 and 18.25486, 14.17637 and 17.32257, and 10.16602 and 12.94509, respectively). These results indicated that these parental cultivars contained the most recessive genes.

On the other hand, the parental cultivars Balady Long Purple and Black Beauty had the lowest values of Vr and Wr (regression) (i.e., 1.22773 and 3.18855, and 1.55195 and 3.54245, respectively), (Table 14 and Figure 3) and, hence contained the most dominant genes. Since the values of Vr and Wr associated with the parental cultivars Balady Long White, Belleza Nera, Violetta Lunga and Baker were close to each other (Table 14 and Figure 3), it can be suggested that these

Table(15):Estimates of genetic components of variation and heritability values for number of days from transplanting to first flower bud anthesis, fruit diameter, fruit weight and total number of fruits per plant according to Jinks-Hayman analysis

Component	No. of days to first flower bud anthesis	Fruit diameter	Fruit weight	Total number of Fruits/plant
D	41.32772 **	9.1407**	8234.331**	108.3745**
H_1	29.23038 **	6.114498**	5079.622**	558.0634**
H_2	17.65012 **	4.39200**	3652.895*	386.0734**
F	31.48111 **	3.307251*	1282.794^{ns}	110.0866^{ns}
h	0.0969473 ^{ns}	0.019459^{ns}	409.131^{ns}	216.4236**
$(H_1 / D)^{1/2}$	0.8410009	0.817882	0.785419	2.269229
$H_2/4 H_1$	0.1509569	0.179573	0.179782	0.1729523
$((4DH_1)^{1/2}+F)/((4DH_1)^{1/2} - F)$	2.655497	1.568023	1.220184	1.576723
h_{bs}	96.19%	99.80%	99.85%	99.68%
h_{ns}	68.13%	77.33%	81.98%	46.72%

ns = Not significant

* = Significant at 5% level of significance

** = Significant at 1% level of significance parental cultivars have similar genotypes concerning number of days to first flower bud anthesis. On the other hand, the parental cultivars Balady Long Purple and Black Beauty have similar genotypes concerning the studied character.

The ratio, $H_2/4H_1$ which is used to estimate the average frequency of negative versus positive alleles in the parents was 0.1509569 (Table 15). Since this value was less than 0.250, it indicated the unequal distribution of alleles which decreased the expression of the studied character and that which increased it over the related loci. In addition, the ratio $((4DH_1)^{½} + F)/((4DH_1)^{½} – F)$ which measures the total numbers of dominant to recessive alleles in all parents was >1, i.e., 2.655497 (Table 15). This result indicated that the six parents used in this study carried more dominant than recessive alleles. This conclusion was supported also by the positive value of F, i.e., + 31.48111 (Table 15), which indicated that there were more dominant than recessive alleles in the parents used in the present study.

The results presented in Table 15 showed high broad sense heritability (96.19%) and relatively high narrow sense heritability (68.13%) which indicated that the additive gene action had an important role in the inheritance of this character. High heritability estimates for the inheritance of early flowering have been reported **(Biswajit *et al.*, 2005a; Omkar and Kumar, 2005).** On the other hand, low values of heritability estimates were recorded by **Mahaveer *et al.* (2004).** Such differences could be due to the fact that the additive and non-additive gene effects calculated by breeders under the environmental conditions of different locations are prone to change with the different environments **(Warade, 1986; Baig and Patil, 2002).** These results indicated that selection in segregating generations on individual plant basis will be effective in eggplant breeding programs to improve this character.

2.2. Fruit length :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning fruit length. Plants of cultivar Belleza Nera had the longest fruit (16.02 cm) followed by Black Beauty (15.45 cm), Balady Long White (13.73 cm), Balady Long Purple (12.43 cm), Baker (11.46 cm) and Violetta Lunga (10.94 cm). The hybrid Balady Long Purple X Black Beauty (19.83cm) significantly exceeded the cultivar which had the longest fruits, i.e., Belleza Nera (Table 10). Such differences in fruit length among plants of the different parental cultivars and hybrids can be useful in eggplant breeding programs. Same conclusion has been reached by **Prasad and Singh (2003), Mahaveer *et al.*(2004) and Thangamani *et al*. (2004).**

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. However, the calculated ratio of GCA/SCA was 3.37, i.e. more than unity, which indicates that the additive type of gene action was more important in the inheritance of this character. The relative importance of additive gene action in the inheritance of fruit length in eggplant was reported by **Peter and Singh (1973 and 1974) ,Singh *et al.* (1979) and Vadivel and Bapu (1990a)** .In addition, both the additive and non-additive type of gene actions were found to be involved in the inheritance of this character **(Sidhu *et al.*,1980; Biswajit *et al.*,2004; Ahmed *et al.*,2006).**

The highest value of general combining ability effect was associated with the parental cultivar Black Beauty (2.11), while the lowest value (-1.26) was associated with the parental cultivar Baker (Table 12). These results indicate that the parental cultivar Black Beauty can be a good combiner in forming hybrids with long fruits, while Baker will be a good combiner in forming hybrids with short fruits.

The highest specific combining ability effects were associated with F_1 hybrids Balady Long Purple X Black Beauty (4.40) and Belleza Nera X Violetta Lunga (2.29). On the other hand, the lowest specific combining ability effects were associated with F_1 hybrids Black Beauty X Balady Long White (-2.17), Balady Long Purple X Belleza Nera (-2.05) and Belleza Nera X Baker (-1.56), (Table 13). These results will give information about the expected performance of these hybrids concerning the expression of the studied character.

The results presented in Table 16 indicated absence of one of the assumptions required for validity of Jinks- Hayman analysis for fruit length.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis. The results presented in Table 17 showed very high broad sense heritability (99.71%) and above intermediate narrow sense heritability (54.23%) which indicated the role of both the additive and non-

additive gene actions in the inheritance of this character. However, the additive type represent the greatest portion of the genetic variance. These results indicated that selection on individual plants basis will be effective in eggplant breeding programs to improve this character. Relatively high estimates of heritability value for fruit length in eggplant was reported by **Mehrotra and Dixit (1973), Prasad and Prakash (1974), Sidhu *et al. (*1980), Singh and Singh (1981), Vadivel and Bapu (1990a) and Chung *et al*.(2003).**

2.3. Fruit diameter :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning fruit diameter. Plant of cultivar Belleza Nera had the highest fruit diameter (8.87 cm) followed by Black Beauty (8.68 cm), Balady Long Purple (3.38 cm), Violetta Lunga, Baker (2.79 cm) and Balady Long White (2.78 cm). Non of the hybrids exceeded the cultivar with highest fruit diameter, i.e., Belleza Nera. However, the F_1 hybrids Black Beauty X Baker and Black Beauty X Belleza Nera were not significantly different from the parent with the highest fruit diameter and also not significantly different from the parent Black Beauty (Table 10). High genotypic coefficients of variation in fruit diameter among eggplant genotypes have been reported **(Vadivel and Bapu, 1990b; Saha *et al.*, 1991a; Sunita and Bandhyopadhya, 2005)**. It is worth mentioning here that the high phenotypic and genotypic coefficients of variation for certain character indicate the potentiality of improving this character through breeding programs **(Mahaveer *et al.*, 2004).**

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non-additive type of gene actions. However, the calculated ratio of GCA/SCA was 11.57, which indicated that the additive type of gene action was more important in the inheritance of fruit diameter. Controlling fruit diameter in eggplant by both the additive and non-additive type of gene actions has been reported **(Biswajit *et al.*, 2004)**. However, **Ahmed *et al.* (2006)** reported that only additive components of gene action was involved in the inheritance of fruit diameter in eggplant.

The highest values of general combining ability effect were associated with the parental cultivars Black Beauty and Belleza Nera (2.27 and 1.14, respectively), while the lowest value (-1.11) was associated with the parental cultivar Violetta Lunga (Table 12). The parental cultivars which had the highest general combining ability will be good combiners in forming hybrids with high fruit diameter, while the parental cultivar Violetta Lunga will be a good combiner for forming hybrids with relatively low fruit diameter.

The highest specific combining ability effects were associated with F_1 hybrids Black Beauty X Balady Long White (1.50) and Black Beauty X Baker (2.01), (Table 13). Such F_1 hybrids will give plants with high fruit diameter. On the other hand, the lowest specific combining ability effects were associated with F_1 hybrids Balady Long Purple X Belleza Nera (-1.54), Black Beauty X Violetta Lunga (-1.64) and Belleza Nera

X Baker (-1.04). Such F_1 hybrids will give plants with low fruit diameter.

The analysis of homogeneity of Wr- Vr over arrays indicated the validity of Jinks- Hayman's genetic assumptions (Table 18). A further prove for the validity of these assumptions was indicated by the regression coefficient (b) for the Wr- Vr which was significantly different from zero and, in the same time, it was not significantly different from unity (Table 18 and Figure 4). This indicated the absence of appreciable epistatic interaction .

The intercept (a) of the regression line of Vr-Wr was 0.854373 which indicated that the regression line intersected the Wr axis slightly above the origin (Table 18). This result indicated the presence of partial dominance. Same nature of dominance, i.e. partial-dominance, was reported by **Biswajit *et al.* (2005a),** who recorded partial-dominance for fruit diameter in eggplant. The mean of N^2 progeny-parental mean was – 0.078888 (Table 18), which indicated that the partial-dominance was toward cultivars with lower fruit diameter. Moreover, the degree of dominance averaged over all loci, measured by $(H_1/D)^{½}$ was 0.817882 (Table 15). This can be considered as a further prove of the presence of partial dominance.

The relative values of the Vr and Wr (Table 18 and Figure 4) showed that the parental cultivars Belleza Nera and Baker had the highest values which indicated that these parental cultivars contained the most recessive genes. On the other hand, the parental cultivar Violetta Lunga had the lowest values and, hence contained the most dominant genes.

Table(18):Manual plotting for parabola limits and regression line, calculated statistics and tested hypothesis in the diallel eggplant crosses for fruit diameter according to Jinks-Hayman analysis

Parents	Vr	Wr-Parabola	Wr-Regression
Balady Long Purple (P1)	0.75852	2.63454	1.58706
Black Beauty (P2)	3.29214	5.48859	4.03442
Balady Long White (P3)	3.63954	5.77092	4.36999
Belleza Nera (P4)	5.26674	6.94213	5.94178
Violetta Lunga (P5)	0.58318	2.31006	1.41770
Baker (P6)	4.41604	6.35680	5.12005

Calculated statistics	Value
Regression Coefficient (b)	0.965951
Intercept (a)	0.854373
Parental Mean	4.882667
Mean of N^2 progeny	4.803778
Mean of N^2 progeny – parental Mean	-0.078888
Variance of Parents (VoLo)	9.150482
Variance of the Mean of Arrays (VoL_1)	1.889801
Mean covariance of Arrays with Non-Recurring Parents ($WoLo_1$)	3.745168
Mean variance of Arrays (V_1L_1)	2.992693

Tested Hypothesis	Calc. $t_{0.05}$	Signif. ^{K}
Ho: Wr - Vr is homogenious	0.1755593	ns
Ho:b=o(not significantly different from zero)	5.351677	**
Ho:b=1(not significantly different from unity)	0.1886422	ns

k_{ns} = Not significant
**= Significant at 1% level of significance

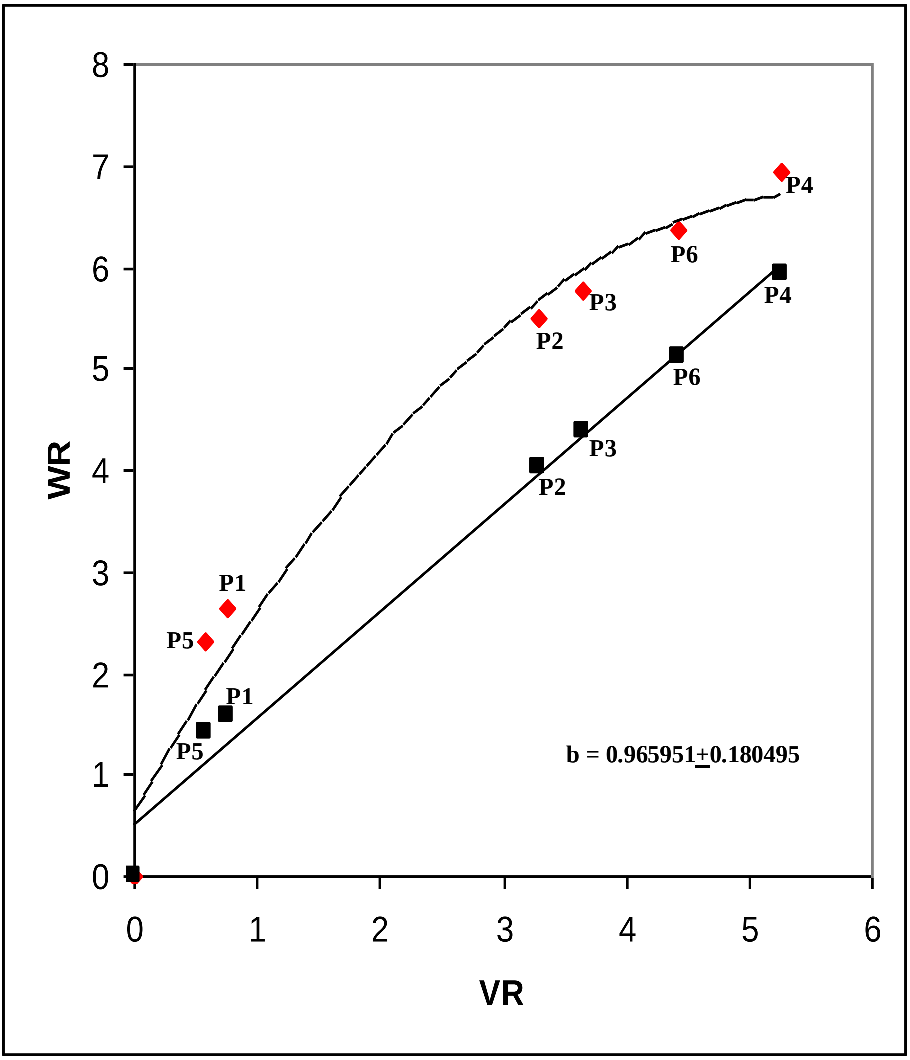


Fig.(4):Variance (VR) and covariance (WR) graph of fruit diameter in F1 generation of egg plant germplasm (P1 = Balady Long Purple, P2 = Black Beauty, P3 = Balady Long White, P4 = Belleza Nera, P5 = Violetta Lunga and P6 = Baker).

The ratio $H_2/4H_1$ was 0.1795734 (Table 15). Since this value was less than 0.25, this indicated the unequal distribution of alleles which decreased the expression of the studied character and that which increased it over the related loci. In addition, the ratio $((4DH_1)^{½} +F)/ ((4DH_1)^{½} -F)$ was 1.568023 (Table 15). This result indicated that the six parent used in the present study carried more dominant than recessive alleles. This conclusion was supported by the positive value of F (Table 15).

The results presented in Table 15 showed very high broad sense heritability (99.80%) and high narrow sense heritability (77.33%) which indicated that the additive gene action had important role in the inheritance of this character. These results indicated that selection in segregating generations on individual plant basis will be effective in eggplant breeding programs to improve this character. These results agreed with those of **Prasad and Prakash (1974), Chung *et al.* (2003) and Sunita and Bandhyopadhya (2005),** who reported high heritability for fruit diameter in eggplant.

2.4. Fruit weight :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning fruit weight. Plants of cultivars Black Beauty and Belleza Nera had the highest fruit weight (257.13 and 223.46g., respectively), (Table 10) followed by Balady Long Purple (74.34g), Baker (68.13g), Balady Long White (61.62g) and Violetta Lunga (59.84g). The F_1 hybrid Black Beauty X Baker (236.41g.) was not significantly different from the parental cultivars with the highest fruit weight, i.e., Black Beauty and Belleza Nera (Table 10). Such differences in fruit weight among eggplant genotypes could be useful in breeding programs to improve this character **(Vadivel and Bapu, 1990a; Prasad and Singh, 2003; Mahaveer *et al.*, 2004; Thangamani *et al.*, 2004; Sunita and Bandhyopadhya, 2005).**

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. The involvement of both the additive and non-additive type of gene actions in the inheritance of fruit weight in eggplant was also reported by **Narendra and Ram (1989), Padmanabham and Jagadish (1996), Aswani and Khandelwal (2005) and Biradar *et al.* (2005).** In addition, **Lawande *et al.* (1992)** reported the presence of additive X dominance and dominance X dominance gene effects in the inheritance of this character. Furthermore, **Chezhian *et al.* (2000)** reported the involvement of additive X additive gene action. However, the calculated ratio of GCA/SCA was 15.68 which indicates that the additive type of gene action was more important in the inheritance of this character. This result agreed with that of **Sidhu *et al.* (1980), Dixit *et al.* (1982), Salehuzzaman and Alam (1983), Lawande *et al.* (1992), Silva *et al.* (1999) and Omkar and Kumar (2005),** who reported that the additive type of gene action was more important than the non-additive type of gene action in the inheritance of this character. However, **Ahmed *et al.* (2006)** reported that only additive component was involved. On the other hand, **Singh *et al.* (1979)** found that non-additive type of gene action was more important than the additive type. Such differences could be due to evaluation of different eggplant genotypes under different environmental conditions. Estimates of both additive and non-additive gene actions are prone to change with the environment **(Baig and Patil, 2002).**

The highest values of general combining ability effects were associated with the cultivars Black Beauty (80.32) and Belleza Nera (26.10), while the lowest values were associated with the cultivars Violetta Lunga (-33.86) and Balady Long Purple (-31.42), (Table 12). These results indicated that the parental cultivars Black Beauty and Belleza Nera will be good combiners for forming hybrids with relatively high fruit weight. It has been reported that Black Beauty was the best general combiner which produced significant GCA effect for average fruit weight **(Biradar *et al.*, 2005).**

The highest specific combining ability effect was associated with the F_1 hybrid Black Beauty X Baker (58.97), (Table 13). This hybrid will give plants with high fruit weight. On the other hand, the lowest specific combining ability effects were associated with the F_1 hybrids Balady Long Purple X Belleza Nera (-43.37), Belleza Nera X Violetta Lunga (-40.94) and Belleza Nera X Baker (-46.58). Such F_1 hybrids will give plants with low fruit weight.

The analysis of homogeneity of Wr- Vr over arrays indicated the validity of Jinks- Hayman's genetic assumptions (Table 19). A further prove for the validity of these assumptions was indicated by the regression coefficient (b) for the Wr- Vr which was significantly different from zero and, in the same time, it was not significantly different from unity (Table 19 and

Figure 5). This indicated the absence of appreciable epistatic interaction .

The intercept (a) of the regression line of Vr-Wr was 1386.701 which indicated that the regression line intersected the Wr axis above the origin (Table 19). This indicated the presence of partial-dominance. Moreover, the degree of dominance averaged over all loci, measured by $(H_1/D)^{½}$ was less than one, i.e. 0.7854192, this can be considered as a further prove on the presence of partial-dominance. These results agreed with that of **Gulam *et al.* (1999),** who found partial-dominance for fruit weight in eggplant. In addition, the value of (mean of N^2 progeny- parental mean) was –10.16689 (Table 19) which indicated that the direction of partial-dominance was toward the low average fruit weight.

The values of Vr and Wr (Table 19 and Figure 5) showed that the parental cultivars Belleza Nera and Baker had the highest values of Vr-Wr, and hence had the most recessive genes. On the other hand, the parental cultivar Balady Long Purple had the lowest values, and hence had the most dominant genes.

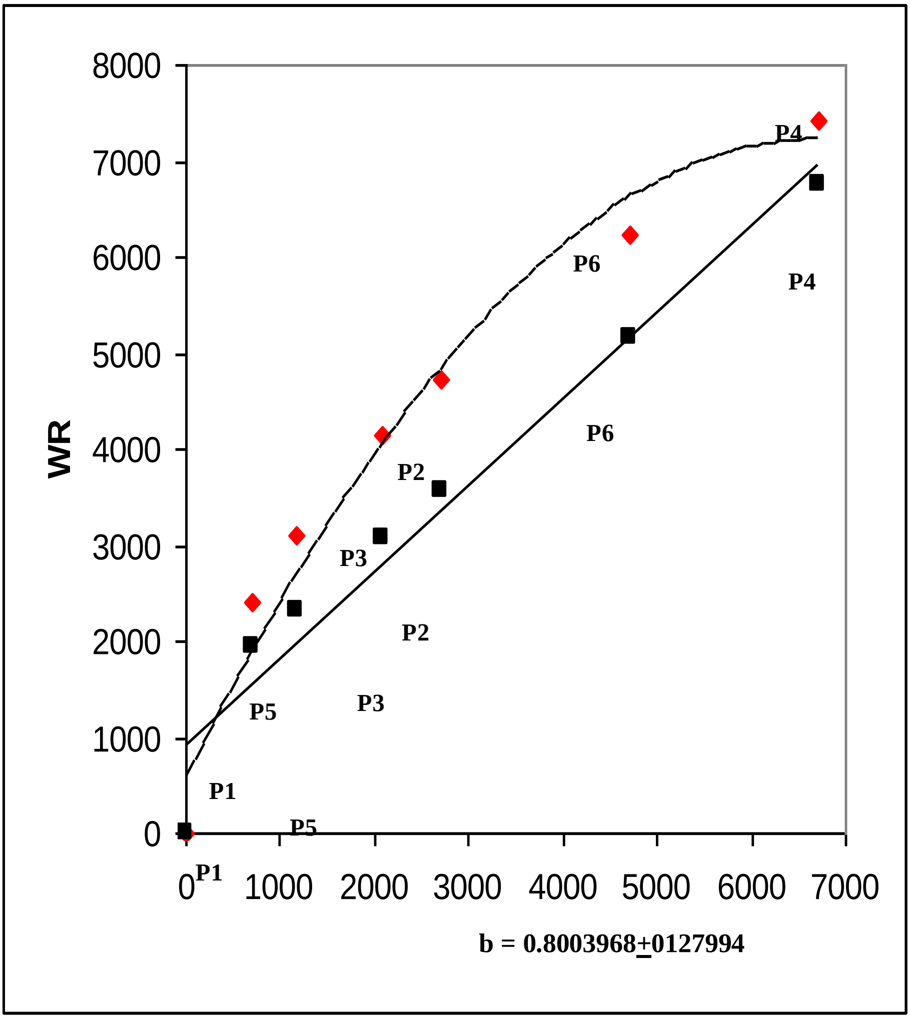
The ratio, $H_2/4H_1$ which is used to estimate the average frequency of negative versus positive alleles in the parents was 0.1797818 (Table 15). Since this value was less than 0.250, this result indicated the unequal distribution of alleles which decreased the expression of the studied character and that which increased it over the related loci. In addition, the ratio $((4DH_1)^{½}+F)/((4DH_1)^{½}-F)$ which measures the total numbers of dominant to recessive alleles in all parents was > 1, i.e.

Table(19): Manual plotting for parabola limits and regression line, calculated statistics and tested hypothesis in the diallel eggplant crosses for fruit weight according to Jinks-Hayman analysis

Parents	Vr	Wr-Parabola	Wr-Regression
Balady Long Purple (P1)	710.00623	2419.0820	1954.9880
Black Beauty (P2)	2705.39990	4722.1021	3552.0947
Balady Long White (P3)	2091.09770	4151.5161	3060.4092
Belleza Nera (P4)	6702.96730	7432.8130	6751.7354
Violetta Lunga (P5)	1160.78833	3093.115	2315.7927
Baker (P6)	4703.76420	6226.4766	5151.5791
Calculated statistics		**Value**	
Regression Coefficient (b)		0.8003968	
Intercept (a)		1386.701	
Parental Mean		124.0867	
Mean of N^2 progeny		113.9198	
Mean of N^2 progeny – parental Mean		-10.16689	
Variance of Parents (VoLo)		8242.127	
Variance of the Mean of Arrays (VoL_1)		2095.216	
Mean covariance of Arrays with Non-Recurring Parents ($WoLo_1$)		3797.766	
Mean variance of Arrays (V_1L_1)		3012.337	
Tested Hypothesis		**Calc. $t_{0.05}$**	**Signif. [K]**
Ho: Wr - Vr is homogenious		1.147847	ns
Ho: b=o(not significantly different from zero)		6.253392	**
Ho:b=1(not significantly different from unity)		1.559473	ns

k $_{ns}$ = Not significant

**= Significant at 1% level of significance


WR
8000
7000
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6000
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P1
P1
P5
P5
P3
P3
P2
P2
P6
P6
P4
P4
b = 0.8003968±0127994

Fig.(5): Variance (VR) and covariance (WR) graph of fruit weight in F1 generation of egg plant germplasm (P1 = Balady Long Purple, P2 = Black Beauty, P3 = Balady Long White, P4 = Belleza Nera, P5 = Violetta Lunga and P6 = Baker).

1.220184, (Table 15). This result indicated that the six parents used in the present study carried more dominant than recessive alleles. This conclusion was supported by the positive value of F, i.e. +1282.794, (Table 15).

The results presented in (Table 15) showed very high broad sense heritability (99.85%) and high narrow sense heritability (81.98%) which indicated that the additive gene action had important role in the inheritance of this character. Relatively moderate to high estimates of heritability for fruit weight in eggplant have been reported **(Harbans and Nandpuri, 1974; Joarder *et al.*, 1981; Salehuzzaman and Alam, 1983; Chung *et al.*, 2003; Mahaveer *et al.*, 2004; Omkar and Kumar, 2005; Sunita and Bandhyopadhya, 2005).** These results indicated that selection in segregating generations on individual plant basis will be effective in eggplant breeding programs to reach the desired expression of this character.

2.5. Early yield per plant :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning early yield per plant. Plants of cultivar Violetta Lunga had the highest early yield/plant (535.0g) followed by Belleza Nera (512.2 g), Black Beauty (438.0g), Balady Long Purple (147.0 g), Balady Long White (94.0 g) and Baker (90.2 g). Genetic differences among eggplant genotypes concerning early yield per plant was reported by **Aggour (1981).** In addition, the F_1 hybrids Balady Long Purple X Balady Long White (992.0g), Violetta Lunga X Baker (750.0g), Belleza Nera X Baker (748.0g) and Balady Long White X Baker (677.0g) exceeded the cultivar with the highest early yield/plant (Violetta Lunga). The superiority of the F_1 hybrids over the better parent concerning early yield per plant has been reported **(Aggour, 1981; Biswajit *et al.*, 2005b).** However, the F_1 hybrid Belleza Nera X Violetta Lunga (528.0g) was not significantly different from the parental cultivar Violetta Lunga (Table 10).

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. These results agreed with that of **Bao *et al.* (2004) and Biradar *et al.* (2005),** who reported the involvement of both additive and non-additive gene actions in the inheritance of early yield. The calculated GCA/SCA ratio was 0.27 (less than unity), which indicates that the non-additive type of gene action was more important in the inheritance of this character. Same conclusion was reached by **Hani *et al.* (1977), Narendra and Ram (1987) and Bendale *et al.*(2005),** who mentioned that the non-additive type of gene action was predominant over the additive type in the inheritance of early yield/plant in eggplant.

The highest values of desirable general combining ability effect were associated with the parental cultivars Baker (41.74) and Violetta Lunga (40.59), (Table 12). This results show that the parents which had the highest desirable general combining ability effects, i.e., Baker and Violetta Lunga will be good combiners for forming hybrids with high early yield.

The highest desirable specific combining ability effect was associated with F_1 hybrid Balady Long Purple X Balady Long White (615.52). Such hybrid will give plants with high early yield followed by Belleza Nera X Baker (264.74), Violetta Lunga X Baker (248.74) and Balady Long Purple X Baker (112.92), (Table 13).

The results presented in (Table 16) indicated absence of one or more of the assumptions required for validity of Jinks-Hayman analysis for early yield per plant.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis (Table 17). The broad and narrow sense heritability estimates were 95.83% and 57.99%, respectively (Table 17). These results indicated that the additive genetic variance components is relatively large comparing to the other types of genetic variance components. These results indicate the relatively high progress which can be achieved by selecting individual plants. **Harbans and Nandpuri (1974)** recorded also moderate to high value of heritability for number of days to first picking as a measure for early yield in eggplant.

2.6. Total number of fruits per plant :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning total number of fruits per plant. Plants of cultivar Violetta Lunga had the highest number of fruits per plant (37.2) followed by Balady Long White (31.6), Baker (26.2), Balady Long Purple (14.4), Black Beauty (14.0) and Belleza Nera (12.6). The F_1 hybrids Belleza Nera X Violetta Lunga, Balady Long Purple X Baker, Belleza Nera X Baker, Balady Long Purple X Balady Long White and Balady Long Purple X

Belleza Nera (48.2, 46.2, 45.4, 42.0 and 38.0, respectively) exceeded the cultivar with the highest number of fruits per plant (Violetta Lunga). The superiority of F_1 hyrbids over parents were expected based on the findings of **Salehuzzaman and Alam (1983),** who reported the involvement of dominance and duplicate epistasis in the inheritance of this character. In addition, **Gulam *et al.* (1999)** reported the presence of over-dominance for number of fruits per plant in eggplant which also explains the superiority of F_1 hybrids over parents in this respect. However, the F_1 hybrids Balady Long White X Baker (36.8) and Balady Long Purple X Violetta Lunga (36.4) were not significantly different from the parental cultivar Violetta Lunga (Table 10). The genotypic differences in number of fruits per plant among eggplant genotypes indicate the potentiality of making progress in improving this character through breeding programs. High genetic coefficient of variation for this character in eggplant was calculated by **Bhutani *et al.* (1977), Dharmegowda *et al.* (1979a), Singh and Singh (1981), Vadivel and Bapu (1990 a&b), Saha *et al.* (1991a), Gulam *et al.* (1999), Illangakoon *et al.* (2004), Mahaveer *et al.* (2004) and Thangamani *et al.* (2004).** In addition, significant genetic differences among eggplant genotypes concerning number of fruits per plant have been observed **(Rashid *et al.*, 1988; Vadivel and Bapu, 1989a; Roman *et al.*, 2001; Antonini *et al.*, 2002; Prasad and Singh, 2003).**

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non-additive type of gene actions.

The involvement of both the additive and non-additive types of gene action has been also reported (**Dharmegowda, 1977; Dharmegowda *et al.*, 1979a; Narendra and Ram, 1989; Padmanabham and Jagadish, 1996; Biswajit *et al.*, 2004; Aswani and Khandelwal, 2005; Biradar *et al.*, 2005; Ahmed *et al.*, 2006)**. In addition, **Lawande *et al.* (1992),** mentioned that the additive gene effects were significant and reported the role of additive x dominance and dominance x dominance gene effect in the inheritance of number of fruits per plant. However, the calculated ratio of GCA/SCA was 1.93, i.e. more than unity, which indicates that the additive type of gene action was more important in the inheritance of this character. This result agreed with that of **Singh *et al.* (1979), Sidhu *et al.* (1980), Vadivel and Bapu (1990a) and Omkar and Kumar (2005),** who reported that the additive type was more important in the inheritance of number of fruits/plant. Moreover, **Chezhian *et al.* (2000)** reported the presence of additive x additive gene effects.

The highest values of general combining ability effects were associated with the parental cultivars Violetta Lunga (4.67), and Baker (3.12), while the lowest value (-10.48) was associated with the parental cultivar Black Beauty (Table 12). This results indicate that the parental cultivars Violetta Lunga and Baker will be good combiners for forming hybrids with relatively high number of fruits per plant.

The highest specific combining ability effects were associated with F_1 hybrids Belleza Nera X Violetta Lunga (15.99), Belleza Nera X Baker (14.74), Balady Long Purple X Black Beauty (13.74) and Balady Long Purple X Baker (11.14),

(Table 13). Such F_1 hybrids will give plants with relatively high number of fruits per plant.

The analysis of homogeneity of Wr- Vr over arrays indicated the validity of Jinks-Hayman's genetic assumptions (Table 20). A further prove for the validity of these assumptions was indicated by the regression coefficient (b) for the Wr- Vr which was significantly different from zero and, in the same time, it was not significantly different from unity (Table 20). This also indicated the absence of appreciable epsitatic interaction.

The intercept (a) of the regression line of Vr-Wr was –48.58612 which indicated that the regression line intersected the Wr axis below the origin (Table 20). This indicated the presence of over-dominance. However, **Dharmegowda *et al.* (1979b) and Biswajit *et al.* (2005a)** recorded different nature for dominance, i.e., partial-dominance. The difference in the nature of dominance recorded for number of fruits per plant could be due to using different eggplant genotypes carrying different genes controlling the studied character. In addition, such differences can be explained by the facts reported by **Baig and Patil (2002),** who found that the estimated additive and non-additive gene action were prone to change with the different environmental conditions and eggplant genotypes. In addition, the value of (mean of N^2 progeny- parental mean) was + 7.361109 (Table 20) which indicated that the direction of over-dominance was toward the high number of fruits per plant. Moreover, the degree of dominance, averaged over all loci, measured by $(H_1/D)^{½}$ was

Table(20):Manual plotting for parabola limits and regression line, calculated statistics and tested hypothesis in the diallel eggplant crosses for total number of fruits per plant according to Jinks-Hayman analysis

Parents	Vr	Wr-Parabola	Wr-Regression
Balady Long Purple (P1)	121.79863	115.19565	17.23650
Black Beauty (P2)	88.76272	98.33998	- 0.61682
Balady Long White (P3)	82.71055	94.92822	- 3.88754
Belleza Nera (P4)	284.62421	176.09653	105.23099
Violetta Lunga (P5)	96.03233	102.28774	3.31184
Baker (P6)	162.61504	133.10526	39.29458
Calculated statistics		**Value**	
Regression Coefficient (b)		0.5404217	
Intercept (a)		- 48.58612	
Parental Mean		22.63333	
Mean of N^2 progeny		29.99444	
Mean of N^2 progeny – parental Mean		7.361109	
Variance of Parents (VoLo)		108.9506	
Variance of the Mean of Arrays(VoL_1)		42.61748	
Mean covariance of Arrays with Non-Recurring Parents ($WoLo_1$)		26.76159	
Mean variance of Arrays (V_1L_1)		139.4239	
Tested Hypothesis		**Calc. $t_{0.05}$**	**Signif. [K]**
Ho: Wr - Vr is homogenious		1.636248	ns
Ho:b=o(not significantly different from zero)		3.040792	**
Ho:b=1(not significantly different from unity)		2.58591	ns

[k] ns = Not significant

**= Significant at 1% level of significance

> 1, i.e.,2.269229, which can be considered also as a further prove for the presence of over-dominance.

The relative values of the Vr and Wr (Table 20) showed that the parental cultivars Belleza Nera and Baker had the highest values which indicated that these parental cultivars contained the most recessive genes. On the other hand, the parental cultivars Black Beauty and Balady Long White had the lowest Vr-Wr values and, hence contained the most dominant genes. Moreover, the values of Vr and Wr associated with the parental cultivars Black Beauty and Balady Long White were close to each other (Table 20) which indicated that these parental cultivars have similar genotypes concerning total number of fruits per plant. On the other hand, the parental cultivar Belleza Nera, had a different genotype because it had a unique high value of Vr- Wr concerning the studied character (Table 20).

The ratio, $H_2/4H_1$ was 0.1729523 (Table 15). Since this value was less than 0.250, this result indicated the unequal distribution of alleles which decreased the expression of the studied character and that which increased it over the related loci. In addition, the ratio $((4DH_1)^{½} + F)/ ((4DH_1)^{½} - F)$ was >1 (1.576723), (Table 15). This result indicated that the six parents used in the present study carried more dominant than recessive alleles. This conclusion was supported by the positive value of F (Table 15), i.e., + 110.0866, which indicated that there were more dominant than recessive alleles in the parents used in the present study.

The results presented in Table 15 showed very high broad sense heritability (99.68%) and intermediate narrow sense heritability (46.72%) which indicated the large influences of the genetic variance on the expression of this character. Furthermore, the additive genetic variance components is relatively large comparing to the non-additive genetic variance indicating high progress which can be achieved by selecting individual plants to improve this character. Relatively high estimates of heritability for number of fruits/plant in eggplant have been reported (**Hiremath and Gururaja, 1974; Bhutani *et al.*, 1977; Dharmegowda *et al.*, 1979b; Joarder *et al.*, 1981; Singh and Singh, 1981; Salehuzzaman and Alam, 1983; Kalda *et al.*, 1988; Mahaveer *et al.*, 2004; Biswajit *et al.*, 2005a; Omkar and Kumar, 2005)**. In addition, **Aggour (1981) and Narendra and Ram (1989)** recorded intermediate heritability estimate values for this character.

2.7. Total yield per plant :

The results presented in Tables 10 and 11 indicate significant differences among different parental genotypes and hybrids concerning total yield per plant. Plants of cultivar Black Beauty had the highest total yield per plant (3604.0g) followed by Belleza Nera (2818.8g), Violetta Lunga (2229.0g), Balady Long White (1944.0g), Baker (1788.8g) and Balady Long Purple (1070.0g). Significant differences in fruit yield per plant among eggplant genotypes have been reported **(Harbans and Nandpuri, 1974; Dharmegowda, 1977; Singh, S.N. *et al.*, 1978; Dharmegowda *et al.*, 1979a; Bhutani *et al.*, 1980; Aggour, 1981; Singh and Singh, 1981; Khurana *et al.*, 1987;**

Rashid *et al.*, 1988; Chadha and Hegde, 1989; Patil and Shinde, 1989; Mishra and Mishra, 1990b; Vadivel and Bapu, 1990b ; Chezhian *et al.*, 2000; Roman *et al.*, 2001; Antonini *et al.*, 2002; Prasad and Singh, 2003; Mahaveer *et al.*, 2004; Thangamani *et al.*, 2004). The F_1 hybrid Balady Long Purple X Black Beauty (4739.0g) exceeded the cultivar with the highest total yield, i.e., Black Beauty (Table 10). The superiority of the F_1 hybrid over one or the two parental genotypes were observed by **Dutt (1970), Singh *et al.* (1977), Singh S.N. *et al.* (1978), Singh S.N. *et al.* (1979), Dharmegowda *et al.*, (1979a), Aggour (1981), Salehuzzaman (1981), Salimath (1981), Dixit *et al.* (1982), Nualsri *et al.* (1986a), Warade (1986), Saha *et al.* (1991b), Parasath *et al.* (1998), Sousa and Maluf (1998), Kaur *et al.* (2001b), Aswani and Khandelwal (2003), Kanthaswamy *et al.* (2003), Mohanty (2003), Sarawathi (2003), Biswajit *et al.* (2005b), Prabhu *et al.* (2005) and Suneetha *et al.* (2006)**.

The results presented in Table 11 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. The involvement of both additive and non-additive gene actions in controlling fruit yield per plant in eggplant was reported by **Peter and Singh (1974), Sidhu *et al.* (1980), Borikar *et al.* (1981), Bao *et al.* (2004), Biswajit *et al.* (2004), Aswani and Khandelwal (2005), Biradar *et al.* (2005), Ahmed *et al.* (2006) and Suneetha and Kathiria (2006).** However, the calculated ratio of GCA/SCA was 0.77, i.e. less than unity, which indicates that the non- additive type of gene action was more important in the inheritance of this character. This result agreed with the results of many authors who reported that the non-additive gene action was predominant in the inheritance of fruit yield per plant in eggplant **(Hani *et al.*, 1977; Singh, *et al.*, 1979; Bhutani *et al.*, 1980; Joarder *et al.*, 1981; Narendra and Ram, 1987; Singh and Mital, 1988; Patel *et al.*, 1994; Padmanabham and Jagadish, 1996; Ingale and Patil, 1997; Singh and Singh, 2004; Bendale *et al.*, 2005; Biradar *et al.*, 2005; Suneetha *et al.*, 2005).** In addition, **Peter and Singh (1973), Joarder *et al.*(1981) and Nualsri *et al.* (1986b)** reported that out of the non-additive effects, the dominance effects were more important in the inheritance of yield/plant in eggplant. Moreover, **Salehuzzaman and Alam (1983)** reported that dominance and duplicate epitasis were most important in the inheritance of this character. On the other hand, the additive gene effects were found to be more important in the inheritance of this character **(Borikar *et al.*, 1981; Dixit *et al.*, 1982; Vadivel and Bapu, 1990a; Omkar and Kumar, 2005).** Such differences could be due to using different eggplant genotypes and/or different environments in evaluation. It has been reported by **Warade (1986) and Baig and Patil (2002)** that the estimates of both additive and non-additive gene actions were prone to change with the different environments and/or different eggplant genotypes. Moreover, **Lawande *et al.* (1992)** found that the additive gene effects were significant and they also reported the influence of additive x dominance and dominance x dominance gene effects on the inheritance of yield/plant in eggplant .

The highest value of general combining ability effect was associated with the parental cultivar Black Beauty, which had the highest yielding capacity (447.53), while the lowest value (-210.67) was associated with the parental cultivar Violetta Lunga (Table 12). **Kaur *et al.* (2001a) and Rajaneesh and Maurya (2003)** reported significant differences in GCA effects among eggplant genotypes. The parental genotype which had the highest desirable general combining ability effect, i.e., Black Beauty, will be a good combiner for forming hybrids with high total yield/plant. Same results had been reached by **Mivechi and Kazerani (2001),** who reported the high yielding capacity of cultivar Black Beauty and **Biradar *et al.* (2005),** who found that the eggplant cultivar Black Beauty was the best general combiner which produced significant GCA for fruit yield per plant. In addition, the results obtained in the present study in this respect agreed with the finding of **Aswani and Khandelwal (2005),** who mentioned that the parents which had the best per se performance were also the best general combiners, indicating a positive association between the two parameters.

The highest specific combining ability effect was associated with F_1 hybrid which includes the best general combiner (Black Beauty), i.e., Balady Long Purple X Black Beauty (1684.8), (Table 13). Such F_1 hybrid will give plants with high total yield/plant. This result was confirmed by results and conclusions of **Aswani and Khandelwal (2005),** who found that the eggplant crosses having high SCA effects and also involved at least one good general combiner parent were considered useful because such crosses provide transgressive type of segregants in the advanced generations more frequently than crosses with poor general combiner parents. On the other hand,

Thakur *et al.* (1968) found that the eggplant cultivar with the highest yield was not the best combiner. These differences can be explained by the findings of **Warade (1986),** who found that the eggplant crosses between parents with high GCA effects but had low magnitude of non-additive of gene effects for certain characters, resulted in small degree of SCA effects and heterosis.

The results presented in Table 16 indicated absence of one or more of the assumptions required for validity of Jinks-Hayman analysis for total yield per plant. Since the Jinks-Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis (Table 17). The results presented in Table 17 showed very high broad sense heritability (98.66%) and low narrow sense heritability (12.96%). The relatively low value of the narrow sense heritabiity estimates indicated the high involvement of the non-additive and environmental effects on the expression of this character. Low estimates of heritability values for the same character were recorded by **Sidhu *et al.* (1980), Aggour (1981), Salehuzzaman and Alam (1983), Nualsri *et al.* (1986b) and Narendra and Ram (1989).** On the other hand, moderate to high estimates for heritability were recorded for fruit yield/plant in eggplant **(Mehrotra and Dixit, 1973; Joarder *et al.*, 1981; Singh and Singh, 1981; Vadivel and Bapu, 1990a; Chung *et al.*, 2003; Mahaveer *et al.*, 2004; Omkar and Kumar, 2005).** These differences could be due to evaluating different eggplant genotypes under different environmental conditions. The fact that the estimation of both the additive and non-additive gene actions are prone to change with the environments **(Warade, 1986; Baig and Patil, 2002)** may result in different calculations for the heritability values. In addition, using different criteria to evaluate total yield/plant in eggplant such as marketable yield/plant or total yield per plant may also cause such differences in the estimated heritability. According to the results obtained in the present study, selection for lines or hybrids with high productivity should be performed in replicated experiments to eliminate as much as possible the environmental effects on the expression of this character. In addition, it is worth mentioning here that selection for other characters as well as total yield per plant, e.g., number of fruits per plant, fruit diameter, weight and length, number of branches per plant, plant height, and number of days to first flowering, may affect the yielding capacity of the selected plants, indicating the importance of considering such characters during selection process **(Hiremath and Gururaja, 1974; Singh H.N., 1978; Kalyanasundaram, 1979; Aggour, 1981; Sanguineti *et al.*, 1985; Howe and Waters, 1987; Khurana *et al.*, 1988; Vadivel and Bapu, 1989b andc; Mishra and Mishra, 1990a; Vadivel and Bapu,1990b; Joshi and Chadha, 1991; Mandal and Dana, 1992; Ponnuswami and Irulappan, 1992; Randhawa *et al.*, 1993; Ushakumari and Subramanian, 1993; Abd El-Rahim *et al.*, 1996; Chung *et al.*, 2003; Patel and Sarnaik, 2004; Sunita and Bandhyopadhya, 2005).**

3. Chemical characters :

3.1. Fruit fibers content :

The results presented in Tables 21 and 22 indicate significant differences among different parental genotypes and

Table(21): Means of fruit fibers, fruit non-reducing sugars, fruit reducing sugars and fruit total sugars (g/100g.d.w.) of different parental genotypes and its F_1 hybrids evaluated in the field

Genotypes	Measurements			
	Fruit fibers content	Fruit non-red. sugars	Fruit red. sugars	Fruit total sugars
Balady Long Purple	11.07	11.86	6.13	17.99
Balady Long Purple × Black Beauty	20.00	12.76	7.86	20.62
Balady Long Purple × Balady Long White	14.53	11.56	5.90	17.16
Balady Long Purple × Belleza Nera	13.33	10.32	8.49	18.80
Balady Long Purple × Violetta Lunga	14.53	10.53	6.94	17.14
Balady Long Purple × Baker	18.80	13.89	6.14	20.03
Black Beauty	7.17	15.86	9.94	25.80
Black Beauty × Balady Long White	15.07	15.21	7.68	22.89
Black Beauty × Belleza Nera	16.67	13.60	6.31	19.91
Black Beauty × Violetta Lunga	10.93	12.88	9.38	22.26
Black Beauty × Baker	18.53	12.64	6.37	19.01
Balady Long White	12.53	10.41	7.11	17.52
Balady Long White × Belleza Nera	15.60	10.98	9.42	20.28
Balady Long White × Violetta Lunga	13.07	14.81	8.82	23.54
Balady Long White × Baker	15.07	12.00	8.74	20.74
Belleza Nera	14.93	13.70	10.49	24.19
Belleza Nera × Violetta Lunga	12.00	13.89	7.41	21.30
Belleza Nera × Baker	13.33	13.95	7.27	21.22
Violetta Lunga	11.33	12.25	7.93	20.18
Violetta Lunga × Baker	17.87	14.33	7.23	21.56
Baker	19.07	14.43	10.58	21.68
L.S.D 5%	1.47	1.86	1.37	2.41
L.S.D 1%	1.95	2.49	1.81	3.22

Table(22): Mean square values of fruit fibers, fruit non reducing sugars, fruit reducing sugars and fruit total sugars content for the different sources of variance

Sources of variance	d.f.	Fruit fibers	Fruit non-red. sugars	Fruit red. sugars	Fruit total sugars
Genotypes	20	31.06**	7.90**	6.34**	15.66**
Parents	5	48.42**	11.54**	10.81**	33.13**
Hybrids	14	20.85**	7.12**	4.08**	9.99**
Parents Vs Hybrids	1	87.28**	0.49^{ns}	15.56**	7.75^{ns}
Error	40	0.78	1.27	0.67	2.13
General combining ability(GCA)	5	14.17**	4.55**	2.20**	10.07**
Specific combining ability (SCA)	15	9.08**	1.99**	2.08**	3.60**
Error	40	0.26	0.42	0.22	0.71
GCA / SCA		1.56	2.28	1.05	2.79

hybrids concerning fruit fibers content. Plants of cultivar Baker had the highest fruit fibers content (19.07g/100g dry weight). The cultivars Belleza Nera (14.93g/100g. dry weight), Balady Long White (12.53g/100g. dry weight), Violetta Lunga (11.33g/100g. dry weight (d.w.)) and Balady Long Purple (11.07g/100g. dry weight) can be classified as cultivars with intermediate levels of fruit fibers content. On the other hand, the plants of cultivar Black Beauty had the lowest value (7.17g/100g. dry weight) concerning this character. Significant differences concerning fruit fibers content among eggplant germplasm has been observed **(Agamia, 1972; Aggour, 1981).** It is worth mentioning that the low fruit fibers content is considered one of the desirable quality characteristics of eggplant. Non of the hybrids had fruits with fibers content as low as the content of the fruits of Blak Beauty. However, the F_1 hyrbid Black Beauty x Violetta Lunga had fruits with relatively low fruit fibers content, i.e. 10.93 g//100g. dry weight, (Table 21).

The results presented in Table 22 show significant general and specific combining ability effects which indicate the presence of both additive and non- additive type of gene actions. However, the calculated ratio of GCA/SCA was 1.56, i.e. more than unity, which indicates that the additive type of gene action was more important in the inheritance of this character.

The results presented in Table 23 show that the parents which had the lowest (highest desirable) general combining ability effects were associated with the parental genotyes Violetta Lunga (-1.34), Black Beauty (-0.78), Balady Long

Table (23): General combining ability effects (g_i) for fruit fibers, fruit non-reducing sugars, fruit reducing sugars and fruit total sugars for the different parental genotypes .

Genotypes	Measurements			
	Fruit fibers	Fruit non-red. sugars	Fruit red. sugars	Fruit total sugars
Balady Long Purple	0.19	-0.98	-0.97	-1.83
Black Beauty	-0.78	1.02	0.26	1.45
Balady Long White	-0.43	-0.65	-0.07	-0.59
Belleze Nera	-0.13	-0.06	0.56	0.65
Violetta Lunga	-1.34	0.04	0.03	0.18
Baker	2.49	0.63	0.19	0.15
L.S.D 5%	0.34	0.42	0.31	0.55
L.S.D 1%	0.44	0.57	0.41	0.74

White (-0.43) and Belleza Nera (-0.13), while the highest value (2.49) was associated with the parental cultivar Baker (Table 23). These results indicated that the parental cultivars Violetta Lunga, Black Beauty, Balady Long White and Belleza Nera will be good combiners for forming hybrids with low fruit fibers content .

The F_1 hybrids which showed the highest desirable specific combining ability effects were, Belleza Nera x Baker (-3.57), Balady Long White x Baker (-1.54), Black Beauty x Violetta Lunga (-1.48) and Balady Long Purple x Belleza Nera (-1.27), (Table 24). Such F_1 hybrids will give plants with low fruit fibers content.

The results presented in (Table 25) concerning values of Wr- Vr indicated absence of one or more of the assumptions required for validity of Jinks- Hayman analysis for fruit fibers content.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis (Table 26). The broad (h_{bs}) and narrow (h_{ns}) sense heritability estimates for fruit fibers content were 97.76% and 21.89%, respectively, (Table 26). These values indicated that progress in improving this character can be achieved. This conclusion is confirmed by the results of **Aggour (1981),** who recorded 70.00% and 43.12% for the broad and narrow sense heritability of this character, respectively.

Table(24):Specific combining ability effects (S_{ij}) of the different F_1 hybrids for fruit fibers, fruit non-reducing sugars, fruit reducing sugars and fruit total sugars content.

Genotypes	Measurements			
	Fruit fibers	Fruit non-red. sugars	Fruit red. sugars	Fruit total sugars
Balady Long Purple × Black Beauty	6.05	-0.23	0.66	0.33
Balady Long Purple × Balady Long White	0.22	0.25	-0.96	-0.79
Balady Long Purple × Belleza Nera	-1.27	-1.59	0.99	-0.68
Balady Long Purple × Violetta Lunga	1.14	-1.47	-0.03	-1.88
Long Purple × Baker	1.57	1.29	-0.99	1.04
Black Beauty × Balady Long White	1.73	1.89	-0.42	1.37
Black Beauty × Belleza Nera	3.03	-0.31	-2.43	-2.86
Black Beauty × Violetta Lunga	-1.48	-1.13	1.18	-0.04
Black Beauty × Baker	2.28	-1.96	-2.00	-3.26
Balady Long White × Belleza Nera	1.61	-1.25	1.02	-0.44
Balady Long White × Violetta Lunga	0.29	2.48	0.95	3.28
Balady Long White × Baker	-1.54	-0.92	0.71	0.51
Belleza Nera × Violetta Lunga	-1.07	0.96	-1.10	-0.20
Belleza Nera × Baker	-3.57	0.43	-1.39	-0.25
Violetta Lunga × Baker	2.17	0.71	-0.91	0.55
L.S.D 5%	0.92	1.17	0.86	1.51
L.S.D 1%	1.22	1.56	1.13	2.02

3.2. Fruit non- reducing sugars content :

The results presented in Tables 21 and 22 showed significant differences among the different parents and F_1 hybrids concerning fruit non-reducing sugars content. Plants of cultivar Black Beauty had the highest fruit non-reducing sugars content (15.86g/100g d.w.) followed by cultivars Baker (14.43g/100g d.w.), Belleza Nera (13.70g/100g d.w.), Violetta Lunga (12.25g/100g d.w.), Balady Long Purple (11.86), and the cultivar Balady Long White which had the lowest value (10.41g).

Non of the hybrids exceeded the cultivar with the highest value of fruit non-reducing sugars content, i.e., Black Beauty. However, the hybrid Black Beauty x Balady Long White was not significantly different from this cultrivar (Table 21).

The results presented in (Table 22) show significant general (GCA) and specific (SCA) combining abilities. In addition, the GCA/SCA ratio was 2.28 which indicated that the additive type of gene action was more important than the non-additive type in the inheritance of fruit non-reducing sugars content.

The parental germplasm which had the highest values of general combining ability effects were Black Beauty (1.02) and Baker (0.63). On the other hand, the parental cultivars which had the lowest values of general combining ability were Balady Long Purple (-0.98), Balady Long White (-0.65), Belleza Nera (-0.06) and Violleta Lunga (0.04), (Table 23). These results will be of great value in eggplant breeding programs especially in forming eggplant hybrids. It is worth mentioning here that the high fruit sugars content in general may be considered as undesirable fruit quality characteristic, in case of eggplant fruits which are cooked by frying in deep oil, since the color of the fried fruit sections will have brown color due to carmilization of sugars in boiled oil. On the other hand, the same character will be considered as desirable fruit quality characteristic, in case of the type of eggplant fruits which are cooked without exposing to boiled oils, i.e., stuffing. The high fruit sugars content in last case will improve the taste and/or the nutrional value of eggplant fruits.

The F_1 hybrids which showed the lowest values of specific combining ability effects, in descending order, were Black Beauty x Baker (-1.96), Balady Long Purple x Belleza Nera (-1.59), Balady Long Purple x Violetta Lunga (-1.47) and Balady Long White x Belleza Nera (-1.25), (Table 23). On the other hand, the F_1 hybrids which had the highest values of specific combining ability effects were Balady Long White x Violleta Lunga (2.48) and Balady Long Purple x Baker (1.29). These results give information about the previously mentioned F_1 hybrids concerning fruit non-reducing sugars content.

The results presented in (Table 25) concerning Wr- Vr which indicated absence of one or more of the assumptions required for validity of Jinks- Hayman analysis for fruit non-reducing sugars content.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis, (Table 26). The broad and narrow sense heritability estimates were 87.16% and 39.14%, respectively (Table 26). These results indicate the influence of the environmental factors and non-additive type of gene action on the expression and inheritance of this character. Based on these results, selection in the segregating generations of eggplant crosses to improve this characters should be made on family mean basis in replicated experiments.

3.3. Fruit reducing sugars content :

The results presented in Tables 21 and 22 indicate significant differences among different parental genotypes and hybrids concerning fruit reducing sugars content. Plants of cultivar Baker had the highest value (10.58 g/100g dry weight (d.w.)), followed by Belleza Nera (10.49g/100g. d.w.), while the cultivar Balady Long Purple had the lowest fruit reducing sugars content (6.13g/100g d.w.). Non of the hybrids exceeded the cultivar with the highest value, i.e., Baker, while the hybrids Balady Long Purple x Violetta Lunga, Balady Long Purple x Baker, Black Beauty x Belleza Nera and Black Beauty x Baker were not significantly different from the parent with the lowest fruit reducing sugars content. It is worth mentioning here that the high fruit sugars content in general may be considered as undesirable fruit quality characteristic, in case of eggplant fruits which are cooked by frying in deep oil, since the color of the fried fruit sections will have brown color due to carmilization of sugars in boiled oil. On the other hand, the same character will be considered as desirable fruit quality characteristic in case of the type of eggplant fruits which are cooked without exposing to boiled oils, i.e., stuffing. The high fruit sugar content in last case will improve the taste and/or the nutrional value of eggplant fruits.

Significant general and specific combining ability effects were detected (Table 22). These results indicate the presence of both additive and non-additive type of gene actions in the inheritance of this character. The ratio of GCA/SCA was 1.05 which indicated the equal importance of both the additive and non- additive type of gene actions in the inheritance of fruit reducing sugars content.

The results presented in Table 23 show that the parental eggplant germplasm Balady Long Purple and Balady Long White had the lowest general combining ability effects, i.e., - 0.97 and - 0.07, respectively, while Bellza Nera (0.56) and Black Beauty (0.26) had the highest values which indicate that these parental cultivars can be used to form F_1 hybrids with desired fruit reducing sugars content.

The F_1 hybrids which showed the lowest values of specific combining ability were, in descending order, Black Beauty x Belleza Nera (-2.43), Black Beauty x Baker (-2.00), Belleza Nera x Baker (-1.39) and Belleza Nera x Violetta Lunga (-1.10), while the highest values were associated with the F_1 hybrids Black Beauty x Violetta Lunga (1.18), Balady Long White x Belleza Nera (1.02) and Balady Long Purple x Belleza Nera (0.99), (Table 24). Such F_1 hybrids will give plants with desired fruit reducing sugars content.

The results presented in Table 25 concerning Wr- Vr were not indicated absence of one or more of the assumptions required for validity of Jinks- Hayman analysis for fruit reducing sugars content.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis (Table 26). The broad and narrow sense heritability estimates were 89.72% and 2.80%, respectively (Table 26). The very low value of the narrow sense heritability estimate indicated the high influence of the non-additive and environmental effects on the expression of this character. According to these results, selection for lines or hybrids should be performed in replicated experiments to eliminate as much as possible the environmental effects on the expression of fruit reducing sugars content.

3.4. Fruit total sugars content :

The results presented in Tables 21 and 22 show significant differences among the different parents and its F_1 hybrids concerning fruit total sugars content. The parents Black Beauty and Belleza Nera had the highest fruit total sugars content (25.80 and 24.19 g/100g d.w., respectively), while the cultivars Balady Long Purple and Balady Long White had the lowest values (17.99 and 17.52 g/100g d.w., respectively), (Table 21). Significant differences concerning fruit total sugars content among eggplant germplasm has been observed **(Agamia, 1972).** It is worth mentioning here that the high fruit sugars content in general may be considered as undesirable fruit quality characteristic, in case of eggplant fruits which are cooked by frying in deep oil, since the color of the fried fruit sections will have brown color due to carmilization of sugars in boiled oil. On the other hand, the same character will be considered as desirable fruit quality characteristic in case of the type of eggplant fruits which are cooked without exposing to boiled oils, i.e., stuffing. The high fruit sugar content in last case will improve the taste and/or the nutrional value of eggplant fruits

The results presented in Table 22 show significant general (GCA) and specific (SCA) combining abilities and the GCA/SCA ratio was 2.79 which indicates that the additive type of gene action was more important than the non-additive type in the inheritance of this character.

The results presented in Table 23 indicate that the parents Balady Long Purple and Balady Long White had the lowest general combining ability effects (-1.83 and -0.59, respectively). The highest general combining ability effects were associated with the parental cultivars Black Beauty (1.45) and Belleza Nera (0.65). On the other hand, the parental cultivars Baker and Violleta Lunga showed relatively intermediate values, i.e., 0.15 and 0.18, respectively.

The F_1 hybrids which showed the lowest specific combining ability effects were Black Beauty x Baker (-3.26), Black Beauty x Belleza Nera (-2.86) and Balady Long Purple x Violetta Lunga (-1.88), (Table 24), while the highest specific combining ability effects were associated with the F_1 hybrids Balady Long White x Violetta Lunga (3.28), Black Beauty x Balady Long White (1.37), and Balady Long Purple x Baker (1.04). Such information give useful expectations character when forming F_1 hybrids using the same or similar parental genotypes of eggplant.

The results presented in Table 25 concerning Wr- Vr which indicated absence of one or more of the assumptions required for validity of Jinks- Hayman analysis for fruit total sugars content.

Since the Jinks- Hayman analysis was not valid, the broad and narrow sense heritability estimates were calculated using genetic components obtained from Griffing analysis (Table 26). The results presented in Table 26 showed that the broad (h_{bs}) and narrow (h_{ns}) sense heritability estimates were 89.61% and 47.33%, respectively. These values indicated that progress in improving fruit total sugars content can be achieved.