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Analysis on 8 × 8 diallel crosses of Cucumber (*Cucumissativus* L.) for potential yield improvement at Can Tho, VietNam

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Abstract— *Combining ability analysis provides useful information for the selection of parents, in the breeding program of cucumber at Can tho, VietNam, as well as information related to the nature and extent of the gene activities involved. Cucumberimprovement involves strategies to enhance yieldpotential and quality of cucumber. Targeting the improvement of new varieties for breeding in cucumber plants, combining abilities and genetic parameters for 12 traits estimated from the full diallel analysis technique 8×8. The results showed that the differences due to general combining ability (GCA) and specific combining ability (SCA) capabilities are significant for most of these important traits.It indicates the importance of both plus- and non-plus gene activity. GCA variances are more intense than SCA variances for all hybrid materials studied showing the advantages of linear effects in their genetics. P1 (PhungTuong) appears as the best general combination for early flowers; P3 (MaLai) has a high primary branch number; P3(MaLai);P4 (TL 00L);P5(TayNinh) P6(BinhPhu) and P7(TQ) have the best combining ability for use in the breeding program to improve the number of fruits per plant. P4 (TL 00L) gives the length of the fruits. The SCA effect as well as the reciprocal effect also have implications for most important combinations in different hybrid combinations such as: the crossing P1xP6, P2xP3, P2xP4,P2xP5 and P2xP7for fruit weight/plant. The length of the fruit forP1x P6 and P2 x P7,these selected crossing were associated with the agronomic performance of cucumber varieties in future.*

Keywords— ***Cucumber, diallel, GCA, SCA, genetic parameters.***

I. INTRODUCTION

There is a big gap between demand and vegetable supply in the Mekong Delta, VietNam. Therefore, considerations improving crop yields and the production of is desirable and important to minimize future demand. A breeding program provides the opportunity to produce high-yielding cultivars of outstanding quality. However, the development of breeding program needs information about the nature of the gene-controlled gene activity of the gene on economic traits and other important traits.Knowledge of the genetic architecture of the characters is improving which is essential to apply the proper breeding process. Such knowledge leads to plant breeders developing new commercial varieties of cucumber. Begna (2021) emphasizes that information about the change due to genetic differences and the relationship between different quantitative characteristics is fundamentally significant in the crop improvement program. In spite of its considerable morphological variability, cucumber showed a narrow genetic base (Staub et al. 1997), which restricts development of new cucumber cultivars by cross-breeding. Being a largely consumed vegetable cucumber had great scope to improve the production productivity to meet the requirement by adoption of improved varieties/hybrids (Singh et al., 2016, Pandey et

al., 2016).In a breeding program, breed selectors often face problems in the selection of desired parents. The popular approach of choosing parents on the basis of performance does not necessarily lead to the best results in the hybrid program (Labroo et al., 2021).Combine more reliable possibility studies because they provide useful information for the selection of parents about the performance of hybrids and shed light on the nature and extent of the different types of gene action involved in the expression of quantitative characteristics.Significant general (GCA) and specific (SCA) combining ability variances were obtained in all the traits implying that both the additive and non-additive gene effects operated in the genetic expression of the traits(ChikezieOnuoraEne et al.,2018).Diallel cross-analysis provides estimates of the genetic parameters involved in combining abilities as well as a quick overall picture of the parent's dominant relationship studied using the first generation of hybrids (F1) with or without reciprocity(Kundua et al 2021). Combining ability is useful in successful prediction of genetic capability of parental lines and crosses (Singh vet al., 2011, Singh vet al., 2013)The GCA of the yield and yield component traits of the cultivars showed that 'Zeina' had negative GCA effect in all the traits except days to male and female flower initiation .Diallel analysis involving parents provides additional information such as the presence or absence of epigenetic, average levels of dominance, distribution of dominant genes, and recession in parents (Zongo et al., 2019).The genetic data of 8 lines subjected to selection represent both genomic variations and their usefulness in cucumber breeding improvement.Here, diallel cross-analysis with 8x8 cucumber lines and found that general combining ability (GCA) and specific combining ability (SCA) for yield and components yield. The data from our 8 parents revealed general combining ability related to breeding efforts, and these selected crossing were associated with the agronomic performance of cucumber varieties and harbored many reportedly important genes.

II. MATERIAL AND METHODS

2.1. Material : The experiment was conducted with eight genotypes of cucumbers include: Phuong Tuong, DaiLoan, Malai, Thai (00L) TayNinh, BinhPhu, TQ, and the Philippines selected as parents (marked P1, P2, P3, P4, P5, P6, P7, and P8, respectively). Eight parents were growed with planted F1 for comparison and evaluation.

2.2. The experiment was designed in a completely random block with three repetitions. There are nine plants for each repetition. The distance is (30 x40cm) . A good drainage system has been maintained for draining rainwater and irrigation water. In order for the plant to grow and grow better, combine the balance of manure (well decomposed cow manure 10 ton / ha) and fertilizer (Urea 150 kg / ha; TSP 175 kg/ha; MP 150 kg/ha; lime 100 kg/ha;).

Fig.1: The experiment was conducted with eight genotypes and F1 of cucumbers at center vegetable crop of High Agricultural Technology Research Institute for Mekong delta (HATRI)

2.3. Collect data for quantity calculations

Days to first male flower opening :days to first female flower opening, the length of the main plant (cm), the number of primary branches per plant, the date of the first harvest of the fruit, the time of harvest, the number of fruits per plant , the average weight of the single fruit (g), the yield of the fruit per plant (kg), length of fruit (cm), Fruit diameter(cm) . For every parameters, data were collected three times and average was calculated.

2.4Analysis of variance (ANOVA) All the quantitative data taken were subjected to ANOVA. The total variances of each character were partitioned in two block, genotype and error differences. The differences within the classes of effects were tested by F-test.

2.5***Combining ability***

The statistical analysis of data for 8 × 8 diallel crosses including reciprocals were done as quoted in Fasahat et al. (2016). The diallel progenies (n2 =64) were portioned into parents (P), crosses (F1), parent vs crosses (P vs. F1), direct crosses (f), reciprocal crosses (l) and direct vs. reciprocal items. The parents, crosses, direct cross, reciprocal crosses items tested the significant differences among the parents, crosses, direct crosses and reciprocal crosses, respectively. For the genetic analysis of diallel population, data were subjected to Griffing's approaches. (1956) method 1, Model 2 (Random effects model) was used for combining ability analysis for each of the trait.

III. RESULTS AND DISCUSSION

3.1.Mean performance of cucumber genotypes

Variance Analysis (ANOVA) shows very significant differences between parents for 12 traits (Table 1).

The day of first male flowers

The duration of first male flowerslied between15.00 and 30 day (Table 1). Maximumharvest duration (30days) was recorded in P4(TL-00L) whichwas statistically at with 7 other genotypes while, itwas minimum (15.00 days) in P1 (PhungTuong).

The duration of first female flowers

The duration of first female flowers between 25.6.00 and 37.5 day (Table 1). Maximumharvest duration (37.5days) was recorded in P4(TL-00L) whichwas statistically at with 7 other genotypes while, itwas minimum (25.60 days) in P1.

The number of primary branches

The number of primary branchesbetween 3 and 7 (Table 1). Maximum number of primary branches / plant (7) was recorded in P 3(MaLai) and P4(TL-00L) which was statistically at with 6 other genotypes while, it was minimum (3) in P6(BinhPhu).

Harvest duration

The duration between first and final fruit harvest lied between 21.00 and 40 day (Table 1). Maximumharvest duration (40 days) was recorded in P4(TL-00L) whichwas statistically at with 7 other genotypes while, itwas minimum (21.00 days) in P7(TQ) .

Number of fruits per plant

Observations recorded for this trait ranged from 6.25 to 9.2(Table 1). The genotype, P 7 (TQ) producedmaximum number of fruits per plant(9.2) whereas, minimum number of marke table fruits(6.25.) were produced inP1(PhungTuong) .

Single fruit weight

Single fruit weight varied from 115 to 265 gram (Table 1). The genotype P 2(DaiLoan)recordedmaximum single fruit weight (265 gram).Minimum single fruit weight (115 gram)was recorded in P 7 (TQ).

Fruit weight/plant

Fruit weight / plant varied from 750 to 1568 gram (Table 1). The genotype P4(TL-00L) recorded maximum fruit weight/ plant (1568 gram). Minimum fruit weight/plant (750 gram) was recorded in P 1 (PhungTuong).

Fruit length

The observations recorded on fruit length ranged from 13.0 to 21.2 cm(Table 1). The genotype in P4(TL-00L) had longest fruit (21.2cm) among all the studied genotypes,which was statistically at par with that of P 6 (BinhPhu) (17.0cm), whereas, the genotype P 7(TQ) had minimumfruit length (13.0cm).

Fruit diameter

Significant variations were observed among all the genotypes for this character and it varied from 11-to12.6cm (Table 1). Fruits of F7 (TQ) had maximum fruitdiameter (12.6cm).

Yield per ha

Yield per plant varied significantly in all thegenotypes and it ranged from 14.50 to 33.10ton.ha (Table 1).Maximum per plant yield (33.10ton/ha) was recorded inP7 , whereas, it was minimum in(P5).

Table 1 Mean performance of cucumber genotypes for different yield and yield components of 8 parents.

Parents	The duration of first male flowers(days)	The duration of first female flowers(Days)	The number of primary branches	The first harvest time(days)	Harvest time(days)	The length of the plant(cm)	Number of fruit/ **plant**	**Single fruit weight (g)**	**fruit weight / plant**	The length of the fruit **(cm)**	**Fruit diameter** (cm)	**Yield (Ton/ ha)**
P1	**15h**	**25.6c**	**5c**	**40b**	**26c**	**175c**	**6.25**	**121c**	**750d**	14.0c	12.4c	16.50c
P2	**21e**	**37.0a**	**6b**	**45b**	**33b**	**197b**	**7.45c**	**265a**	**1250c**	16.1b	13.6b	15.85d
P3	**20f**	**31.0d**	**7a**	**55a**	**37b**	**190b**	**8.5b**	**132**	**1425b**	13.0d	11.0d	22.04b
P4	**30a**	**37.5a**	**7a**	**49b**	**40a**	**206a**	**7.6c**	**255a**	**1568a**	21.2a	12.0c	32.10a
P5	**29b**	**37.6a**	**5c**	**45b**	**34b**	**195b**	**6.5d**	**120c**	**1427b**	13.5d	12.3c	14.50e
P6	**18g**	**25.0c**	**3d**	**51a**	**39a**	**215a**	**8.4b**	**172b**	**1234c**	17.0b	12.6c	31.10a
P7	**28c**	**26.5b**	**6b**	**57a**	**21d**	**196b**	**9.2a**	**115d**	**1542a**	13.0d	15.6a	33.10a
P8	**25d**	**36.0a**	**5c**	**45b**	**30b**	**222a**	**7.6c**	**174b**	**1447b**	13.7d	12.4c	30.20a
CV%	**1.12**	**2.36**	**0.23**	**0.12**	**1.25**	**1.36**	**4.25**	**5.36**	**10.23**	7.36	5.2	7.63

3.2. General combining ability effects(GCA)

The results of GCA effect for 12 different characters of eight parental lines are presented in the Table 2a, 2b.

The number of first male flowers

Negative GCA effect is preferable for days to flowering as it indicates the earliness of the parents. The positiveGCA effect is preferable for many days to flower because it indicates the time of parental flowering. Very important (1.45*) for P7 (TQ)and the highest positive GCA effect (1.52*) was recorded for parents fromTL(00L) for several days to the first male flowers (Table 1a). P6 (BinhPhu) showed a significantly but negative effect. On the other hand, P1 and P6 show very significant and negative GCA effects (-3.10** and - 3.41**). Therefore, P1 and P6 (DaiLoan) are the best GCA to promote early flowering in cucumbers.

The number of first female flowers

The number of first female flowers, P4 (TL (00L) has a very significant GCA effect (-1.71*) and a negative GCA effect (37.5 days), while P1(PhungTuong) has a very significant GCA effect (-1.23*) but negative (25.6 days). The GCA effect of P2 parents, P3 and P4 for this parameter is negligible. Therefore, P1 is the best general combination(Table 2a). P7 (TQ) provides a very significant positive GCA effect (1.43*) for many days to give the first female flower (26.5days).On the other hand, P1 show very significant and negative GCA effects (-3.33**) and the best GCA to promote early flowering in cucumbers.

The number of primary branches

The number of primary branches of cucumbers affects the yield of the fruit. The best GCA for parents to use hybrid materials is P2, P4, P7 and P8 ,the GCA effect for other parents is negligible. The P4((T.L 00L) would be a better option for the number of primary branches . In breeding programs for the number of primary branches per plant and P2 will be a better option for the number of branches. P4 is very important (0.60).

Harvest time: P1 and P 8 showed GCA (-1.87*; -1.47* respecitive) and the negative and average GCA effect of parents was lower (26-30days) for this trait. On the other hand P6 (BinhPhu) showed for positive (1.30*) and P3(MaLai) give GCA (1.21*) can be selected as the best GCA for enhancing fruiting . (Table 2a).

The length of the plantrecords the cucumber for negative general combining ability on P1, P2, P3, and P7 varieties. The P1 (for the shortest length in table 2a .P2(DaiLoan)

shows that the GCA effect is very important (-13.42**) followed by P1(PhungTuong) with GCA (- 10.61 **).

Table 2a. General combining ability effect the biological characteristics of the 8 genotypes of cucumbers

No	Lines	The duration of first male flowers (days)	The durationof first female flowers (Days)	The number of primary branches	The first harvest time(days)	Harvest time(days)	The length of the plant(cm)
P1	PhungTuong	-3,10**	-3,33**	-0,14ns	-1,43*	-1,87*	-10,61**
P2	DaiLoan	1,37*	-0,40ns	0,10ns	-1,35*	0,08ns	-13,42**
P3	MaLai	0,89ns	-0,15ns	-0,64ns	1,31*	1,21*	-3,12*
P4	TL(00L)	1,52*	-1,71*	0,60ns	-0,15ns	0,91ns	3,49*
P5	TayNinh	0,33ns	-0,33ns	-0,39ns	-0,12ns	-0,13	5,67*
P6	BinhPhu	-3,41**	-0,65ns	-0,14ns	0,50ns	1,30*	9,65**
P7	TQ	1,45*	1,43*	0,36ns	0,56ns	-0,03ns	-0,67ns
P8	Philippine	0,99ns	0,96	0,23ns	0,93ns	-1,47*	9,02**

*Significant at 5% level of probability; **Significant at 1% level of probability. Ns: non-significant .

Fruit/ Plant

Other parents show negligible values generalcombining ability for characteristics (Table 2b).

Single fruit weight

Estimates of the GCA effect on average single fruit weight of plant (255g) show that P4 has the highest positive value significantly (16.17**) followed by P3(Malai) with GCA (14.75**) and P1 with GCA (13.67**) (Table 2b). Other parents showed significant negative effects on this trait such as P5, P6, P7 and P8 . Therefore, P4 is a good general combining ability for use in passing to improve single fruit weight on theplant . P4 has a significantly positive SCA effect (16.17**) on fruit yield (255g) (Table 2b).

Considering fruit/ plant. The five parents showed positives as P3(MaLai) ; P4(TL00-L) ;P5(TayNinh) , P6(BinhPhu) and P7(TQ) give goods for GCA and positive and other parents showed negative GCA effects. Therefore, 5 parents P3,P4,P5, P6 and P7 have the best general combining ability for use in the breeding program to improve the number of fruits per plant in cucumbers as it has a higher average value along with a significantly higher and higher GCA. (Table 2b).

The length of the fruit:

The length of the fruit: Other parents show negligible or negative values for this trait. Therefore, P4 is the combination with the best GCA for use in the breeding program to improve the length of the fruit. P1 and P6 parents can be seen as alternative parents to this trait (Table 2b). For P4 has significance (2.43*) and the highest positive GCA effect on length of fruit (21.2 mm) followed by P6 (2.27*) (Table 2b).

Fruit diameter:

Parents negatively impact this trait. With the exception of the P7 which has a high GCA, (1.46**). Next comes the DaiLoanand Philippine varieties (however, these two varieties are not of high significance).

The yield

Four parents showed positive effects on yield /ha P3, P4, P6 and P7 and 4 parent significantly negatively impacted this trait. Therefore, P4 is a parent with a good GCA to use in hybridization to improve fruit/plant carrying capacity per plantand total yield. Very significant (2.43**) and the highest positive GCA effect on ton/ha yields (32.1ton/ha) was found in P4, followed by P6 (2.28**) and P7 (1.70**) (Table 2b). Other parents showed significant negative effects on this trait.

Table 2b. general combining ability effects the yield and component of yield in 8 genotypes of cucumbers

numbers	**parents**	Fruit/ **plant**	**Single fruit weight (g)**	**fruit weight / plant**	The length of the fruit **(cm)**	**Fruit diameter** (cm)	**Yield Ton/ha)**
P1	PhungTuong	-0,41 ns	13,67**	-2,65*	-2,13**	-0,82 ns	-2,41**
P2	DaiLoan	-0,33 ns	2,67*	-36,5**	-1,46*	0,64 ns	-1,47*
P3	MaLai	0,07 ns	14,79**	59,68**	1,40*	-0,35 ns	1,41*
P4	TL(00L)	-0,05 ns	16,17**	30,53**	2,43**	-0,65 ns	2,43**
P5	TayNinh	-0,08 ns	-10,89**	10,68**	-0,64 ns	-0,05 ns	-0,65ns
P6	BinhPhu	0,33 ns	-3,76*	74,25**	2,27**	-0,24 ns	2,28**
P7	TQ	0,31 ns	-21,14**	90,31**	1,69*	1,46*	1,70*
P8	Philippine	0,18 ns	-11,52**	-53,31**	-3,56**	0,02 ns	-3,56**

*Significant at 5% level of probability; **Significant at 1% level of probability. Ns: non-significant.

3.3. Specific combining ability effects(SCA)

The SCA effect of 10 F1 combinations for the 12 traits studied is presented in Table 3a, 3b. Of the 10 F1s, six show negative SCA values (Table 3a) Based on the SCA effect, the P1 x P3 cross-combination; P1xP6; P2XP4 and P3XP5 were found to be superior to the duration of first male flower.

For the flowering time female indicates that there are significant differences to this combination and that at least 40% of the hybrids flower earlier than the means of their parents. Among hybrid pairs, the four combinations show very significant negative SCA values with the largest negative values in the combinations P1 x P4 (-0.29), P2 x P4 (-3.53**), P2 x P5 (-0.47), P2 x P7 (-0.25), P3XP5(-1.47*) and are the best specific P5xP8 (-0.54) combinations for early flowering. While the combinations of P1 x P2 (3.08**) and P1 x P6 (2.58**) showed a significantly positive SCA effect that produced flowering later than their average value. The most significant and positive SCA effects for this trait are expressed by P4 x P6 (3.02**). Other combinations that showed significant and positive SCA effects were P3 x P5 (2.59**), P4 x P5 (2.48**) and P2 x P3 (1.78*). The P2 x P5 cross-combination showed the highest and negative SCA effect (-2.94**).

The first day of fruit harvest is well recorded on the P1xP4 complex (2.35*); P2xP7(3.06**) P3xP5(6.18**) and P5xP6(2.0*). Among the combinations, P23x P5 (6.18**) showed the most significant and positive SCA effect on this character,

The length of the plant

Out of 10 F1, 4 give positive and 6 show negative SCA values. So there is little scope for characteristic changes in this crossed. Only four pairs of crossedshow significant SCA values, P1 x P3 crossed combinations show significant positive values (5.25*), P2xP3 (1.52) ; P5xP6 (12.99**) and P5xP8(15.56**), on the other hand, hybrid pairs give negative individual coordination capability values. Therefore, the hybrid pair shows that the negative SCA value is the best pair of hybrids to improve the length characteristics of the combination has a negative SCA value is best to improve this characteristic. Of the cross combinations, about 60% of F1 show a negative SCA value for this trait (Table 3a). This indicates that these F1s produce a shorter length of the plant than the average parent better.

Table 3a. Specific combining ability effects10 cross of hybrids on the biological characteristics of cucumbers

No	Crosses	The duration of first male flowers (days)	The duration of first female flowers (Days)	The number of primary branches	The first harvest time(days)	Harvest time(days)	The length of the vine (cm)
1	P1XP3	2,70**	3,08**	-0,98	-1,0n	1,13*	5,25**
2	P1xP4	-0,83	-0,29ns	0,26 ns	2,31*	-1,36*	-1,31*
3	P1xP6	3,66**	2,58**	1,01*	-0,68 ns	4,00**	-6,61**
4	P2xP3	-1,68*	1,84*	-0,23 ns	-5,68**	-1,11*	1,52*
5	P2xP4	3,16**	-3,53**	-0,48 ns	0,13n	3,18**	-10,10**
6	P2xP5	-2,12**	-0,47ns	1,06*	-1,125*	1,43*	-5,87**
7	P2xP7	0,75ns	-0,25ns	-0,73	3,06**	1,38*	-7,52**
8	P3xP5	2,35**	-1,41*	-0,23	6,18**	2,94**	-5,73**
9	P5xP6	-2,70**	0,08ns	-0,61n	2,0*	0,21ns	12,99**
10	P5xP8	-2,25**	-0,54ns		-0,43n	0,13 ns	15,56**

*Significant at 5% level of probability; **Significant at 1% level of probability. Ns: non-significant.

Number of fruits

The P2 x P6 combination can be considered the best specific combination for strengthening the number of fruit of cucumbers. Of the 10 F1s, most of the 10 combinations for their own combined abilities showed positive and statistically significant (Table 3b).

Single fruit weight

Specific combining ability effects showed positive and statistically significant excep P2xP3 and P2XP4 . The cross-combination of P1 x P3;P1 x P4; P1xP6; P2 x P5; P2 x P7; P3 x P5 P5 x P6 and P5XP8 exhibit significant and positive SCA effects, where P3 x P5 provides maximum value (52.51**) for single fruit weight.Other combinations show significant or negligible SCA effects. Therefore, the P2 x P3 is the next best specific combination of P2 x P4.(Table 3b).

Fruit weight/ plant

Out of 10 F1, 5give positive (P1XP6; P2xP3;P2xP4;P2xP5 and P2xP7 and 5 show negative SCA values remain .

The length of the fruit

Length of the fruit: All combinations show that the SCA effect is very statistically significant . The most significant and positive SCA effect for this trait is provided by P1x P6 (5.71**) P2 x P7 (5.62**) followed by P5x P8 (5.47**).

Fruit diameter

Therefore, the hybrid crosses P5 x P8(1.03*) is the best specific combination for this trait whose large diameter is undesirable. Of the 10 pairs of F1, three combinations showed negative SCA values indicating that the hybrids gave the fruit a smaller diameterthan the average parent. The lowest positive significant SCA value obtained from P1 x P6 (-1.33*) (Table 3b).

The yield : Highest significant and positive SCA effects were observed in yield .Of the 10 F1s, most of the 10 combinations for their specific combining ability effects showed positive and statistically significant (table 3b)

Table 3b. Specific combining ability effects10 cross of hybrids on the yield and component of yield of cucumbers

No	Crosses	Fruit/ plant	Single fruit weight (g)	fruit weight / plant	The length of the fruit (cm)	Fruit diameter (cm)	Yield Ton/ha)
1	P1XP3	-0,73 ns	25,43**	-81,12**	3,84*	0,73 ns	3,57**
2	P1XP4	0,19 ns	12,07**	-82,87**	2,45*	0,83 ns	2,44**
3	P1XP6	-0,38 ns	42,62**	42,0**	5,71**	-1,33*	4,75**
4	P2xP3	-0,89 ns	-5,04*	18,6**	3,38*	-0,28 ns	3,45**
5	P2xP4	-0,62 ns	-51,92**	25,06**	2,24*	0,66 ns	2,07**
6	P2xP5	0,32 ns	13,14**	24,43**	3,78*	0,91 ns	4,85**
7	P2xP7	0,83 ns	30,39**	10,98**	5,62**	0,08 ns	4,31**
8	P3xP5	0,51 ns	52,51**	-40,87**	2,82*	-0,03 ns	2,73*
9	P5XP6	0,65 ns	13,07**	-23,61**	3,98*	0,55 ns	3,21**
10	P5XP8	-0,69 ns	19,67**	-24,63**	5,47**	1,03*	4,44**

*Significant at 5% level of probability; **Significant at 1% level of probability. Ns: non-significant.

IV. DISCUSSION

We concluded that the genotype P1 was best with respect to earliness, P4 was found to be seed length of fruit and fruit weight/ plant. P7 had maximum number of fruit /plant and yield ton/ ha. Further selection can be carried out in these genotypes or these may be subjected to future breeding programmes for exploitation of hybrid vigour in cucumber(table 1) . Variance Analysis (ANOVA) shows very significant differences between parents and hybrids for all hybrid pairs studied (Table 2a, 2b,3a,3b). For GCA :Anlysis for yield the parents good for GCA such as (P3, P4, P6 and P7). The significant mean square due to general combining ability (GCA) and specific combining ability (SCA) for all the characters indicated that both additive and non-additive gene actions played dominant role for the expression of these characters.The higher magnitude of SCA variance than that of GCA variance for only one character out of 12 characters studied indicated the predominance of the non-additive gene effects for that character.The average of the reciprocal pair effect of 12 traits is higher than the SCA, indicating that the reciprocal effect also exists in cucumbers. In cucumbers (Golabadi et al., 2017), and in the gourd Quamruzzaman et al. (2020) found non-additive gene effects for the first female attrition as well as the number of female flowers per stem, branches per plant in the cucumber. The Specific combining ability effects signify the the role of non-compounding gene activity in the expression of traits. It indicates theSCA ,specifically leading to the highest performance of some specific hybrid combinations. That's why it involves a specific hybrid being successful. High SCA effects can arise not only in hybrid combinations involving highly coordinated substances but also in hybrids associated with low combinations. Therefore, in practice, some combinations with low individual coordination capabilities should also be contained in the breeding program such as Average fruit weight/ plant on P1xP6, P2xP3, P2xP4,P2xP5 and P2xP7 hybrid crosses.

V. CONLUSION

The ability to coordinate in relation to 8 x 8 full diallel hybrids indicates both plus and non-cumulative gene activity in the characteristic expression of different traits. The P4 genotype is the best general combination for promoting flowering. The P4 genotype is great for boosting productivity as well as most other important characters, namely, the average single fruit weight and fruit yield per plant. P4 is best for female flowers to grow. P6 and P7 are varieties that have good general coordination capabilities for use in passing to improve the fruit /plant. P1(PhungTuong) and P2(DaiLoan) are the best general coordination to promote early flowering in cucumbers. Significant SCA effects have been shown for early flowering in pairs of P1xP2 and P3xP5 hybrids. Average fruit weight/ plant on P1xP6, P2xP3, P2xP4,P2xP5 and P2xP7 hybrid crosses. Significant reciprocal effects are also observed in most important characteristics namely, the date to the first male and female flowers (highly desirable), the number of fruits per

plant, the average singlefruit weight and fruit yield. Reciprocal hybrid pairs can be used to improve the desired characteristics in future breeding processes. Further selection can be carried out in these genotypes or these may be subjected to future breeding programmes for exploitation of hybrid vigour in cucumber.

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