P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-6* ISSUE-4*(Part-2) December- 2018
E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

Genetic Studies of Variability, Correlation and Path Coefficient Analysis in Diverse Cucumber Genotypes

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Abstract

Variability, correlation and path coefficient analysis were conducted using twenty genotypes of *Cucurmis sativus*. The phenotypic coefficient of variation which measures the total variation was found to be greater than the genotypic coefficient of variation in majority of characters in the present study. The closer magnitude of GCV and PCV indicated that genotype had played greater role rather than environment. Wide variability was found for the plant parameters such as days to seed germination, vine length and yield contributing characters namely, days to first male and female flowering, average fruit weight, number of fruits per plant and yield per plant. The highest GCV was recorded in yield per plant (42.76) followed by number of fruits per plant (33.42). Among the twenty cucumber germplasm, SB-3 gave the highest yield per plant (3.67kg). The correlation co-efficient revealed that, yield per plant had highly positive and significant association with average fruit weight and number of fruits per plant. Path analysis showed that the average fruit weight directly contributed towards the yield per plant in the SB-3 cucumber.

Keywords: Variability, Correlation, Path Analysis, Yield Performance And Cucumber.

Introduction

Vegetables play an important role in the balanced diet by providing not only energy but also by supplying vital protective nutrients like minerals, antioxidants, and vitamins. Vegetables also play an important role in neutralizing the acids produced during digestion of proteins and fatty foods and thus promote digestion and also prevents constipation. At present India is the second largest producer of vegetables in the world with a total production of 146.554 million tonnes from an area of 8.495 million hectares with a productivity of 11.6 tonnes per hectare and stand next only to China. Cucumber (*Cucumis sativus* L.) is an important vegetable crop of India cultivated throughout the country. It belongs to the family *Cucurbitaceae* and is distinct from other *Cucumis* species (Rai et al.,2007) as it has seven pairs of chromosomes (2n=2x=14), whereas most of the other *Cucumis* species have 12 pairs of chromosomes, or multiple of 12 (i.e., 2n=2x=24, 2n=4x=48, etc.) (Kalloo et al., 2000). Cucumber is believed to be native to India or Southern Asia, and has been apparently cultivated for the last 3000 years (De Candolle, 1886). The plant was carried westward to Asia Minor, North Africa, and Southern Europe long before written history (Pandey et al. 2001). It is a warm season vegetable crop grown throughout the country mainly under tropical and sub-tropical parts. It is grown primarily for fresh market (slicing) or for processing (pickling). The fruit of cucumber is said to have cooling effect, prevents constipation and useful in Jaundice and indigestion. The fruits are eaten with salt and pepper or as an ingredient of salad, pickles and rayta. The fruits are used as an astringent and antipyretic. The seed oil also has antipyretic property. Production of cucumber in India is 6, 07,000 tonnes from an area of 40,000 hectares. The nutritive value per 100 g edible portion of cucumber is, moisture 96.3 g, protein 0.4 g, fat 0.1g, fibre 0.4g,carbohydrates 2.5 g, energy 13kcal, calcium 10 mg, phosphorus 25 mg, iron 1.5 mg, thiamine 0.03 mg, niacin 0.2 mg and vitamin C 7 mg (Hossain *et al*., 2012).

It has been well documented that effectiveness of the selection in a crop under plant improvement programme is mainly dependent on the

variability present in the population and the extent to which it is heritable. The greater genetic diversity in population, more the genetic potentiality and thereby wider is the scope for the improvement of the crop. Depending on genetic variability present in base population *viz.,* character association, cause and effect relationship, heritability and genetic advance breeders can make an effective selection in a breeding programme. Genetic variability increases the genetic potentiality and wider scope for improvement in the genotypes. To explore the purpose of improvement by selection it is essential to study first the extent of genetic variability and heritability along with genetic advance. Yield is a complex character influenced by several genetic factors interacting with environment and requires giving a better insight of the ancillary characters for better selection. Correlation and path coefficient analysis are the important biometrical tools, which are effective for determining the various yield components of different crops leading to selection of superior genotypes. Therefore, for a rational approach for the improvement of yield, it is essential to have information on the association between different yield components and their relative contribution to yield. Knowledge of such relationship is essential in selection for the simultaneous improvement of yield components and which in turn affect the yield. Path coefficient analysis gives a clear picture about cause and effect as it splits the correlation into the estimates of direct and indirect contribution of each character towards yield.

Therefore, keeping in view, the importance of the crop the present investigation
entitled "Study on genetic variability, correlation and path coefficient analysis in diverse genotypes of cucumber (*Cucumis sativus* L.)" was under taken with the following objectives:

1. To study the extent of variability for fruit yield and its component traits.
2. To determine genotypic and phenotypic correlation coefficient between yield and its contributing characters.
3. To identify the characters having direct and indirect effect on fruit yield per plant with the help of path analysis.

Material and Methods

The present investigation entitled "Study on genetic variability, correlation and path coefficient analysis in diverse genotypes of cucumber (*Cucumis sativus* L.)" was carried out at the Research Farm of University Teaching Department of Sri Satya Sai University of Technology and Medical Sciences, Sehore, (M.P.) during the summer season of 2016. Twenty genotypes were evaluated in RCBD design in three replications. Plant characters such as Days to seed germination, vine length, Days to first male and female flowering, average fruit weight, number of fruits per plant and yield per plant will be recorded in each entry/ replication. Ten plants from each entry will be selected at random for recording observation. Collected data on yield and yield contributing characters under study will be statistically analyzed to find out the significance of difference among the treatment means. The means for all the treatments will be calculated. The analysis of variance for most of the characters under consideration shall be performed by F variance test. The significance of the difference between treatments means will be evaluated by least significance difference (LSD) test for the interpretation of the results (Gomez and Gomez, 1984). According to the Dewey and Lu (1959), path coefficient analysis will be done by using the simple correlation values. In path analysis, correlation coefficient is divided into direct and indirect effect of independent variable on the dependent variable.

Results and Discussion

Variability, correlation and Path analysis in respect of different plant characters, yield contributing characters of different cucumber genotypes are discussed below:

Days to Seed Germination

The analysis of variance indicated the existence of sufficient genetic variability among the 20 genotypes for all the plant characters. Days to seed germination as observed in this experiment varied significantly among the genotypes. The earliest days to seed germination in the field was found in SB-6 and SB-8 (4 days) which were statistically similar with the genotypes SB-2 and SB-3. Long days required for seed germination was found in genotype SB-16 (10.34 days), which was statistically similar with the genotypes SB-15 and SB-20. This findings was supported by Arunkumar et al. (2011).

Vine length

Estimation of genotypic and phenotypic variances was fairly high for vine length at 45 DAD and vine length at final harvest. Genotypic co-efficient of variation was found lower than the corresponding phenotypic one, which indicated the larger influence of environment. Kumar et al. (2011) found low value in cucumber (0.35 and 0.36) for vine length, which indicating high environment influence on this trait, Correlation co-efficient revealed that vine length had positive correlation with days to first male flowering (r=0.027), female flowering (r=0.007), average fruit weight (r=0.11) and number of fruits per plant (r=0.179). This indicates that days to first male and female flowering, average fruit weight and number of fruits per plant will be increased with the increase of vine length.

Days to First Male and Female Flowering

The highest range of variation was recorded in days to first male flower opening among the accessions and ranged from 35.37 to 51.50 days with the mean value of 41.70 days. The plant of genotype SB-2 showed the minimum days to first male flowering which was statistically similar with SB-4, SB-6 (Table3). The genotype SB-7 showed the maximum days to first male flowering (51.50) followed by SB-14 and SB-16 but all were statistically same. Differences between genotypic (7.27) and phenotypic (18.42) variances as well as genotypic (6.47%) and phenotypic (10.29%) co-efficient of variation were high indicating considerable environmental effect upon the expression of this trait. Days to first male flowering had significant and positive correlation with days to first female flowering (r=0.423**) and negative correlation with average fruit weight (r=-0.053),

number of fruits per plant (r=-0.194) and yield per plant (r=-0.185). This results were in close resemblance with Veena et al. (2012).

Average Fruit Weight

Average fruit weight varied significantly among the different genotypes and ranged from 158.8g to 421.3g where mean value was 234.69g. The genotypes SB-3 (421.3g) had the highest fruits followed by SB-18. On the other hand SB-13 (158.8g) was carried the lowest weighty fruits which was statistically similar with genotypes SB-10 and SB-17. Ullah et al. (2012) observed high variability among the cucumber genotypes for this trait. Wide range of genotypic (2701.15) and phenotypic (2925.84) variances as well as genotypic (22.15%) and phenotypic (23.06%) co-efficient of variation (Table 2) was obtained from the above result for this character, which indicated the maximum amount of variability within the genotypes for average fruit weight and offered better scope of selection. This finding was supported by Reshma *et al.* (2011).

Number of Fruits per Plant

The number of fruit per plant varied significantly among the different genotypes and ranged from 2.79 to 8.79 (Table 2). The genotype SB-3 was obtained the maximum number of fruits per plant (8.79), which was statistically similar with SB-6. On the other hand, the minimum number of fruits per plant (2.79) was obtained in SB-9 followed by SB-2 and SB-20 (Table 3). Bhardwaj and Kumar (2012) reported that number of fruits per plant varied significantly among the studied cucumber lines. Slight differences were observed between genotypic (2.62) and phenotypic (2.78) variance as well as genotypic (33.42%), phenotypic (34.26%) co-efficient of variation indicating low environmental influence on this trait.

Yield per plant

The cultivars showed a significant difference in producing yield per plant and ranged from 1.17kg to 2.67kg (Table 2). From the above result, the data indicated that SB-3 (2.67kg) had the highest yield per plant followed by SB-10 (2.50kg), SB-1 (2.45kg) and SB-17 (2.42kg) which were statistically similar with each other. The genotype number SB-2 (1.17kg) had the lowest yield per plant followed by SB-4 (1.19kg) and SB-12 (1.34kg) which were statistically similar to each other but significantly different from the other genotypes. Golabadi et al. (2013) also supports our results in their findings.

By the present investigation we can suggest that average fruit weight and number of fruits per plant which are the main components of yield should be given priority in the selection programme and as well as variety development.

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P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-6* ISSUE-4*(Part-2) December- 2018
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Table 1

Plant Characteristics In Respect Of Days to Seed Germination, Vine Length, Days to First Male and Female Flowering, Average Fruit Weight, Number of Fruits Per Plant And Yield Per Plant.

Genotypes	DSG	Vine Length		DFOMF	DFOFF	AFW	NF/P	Y/P
		30D	45D					
SB-1	6.34	55.06	183.8	42.68	51.01	185.7	5.34	2.45
SB-2	4.34	35.95	143.9	35.37	49.57	227.9	3.01	1.17
SB-3	4.34	44.34	191.3	39.68	47.68	421.3	8.79	2.67
SB-4	5.34	47.57	181.2	38.46	55.01	222.9	5.56	1.19
SB-5	7.68	57.23	184.1	41.46	51.68	234.5	5.01	1.65
SB-6	4.00	52.23	183.1	39.56	48.23	190.1	8.57	2.00
SB-7	8.68	43.23	140.3	51.50	50.68	263.4	4.34	2.70
SB-8	4.00	57.34	177.3	38.12	42.01	230.1	6.23	2.30
SB-9	9.34	38.68	121.5	44.57	57.79	248.8	2.79	1.98
SB-10	8.34	38.34	112.8	45.68	55.57	165.8	5.23	2.50
SB-11	8.34	38.34	161.7	38.34	47.79	192.3	5.12	1.90
SB-12	4.68	29.79	166.1	44.57	55.68	235.4	3.98	1.34
SB-13	4.68	39.34	141.1	42.57	56.01	158.8	4.68	2.32
SB-14	7.34	46.57	134.3	50.68	55.68	241.2	3.55	1.98
SB-15	9.34	49.23	167.9	45.57	51.01	218.8	4.12	2.40
SB-16	10.34	59.90	90.68	46.34	56.79	198.8	4.68	2.08
SB-17	4.68	49.34	181.5	41.79	55.57	177.9	5.45	2.42
SB-18	4.34	49.68	146.4	38.34	47.68	314.5	3.68	2.26
SB-19	4.68	35.68	126.1	44.57	46.12	224.5	3.56	2.12
SB-20	9.68	54.01	114.9	43.68	48.69	180.1	3.34	2.36

Table-2

Estimates of Parameters of Characters, Yield Contributing Characters of Cucumber

Characters	DSG	Vine Length		DFOMF	DFOFF	AFW	NF/P	Y/P
		30D	45D					
GV	3.43	64.77	719.56	7.27	9.96	2702.16	2.62	0.26
PV	4.19	82.54	819.19	18.42	25.37	2925.84	2.78	0.27
GCV	30.90	17.29	16.98	6.47	6.24	22.15	33.42	42.76
PCV	34.16	19.52	18.12	10.29	9.96	23.06	34.26	43.70
Range	4-10.34	29.79-69.12	88.79-120.49	35.57-51.57	42.0-57.78	158.90-424.34	2.79-10.45	0.53-2.70
Mean± SE	5.99±0.51	46±2.44	158.06±5.77	41.72±1.93	50.59±2.27	234.70±8.66	4.86±0.23	1.18±0.07
CV(%)	14.59	9.06	6.33	8.00	7.77	6.4	7.98	8.98

Table-3

Correlation Coefficient among Yield and Yield Contributing Characters of Cucumber

Characters	DFMF	DFFM	AFW	NF/P	Y/P
VL	0.027	0.007	0.11	0.179	0.186
DFMF		0.423**	-0.053	-0.194	-0.185
DFFM			-0.228	-0.248	-0.333
AFW				0.154	0.602**
NF/P					0.874**

Table-4

Path Analysis Showing Direct and Indirect Effects on Yield Components of Cucumber

Characters	VL	DFMM	DFFM	AFW	NF/P	Y/P
VL	-0.00866	0.00003	0.00009	0.04704	0.14263	0.186
DFMF	-0.00023	0.00057	0.00596	-0.02446	-0.15465	-0.185
DFFM	-0.00006	0.00025	0.0142	-0.13498	-0.1978	-0.333
AFW	-0.00087	-0.00004	-0.00405	0.047028	0.12258	0.602
NF/P	-0.00155	-0.00012	-0.00349	0.07196	0.80124	0.874