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Variability, Correlation Path Analysis of Yield and Yield Components of Pointed Gourd

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ABSTRACT

The experiment was conducted with 24 accessions of pointed gourd at the Regional Agricultural Research Station, Ishurdi, Pabna during the growing season 2005-2006. Evaluation of 24 accessions of pointed gourd for yield and yield components reveled high phenotypic and genotypic coefficients of variation (PCV and GCV, respectively). Wide variations among the accessions in respect of plant, leaf, flower, fruit and seed characters were recorded. The accessions varied significantly for days required to first flowering, number of node at 1st harvest, inter node length at first harvest, vine length at 1st harvest, fruit length, fruit breath, fruit weight, pulp weight per fruit, pulp seed ratio, number of fruits per plant, weight of fruits per plant, number of seeds per fruit, weight of seed per fruit and yield.

Key words: PVC, GVC, Correlation, Path Analysis and Pointed gourd.

INTRODUCTION

Pointed gourd (*Trichosanthes dioica* Roxb) is an important dioecious vegetable crop belonging to the family cucurbitaceae. The natural variation in most of the yield components of the crop is high. The assessment of variability present in the crop helps for successful utilization of plant characters in developing suitable variety for yield and stability as suggested by Singh *et al.* (1985). Correlation studies between yield and other traits of the crop will be of interest to the breeders in planning the hybridization programme and evaluating the individual plants in segregating populations. But it does not give an exact position of the relative importance of direct and indirect effects of the various characters on yield. Path analysis helps in portioning of correlation coefficient into direct and indirect effects of various traits on yield or any other attributes.

The phenotypic and genotypic variations of the yield components are considerably high in pointed gourd (Sarkar *et. al*., 1990) which points to the possibility of developing a variety with high yield. In a hybridization program, knowledge of the interrelationships among yield and yield contributing characters are necessary. Thus, determination of correlation among the characters is a matter of considerable importance in selection of correlated response. Therefore, the present study was undertaken to deal with association of important quantitative characters and the path coefficient analysis between the components of yield in pointed gourd.

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MATERIALS AND METHODS

The investigation was carried out at the Regional Agricultural Research Station, Ishurdi, Pabna during the growing season 2005-2006. The experiment was laid out in RCB design with three replications. Twenty four pointed gourd accession were collected from north western region. Each pointed gourd accession was considered as individual treatment of the experiment. Therefore, there were 24 treatments of the experiment. The unit plot size was 1.25m x 4.0 m and plant spacing was 1m x 1.25 m. The crop was grown following the recommended cultural practices (Rashid, 1999). Harvesting of pointed gourd was done on different dates based on edible stage. Harvesting was started from second week of March and continued up to last week of October. Data were recorded for the days required to 1st flower, number of node at 1st harvest, internode length at first harvest, vine length at first harvest, fruit length , fruit breadth , single fruit weight, pulp weight per fruit, pulp seed ratio, number of fruits per plant, weight of fruit per plant, number of seeds per fruit, seed weight per fruit and yield. The genotypic and phenotypic variances were calculated according to Johnson *et al.* (1955) and Comsstock and Rabinson (1952). Correlation coefficient and path analysis were worked out as suggested by Dewey and Lu (1959).Residual effect (R) was calculated by Singh and Chaudhury (1995). The significant of the difference between treatment means was evaluated by the least significant difference (LSD) test for the interpretation of the results (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The variability among the accessions, correlation coefficient among different important yield and yield components and also direct and indirect effects of fruit producing traits were estimated. Mean square obtained from analysis of variance (ANOVA) for yield and yield componts characters are presented in Table 1. It revealed from mean square values that there were significant differences among the accessions for all the characters**.**

Table 1. Mean square values of yield and yield contributing characters of pointed gourd accessions from ANOVA

Source of variation	Degree of freedom	Days required to first flower emergence	Number of node at first harvest	Inter node length at first harvest	Vine length at first harvest
Replication	2	3.01	6.72	12.18	0.011
Treatment	23	131.17**	124.01**	17.25**	1.579**
Error	46	2.20	7.67	12.50	0.044

Table 1 continued

Days to first harvest	Fruit length	Fruit breath	Fruit weight	Pulp weight per fruit	Pulp seed ratio
1.67	0.001	0.139	1.67	0.453	0.296
157.16	2.24**	2.79**	220.67**	208.72**	20.49**
2.77	0.003	0.122	0.432	14.36	0.149

Table 1 continued

No. of fruit per plant	Wt. of fruits per plant	No. of seeds per fruit	Wt. of seeds per fruit	Yield (t/ha)
130.54	0.007	6.23	0.040	0.036
39930.03	39.77**	74.66**	1.537**	314.63**
505.03	0.075	2.22	0.052	0.174

* Indicates 5% level of significant (using mean value) ** indicate 1% level of significant (using mean value)

The estimation of range, mean, genotypic and phenotypic variances, genotypic and phenotypic coefficients of variation (PCV and GCV, respectively) are presented in Table 2. In general, the PCV,

estimates were higher than the GCV estimates for all the traits. This indicated the inheritance association among various characters studied. Genotypic variance was maximum in fruits per plant (13141) followed by fruit yield (104), fruit weight (73.41) and pulp weight per fruit (64.79), respectively. High phenotypic variance was recorded in fruit number (13646), yield (105), fruit weight (73.84) and pulp weight per fruit (79.14). Minimum phenotypic variance was recorded in vine length at 1st harvest (0.55), fruit length (0.76) and fruit breadth (1.01), respectively (Table 2). Moderately high genotypic coefficient of variation was evident in fruit number (5415%), yield (410%), fruit weight (172%) Pulp weight per fruit (162%) and fruit weight per plant (162%), respectively. This indicated the presence of maximum amount of genetic variability. High phenotypic coefficient of variation was observed in fruit number (5623%), yield (411%), fruit weight (173%) pulp weight per fruit (198%) and fruit weight per plant (161%), respectively (Table 2) which emphasized the wide scope of selection for the improvement of these characters from a considerable amount of variability present. The influence of environment was minimum while the genotypic and phenotypic coefficients of variation were similar in magnitude (Table 2). However the magnitude of difference between PVC and GVC was less for all the characters. The existing variation for the characters were mainly due to the genetic factor .There is enough scope for selection based on these characters.

Table 2. Genotypic variance, phenotypic variance, genotypic coefficient of variation, phenotypic coefficient of variation, range and mean of yield and yield contributing characters of 24 pointed gourd accessions

Genetic components	Days required to first flowering	Number of node at first harvest	Inter node length at first harvest	Vine length at first harvest
Genotypic variance	42.99	38.78	1.75	0.51
Phenotypic variance	45.19	46.459	14.26	0.55
Genotypic coefficient of variation (%)	49.86	112.77	19.15	22.90
Phenotypic coefficient of variation (%)	52.41	135.10	156.07	24.70
Range	77.00-97.00	19.00-45.00	6.15-17.39	0.95-4.70
Mean ± SE	86.22± 1.21	34.39± 2.26	9.14± 2.89	2.23± 0.17

Table 2 continued

Genetic components	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)	Pulp wt. per fruit (g)	Pulp seed ratio
Genotypic variance	0.75	0.89	73.41	64.79	6.782
Phenotypic variance	0.753	1.012	73.84	79.15	6.931
Genotypic coefficient of variation (%)	7.4	23.56	172.27	162.25	51.23
Phenotypic coefficient of variation (%)	7.42	26.79	173.28	198.21	52.35
Range	8.06-11.94	3.26-8.05	24.33-56.33	22.60-52.83	7.76-20.37
Mean ± SE	10.14±0.045	3.78±0.285	42.61±0.537	39.93±3.09	13.24±0.32

Table 2 continued

Genetic components	Fruits per plant	Wt. of fruit per plant (kg)	Seeds per fruit	Wt. of seed per fruit (g)	Yield (t/ha)
Genotypic variance	13141	13.23	24.15	0.50	104.8
Phenotypic variance	13646	13.31	26.37	0.55	104.99
Genotypic coefficient of variation (%)	5415	161.87	101.40	16.37	410.30
Phenotypic coefficient of variation (%)	5623	162.85	110.72	18.01	410.98
Range	41.33-406	1.03-13.56	13.9-32.3	1.6-4.66	3.08-40.05
Mean ± SE	242±8.35	8.17±0.22	23.82±1.22	3.04±0.19	25.55±0.34

Estimation of simple correlation coefficient was made among eight important yield componts with yield of the 24 pointed gourd accessions. The value of 'r' and the characters correlated are presented in Table 3. Correlation coefficient revealed that number of node at first harvest had positive association with single fruit weight, pulp seed ratio, number of fruits per plant and yield of fruits per hectare. On the other hand number of node at first harvest had negative correlation with fruit length and weight of fruits per plant. Similar findings were noticed by Sarkar *et al.* (1990). Days to first flowering had positive association with fruit breadth, number of fruits per plant, weight of fruit per plant and yield of fruit. Singh *et al*. (1986) reported similar result in water melon. Correlation coefficient revealed that fruit weight had positive significant correlation with number of fruits per plant (r = 0.502*), weight of fruit per plant (r = 504*) and yield of fruit ton per hectare (r = 0.697**). Correlation coefficient revealed that fruit breadth had negative significant correlation with pulp seed ratio (-0.404*). Fruit length had positive correlation with single fruit weight, pulp seed ratio, number of fruits per plant and yield of fruit per hectare. On the other hand, negative correlation with weight of fruit per plant. Saha *et al.* (1992) reported also similar results in respect of fruit length in pumpkin. Number of fruits per plant had positive significant correlation with weight of fruits per plant (0.915**) and yield of fruit (0.813**) which indicates that yield per plant will be increased with the increase in fruit number. These results are in consonance with the findings of Singh (1983) and Singh *et al.* (1993), in pointed gourd, Panwar *et al.* (1977) in sponge gourd and Rana (1982) in Pumkin. Weight of fruits per plant had positive significant correlation with yield of fruit (0.890**) which indicates that yield per plant will be increased with the increase in fruit number. Similar findings were noticed by Singh *et al.* (1986) and Singh and Prasad (1989).

Table 3. Correlation coefficient between yield and yield contributing characters of 24 pointed gourd accessions

Character	Days to first flowering	Number of node at first harvest	Fruit length (cm)	Fruit breadth (cm)	Fruit weight	Pulp seed ratio	Number of fruits per plant	Weight of fruit per plant	Fruit yield (t/ha)
Days to first flower		-0.288	-0.172	0.080	-0.271	-0.127	0.166	0.131	0.057
Number of node at first harvest			-0.061	-0.457*	0.349	0.027	0.024	-0.052	0.157
Fruit length (cm)				-0.457*	0.349	0.027	0.024	-0.052	0.132
Fruit breadth (cm)					-0.284	-0.404*	-0.107	0.160	0.157
Single fruit weight						0.301	0.502*	0.504*	0.697**
Pulp seed ratio							0.221	-0.274	-0.161
Number of fruits per plant								0.915**	0.813**
Weight of fruit per plant									0.890**

*indicate 5% level of significant (using mean values)
** indicate 1% level of significant (using mean values),
df = N- 2 = 24-2 = 22 (.05 = 0.404, .01 = 0.515)

Association of characteristics determined by correlation may not provide an exact picture of the relative significance of direct and indirect influence of each of the yield components towards yield. In true sense, in order to find a clear picture of the interrelationships among the fruit yield and yield components, direct and indirect effects were worked out using path analysis. This analysis at both the genotypic and phenotypic levels was done with the help of genotypic and phenotypic levels (Table 4).

Table 4. Path analysis showing direct and indirect effects of yield components towards yield in pointed gourd

Character	Days to first flower	No. of node at first harvest	Fruit length (cm)	Fruit breadth (cm)	Fruit weight	Pulp seed ratio	Number of fruits per plant	Weight of fruit per plant	Yield of fruit ton per hectare
Days to first flower	**-0.0803**	0.0668	-0.0766	0.1330	-0.1366	-0.0461	0.4336	-0.2329	0.0608
Number of node at first harvest	0.0281	**-0.1909**	-0.0307	0.3070	-0.2139	-0.0695	0.2381	0.0708	0.5668
Fruit length (cm)	0.0142	0.0135	**0.4321**	-0.6595	0.1703	0.0088	0.0620	-0.0782	0.0138
Fruit breadth (cm)	-0.0079	-0.0434	-0.2111	**1.3495**	-0.1464	-0.1435	-0.3383	-0.0086	0.4500
Single fruit weight	0.0226	-0.0842	0.1518	-0.4075	**0.4848**	0.0995	-0.3201	0.0840	0.6713
Pulp seed ratio	0.0112	0.0404	0.0116	-0.5900	0.1470	**0.3283**	-0.6009	-0.1414	0.7935
Number of fruits per plant	-0.0135	-0.0920	0.0104	-0.1777	0.2492	-0.0768	**0.5683**	-0.2610	0.2067
Weight of fruit per plant	-0.0106	-0.1016	-0.0225	0.2237	-0.2456	-0.0916	-0.4018	**0.9351**	0.5798

Days to first flowering showed highly negative direct effect (-0.187) on yield per plant. It also showed negative indirect effect on yield per plant through fruit weight, pulp seed ratio and weight of fruits per plant. On the other hand, it showed positive direct effect on yield via number of node at first harvest, fruit length, fruit breadth and number of fruits per plant Number of node at first harvest showed highly negative direct effect (-7.795) on yield per plant. But positive direct effect on yield via days to first flowering, fruit breadth and number of fruits per plant, fruit length had positive direct effect (0.482) on yield per plant through number of node at first harvest, fruit weight, pulp seed ratio and number of fruits per plant. Fruit breadth had positive direct effect (1.348) on yield per plant but it showed negative indirect effect on yield through days to first flower, number of node at first harvest, fruit length, fruit weight, and pulp seed ratio, number of fruits per plant and weight of fruit per plant. Fruit weight had considerable direct and positive effect (0.331) on fruit yields per plant. Mishra and Mishra (1990) reported fruit weight was one of the most important characters contributing towards fruit yield in brinjal. The results of the present experiment also suggest that selection for fruit weight would increase fruit yield of this crop. Pulp seed ratio had positive direct effect (0.433) on yield per plant through days to first flower, number of node at first harvest, fruit length, fruit weight, number of fruits per plant and weight of fruit per plant. Number of fruits per plant had positive direct effect (2.562) on yield per plant through fruit length and pulp seed ratio. Vijay (1987) also found similar result in muskmelon. Weight of fruit per plant showed positive indirect effect on yield via fruit length, fruit breadth and number of fruits per plant. As evident from correlation studies, the fruit length and fruit weight, pulp seed ratio, number of fruits per plant and weight of fruits per plant were important for pointed gourd yield, which showed moderate and positive relationship with yield, selection could be effective for breeding about the improvement of pointed gourd. Similar result was found in pointed gourd (Singh *et al.* 1993).The result of the present experiment revealed that a wide variability existed among the collected pointed gourd accessions. Also there was correlation of different yield componts with the yield of pointed gourd.

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