BIOMETRIC STUDIES ON YIELD AND ITS COMPONENT CHARACTERS ON PEPPER (*PIPER NIGRUM* L.)

AN experiment was laid out in Randomized Block Design to compare eight varieties of pepper at Neriamangalam. Data on biometric characters recorded after the crop attained steady bearing stage have been analysed to get information on the genetic parameters. Number of spikes and yield showed maximum variability. Heritability was very high for the weight of 1,000 green berries and number of spikes. These lead to very high genetic advance in the case of number of spikes. In the case of yield also, genetic advance is high. The study of inter-correlations showed high influence of the number of spikes on yield. These lead to the conclusion that by selection for number of spikes substantial improvement in yield can be achieved.

Introduction

Yield, being a metric trait, is highly influenced by environment. Further there are a number of characters that contribute to the yield. In any crop imprvement programme, a basic knowledge of the influence of yield attributes, on the yield and the heritable or genotypic share of the variabilities are important. The possibility of crop improvement by selection can also be explored by studying the genotypic and environmental contributions of the characters. Information on the relative magnitude of their contributions towards yield in pepper is scanty. In this study, it is attempted to analyse the biometric observations on pepper, to arrive at useful results for improvment of its yield.

Materials and Methods

An experiment was conducted at Neriamangalam under the scheme for research on pepper with 8 popular varieties which are extensively cultivated in Kerala. The varieties used were, Panniyoor-I, Kottanadan, Karimunda, Kuthiravali, Valiya Kaniakadan, Kalluvalley, Karimundi and Narayankodi. Randomized Block Design with 4 replications was adopted for the trial. Planting was done in 1967–68 and the observations on six characters, *viz.*, number of spikes, length of spikes, number of berries per spike, length of internodes of bearing shoots, weight of 1,000 green berries and green yield were recorded during 1973–74, after the crop had attained steady bearing stage. Each plot consisted of 10 standards. Observations were recorded from the surface choosing one sq. ft area at random, 5 ft. above the ground level.

The data on all the characters were subjected to analysis of variance. Further, the genetic parameters like genotypic and phenotypic variances, coefficients of variation and correlation coefficients, heritability and genetic advance were worked out using the methods given in Kempthorne[2].

Results and Discussion

Analysis of variance of all characters showed significant differences among varieties as can be seen from Table I.

TABLE I

Analysis of variance

Mean Squares

Source	Degree of freedom	No. of spikes	Length of spikes (cm)	No. of berries per spike	Length of internodes (cm)	Weight of 1,000 green berries (g)	Yield (g)
Varieties	7	153·3**	11·1**	433·1**	4·1**	627·0**	3491·7**
Random variation	21	3·3	0·5	36·0	0·4	4·1	203·1

** Significant at 1% level of probability.

Table II gives the mean values, measures of variability, heritability and genetic advance due to selection for the six characters. The number of spikes and the yield exhibited high variability, their genotypic coefficients of variation being 54·0 and 50·9 respectively. The least variable character was green weight of 1,000 berries.

All the characters under study exhibited very high heritabilities measured in the broad sense. Number of spikes exhibited maximum genotypic coefficient of variation and heritability of 92%. Thus genetic advance

TABLE II

Means, measures of variability, heritability and genetic advance

Characters	Range	Mean ± S.E.$_m$	Ph.C.V.*	G.C.V.**	Heritability (%)	G.A. for the selection of the best 5% (% of mean)
No. of spikes	0·8– 22·6	11·3 ± 0·9	56·3	54·0	92·0	106·7
Length of spikes	5·7– 13·3	8·3 ± 0·4	21·3	19·5	83·8	36·8
No. of berries per spike	25·4– 69·5	44·9 ± 3·0	25·9	22·2	73·4	39·2
Length of internodes of bearing shoot	3·3– 7·3	4·8 ± 0·3	24·0	20·0	69·4	34·4
Weight of 1,000 green berries	104·0–149·0	116·3 ± 1·0	10·9	10·7	97·4	21·8
Yield	3·2–118·2	56·4 ± 7·1	56·8	50·9	80·2	93·9

* Ph.C.V. : Phenotypic coefficient of variation. ** G.C.V.: Genotypic coefficient of variation.

TABLE III

Phenotypic and genotypic correlations among various characters in pepper

Characters		Length of spike	No. of berries per spike	Length of internodes of bearing shoot	Weight of 1,000 green berries	Yield
No. of spikes	P	—·44*	—·07	—·58**	—·11	·87**
	G	—·55**	—·13	—·79**	—·13	·93**
Length of spikes	P		·70**	·56**	·67**	—·15
	G		·84**	·86**	·75**	—·23
No. of berries per spike	P			·39*	·65**	·36*
	G			·55**	·76**	·27
Length of internodes of bearing shoot	P			·46**	—·40*	
	G			·61**	·55**	
Weight of 1,000 green berries	P				·16	
	G				·16	

* Significant at 5% level. ** Significant at 1% level. P — phenotypic. G — genotypic.

due to selection is maximum for the number of spikes. In the case of yield also, high values of genotypic coefficient of variation and heritability have given rise to 93·9% genetic advance due to selection.

According to Hanson[1] heritability and genetic advance are complementary aspects. Thus values of heritability can also be used for computing the expected genetic progress possible through selection.

Number of spikes was found to have maximum genetic advance together with high heritability of 92%, indicating that the high heritability could be attributed to additive gene effects. (Panse[3]). Weight of 1,000 green berries and the length of spike have high heritability, but low genetic advance suggesting that the high heritability could be attributed to non-additive (dominance and epistasis) gene effects. (Panse[3]). Therefore selection for the number of spikes will be quite effective.

Table III gives the inter-correlations between the characters taking the phenotypic and genotypic values. The number of spikes and the yield are highly correlated as can be seen from the genotypic correlation coefficient of 0·93. The length of the spike had high influence on the number of berries per spike. The length of the internodes exhibited a negative influence on the number of spikes and a positive influence on the number of berries per spike. The spike length, the number of berries/per spike and the length of the internodes of the bearing shoot had positive influence on the weight of 1,000 green berries.

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CYTOMORPHOLOGICAL STUDY OF THE AMPHIDIPLOIDS DERIVED FROM THE HYBRIDS OF THE CROSSES BETWEEN *SOLANUM MELONGENA* L. AND *SOLANUM INTEGRIFOLIUM* POIR.

THE present note deals with the Cytomorphological study of the amphidiploids obtained from the hybrids of the crosses between the cultivated varieties of *solanum melongena L.*, namely, Pusa Purple Long (PPL), Nurki Baigan (NB), Giant of Banaras (GB) and Hungary: 290469 (HRY) and *Solanum integrifolium* Poir.

The varieties of *S. melongena* used in the present study are distinguishable from each other mainly on the basis of fruit character. In PPL, the fruits are solitary as well as in clusters, long, cylindrical and shiny purple. In GB, the fruits are solitary, large, round and light green. In NB, the fruits are in clusters, small, oval and purple while in HRY, they are solitary, large, oblong and light purple. Three kinds of flowers were recognised in these varieties: Long styled flowers (the style protruded above the anther tips). medium styled flowers (the length of style was equal to that of the anthers) and the short styled flowers (the style was very small or rudimentary). The variety NB and *S. integrifolium* possessed only long styled and medium styled flowers. Only long styled and medium styled flowers set fruit whereas the short styled flowers did not set frui either on self-pollination or cross-pollination. Therefore, in hybridization attention was concentrated on long styled and medium styled flowers.

In each cross combination, 100 flowers were pollinated. In *S. integrifolium* × NB, 60·0% of the flowers set fruit and 62·5% of the hybrid seed germinated; in *S. integrifolium* × GB, 25·0% of the flowers set fruit and 75·0% of the hybrid seed germinated, and in each of the crosses, *S. integrifolium* × HRY and PPL × *S. integrifolium*, 60·0% of the flowers set fruit but in the former germination percentage of the hybrid seed was 47·2 while in the latter it was 65·0. The reciprocal hybrids of each cross were alike in morphological and cytological characters.

Meiosis was normal in all the varieties of *S. melongena* and *S. integrifolium* with 12 bivalents at metaphase I. The F_1 hybrids ($n = 12$) of the crosses were tall, erect, vigorous in growth, profusely branched and spiny bearing small, seedless fruits in clusters of 2–9. The Pollen fertility of the hybrids varied from 19·4–34·0%. Several pollen mother cells (80·0–86·0%) of the hybrids showed as many as 12 bivalents at metaphase I. A few cells showed occasional univalents. Multivalents were completely absent. At anaphase I, a low percentage of cells (3·8–4·5%) showed 2–4 dividing or non-dividing laggards. Chromatin bridges with or without fragments were recorded in 4·0–8·0% of the cells, but they were not recorded in pollen mother cells of the hybrids of the cross *S. integrifolium* × HRY.

The chromosome number of the F_1 hybrids ($n = 12$) was doubled by colchicine treatment and a study of the flower buds of induced tetraploid branches ($n = 24$) revealed full restoration of pollen fertility, ranging from 73·5–88·0%, and fruit-set with several viable seeds. A number of pollen mother cells showed 24 bivalents at diakinesis and metaphase I,