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VARIABILITY IN BLACK GRAM UNDER PARTIALLY SHADED CONDITIONS

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Abstract: Variability in nineteen varieties of black gram was studied, under partially shaded conditions in coconut plantations. Analysis of variance for nineteen characters showed significant differences among the varieties for ten characters. Analysis of variance for chlorophyll pigments (a and b) at flowering and pod maturity revealed that there was no significant difference in the chlorophyll content among the varieties, but significant differences existed among the varieties for the chlorophyll pigments estimated at flowering and pod maturity periods. High genotypic coefficient of variation, moderate to high heritability and high genetic advance recorded for leaf area index at 50 per cent flowering and accumulation of dry matter (photosynthetic efficiency) at 50 per cent and 100 per cent flowering, number of days to blooming and number of days to the first pod harvest suggest the reliability of these characters during selection programmes for the improvement of this crop.

INTRODUCTION

Black gram is one of the most important pulse crops cultivated in Kerala. Availability of a variety with appreciable grain yield and shade tolerance is a limitation in the popularisation of black gram cultivation in coconut gardens. The effectiveness of selection depends upon the available variability in the population. The variability in a population could be partitioned into heritable and non-heritable components with the aid of genetic parameters like coefficients of variation, heritability in the broad sense and genetic advance, which serve as useful guidelines for selection. With this objective, a detailed evaluation of black gram varieties was conducted, to assess the extent of genetic variability for yield and its components, under partially shaded conditions in coconut plantations.

MATERIALS AND METHODS

Nineteen varieties of black gram were evaluated in a field trial in randomised block design with three replications, under partially shaded conditions in coconut plantations. Data were recorded on a number of growth and yield characters given in Table 1 and 2 and subjected to analysis of variance and covariance. The phenotypic and genotypic coefficients of variations (pcv and gcv respectively), heritability in the broad sense (h^2) (Jain, 1982) and genetic advance (ga) (Allard, 1960) were estimated.

RESULTS AND DISCUSSION

The varieties of black gram exhibited significant differences for number of days to blooming, number of days for completion of blooming, number of days to the first pod harvest, height of the plant, number of branches per plant, leaf area index at 50 per cent flowering and accumulation of dry matter (photosynthetic efficiency) at 50 per cent and 100 per cent flowering periods, indicating the existence of more variability for the above characters. In accordance with the results of this study Philip (1987) also reported significant differences for the above characters. Analysis of variance for the chlorophyll content (a and b) revealed that there was no significant difference in the chlorophyll content among the varieties. But significant difference among the varieties was noticed for the chlorophyll a and b pigments estimated at the

Table 1. Mean content of the chlorophyll during flowering and maturity periods

Varieties	Flowering period		Pod maturity period	
	Chlorophyll-a mg/l	Chlorophyll-b mg/l	Chlorphyll-a mg/l	Cholorphyll-b mg/l
NPRB-3	12.0	15.8	9.5	11.7
NPRB-2	9.6	12.2	13.8	21.5
UPUG 40-4	9.5	11.7	10.1	13.1
TAU-1	8.6	10.4	11.3	16.3
TAU-2	8.3	9.7	11.3	14.9
Co-Bg-10	10.7	13.5	11.3	15.8
PDU-1	10.1	13.6	10.8	15.8
Pant U-30	8.8	10.6	7.6	9.3
MBG 162	8.5	10.1	8.8	11.3
B 3-8-8	9.5	12.0	11.3	15.8
PDU-3	10.7	14.0	10.1	12.2
UH 80-4	9.6	12.9	12.6	19.2
PU-19	9.1	11.5	9.7	12.2
T-9	9.3	11.3	13.8	22.6
UH 80-9	8.6	10.4	11.6	17.0
Co-4	10.7	12.2	8.6	9.7
TMV-1	12.0	17.0	13.8	22.6
UG 218	11.3	14.9	9.5	12.7
CO-2	9.2	10.6	11.3	18.3
Mean	9.8	12.3	10.9	15.4

flowering and maturity periods, when tested against the interaction between the two periods. The chlorophyll a and b pigments were higher at the pod maturity than at the flowering period (Table 1). The higher amount of photosynthetic pigments at the pod maturity period can be expected to have an important role in the grain filling process.

Comparatively high values of phenotypic and genotypic coefficients of variation were recorded (Table 2) for number of branches per plant, leaf area index at 50 per cent flowering and accumulation of dry matter (photosynthetic efficiency) at 50 per cent and 100 per cent flowering indicating high amount of genetic variability for the above characters and the scope for their improvement through selection. In agreement to the present findings, high genotypic coefficient of variation was reported in black gram by Philip (1987) under partially shaded conditions for number of branches per plant and leaf area index at blooming.

Comparatively high values of phenotypic coefficient of variation with correspondingly low values of genotypic coefficient of variation were recorded for number of pod clusters per plant, num-

Table 2. Phenotypic and genotypic coefficients of variation, heritability and genetic advance for 15 characters in black gram

Characters	Phenotypic coefficient of variation (pcv)	Genotypic coefficient of variation (gcv)	Heritability in the broad sense (h^2)	Genetic advance (ga)
Number of days to blooming	15.12	13.90	84.50	26.33
Number of days for completion of blooming	2.87	2.44	71.81	4.25
Number of days to first pod harvest	12.76	11.73	84.59	22.22
Height of the plant	23.27	13.79	35.15	16.84
Number of branches per plant	39.77	21.40	28.95	23.74
Number of pod clusters per plant	33.13	11.29	11.61	7.90
Number of pods per plant	42.09	8.55	4.13	3.59
Length of pod	11.64	4.85	17.39	4.17
Number of grains per pod	5.64	2.41	18.18	2.11
Grain yield per plant	47.22	14.63	9.60	9.33
Grain yield per plot	37.22	15.93	18.31	14.04
LAI at 50 per cent flowering	40.41	28.57	50.00	41.71
Accumulation of dry matter at 50 per cent flowering	36.85	30.09	66.67	5.64
Accumulation of dry matter at 100 per cent flowering	48.78	33.70	47.75	48.14
Harvest index	23.24	8.78	14.29	6.94

ber of pods per plant, grain yield per plant and per plot and harvest index, in agreement to the results of Sagar *et al.* (1976) and Philip (1987).

Burton (1952) had suggested that genotypic coefficient of variation together with heritability estimates would give a better idea regarding the amount of genetic advance to be expected by selection. Moderate to high heritability observed for number of days to blooming, number of days to first pod harvest, number of days for completion of blooming, leaf area index at 50 per cent flowering, accumulation of dry matter at 50 per cent and 100 per cent flowering reveals the highly heritable nature and the minimum influence of the environment in the expression of these characters. The high heritability estimates recorded, for number of days to blooming was also reported by Sandhu *et al.* (1978) and Patel and Shah (1982) in black gram.

Johnson *et al.* (1955) have suggested that along with heritability estimate, genetic advance should also be considered for identifying characters during selection programmes. Comparatively high heritability estimates along with high genetic advance was recorded for accumulation of dry matter (photosynthetic efficiency) at 50 per cent and 100 per cent flowering, leaf area index at 50 per cent flowering, number of days to blooming and number of days to the first pod harvest. According to Panse (1957) the characters with high heritability and genetic advance were controlled by additive gene action and therefore amenable to genetic improvement through selection. Therefore, the above characters may be considered during selection programmes for the improvement of this crop. The comparatively high heritability estimates and high genetic advance for leaf area index at 50 per cent flowering reported by Philip (1987) under partially shaded conditions and for number of days to blooming reported by Sandhu *et al.* (1978) and Patel and Shah (1982) in black gram were in conformity with the results of this study.

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