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CORRELATION AND PATH COEFFICIENT ANALYSIS OF COLCHICINE INDUCED MUTANTS IN BLACK GRAM - (*Vigna Mungo* (L) HEPPER)

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ABSTRACT

Variability was induced in blackgram - cultivar T-9, through colchicine treatment of seeds and these colchicine induced mutant plants (colchiploids) were studied to find out the character association with yield through correlation and path coefficient analysis. This study clearly exhibited a certain positive correlation between plant height with stem girth, number of bunches per plant, number of pods per bunch and per plant and 100 seed weight. Further an interesting negative correlation between number of seeds per pod with grain yield was also reflected in this study and in addition the regression function indicated a high degree of influence on number of bunches per plant and the total number of days taken by the plant to flower on the expression of grain yield. The path analysis revealed that the total number of bunches per plant exerted the maximum direct effect on grain yield followed by the number of pods per plant, the total number of days taken by the plant for flowering and 100 seed weight.

Induced mutants in blackgram produced through other mutagenic agents have also resulted in plants with poor yield, short statured mutant lines with prolonged flowering and with reduced number of pods (Mahna, *et al.*, 1989). In any plant breeding studies carried out, either through orthodox breeding or through mutation breeding especially in economically useful seed crops, yield contributing factors are given greater importance. Hence in this study also grain yield was correlated with a number of associated factors. In this study the estimates of coefficient correlation clearly exhibits the inter relationship of a number of yield contributing characters. Further in this work through path analysis (Dewey and Lu, 1959) different factors were separated into as those that have direct correlation coefficient effect on yield and those that have indirect correlation coefficient effect. In addition the direct influence of one variable upon the other was also studied. This work is also aimed at to determine the characters associated with yield

Table 1. Correlation coefficients between yield and other characters of Blackgram.

Characters	Yield	Plant height in cm. x 1	No. of bunches x 2	Pods per bunch x 3	Pods per plant x 4	Seeds per pod x 5	Days to flower x 6	Leaf area in sq. cm. x 7	No. of Branches x 8	Stem girth (cm.) x 9	100 seed weight (gm) x 10
Yield	-	0.5954**	0.7006**	0.0756	0.6361**	-0.1829	0.3774*	0.1468	0.5395**	0.5522**	0.4998**
Plant height in cm. x 1			0.4956**	-0.3285*	0.3856**	0.0282	0.4203**	0.1512	0.7170**	0.8689**	0.6289**
No. of bunches x 2				0.0145	0.7542**	0.1129	-0.0562	0.2902*	0.4435**	0.3783**	0.2086
Pods per bunch x 3					0.3734**	-0.1268	-0.0148	0.0317	-0.0426	-0.2774	0.2186
Pods per plant x 4						-0.1590	-0.0734	0.3920**	0.3924**	0.2400	0.0195
Seeds per pod x 5							-0.0036	-0.0335	-0.0119	0.0126	-0.1487
Days to flower x 6								-0.2030	0.3813**	0.5392**	0.6302*
Leaf area in sq. cm. x 7									0.3287*	0.0364	-0.1220
No. of Branches x 8										0.7456**	0.5672**
Stem girth (cm.) x 9											0.7514**
100 seed weight (gm) x 10											--

** - Significant at 1% level.

Table 2. Multiple Regression Analysis.

Characters	Partial regression	SE of partial regression	±
Plant height	0.4058	1.6010	0.2535
No. of bunches	9.2899	3.3763	2.7512**
Pods per bunch	2.0532	18.047	0.1138
Pods per plant	2.4000	1.3956	1.7210
Seeds per pod	-3.0110	5.0777	-0.5931
Days to flower	17.8626	7.5333	2.3712**
Leaf area	-0.0454	0.1978	-0.2252
No. of branches	-0.5534	7.7703	-0.0712
Stem girth	-3.2534	22.3593	-0.1455
100 seed weight	22.1937	15.5278	1.4292

$a = -656.37$ $R^2 = 0.7298$** ** - significant at 1% level; * - significant at 5% level Multiple regression functions = $-656.37 + 0.41_{x1} + 9.29_{x2} + 2.05_{x3} + 2.40_{x4} - 3.01_{x5} + 17.86_{x6} - 0.04_{x7} - 0.55_{x8} - 3.25_{x9} + 22.2_{x10}$

increase and their degree of association, especially in colchicine induced mutants of T-9 black gram.

MATERIALS AND METHODS

Seeds of T-9 black gram cultivar were treated with colchicine at 0.5 percentage for eight hours. The seeds were then washed in sterile water and kept for germination in pertridishes on moist filter paper. After sprouting seeds were transferred to pots. The plants raised from the treated seeds were labelled as M_1 generation. Seeds from M_1 generation were carried over to M_2, M_3 and M_4 generations. In M_4 generation high yield mutants were selected on the basis of plant height, number of bunches, number of pods, number of pods per bunch and hundred seed weight. In M_5 generation, selected mutants were tested in replicated yield trial for uniformity of plant characters. Data were collected from ten randomly selected plants. The mean data were used to calculate the correlation coefficient. The path coefficient analysis was carried out in M_5 generation with all independent variables described by Dewey and Lu (1959).

RESULTS AND DISCUSSION

A positive and significant association between yield with plant height, bunches per plant, pods per plant, branches per plant, stem girth and 100 seeds weight (Table I) has become evident in this work and it also confirms the observations made by Malhotra *et al.*, (1974) in green gram and Irfan Khan (1989) in black gram. This study does not also reveal any correlation between leaf area with seed yield. The observations recorded on the highly positive correlation values and the significant positive inter correlation existing among the variables throws much light on the significant association between yield with plant height, bunches per plant, pods per plant, branches per plant, stem girth and 100 seeds weight. This proves that in a mutation breeding programme for yield improvement observations of these factors must be given greater importance.

Table 3. Path Coefficients of the Components of yield in Black gram.

Characters	Plant height	No. of bunches	Pods per bunch	Pods per plant	Seeds per pod	Days to flower	Leaf area	No. of branches	Stem girth	100 seed weight	Correlation Coefficient
Plant height	(0.0536)	0.2075	-0.0048	0.1247	-0.0014	0.1187	-0.0035	-0.0072	-0.0272	0.1366	0.5954**
No. of bunches	0.0261	(0.4187)	-0.0002	0.2439	0.0059	-0.0159	-0.0068	-0.0068	-0.0047	0.0118	0.7006**
Pods / bunch	-0.0173	-0.0060	(0.0717)	0.1207	0.0067	-0.0042	-0.0007	0.0004	0.0087	0.0475	0.0765
Pods / plant	0.0203	0.3158	0.0065	(0.3234)	0.0084	-0.0020	-0.0091	-0.0042	-0.0075	0.0042	0.6361**
Seeds / pod	0.0015	-0.0473	-0.0018	-0.0514	(-0.0530)	0.0010	0.0007	0.0001	-0.0004	-0.0323	0.1829
Days to flower	0.0221	-0.0235	-0.0002	-0.0237	-0.0001	(0.2823)	0.0047	-0.0041	-0.01686	0.1370	0.3774**
Leaf area	0.0079	0.1215	0.0004	0.1268	0.0018	-0.0573	(-0.0232)	0.0035	-0.0011	-0.0265	0.14076
No of branches	0.0377	0.1857	-0.0006	0.1269	0.0006	0.1076	-0.0076	(-0.0107)	-0.0233	0.1232	0.5395**
Stem girth	0.0457	0.1584	-0.0041	0.0776	-0.0007	0.1522	-0.0008	-0.0080	(-0.0313)	0.1632	0.5522**
100 seed weight	0.0331	0.0873	-0.0032	0.0063	0.0079	0.1779	0.0028	0.0060	-0.0253	(0.2172)	0.4998**

Figures in Parentheses indicate direct effects. ** - Highly significant.

Multiple regression function (Table 2) shows that the number of bunches and days to flowering gave high degree of influence on the expression of grain yield. The R^2 value indicated that the variation in yield was 72.98% ($R^2 = 0.7298$) by the combined influence of all the characters studied. The above combined influences were statistically significant. This is in line with the findings of Irfan Khan (1989) in black gram.

The path coefficient analysis (Table 3) indicates that the number of bunches per plant exert a maximum direct effect on the grain yield. The total number of pods per plant, the total number of days taken by the plant to flower and the 100 seeds weight also have an effect on the grain yield in a descending order. These observations are in line with the earlier findings (Malik and Singh, 1983).

It has also been noticed that the plant height and number of pods per bunch have the least positive direct effect on the grain yield. From this study it is obvious that the plant height, the number of bunches per plant, the total number of pods per plant, the total number of branches per plant, increase in stem girth and 100 seeds weight and their direct and indirect combinations have a direct bearing in improving the yield potential in black gram mutants.

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VARIATION AND CHARACTER ASSOCIATIONS OF GREEN FODDER YIELD AND COMPONENT TRAITS IN RAGI (*Eleusine coracana* L. Gaertn.)

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ABSTRACT

Forty diverse genotypes of ragi were evaluated for the variability, heritability estimates and path co-efficient analysis of six quantitative traits. Close resemblence between GCV and PCV estimates for days to 50 per cent flowering and green fodder yield/plant, and high heritability indicated that selection for these traits would be much effective. The highest heritability and genetic advance in green fodder yield revealed predominance of additive gene effects. Green fodder yield/plant significantly and positively correlated with all the characters studied. Though leaf weight/plant had high influence of environment, it had the maximum positive direct and indirect effects through all other characters. Besides, days to 50 per cent flowering should be reckoned as an important trait in selection programmes.

The non availability of high yielding fodder types in the small millets which can be grown under less fertile lands is a limiting factor. The common feature of ragi is that, it can come up on land that is too poor and too dry for other crops. As forage crop, it is palatable to the stock and has a feeding value, can be utilised for hay or silage even when badly damaged (Kempanna, 1974). Another advantage is that it can be cut and fed to the animal at any stage of the crop growth unlike sorghum which contains - HCN compared to other millets. So the present investigation aims to obtain information on genetic variability, heritability (broad sense) and genetic advance for different