Table 1. Physical and chemical characteristics of rice IET 10522.

Characteristics			
Milling and polishing characteristics			
Endosperm	(%)	79.4	
Husk	(%)	20.4	
White rice	(%)	92.0	
Bran	(%)	7.8	
Cooking characteristics			
Weight increase	(g)	21.6	
Volume increase	(ml)	16.4	
Water absorption	(ml)	24.0	
Actual time taken for cooking	(mts)	24.0	
Chemical characteristics			
Starch	(%)	72.90	
Amylose	(%)	28.41	
Protein	(%)	9.15	
Organoleptic characteristics			
		O.C.	P.C.
Colour and appearance		3.6	3.8
Flavour		3.8	3.8
Donness		3.6	3.6
Taste		3.6	3.6
Overall acceptability		3.6	3.6

it ranked good score of 9.15 per cent, starch 72.9 per cent and amylose 28.41 per cent (Table 1)

IET 10522 was tested for its reaction to major pests and diseases both under field and artificial conditions and was found to be moderately resistant to the brown planthopper, *Nilaparvata lugens* (Stal.) and resistant to blast under field conditions in blast prone areas of Kanyakumari District. Blast is a major disease in the *Ela* situation and the culture IET 10522 was completely free from blast when raised in blast prone areas and gave higher grain and straw yield.

The culture IET 10522 was found suitable for cultivation under water logged *(Ela)* conditions in the *Pishanam* season due to its better adaptability and tolerance to submergence and also for general cultivation during *Pishanam* season in Kanyakumari District in the place of ADT 40, Co 42 and TPS 2.

In view of its good performance in the research station trials, adaptive research trials, on-farm trials and minikit trials, its better adaptability and tolerance to submergence and its resistance to blast in endemic areas of Kanyakumari District, the State Variety Release Committee approved its release as TPS 3 for cultivation in water logged *(Ela)* condition in Kanyakumari District.

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CORRELATION AND PATH CO-EFFICIENT ANALYSIS IN F_2 GENERATION OF BLACK GRAM (*Vigna mungo*)

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ABSTRACT

Correlation co-efficients (genotypic and phenotypic) and path co- efficients were worked out based on the mean values obtained from 20 F_2 Family means of cross combinations derived from a 5x5 diallel set for 15 characters. Significant positive correlation with yield was exhibited by primary leaf area, days to maturity, plant height, branch number, leaf number, total leaf area, pod number, pods per cluster, cluster number and total drymatter production. The above yield components also exhibited significant positive inter- correlations among themselves. Pod number followed by days to maturity and leaf number had positive direct effect on grain yield. Branch number followed by plant height, harvest index and primary leaf area contributed only negative direct effects on grain yield. Sinnificant positive correlation of primary leaf area with total drymatter production and grain yield indicated that this character could be relied on as an indicator of superior genotypes for total dry matter production and grain yield even at the seedling stage itself.

KEY WORDS : Black gram, Correlation, Path Analysis.

Yield is a complex character and the estimates of genotypic correlations between yield and its component characters and *inter se* associations among themselves may provide useful information for the choice of characters in the selection programme to improve seed yield. Hence an

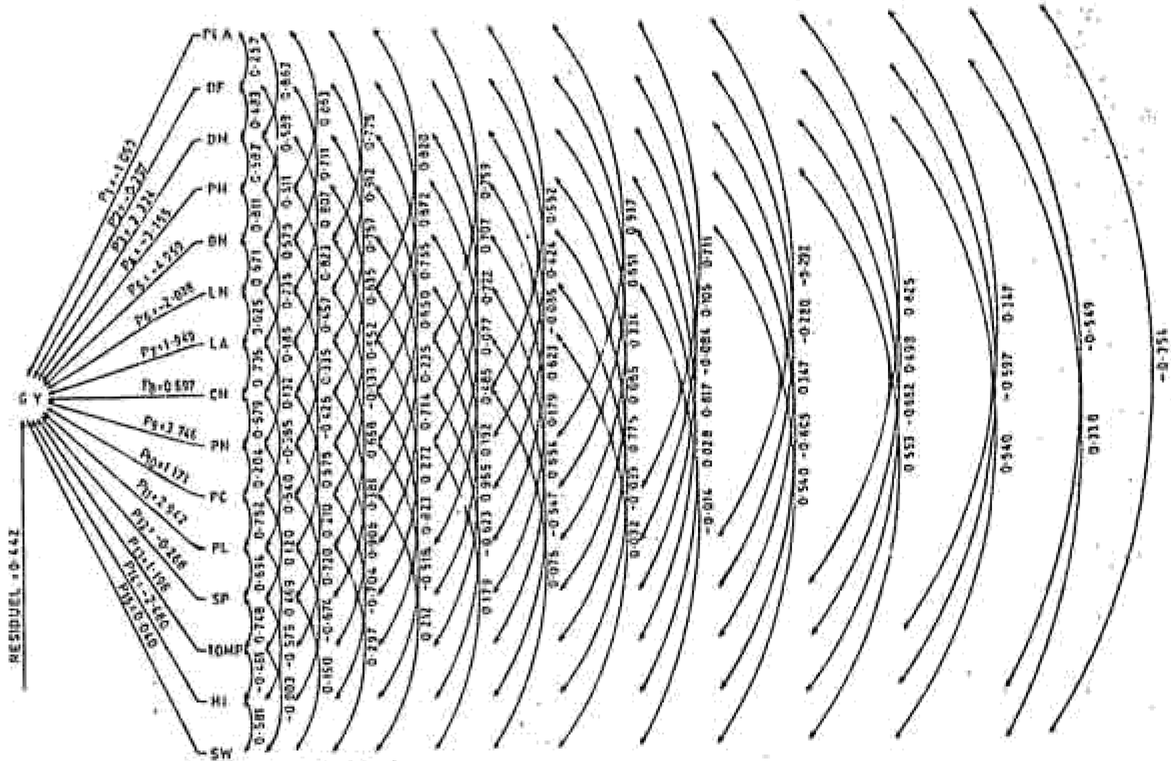

Fig. 1. Path Coefficient Analysis in black gram

Table 1. Genotypic and phenotypic correlation coefficients in F_2 generation

PLA		DFF	DM	PH	BN	LN	LA	CN	PN	PC	PL	SP	TDMP	HI	SW	GY
PLA	G	0.257	0.489*	0.687**	0.811**	0.671**	0.625**	0.736**	0.579**	0.205	0.752**	0.694**	0.748**	-0.481*	0.581**	0.679**
	P	0.242	0.445	0.619**	0.699**	0.601**	0.494**	0.635**	0.504*	0.153	0.598**	0.404*	0.661**	-0.442*	0.516**	0.542**
DFF	G		0.863**	0.589**	0.611**	0.575**	0.736**	0.186	0.132	-0.585*	0.540**	0.120	0.469*	-0.575**	0.003	0.282
	P		0.835**	0.564**	0.554**	0.555**	0.636**	0.159	0.107	-0.319	0.461*	0.110	0.426*	-0.533**	0.013	0.243
DM	G			0.863**	0.711**	0.807**	0.823**	0.457*	0.335	-0.426*	0.578**	0.210	0.720**	-0.674**	0.150	0.498*
	P			0.829**	0.624**	0.765**	0.740**	0.422*	0.311	-0.229	0.484*	0.173	0.631**	-0.634**	0.142	0.437*
PH	G				0.778**	0.912**	0.757**	0.635**	0.352**	-0.139	0.668**	0.381	0.906**	-0.704**	0.297	0.732**
	P				0.679**	0.882**	0.714**	0.599**	0.511**	-0.135	0.565*	0.274	0.835**	-0.673**	0.268	0.636**
BN	G					0.820**	0.872**	0.765**	0.650**	0.235	0.714**	0.272	0.823**	-0.518**	0.212	0.759**
	P					0.734**	0.729**	0.692**	0.589**	0.121	0.511**	0.264	0.661**	-0.391	0.119	0.585**
LN	G						0.759**	0.707**	0.722**	0.077	0.485*	0.192	0.965**	-0.623**	0.179	0.232**
	P						0.721**	0.675**	0.688**	0.067	0.441*	0.179	0.270**	-0.584**	0.157	0.745**
LA	G							0.552**	0.424*	-0.086	0.623**	0.179	0.654**	-0.547**	0.076	0.493*
	P							0.522**	0.402*	-0.023	0.519**	0.160	0.580**	-0.500*	0.036	0.451*
CN	G								0.937**	0.651**	0.334	0.085	0.775**	-0.039	0.032	0.891**
	P								0.877**	0.363	0.239	0.096	0.657**	-0.019	0.070	0.767**
PN	G									0.711**	0.105	-0.084	0.817**	0.028	-0.014	0.962**
	P									0.452*	0.079	-0.033	0.683**	0.053	-0.005	0.857**
PC	G										-0.292	-0.280	0.347	-0.605**	0.540**	0.531**
	P										-0.119	-0.72	0.131	-0.401	0.376	0.372
PL	G											0.625**	0.498*	-0.662**	0.553**	0.272
	P											0.374	0.390	-0.560**	0.372	0.256
SP	G												0.347	-0.597**	0.540**	0.021
	P												0.189	-0.401*	0.386	0.125
TDMP	G													-0.549**	0.338	0.991**
	P													-0.521**	0.242	0.779**
HI	G														-0.364	-0.182
	P														-0.341	-0.177
SW	G															0.182
	P															0.175

G = Genotypic correlation coefficients * - Significant at 5% level

P = Phenotypic correlation coefficients ** - Significant at 1% level

Table 2. Path coefficients - Direct effects (underline) and indirect effects in F_2 generation

	PLA	DFF	DM	PH	BN	LN	LA	CN	PN	PC	PL	SP	TDMP	HI	SW	Total correlation with GY
PLA	<u>-1.099</u>	-0.076	1.136	-2.175	-4.022	-1.361	1.219	0.513	2.169	0.240	2.212	-0.189	0.895	1.192	0.023	0.679**
DFF	-0.282	<u>-0.297</u>	2.005	-1.863	-3.030	-1.166	1.433	0.129	0.495	-0.685	1.588	-0.031	0.560	1.426	0.000	0.282
DM	-0.537	-0.256	<u>0.324</u>	-2.730	-3.525	-1.637	1.604	0.313	1.254	-0.499	1.701	-0.056	0.861	1.671	0.006	0.498*
PH	-0.755	-0.175	2.005	<u>-3.165</u>	-3.856	-1.851	1.475	0.442	2.069	-0.163	1.969	-0.102	1.084	1.746	0.012	0.732**
BN	-0.892	-0.181	1.652	-2.461	<u>-4.959</u>	-1.662	1.700	0.547	2.436	0.275	2.100	-0.072	0.984	1.285	0.008	0.759**
LN	-0.737	-0.171	1.876	-2.888	-4.065	<u>-2.028</u>	1.478	0.492	2.703	0.090	1.426	-0.051	1.155	1.545	0.007	0.832**
LA	-0.687	-0.218	1.913	-2.400	-4.326	-1.539	<u>1.949</u>	0.384	1.587	-0.101	1.832	-0.048	0.782	1.357	0.003	0.493*
CN	-0.809	-0.055	1.062	-2.10	-3.894	-1.433	1.075	<u>0.697</u>	3.510	0.762	0.983	-0.023	0.827	0.098	0.001	0.891**
PN	-0.636	-0.039	0.778	-1.748	-3.224	-1.463	0.826	0.653	<u>3.746</u>	0.833	0.308	0.022	0.977	-0.070	-0.001	0.962**
PC	-0.225	0.174	-0.991	0.441	-1.167	-0.157	-0.168	0.454	2.666	<u>1.171</u>	-0.861	0.075	0.363	-1.239	-0.004	0.531**
PL	-0.326	-0.160	1.343	-2.114	-3.539	-0.983	1.213	0.233	0.392	-0.343	<u>2.942</u>	-0.167	0.595	1.666	0.022	0.272
SP	-0.763	-0.034	0.489	-1.206	-1.349	-0.389	0.348	0.059	-0.314	-0.328	1.839	<u>-0.268</u>	0.416	1.500	0.021	0.021
TDMP	-0.823	-0.139	1.672	-2.869	-4.079	-1.958	1.275	0.540	3.061	0.355	1.463	-0.093	<u>1.196</u>	1.376	0.013	0.991**
HI	0.528	0.471	-1.566	2.229	2.570	1.263	-1.066	-0.027	0.105	0.585	-1.976	0.162	-0.664	<u>-2.480</u>	-0.014	-0.182
SW	-0.639	0.001	0.350	-0.943	-1.052	-0.363	0.149	0.022	-0.052	-0.120	1.628	-0.145	0.404	0.902	<u>0.040</u>	0.182

Residual = 0.442 Underlined (daigonal) figures denote direct effects.

attempt was made to estimate the association between the yield and its components and their direct and indirect contribution to the grain yield by utilizing the F_2 family means.

MATERIALS AND METHODS

Mean values of F_2 families (mean of 50 plants in each replication) derived from a 5x5 diallel set involving the parents *viz.,* 04, C05, UG 135, UG 191 and T 9: raised in a RBD with three replications during summer 1987 were utilized to compute genotypic, phenotypic and environmental correlations among the grain yield and its components *via.,* primary leaf area, days to flowering, days to maturity, plant height, branch number, leaf number, total leaf area, pod number, cluster number, pods per cluster, seeds per pod, pod length, total drymatter production (TDMP) hundred grain weight and harvest index. (Johnson *et al.,* 1955). Path co-efficient analysis as applied by Dewey and Lu (1959) was used to partition the genotypic correlation co-efficients into direct and indirect effects.

RESULTS AND DISCUSSION

Phenotypic and genotypic correlation co-efficients between yield and its components and also their inter correlations are presented in Table 1.

In the present investigation, in general, the genotypic correlations were slightly higher than the phenotypic correlations. This focussed attention on the point that in spite of strong inherent phenotypic association between various character pair studied, the environment may modify the full expression of the genotypes (Nandpuri *et al.,* 1973).

Among the characters, primary leaf area, days to maturity, plant height, branch number, leaf number, leaf area, cluster number, pod number and TDMP exhibited significant positive correlation with grain yield both at genotypic and phenotypic level, while pods per plant showed only at genotypic level. Their inter correlation coefficients were also significant and positive. Hence, these characters can be apparently used as selection criteria for improving seed yield in black gram. Such positive association of yield with pod number, cluster number and branch number was also reported by Verma and Dubey (1970), Singh *et al.* (1972), Singh *et al.* (1975), Ashok Kumar (1977), Muthiah and Sivasubramanian (1981), Hemanthakumar and Narasimha Reddy (1987) and Patil and Narkhede (1987). As the primary leaf area showed significant and positive correlation with almost all the yield components, especially with TDMP and grain yield, this character may serve as best indicator of superior genotype even at the seedling stage itself. Similar findings were also reported in other legume by Carnaham (1963), Burris *et al.* (1973) Cooper (1974) and Acharya *et al.* (1984).

Singh *et al.* (1975) and Das (1978) and Dasgupta and Das (1984) reported significant and negative correlation between grain yield and days to maturity. Usha Rani and Sakaram Rao (1981) also reported significant positive correlation between leaf area at re- productive phase with yield and Singh *et al.* (1975) reported significant positive association of pod number, with plant height and primary branches.

In the present study significant, positive association was observed between pod length, seeds per pod and seed weight. Similar association was also reported by Patil and Narkhede (1987).

Harvest index had significant and negative association with most of the components except pod number and cluster number. Hence, while formulating selection programme based on the yield components, harvest index should be taken into consideration by keeping at optimum level. Since the harvest index alone determine the actual portion drymatter produced, converted into economically important plant parts (Jeswani, 1986).

As the correlation coefficients are insufficient to explain true relationship for an effective manipulation of the characters, path coefficients were worked out. The path analysis furnishes a method for partitioning the correlation coefficients into direct and indirect effects and measures the relative importance of the casual factors involved (Dewey and Lu, 1959). The direct, indirect effects and total correlation of individual character on grain yield are presented in Table-2. and Fig.1.

The estimated R^2 (0.805) and residual effects (0.442) in the present study reflected the adequacy and appropriateness of the characters chosen for path analysis. The inclusion of the characters which had nonsignificant association with yield viz., days to flowering, pod length, seeds per pod and seed weight might have inflated the residual value.

Pod number followed by pod length, days to maturity and leaf area exhibited the highest positive direct effect on grain yield. Singh *et al.* (1975) also reported positive direct effect of pod number, cluster number and branch number on yield in black gram. Branch number followed by plant height, harvest index and primary leaf area contributed only negative direct effect on grain yield in the present study. Usha Rani and Sakaram Rao (1981) also reported negligible direct effect of plant height on grain yield. However, Soundarapandian *et al* (1975), Das (1978), Patel and Shah (1982) reported the highest direct of plant height on grain yield in this crop. Though pod number, pod length, days to maturity, leaf area and TDMP had high positive direct effects, they had high negative indirect effects on yield. Hence, optimum number of branches has to be kept in mind, while formulating selection indices based on these traits.

Among the indirect effects, cluster number exerted highest followed by TDMP and leaf number through pod number. Singh *et al* (1975) also reported the highest indirect effect of cluster number through pod number in this crop. Highest negative indirect effect were exerted by leaf area, TDMP, leaf number and primary leaf area through branch number on grain yield. Although leaf number had negative direct effects of yield, it had high positive indirect effects through all characters excepting primary leaf area, days to flowering, plant height, branch number and seeds per pod. Likewise harvest index also had negative direct effects on yield,but high positive indirect effects through primary leaf area , days to flowering, plant height, branch number, leaf number, pod number, pods per cluster and seeds per pod. Most of the characters led positive indirect effects on grain yield through, days to maturity, leaf area, pod number, pod length TDMP and harvest index. In contrast Madumoorthy and Narasimha Reddy (1986) reported negative indirect effects of different yield components through pod number on grain yield. Based on the present investigation, it could be concluded that pod number, pod length, cluster number, days to maturity, leaf area and TDMP should be taken into consideration while formulating selection programmes to improve grain yield in black gram.

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RELATIVE UTILISATION OF DIFFERENT ZINC CARRIERS IN WETLAND RICE *(Oryza sativa)*

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ABSTRACT

The utilisation of fertiliser zinc by rice crop was studied using few ^{65} Zn-labelled zinc carriers in a greenhouse experiment on an Udic Haplustalf and an Entic Chromustert. With respect to the yield of grain and straw, $ZnSO_4$ was found to be the best among the zinc carriers tried. Its effect was more pronounced when applied along with ammonium polyphosphate. However, the per cent zinc utilisation followed the order:-Zincated urea > $ZnSO_4$ > $ZnSO_4$ + APP > Zincated DAP.

KEY WORDS : Zinc sources, Wetland rice

Zinc deficiency is probably the most widespread micronutritional disorder the world over. Wetland rice is most susceptible since zinc is removed from the solution phase as insoluble zinc sulphide, silicate or zinc ammonium phosphate (Mikkelsen and Kuo, 1976). It is likely that high phosphorus levels and certain carbonate-bicarbonate relationships cause its