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SHORT COMMUNICATION

CORRELATION AND PATH ANALYSIS IN EXOTIC AND INDIGENOUS TYPES OF FABABEAN FOR YIELD AND ITS COMPONENT TRAITS

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SUMMARY

Correlation and path analysis studies were conducted to determine the association among various seed yield and its component traits, and the direct and indirect contribution towards seed yield in 80 elite diverse fababean genotypes collected from different geographical areas among them 31 are exotic types and 49 are indigenous types. Seed yield per plant had a positive and highly significant genotypic and phenotypic correlations with days to 50% flowering(41.67 and 96.33), days to maturity(142 and 195.33), plant height, number of branches per plant, number of pods per plant, number of seeds per pod and 100 seed weight. Path coefficient analysis indicated that 100 seed weight had the highest direct and positive effect on seed yield per plant followed by number of pods per plant, number of seeds per pod, days to 50% flowering, number of branches per plant, plant height. So, from the combined results of correlation coefficient and path analysis, it may be concluded that 100 seed weight, branches per plant and number of pods per plant are the major yield contributing traits to be given selection pressure for improving yield.

Key words : Fababean, seed yield, correlation and path analysis

Fababean is a preferred pulse in North Africa and parts of West Asia, and provides variety to diets elsewhere. As far as India is concerned, it is categorized as underutilized legume. It is grown in Bihar, Uttar Pradesh, Himanchal Pradesh, Punjab, Madhya Pradesh, Karnatka, Chhattisgarh, Odisha, Jhadkhand and North Eastern states of India. This crop is widely grown for forage, vegetable, pulse, green manure and as a cover crop. It is a highly productive crop, and it is also higher yielder than conventional pulses. It is also used as human food in developing countries as well as animal feed mainly for pigs, horses, poultry and pigeons. It is rich in L-dopa, a substance used medically in the treatment of Parkinson's disease. L-dopa is also a neurotic agent, which might help in controlling hypertension. Faba bean plays a critical role in crop rotations and effective in nitrogen fixation for soil improvement. In order to initiate any effective selection programme (Arya, 2018) for further improvement in fababean, it is necessary to have a thorough understanding about the association among the yield and its component traits. This would improve the chances of achieving correlated response in the desired direction. Therefore, information regarding the direct and indirect effects of the various components on yield, like seed weight, number of pods per plant and pod length, is most essential.

The present investigation was carried out on 80 faba bean genotypes selected from Medicinal, Aromatic & Potential Crops Section, Department of Genetics and Plant Breeding, CCS HAU, Hisar during *Rabi*, 2015-16 in a Randomized Block Design (RBD) with three replications in two rows plot of 3 m length, keeping row to row distance of 30 cm and plant to plant distance of 10 cm for each genotype. All the recommended package of practices was followed for raising a good crop. To evaluate these genotypes for yield and its component traits, the data recorded on 11 quantitative traits from five randomly selected plants (excluding border plants) in each genotype and each replication viz., days to 50% flowering, days to maturity, number of secondary branches per plant, number of pods per plant, plant height (cm), number of seeds per pod, 100 seed weight (g), seed yield per plant (g), standard germination (%), seedling length (cm) and seed vigour index-I. The ANOVA (Analysis of Variance) for different characters were statistically analyzed as described by Gomez and Gomez (1984). To determine the degree of association between yield and its yield component traits, the correlation coefficients were calculated by using the variance and covariance components as suggested by Al-Jibouri *et al*. (1958) and for the estimation of direct and indirect effect of 10 independent characters on yield as

dependent character was performed by employing the method suggested by Dewey and Lu (1959).

Correlation Coefficient Analysis

The estimates of phenotypic and genotypic correlation coefficients revealed that the genotypic correlations were in higher magnitude than their corresponding phenotypic correlation for all the character combinations, thereby establishing strong inherent relationship among the studied attributes. Most of the traits like days to 50% flowering (0.492 & 0.477), days to maturity (0.387 & 0.371), plant height (0.358 & 0.327), branches per plant (0.268 & 0.224), pods per plant (0.240 & 0.252), pod length (0.602 & 0.547), number of seeds per pod (0.584 & 0.423), 100 seed weight (0.760 & 0.750), had showed positive and significant correlation with seed yield at both genotypic and phenotypic level, respectively (Table No. 2). This result was confirmed by Chaubey *et al*., (2012) seed yield per plant, number of pods per plant, biological yield per plant, number of branches per plant, number of seeds per pod, 100 seed weight, Cokkizgin *et al*., (2013) observed that seed yield was significantly correlated with all traits except plant height and 100-seed weight, Bakhiet *et al.*, (2015) between seed yield, plant height, 100 seed weight, seed weight per plant, Sheelamary and Shivani, (2015) between seed yield and 100 seed weight, plant height, seed weight/plant and biological yield, Tofiq *et al.*, (2016) between seed yield, with the number of seeds per plant and number of pods per plant. Negative and significant correlated with clusters per plant (-0.400) and pods per plant (-0.339), like this Peksen, (2007) found negative and significant correlations between seed yield and flowering time, maturity date number of branches per plant and 100 seed weight. Sharifi (2015) observed significant negative correlation coefficient was detected between seed yield and days to pod initiation.

Path Coefficient Analysis

Path coefficient is used in plant breeding

TABLE 1
Genotypic (above diagonal) and Phenotypic (below diagonal) correlation coefficients for seed yield and its component traits in 80 Fababean genotypes

Characters	DF	DM	PH	BP	CP	PP	PL	SP	100SW	SY
DF	**1**	0.901**	0.370**	-0.128*	-0.464**	-0.358**	0.671**	0.256**	0.667**	0.492**
DM	0.885**	**1**	0.257**	-0.132*	-0.398**	-0.307**	0.638**	0.127*	0.592**	0.387**
PH	0.362**	0.279**	**1**	-0.097	-0.304**	-0.145*	0.325**	0.151*	0.420**	0.358**
BP	-0.109	-0.114	-0.089	**1**	0.560**	0.595**	0.025	-0.038	-0.038	0.268**
CP	-0.441**	-0.363**	-0.257**	0.492**	**1**	0.817**	-0.340**	-0.046	-0.400**	0.033
PP	-0.339**	-0.281**	-0.12	0.501**	0.753**	**1**	-0.320**	0.005	-0.339**	0.240**
PL	0.601**	0.564**	0.295**	-0.003	-0.299**	-0.286**	**1**	0.401**	0.851**	0.602**
SP	0.172**	0.070	0.070	0.009	-0.002	0	0.282**	**1**	0.351**	0.584**
100SW	0.658**	0.572**	0.385**	-0.031	-0.385**	-0.320**	0.783**	0.261**	**1**	0.760**
SY	0.477**	0.371**	0.327**	0.224**	0.031	0.252**	0.547**	0.423**	0.750**	**1**

*Significant at 5 per cent ** Significant at 1 per cent.
DF = Days to 50% flowering, DM = Days to maturity, PH = Plant height (cm), BP = No. of branches/plant, CP=No. of clusters/plant, PP=No. of pods/plant, PL=Pod length (cm), SP=No. of seeds/pod, 100SW = 100 seed weight (g), SY = Seed yield/plant (g).

TABLE 2
Path coefficient analysis for seed yield and its component traits in 80 Fababean genotypes

Characters	DF	DM	PH	BP	CP	PP	PL	SP	100SW
DF	**0.18**	0.162	0.066	-0.023	-0.083	-0.064	0.121	0.046	0.120
DM	-0.061	**-0.068**	-0.017	0.009	0.027	0.021	-0.043	-0.009	-0.040
PH	0.003	0.002	**0.008**	-0.001	-0.002	-0.001	0.003	0.001	0.003
BP	-0.007	-0.007	-0.005	**0.054**	0.030	0.032	0.001	-0.002	-0.002
CP	0.046	0.039	0.03	-0.055	**-0.099**	-0.080	0.034	0.005	0.039
PP	-0.203	-0.174	-0.082	0.338	0.464	**0.568**	-0.182	0.003	-0.193
PL	-0.173	-0.164	-0.084	-0.007	0.087	0.082	**-0.257**	-0.103	-0.219
SP	0.080	0.040	0.047	-0.012	-0.014	0.001	0.126	**0.313**	0.110
100SW	0.628	0.557	0.395	-0.036	-0.377	-0.319	0.801	0.331	**0.941**
Correlation with SY	0.492**	0.387**	0.358**	0.268**	0.033	0.240**	0.602**	0.584**	0.760**

*Significant at 5 per cent **Significant at 1 per cent.

programs to determine the nature of the relationships between yield and its component traits that would be useful as selection criteria to improve the crop yield. The seed yield was taken as dependent variable to determine the direct and indirect effects of component traits.

It showed that 100 seed weight had the highest direct and positive effect (0.941) on seed yield per plant, followed by number of pods per plant (0.568), number of seeds per pod (0.313), days to 50% flowering (0.180), number of branches per plant (0.054), plant height (0.008). The100 seed weight (0.628), number of seeds per pod (0.080), number of clusters per plant (0.046), plant height (0.003), had positive indirect effect whereas days to maturity (-0.061), number of branches per plant (-0.007), number of pods per plant (-0.203), pod length (-0.173) had negative indirect effects on seed yield per plant via days to 50% flowering. Days to maturity (0.009), pods per plant (0.338), had positive indirect effects on seed yield via branches per plant. Similarly, days to maturity (0.021), branches per plant (0.032), pod length (0.082), and seeds per pod (0.001), had positive indirect effects on the seed yield via pods per plant. Days to 50% flowering (0.046), plant height (0.001), clusters per plant (0.005), pods per plant (0.003) and 100 seed weight (0.331) had positive indirect effects via seeds per pod. Days to 50% flowering (0.120), plant height (0.003), clusters per plant (0.039) and seeds per pod (0.110) had positive indirect effects via 100 seed weight. Similar results for one or more characters were reported by Verma *et al*., (2013)**,** Cokkizgin *et al*., (2013) and Chaubey *et al*., (2012). Direct negative effects were observed for pod length (-0.257), clusters per plant (-0.099), and days to maturity (-0.068). Same results found for clusters per plant by Kumar *et al*., (2016).

CONCLUSIONS

The present study would certainly provide some guidelines in the selection of parents and in the prediction of possible merits for genetic recombination and would also be paramount importance in formulating model plant type in selection segregating generations. So, from the combined results of correlation and path coefficient analysis, it may be concluded that 100 seed weight, branches per plant, number of pods per plant and days to 50% flowering are the major yield contributing traits to be given selection pressure for improving yield.

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