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Correlation and path analysis of promising faba bean genotypes

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Abstract
The investigation evaluates 35 promising faba bean genotypes for correlation and path analysis. During Rabi season 2021–2022. Genotypes were sown in a Randomized complete block design (RCBD) with three replications. The data was recorded for fifteen quantitative characters. Days to pod initiation, plant height, number of pods/plant, number of clusters/plant, number of seeds/plant, seed yield/plant, and total protein content all significantly and positively correlated with seed yield/plot. Path analysis showed that number of pods/plant, number of clusters/plant, and total protein content all had significant positive direct effects on seed yield/plot.

Keywords: Faba bean, correlation, yield, path analysis

Introduction
Faba bean is an important potential pulse crop in India and one of the oldest pulse crop in the world. Decrease in the yield of the other pulse crop due to adverse climatic condition faba bean will be important pulse crop in near future due to high protein content (22-28%, Crepon *et al*., 2010) [2] and good nitrogen fixer. Faba bean is a diploid with 2n=2x=12 chromosome (Cubero), Faba bean is a often cross pollinated crop from 4% to 84% and cross pollination is greatly affected by the bee population. It posses one of the largest genomes among the legumes crops (13000 Mb). Faba bean can grow up to height of 1-2 m. It has a taproot and many fibrous roots that explorer up to 90 cm. The stem is coarse, hollow and unbranched. The leaves are alternate, pinnately compound with 2-7 leaflets, without a tendril Flowers are large 3-4 cm white in colour with purple spot. The fruit is a dehiscent cylindrical pod, can grow up to 10-12 cm and 1-2 cm diameter. The young pods are green slowly become dark brown then black at maturity. Each pod contains 2-4 oblong-oval seed. Faba bean beings a crop of relatively high moisture areas.

Materials and Methods
The experiment unit consisted of 35 promising genotypes of faba beans. The genotypes were grown in Rabi 2021-2022 at Birsa Agricultural University, Kanke, and Ranchi. The plot size of 3 m long having 3 row and distance between rows and plant were as 30 × 10 cm, respectively in Randomized block design with three replication. Five randomly selected plant were taken to record the data for days to first flowering, days to 50% flowering, days to pod initiation, number of primary branches/plant, plant height, number of pods/plant, number of clusters/plant, number of pods/cluster, day to maturity, number of seeds/pod, number of seed/plant, seed yield/plant, seed yield/plot, 100-seed weight, total protein content. Correlation and regression analysis was done to know the degree and direction, direct and indirect effect of the yield and yield attributing characters.

Results and Discussion
The association between Seed yield/plot with plant height, days to pod initiation, number of pod/plant, number of cluster/plant, number of seed/plant, seed yield/plant, total protein content (Table No. 1) was high positive and significant correlated. Seed yield/plot revealed that there was non-significant and positive correlation with days to 50% flowering, number of pods/cluster and days to maturity. Seed yield/plant showed positive and significant correlation with days to maturity, number of pod/plant, number of cluster/plant and number of seeds/plant. Seed yield/plant showed positive correlation with days to first flowering, days to 50%

flowering. Seed index showed negatively correlated with number of pod/plant (Abhay *et al*.) 2009 [1].

Path coefficient analysis

a) Direct effects: usal Table no. 2 revealed that the diagonal values are direct effects of different charachrer on seed yield/plot. This showed that total protein (1.827) content highest positive direct effect on seed yield followed by number of pod/plant (1.683), Number of cluster/plant (1.467), Days to pod initiation (1.419), plant height (0.957). Seed yield/plot showed direct negative effect observed by number of seed/plant (-2.118), seed yield/plant (-0.899) and number of pods/cluster (-0.76).

b) Indirect effects: In perusal table no 2 revealed that Seed yield/plant was high and positive direct effect with number of pods/plant, number of clusters/plant and number of pod initiation, (Habetinek *et al*., 1982) [4]. Seed yield/plant showed negative indirect effect on number of, seed/plant and number of seed/pod. Seed index showed positive indirect effect for all character except the negative indirect effect on days to pod initiation, days to pods/plant, number of cluster/plant and total protein content. Total protein content showed indirect positive effect on days to first flowering, plant height and number of seed/plant.

Table 1: Correlation between yield and yield attributing character in faba bean genotypes

	DFF	D50% F	DPI	PH	NPB	NPP	NCP	NPC	DM	NSP	NSPL	SYPL	SYPLO	SI	TPP
DFF	1.000														
D50% F	0.043	1.000													
DPI	0.129	0.155	1.000												
PH	-0.033	0.037	-0.090	1.000											
NPB	-0.066	0.109	0.098	-.264**	1.000										
NPP	-0.014	.295**	0.173	-0.064	.385**	1.000									
NCP	0.121	0.113	-0.057	-0.034	0.172	.533**	1.000								
NPC	.235*	-0.149	-0.096	0.115	-0.034	0.122	.337**	1.000							
DM	-0.052	-0.007	0.040	-0.016	0.058	0.004	-0.046	-0.016	1.000						
NSP	-.255**	-0.043	-.305**	-0.063	-0.073	-0.013	-0.047	-0.136	-0.060	1.000					
NSPL	-0.066	.280**	.203*	-0.066	.367**	.906**	.495**	0.061	-0.020	0.058	1.000				
SYPL	0.153	0.106	0.056	0.077	0.068	.440**	.294**	0.013	.245*	-0.042	.366**	1.000			
SYPLO	0.005	0.133	0.378*	0.393*	-0.071	0.483**	0.262**	0.018	0.011	-0.228	0.456**	0.460**	1.000		
SI	0.019	0.106	-0.163	0.119	0.111	-0.130	-.277**	-0.107	.193*	0.075	-0.107	-0.077	-0.311	1.000	
TPP	0.036	-0.075	-0.029	.222*	-0.148	-0.095	-0.059	0.123	0.089	-.195*	-0.091	0.090	0.707**	-.254**	1.000

DFF- Days to first flowering, D50% F- Days to 50% flowering, DPI- Days to pod initiation, PH- Plant height, NPB- Number of primary branches/plant, NPP-Number of pods/plant, NCP-Number of clusters/plant, NPC-Number of pods/cluster, DM-Day to maturity, NSP-Number of seeds/pod, NSPL-Number of seeds/plant, SYPL-Seed yield/plant, SYPLO-Seed yield/plot, 100 SI-Seed index, TPP-Total protein content

Table 2: Direct and indirect effects on seed yield through its components characters in faba bean genotypes

	DFF	D50% F	DPI	PH	NPB	NPP	NCP	NPC	DM	NSP	NSPL	SYPL	SI	TPP
DFF	0.285	0.016	0.254	0.004	-0.212	0.002	0.302	-0.408	-0.066	-0.652	0.36	-0.229	-0.001	0.351
D50% F	0.02	0.223	0.53	0.197	0.181	0.91	0.295	0.042	-0.127	-0.103	-1.059	-0.137	0.047	-0.888
DPI	0.051	0.083	1.419	-0.279	0.137	0.67	-0.12	0.155	-0.126	-0.168	-0.635	-0.215	-0.334	-0.259
PH	0.001	0.046	-0.413	0.957	-0.568	-0.014	-0.081	-0.185	-0.028	-0.049	0.129	-0.103	0.172	0.528
NPB	-0.059	0.039	0.19	-0.533	1.021	0.922	0.323	-0.071	-0.068	-0.09	-1.074	-0.077	0.021	-0.614
NPP	0.01	0.121	0.565	-0.008	0.56	1.683	0.831	-0.139	0.026	-0.193	-2.132	-0.447	-0.12	-0.263
NCP	0.059	0.045	-0.116	-0.053	0.225	0.953	1.467	-0.346	-0.015	-0.136	-1.114	-0.276	-0.281	-0.151
NPC	0.153	-0.012	-0.29	0.233	0.096	0.308	0.667	-0.76	0.034	-0.344	-0.187	0.061	-0.055	0.114
DM	-0.032	-0.048	-0.307	-0.045	-0.12	0.075	-0.038	-0.045	0.584	0.193	0.025	-0.372	0.149	-0.006
NSP	-0.2	-0.025	-0.256	-0.05	-0.098	-0.349	-0.214	0.281	0.121	0.931	-0.228	0.123	0.315	-0.578
NSPL	-0.048	0.111	0.426	-0.058	0.518	1.694	0.771	-0.067	-0.007	0.1	-2.118	-0.375	-0.1	-0.391
SYPL	0.073	0.034	0.34	0.11	0.088	0.837	0.45	0.052	0.242	-0.127	-0.884	-0.899	-0.06	0.206
SI	0.001	0.012	-0.549	0.191	0.024	-0.233	-0.477	0.048	0.101	0.339	0.245	0.063	0.864	-0.94
TPP	0.055	-0.108	-0.201	0.277	-0.343	-0.242	-0.121	-0.047	-0.002	-0.294	0.453	-0.101	-0.444	1.827
Correlation with SPLO	0.005	0.133	0.378	0.393	-0.071	0.483	0.262	0.018	0.011	-0.228	0.456	0.460	-0.311	0.707

Residual effect: 0.4924

DFF- Days to first flowering, D50% F- Days to 50% flowering, DPI- Days to pod initiation, PH- Plant height, NPB- Number of primary branches/plant, NPP-Number of pods/plant, NCP-Number of clusters/plant, NPC-Number of pods/cluster, DM-Day to maturity, NSP-Number of seeds/pod, NSPL-Number of seeds/plant, SYPL-Seed yield/plant, SYPLO-Seed yield/plot, SI- Seed index, TPP-Total protein content

Conclusion

Number of pods/plant, number of clusters/plant, and total protein content should be taken into consideration while doing selection for increase of seed yield in faba bean based on correlation and path analysis of the fifteen quantitative traits.

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