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Short Communication

Character association for seed yield components in grasspea (*Lathyrus sativus* L.)

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The relationships of different plant characters with the seed yield in grasspea (*Lathyrus sativus* L.) were examined over the years through the study of genotypic and phenotypic correlations and path coefficient analysis in an attempt to decipher consistent relationships of the characters which interact frequently with the everchanging environment. Widely divergent nine genotypes were taken for the study. Of them Nirmal, Hooghly Local and Midnapur Local from West Bengal and P-24 , P-28, P-90, P-505 and Sel 1276 were from Indian Agricultural Research Institute, New Delhi, while Exotic Bold was from Syria. The genotypes were grown with normal cuitural practices during November-March in 1996, 1997 and 1998 in a randomized block design with three replications maintaining 1 meter distance between the rows and 40 cm between the plants. From each plot 15 plants excluding border were taken at random to record observations on ten different characters.

In each year genotypes were significantly different for majority of the characters except pod length. In three consecutive years pods/plant and seeds/pod showed consistently highly positive correlation both at phenotypic and genotypic level with seed yield/plant (Table 1). On the other hand, 100-seed weight registered consistently negative association with the seed yield. Kaul *et al.* [1] and Wolde [2] also observed highly significant and positive correlation between number of pods and seed yield in grasspea. When interrelationships of different characters were monitored over the years it was observed that pods/plant and seeds/pod maintained significantly positive association between them in three consecutive years suggesting increased pod number would likely to increase the seed number. On the other hand, consistent negative association between pods/plant and 100-seed weight would result in negative influence on seed size as the number of pods increased in a plant. Similarly consistently negative trend in association either between pod number and days to flowering or between pod number and days to maturity would suggest that both early flowering and early maturity would boost the pod production which closely agreed with the observation of Kaul *et al.* [1] in grasspea. Again a significantly positive correlation was consistently observed between days to flowering and days to maturity meaning that conversing early flowering may lead to early maturity. It is therefore suggested that seed yield in grasspea can be improved by improving pod production in the plant which in turn can be generated by inducing early flowering and early maturity. Such increase in pod number would however, likely to have negative influence on pod length as these two characters continued to maintain significant negative association over the years. Seed protein content showed a negative trend in association with seed yield. This however is commonly observed in pulse legumes or in diferent cereals. Similar trend was also observed between 100 seed weight and protein content. Interestingly, days to flowering and days to maturity tended to maintain a positive association with seed protein content suggesting thereby late flowering as well as late maturity may positively influence seed protein content. In fact seed weight and maturity period was observed to be significantly and positively correlated. The availability of extended period of maturity may not only promote higher seed weight but also protein synthesis and its accumulation. Path coefficient analysis at phenotypic level for different characters on seed yield over three years provided a few interesting readings (Table 2). Pods/plant registered high positive direct effects on seed yield in three different years. On the other hand, pod length, seeds/pod and 100 seed weight recorded positive direct effects on seed yield in two different years. These characters also produced positive indirect effects of different magnitudes when correlation of different characters with seed yield were elaborated in different years. Thus pod and seed character in grasspea appeared to be major yield contributing characters, of them the character pods/plant is the most important

Table 1. Correlation coefficients among different characters* over three consecutive years in grasspea

S.No.	Characters	Phenotypic correlation coefficients Year			Genotypic correlation coefficients Year		
1.	**Plant ht. Vs.**	I	II	III	I	II	III
	Days to first flowering	0.628	0.674	0.889	0.820	0.711	0.879
	Days to maturity	0.659	0.852	0.889	0.816	0.893	0.904
	Pod length	0.655	0.880	0.867	0.807	0.902	0.909
	100 seed weight	0.593	0.810	0.815	0.708	0.828	0.838
	Seed yield/pl.	–0.048	0.051	0.075	–0.116	0.055	0.067
2.	**Primary branch No. vs.**						
	Seed yield/pl.	–0.168	–0.123	–0.564	–0.417	–0.203	–0.097
3.	**Days to first flowering vs.**						
	Days to maturity	0.947	0.797	0.929	0.973	0.819	0.973
	Pod length	0.915	0.767	0.897	0.958	0.787	0.938
	100 seed weight	0.805	0.582	0.791	0.832	0.596	0.827
	Seed yield/pl.	–0.162	–0.039	–0.025	–0.178	–0.044	–0.050
4.	**Days to maturity vs.**						
	Pod length	0.918	0.927	0.915	0.973	0.938	0.940
	Seeds/pod	–0.535	–0.404	–0.434	–0.560	–0.412	–0.433
	100 seed weight	0.884	0.882	0.887	0.894	0.892	0.895
	Seed yield/pl.	–0.128	–0.021	–0.019	–0.150	0.022	–0.040
5.	**Pods/plant vs.**						
	Pod length	–0.606	–0.663	–0.461	–0.704	–0.665	–0.494
	Seeds/pod	0.932	0.981	0.939	0.916	0.993	0.973
	100 seed weight	–0.721	–0.698	–0.621	–0.557	–0.699	–0.634
	Seed yield/pl.	0.893	0.893	0.945	0.555	0.904	0.950
6.	**Pod length vs.**						
	Seed/pod	–0.657	–0.650	–0.621	–0.704	–0.646	–0.629
	100 seed weight	0.869	0.936	0.908	0.916	0.939	0.935
	Seed yield/pl.	–0.357	–0.276	–0.211	–0.337	–0.280	–0.248
7.	**Seeds/pod vs.**						
	100 seed weight	0.771	–0.643	–0.716	–0.804	–0.652	–0.717
	Seed yield/pl.	–0.803	0.886	0.857	0.888	0.914	0.902
8.	**100 seed weight vs.**						
	Seed yield/pl.	–0.436	–0.345	–0.365	–0.470	–0.346	–0.377
9.	**Seed yields vs.**						
	Protein content	–0.357	–0.100	–0.165	0.413	–0.120	–0.173

*Only significant estimates for different characters considered and all possible correlations with seed yield presented.

Table 2. Path coefficients of seed yield with other characters at the phenotypic level over three consecutive years (I, II, III)

		Plant height (cm)	Primary branch number/pl.	Days to flowering	Days to maturity	Pods/plant	Pod length (cm)	Seeds/pod	100 seed weight (g)	Protein content (%)
1.	I	**–0.001**	0.021	–0.088	0.460	–0.208	0.187	0.070	0.045	–0.018
	II	**0.070**	–0.007	0.063	–0.088	–0.501	0.254	0.029	0.232	0.001
	III	**–0.022**	–0.010	–0.138	0.034	–0.187	0.212	–0.075	0.260	0.000
2.	I	–0.001	**0.042**	–0.080	0.384	–0.281	–0.173	–0.004	0.034	–0.008
	II	0.027	**–0.019**	–0.041	–0.064	–0.426	0.147	0.028	0.151	–0.007
	III	–0.004	**–0.048**	–0.021	0.002	–0.589	–0.007	0.100	0.043	–0.004
3.	I	–0.010	0.024	**–0.141**	0.660	–0.371	0.262	–0.099	0.061	–0.350
	II	0.047	–0.008	**–0.094**	–0.083	–0.508	0.221	0.034	0.166	–0.003
	III	–0.018	–0.006	**–0.166**	0.035	–0.264	0.219	–0.086	0.253	0.008
4.	I	–0.001	0.023	–0.133	**0.698**	–0.380	0.263	–0.100	0.067	–0.039
	II	0.059	–0.011	0.075	**–0.104**	–0.590	0.267	0.037	–0.252	–0.006
	III	–0.019	–0.003	0.154	**0.038**	–0.305	0.223	–0.091	0.284	0.006
5.	I	–0.000	–0.014	0.063	–0.319	**0.833**	0.173	0.174	–0.055	0.037
	II	–0.025	–0.006	–0.035	0.044	**1.380**	–0.191	–0.089	–0.200	0.003
	III	0.004	–0.027	0.041	–0.011	**1.058**	–0.113	0.196	–0.198	0.006
6.	I	–0.001	0.025	–0.129	0.640	–0.505	**–0.286**	–0.123	0.066	–0.045
	II	0.061	–0.009	0.072	–0.096	–0.914	**0.288**	0.058	0.268	–0.003
	III	–0.019	0.001	–0.149	0.035	–0.488	**0.244**	–0.130	0.290	0.004
7.	I	–0.001	–0.019	0.074	–0.373	0.776	0.188	**0.187**	–0.058	0.028
	II	0.022	0.006	–0.036	0.042	1.354	–0.185	**–0.091**	–0.184	0.003
	III	0.008	–0.023	0.068	–0.016	0.994	–0.152	**0.209**	–0.227	–0.004
8.	I	–0.001	0.019	–0.113	0.617	–0.601	0.248	–0.144	**0.076**	–0.040
	II	0.057	–0.100	0.055	–0.091	–0.964	0.270	0.058	**0.286**	–0.005
	III	–0.018	0.007	–0.131	0.034	–0.657	0.222	0.149	**0.320**	0.088
9.	I	0.000	0.004	–0.056	0.306	–0.351	–0.148	–0.060	0.035	**–0.088**
	II	–0.002	–0.009	0.019	–0.038	–0.233	0.064	0.017	0.097	**0.015**
	III	0.000	0.007	–0.560	0.013	–0.263	0.041	–0.037	0.104	**0.025**

Residual effects I = 0.0795, II = 0.0199, II = 0.0185; Direct effect = diagonal values in bold

because of its remarkable consistency in maintaining significantly high positive correlation as well as positive direct effect with seed yield over the years. In other legumes in general, such trend was also observed by Frey [3] and Dasgupta [4]. It is to be recalled in this context that pods appeared to be primarily controlled by additive gene action [5]. This is a welcome situation as this character would respond positively by direct selection which would ultimately help promote higher seed yield in grasspea. Interesting to note that seed protein did not register any significant positive direct influence on seed yield. Instead it tended to display in majority of the cases negative indirect effects on seed yield. A simultaneous improvement for both seed yield and protein content in grasspea may be difficult. If negative correlation between protein content and seed yield is due to linkage, then it is possible to get recombinant of higher seed yield with higher protein content through biparental mating, even in case of very tight linkage. So it is not impossible to get the recombinant, rather it is difficult. However, an attempt has to be made to strike a balance between them.

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