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Association of seed yield components along with seed neurotoxin content in different varieties and induced mutant lines of grass pea (*Lathyrus sativus* L.)

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SUMMARY

Significant and positive correlation exists between seed yield and pods per plant, plant height, number of primary branches and 100 seed weight; of which maximum contribution towards yields was due to number of pods per plant in case of both varietal and mutant lines in grass pea (*Lathyrus sativus* L.). Both pods per plant as well as seed yield exhibited negative and significant correlation with days to flowering. Significant negative association of seed neurotoxin, ODAP with 100 seed weight and pods per plant and positive correlation with days to flowering in different varieties and mutant lines suggested induction of early flowering and enhancement of pod production in combination with bold size of seeds can improve seed yield with reduction in seed ODAP content in grass pea.

Key words : Seed yield components, Varieties, Induced mutants, Correlation, Grass pea.

For more than 8000 years grass pea (*Lathyrus sativus* L.) has been cultivated in different geographical regions both as a grain crop as well as forage crop (Smartt, 1984, McCutchan, 2003). Its improvement as an ideal pulse crop however, depends on development of high yielding and low seed neurotoxin (ODAP) containing lines. Present author was able to isolate some promising morphological mutant lines in grass pea and their yield potential along with nature and magnitude of variability has been studied (Biswas, 2007, Talukdar and Biswas, 2008). Grain yield is a complex and multiplicative end product of various yield components and hence, assessment of relationship among different morphological and yield related traits is essential to upgrade crop performances. Seed ODAP content in grass pea is quantitatively inherited and its association with yield related characters assumes significance in grass pea breeding. Keeping this in mind present work was undertaken on 7 different cultivated varieties and different induced mutant populations (M_3) to evaluate the nature of relationships among various seed yield components and also with seed ODAP content in grass pea, a description of which was presented in this communication.

MATERIALS AND METHODS

Seven cultivated varieties of grass pea, namely, 'LSD 3', 'Nirmal', 'Hooghly Local', 'Midnapur Local', 'Ratan', 'BioR-231' and 'P-24/3' were grown with normal cultural practices during winter season of 2004-05 in experimental garden, University of Kalyani, Kalyani in a randomized block design with four replications keeping a uniform distances of 80 cm and 30 cm. between the rows and between the plants, respectively. One border row was also maintained. Five normal plants from each replication were randomly selected to record observations on different characters namely, plant height, days to flowering, days to maturity, number of primary branches, pods per plant, seeds per pod, 100 seed weight, seed yield/ plant and seed ODAP content. M_3 generation of different mutant populations was raised from selfed seeds of individual viable M_2 mutants of grass pea cultivar BioR-231. Field design for growing M_2 generation was followed as reported earlier (Talukdar and Biswas, 2008). Observations were recorded on the same traits taken into account for 7 varieties. Interrelationship between different yield attributes were evaluated by determining simple correlation coefficient (r) values. Seed ODAP content was estimated following the methods of Rao (1978).

RESULTS AND DISCUSSION

Correlation coefficients between seed yield and its components estimated among 7 cultivated varieties and among different induced mutant lines of grass pea have been presented in Table 1 and 2, respectively. In both cases, phenotypic correlation studies revealed existence of significant positive association of seed yield with plant height, number of primary branches per plant, pods per plant and 100 seed weight (g); of which maximum contribution was recorded due to pods per plant ($r = 0.828$ in varietal population and $r = 0.764$ in mutant population). Number of pods per plant was also significantly and positively correlated with plant height and number of

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Table 1 : Simple correlation between different yield attributes as well as seed neurotoxin (ODAP) in seven varieties of grass pea (*Lathyrus sativus* L.)

Attributes	Plant height	Number of primary branches	Days to flowering	Days to maturity	Pods/ plant	Seeds / pod	100 seed wt. (gm.)	Seed yield / plant (gm.)
Plant height	-	0.447*	-1.672***	0.105	0.721***	0.331	-0.433*	0.551**
Number of primary branches	-	-	0.027	0.381	0.583**	0.170	0.091	0.687***
Days to flowering	-	-	-	0.290	-0.607**	0.340	-0.231	-0.78***
Days to maturity	-	-	-	-	0.14	-0.50*	0.078	0.013
Pods / plant	-	-	-	-	-	0.39	0.193	0.828***
Seeds / pod	-	-	-	-	-	-	-0.25	0.202
100 seed wt.(gm.)	-	-	-	-	-	-	-	0.555**
Seed ODAP (%)	-	-0.043	0.563**	0.320	-0.541*	0.254	-0.656***	-0.220

*, ** and *** indicates significance of values at P=0.05, 0.01 and 0.001, respectively

Table 2 : Simple correlation between different yield attributes in control and induced mutant lines of grass pea var. BioR-231

Attributes	Plant height	Number of primary branches	Days to flowering	Days to maturity	Pods/ plant	Seeds / pod	100 seed wt. (gm.)	Seed yield / plant (gm.)
Plant height	-	0.365	-1.398***	0.125	0.828***	0.429	-0.0033	0.522*
Number of primary branches	-	-	-0.061	0.481*	0.531*	0.192	0.188	0.491*
Days to flowering	-	-	-	0.289	-0.688***	2.94***	-0.223	-0.690***
Days to maturity	-	-	-	-	0.27	-0.53*	0.098	0.014
Pods / plant	-	-	-	-	-	0.37	0.193	0.764***
Seeds / pod	-	-	-	-	-	-	-0.29	0.194
100 seed wt.(gm.)	-	-	-	-	-	-	-	0.545*
Seed ODAP (%)	-	-0.242	0.559**	0.364	-0.543*	0.386	-0.456*	-0.351

*, ** and *** indicates significance of values at P=0.05, 0.01 and 0.001, respectively

primary branches but exhibited significant negative association with days to flowering. Relationship between plant height and 100 seed weight was negative in both varietal as well as mutant lines but it was significant in varieties only. On the other hand, association of seeds per pod was significant and positive with days to flowering in mutant population but not significant in varieties. Its correlation with pods per plant and seed yield was also not significant and manifested negative relation with 100 seed weight and significantly with days to maturity.

Present investigation indicated that correlations among different seed yield components followed close pattern both in varietal as well as in mutant populations of grass pea. In both cases, high positive coefficient value between yield and number of pods per plant, 100 seed weight, plant height and number of primary branches suggested their positive contributions towards seed yield, and maximum contribution was due to number of pods per plant as indicated by its high co-efficient value. Significantly negative association of days to flower with number of pods and seed yield per plant but positive correlation with number of seeds per pod indicated favorable influence of earliness towards pod setting and seed yield per plant although per pod seed number reduced. Induction of early flowering can, therefore, improve seed yield through high number of seed setting. Significantly positive correlation of both plant height and number of branches with per plant number of pods and seed yield, on the other hand, suggested that these traits contributed towards yield via increased number of pods per plant. Number of pods, thus, appeared to be most important yield component, which may be enhanced due to increase in height and number of branches, although association of height and number of branches was not significantly positive. Kaul *et al*. (1982), Waghmare *et al*. (1996), Pandey *et al*. (1997), Biswas (1998), Kumar and Dubey (2001) and Das and Kundagrami (2002) also observed strong positive association of grain yield with pods per plant and negative association with days to flowering in different genotypes of grass pea. Kumari and Prasad (2005), however observed positive correlation between days to flowering and seed yield in 24 diverse

hill genotypes of grass pea. They opined that days to flowering contributed to seed yield but mainly via pods per plant and advocated higher number of days to flowering suitable for hill farming of grass pea. Negative association of seeds per pod and 100 seed weight indicated adverse effect of seed number over its size to some extent although it could be overcome by increasing pod size, as explained by Biswas (1998). It is, therefore, apparent that seed yield in grass pea in general can be improved by enhancing pod production in combination with induction of early flowering as well as maturity.

Association of seed ODAP content with number of pods and 100 seed weight was significantly negative, and barring days to flower and seeds per pod its relationship with seed yield was negative but not significant during all the three years of observations. The observations suggested that early flowering and bold size of seeds might have contributed towards reduced ODAP content in seed. Similar relationships of ODAP content and yield components have been reported earlier in different genotypes of grass pea (Sharma *et al*., 1997; Pandey *et al*., 1997; Das and Kundagrami, 2002). Tadesse and Bekele (2003) reported negative association of ODAP with plant height, seed yield and seed size and suggested tall, late maturing varieties with large seed size and high grain yield potential would enable the development of certain varieties with low ODAP content. Kumari and Prasad (2005), however, recorded positive correlation of seed ODAP with yield and all other components except 100 seed weight in different hill genotypes of grass pea in India

REFERENCES

Biswas, A.K. (2007). Induced mutation in grass pea (*Lathyrus sativus* L.). In : *Breeding of neglected and under-utilized crops, spices and herbs*, (eds. Ochatt, S. and Jain, S.M.). Science Publishers, Jersey, Plymouth: pp 29-39.

Biswas, S.C.(1998). Cytogenetic evaluation of induced variations in *Lathyrus sativus* L. through mutation and polyploidy and varietal diversities. Ph.D Thesis, University of Kalyani, Kalyani, West Bengal, India.

Das, P. K. and Kundagrami, S. (2002). Character association for seed yield components in grass pea. *Indian J. Genet*., **62** : 352-354.

Kaul, A.K., Islam, Q. and Begum, K. (1982). Variability for various agronomic characters and neurotoxin content of some cultivars of Khesari in Bangladesh. *Bangladesh. J. Bot*., **11**: 158-167.

Kumar, S. and Dubey, D.K. (2001).Variability, heritability and correlation studies in grass pea (*Lathyrus sativus* L.). *Lathyrus Lathyrism Newsletter*., **2** : 79-81.

Kumari, V. and Prasad, R. (2005). Model plant type in 'khesari' (*Lathyrus sativus* L.) suitable for hill farming. *Lathyrus Lathyrism Newsletter*., **4** : 15-17.

McCutchan, J. S.(2003). Review: a brief history of grass pea and its use in crop improvement. *Lathyrus Lathyrism Newsletter*., **3** : 21-25.

Pandey, R.L., Chitale, M.W., Sharma, R.N. and Geda, A K.(1997). Evaluation and characterization of germ plasm of grass pea (*Lathyrus sativus* L.). *J. Medicinal & Aromatic Plant Sci*., **19**: 14-16.

Rao, S.L.N. (1978). A sensitive and specific colorimetric method for the determination of α,α-diamino propionic acid and the *Lathyrus sativus* neurotoxin. *Analytical Biochem*., **86** : 386-395.

Sharma, R.N., Kashyap, O.P., Chitale, M.W. and Pandey, R.L. (1997). Genetic analysis for seed attributes over the years in grass pea (*Lathyrus sativus* L). *Indian J. Genet*., **57** : 154-157.

Smartt, J. (1984). Evolution of grain legumes. I. *Mediterranean Pulses. Exp. agric*., **20** : 275-296.

Tadesse, W. and Bekele, E. (2003). Variation and association of morphological and biochemical characters in grass pea (*Lathyrus sativus* L.). *Euphytica*.,**130** : 315-324.

Talukdar, D. and Biswas, A.K. (2008). Variability, heritability and scope of selection for some quantitative traits in induced mutant lines of grass pea (*Lathyrus sativus* L.). *Internat. J. Plant Sci*.

Waghmare, A.L., Sakhare, R.S., Maheswari, J.J. and Phalak, M.S. (1996). Genetic divergence, correlation and Path co-efficient analysis in *Lathyrus sativus*. *J. Soils & Crops*, **6** : 142-145.

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