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Short communication

Genetics of seed yield and neurotoxin content in grasspea (*Lathyrus sativus* L.)

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The present study was undertaken to know the genetic nature of grain yield and neurotoxin involving low ODAP parents through generation mean analysis of four grasspea (*Lathyrus sativus* L.) crosses, BioL-203 × Biol-222 (C_1), BioL 203 × RLS-9 (C_2), Biol-222 × BioR-231 (C_3), Biol-222 × Pusa-24 (C_4). Six generations viz. P_1, P_2, F_1, F_2 BC_1P_1 and BC_1P_2 were grown at Indira Gandhi Agricultural University, Raipur during winter 1997-98, in RBD with three replications accommodating six rows of each F_2 and single rows for other generations. Observations (Table 1) were recorded on single plants and ODAP content in dry seeds was estimated following Rao [1].

Both additive (d) and dominance (h) components in general, were significant for almost all the traits except for days to flower, seed size and ODAP content. Significant dominance effect was noted in all the crosses for days to flower and for seed size only in C_1. For ODAP content additive genetic effect was significant in C_2 and C_4 while dominance effect was significant in C_4 only. Relative magnitude of dominance (h) component was invariably higher than additive component (d) indicating preponderance of non-additive gene action in the inheritance of these characters. Importance of additive and dominance gene effects has been reported in grasspea for branches, pod number and seed yield [2] and for ODAP content [3]. Preponderance of non-additive gene effects was also reported for days to flower, pod number, seed size and neurotoxin content [4].

All the three epistatic interactions were significant for grain yield/plant in three crosses, for pod number in C_1 and C_2, for seeds^{-1} plant in C_1 and C_4, for plant height and branches in C_1, for seeds^{-1} pod and ODAP content in C_4 respectively. Invariably additive × additive and dominance × dominance gene interactions were significant for all the characters but later component was predominant indicating major effect of non-fixable gene action in the expression of the traits under study, as also evidenced by duplicate type of epistasis.

It is obvious that non fixable gene effects were more important for seed yield and its components Neurotoxin content showed variable genetic nature under different genetic backgrounds. Hence breeding methods can not be generalized. Approaches like intermating among superiors [2] and single seed descent methods [5] have been suggested for seed yield improvement. But breeding toxin free varieties being the basic objective in this crop, therefore, large F_2 population first be screened out for low/no neurotoxin content and there after SSD method should be practiced for 3-4 generations. In the end of such a cycle, population should again be screened out for confirming the toxin level of single plants and also be evaluated for higher seed yield.

References

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Table 1. Estimates of gene affects and interactions in and four crosses of grasspea

Crosses	m	d	h	i	j	l	epistasis
Days to flower							
Biol-203 × Biol-222	43.6	3.27**	9.49**	6.15**	3.00**	6.24	C
Biol-203 × RLS-9	43.3	−0.93	8.45**	8.08**	−2.10	−6.15	D
Biol-222 × BioR-231	50.3	−1.20	−5.58**	−8.78**	0.33	13.84**	D
Biol-222 × Pusa 24	46.1	1.13	−9.66**	−11.66**	1.40	29.13**	D
Plant height							
Biol-203 × Biol-222	63.5	9.20*	44.78**	47.04**	14.47**	−102.51**	D
Biol-203 × RLS-9	61.6	−0.86	47.30**	43.67**	5.23	−72.93**	D
Biol-222 × BioR-231	62.1	3.90*	13.35*	-	-	-	
Biol-222 × Pusa 24	74.4	−7.06*	6.09	−.13	−13.33**	−12.86	D
Branches per plant							
Biol-203 × Biol-222	17.1	9.73**	16.94**	12.31**	10.56**	−23.98*	D
Biol-203 × RLS-9	17.1	−.27*	13.84**	13.18**	0.59	21.84	C
Biol-222 × BioR-231	15.6	−0.49	3.01*	-	-	-	-
Biol-222 × Pusa 24	16.4	−.00**	5.61	2.84	−3.16*	0.68	C
Pods per plant							
Biol-203 × Biol-222	39.3	25.40**	54.60**	58.46**	25.60**	−109.00**	D
Biol-203 × RLS-9	48.4	10.26	48.19**	38.02**	12.10*	−70.08**	D
Biol-222 × BioR-231	41.8	1.11	4.70	-	-	-	-
Biol-222 × Pusa 24	38.0	5.67^{8*}	20.42**	-	-	-	-
Seeds per pod							
Biol-203 × Biol-222	2.5	−0.33**	0.75**	1.28**	−0.14	−3.92**	D
Biol-203 × RLS-9	2.1	0.24**	0.96**	-	-	-	-
Biol-222 × BioR-231	2.6	0.45*	0.46	0.63	0.41	−1.75*	D
Biol-222 × Pusa 24	2.6	−0.40*	2.22**	2.72*	−0.42*	−6.51**	D
Seeds per plant							
Biol-203 × Biol-222	68.3	−25.67**	88.88**	104.70**	−24.80**	−294.78**	D
Biol-203 × RLS-9	67.7	26.47	208.21**	158.18*	23.83	−281.58**	D
Biol-222 × BioR-231	36.8	15.40	148.17**	143.51**	14.93	−203.38**	D
Biol-222 × Pusa 24	52.1	−33.80*	211.90**	211.04**	−34.03**	−406.31**	D
Grain yield per plant							
Biol-203 × Biol-222	4.0	−1.08**	1.41	2.22*	−0.92**	−11.26**	D
Biol-203 × RLS-9	4.0	1.41	10.79**	7.83**	1.34	−15.73**	D
Biol-222 × BioR-231	2.1	1.48*	7.81**	7.69**	1.40*	−12.38**	D
Biol-222 × Pusa 24	2.8	−2.08**	11.97**	12.17**	−2.20**	−24.31**	D
100 seed weight							
Biol-203 × Biol-222	6.0	0.23	−4.43**	−4.50**	0.37	5.36**	D
Biol-203 × RLS-9	6.1	0.33	−1.86	−2.40*	0.34	1.11	D
Biol-222 × BioR-231	5.5	0.47	−0.23	0.10	0.30	−2.91	C
Biol-222 × Pusa 24	5.5	−0.16	−0.07	-	-	-	-
ODAP content (%)							
Biol-203 × Biol-222	0.25	0.02	0.07	0.03	−0.03	−0.04	D
Biol-203 × RLS-9	0.23	−0.07**	−0.06	0.02	−0.01	−0.05**	C
Biol-222 × BioR-231	0.12	0.01	0.03	0.01	0.05*	0.07	C
Biol-222 × Pusa 24	0.14	−0.13**	0.26**	0.23**	−0.03**	−0.17*	D

* = P_{01}, ** = P_{05}, C = Complementary, D = Duplicate