

GENETIC ANALYSIS FOR SEED ATTRIBUTES OVER THE YEARS IN GRASSPEA (*LATHYRUS SATIVUS* L.)

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ABSTRACT

Neurotoxin content (ODAP) and 100-seed weight expressed additive genetic variance and were negatively correlated with each other, while 100-seed weight showed positive correlation with days to maturity. Varieties RLS-1 and LSD-3 were stable for low ODAP content, and selections 505 and JRL-115 for 100-seed weight.

Key words: *Lathyrus sativus* L., ODAP, genetic stability.

Grasspea (*Lathyrus sativus* L.), a hardy crop requires no inputs in term of fertilizers. Unfortunately, the presence of a neurotoxin (ODAP) renders the grain of this crop unsuitable for human consumption [1]. According to the information in hand variability in neurotoxin content appears to range from 0.05 to over 1.00% [1,2]. Very little attempts has been made in the past to know the stability of ODAP content over the years and its association with yield and other yield attributing traits. Hence, the present investigation has been carried out to understand the genetic nature (stability) of ODAP content and its association with yield attributes.

MATERIALS AND METHODS

Eight varieties of grasspea were grown in randomized block design during 1989–90, 1990–91 and 1991–92 at research farm of Indira Gandhi Agricultural University, Raipur. Each plot consisted of 4 m long six rows with the spacing of 30 x 10 cm. Observations were recorded on five randomly selected plants. Whereas samples were analysed for β -N-oxalyl L- α , β -diaminopropionic acid (ODAP) content as suggested by [3]. Statistical analysis was done as per [4].

RESULTS AND DISCUSSION

Results of the genetic variability analysis (Table 1) revealed high genotypic coefficient of variation (gcv) for all the characters except 100-seed weight during 1991-92. High heritability estimates coupled with high genetic advance were recorded for 100-seed weight and ODAP content during 1989-90, 1990-91 and 1991-92. Seed yield showed the presence of additive genetic variance in 1990-91. High to low genetic advance coupled with medium heritability for the remaining characters indicated the presence of nonadditive genetic variance in the expression of these traits.

Table 1. Genetic parameters of variation of different traits in grasspea

Parameter	Year	Maturity (days)	100-seed weight (g)	Yield per plant (g)	ODAP content (%)
Mean	1989-90	104.62	8.18	3.95	0.32
	1990-91	115.20	8.56	3.80	0.28
	1991-92	109.04	8.10	4.10	0.28
Gcv	1989-90	20.24	28.26	29.68	40.55
	1990-91	18.36	26.57	50.23	29.60
	1991-92	35.87	12.96	29.67	23.52
$h^2\%$ (BS)	1989-90	43.09	72.02	54.23	83.22
	1990-91	48.58	82.17	71.21	94.12
	1991-92	58.23	80.93	66.61	93.68
GA (% of mean)	1989-90	8.67	41.93	71.44	32.27
	1990-91	12.50	51.29	98.11	60.76
	1991-92	26.48	48.20	82.12	43.11

Correlation analysis among characters in all the years of testing (Table 2) revealed that ODAP content was negatively associated with 100-seed weight. It also shown negative correlation with days to maturity and seed yield in 1990-91 and 1991-92, respectively. Simultaneously 100-seed weight

Table 2. Correlation coefficients among different traits in grasspea

Character	Year	100-seed weight	Seed yield	ODAP
Maturity	1989-90	0.43**	0.19	-0.18
	1990-91	0.76**	0.21	-0.39*
	1991-92	0.38*	0.43*	-0.21
100-seed weight	1989-90	-	-0.21	-0.56**
	1990-91	-	-0.43	-0.51
	1991-92	-	0.17	-0.89*
Seed yield	1989-90	-	-	-0.22
	1990-91	-	-	-0.31
	1991-92	-	-	-0.41*

* ** Significant at 5% and 1% levels, respectively.

showed positive correlation with duration of maturity. Thus, late maturing genotypes can be expected to produce bold seed with low ODAP content. Selection for these traits in grasspea may lead to development of strains having very low neurotoxin (ODAP) content.

Pooled analysis of variance for stability (Table 3) indicated that mean squares due to varieties and variety x environment (linear) interactions were significant for all the traits, indicating that performance of genotypes is predictable. According

to Eberhart and Russell [5], a stable variety would be the one with high mean (desirable) with unit regression coefficient ($b_i = 1$) and deviation from regression as small as possible or with nonsignificant difference from zero ($\bar{S}_{di} = 0$). Based on these criteria variety Pusa-24 was found to be stable for maturity, Sel. 505 and JRL 115 for 100-seed weight, and LSD-3 and RLS-1 for low ODAP content, with the regression coefficients near unity.

These variety should be extensively used in hybridization programmes.

Table 3. Pooled analysis of variance (mean squares) for different characters in grasspea

Source	d.f.	Matur- ity	100-seed weight	Seed yield	ODAP content
Varieties (V)	7	10.0*	1.2*	60.8**	0.055**
E + (V x E)	16	8.4	0.3	308.4**	0.010
Env (lin.)	1	82.8*	2.1**	522.6**	0.169**
VxE (I)	7	9.8*	0.2	65.7**	0.001
Pooled variation	8	2.7**	0.23**	9.0*	0.004**
Pooled error	48	0.6	0.01	2.9	0.001

**Significant at 5% and 1% levels, respectively.

Table 4 Stability parameters for different characters in grasspea

Genotype	Maturity			100-seed wt.			Seed yield/plant			ODAP content		
	$\bar{X}(d)$	b_i	$\bar{S}_{di}^{-2}$	$\bar{X}(g)$	b_i	$\bar{S}_{di}^{-2}$	$\bar{X}(d)$	b_i	$\bar{S}_{di}^{-2}$	$\bar{X}(g)$	b_i	$\bar{S}_{di}^{-2}$
Pusa-24	112	0.99	0.08	7.87	2.33	0.004	4.04	0.84	71.70	0.202	1.22	0.001
LSD-3	110	0.55	0.10	7.62	1.00	0.006	4.47	0.98	23.32	0.242	0.91	0.001
JRL-41	106	0.46	0.09	8.12	0.82	0.226	4.45	1.28	15.23	0.319	0.97	0.002
RLS-1	108	1.04	4.29	8.01	0.18	0.002	3.62	1.38	42.15	0.198	0.98	0.035
RLS-2	107	0.51	0.01	8.02	0.41	0.313	3.97	0.81	34.96	0.303	1.05	0.008
Sel. 505	110	1.59	1.39	9.47	0.92	0.723	3.35	0.88	41.66	0.356	1.19	0.007
Sel. 1276	109	1.27	0.08	8.67	0.61	0.471	3.60	0.54	6.45	0.321	0.75	0.002
JRL-115	115	2.09	15.5	8.45	1.09	0.001	4.00	1.29	16.81	0.385	1.16	0.001
Overall mean	110			8.28			3.95			0.291		

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