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Genetic variability for yield and its components in Lathyrus under different environment

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Abstract
Diversity among 16 lathyrus genotype was assessed for various agronomic traits under four environments *viz.*, irrigated & timely sown, non-irrigated & timely sown, non-irrigated with late sown and irrigated with late sown environment. The analysis of variance and genotypic correlation coefficient of variation revealed the presence of considerable amount of genetic variability for the characters studied over pooled. The heritability in broad sense and genetic advance as percent of mean was highest for seed yield plot-1 and lowest for plant height.

Keywords: lathyrus, heritability, genetic advance, variability

Introduction
Pulses being the cheapest and economic source of protein have greater significance in the dietary system of vegetarian population besides, help in maintaining soil fertility through biological nitrogen fixation. Pulse crops are cultivated in an area of about 23 million ha with an annual production of 14.42 million tonnes. The productivity of pulse crops remains low i.e. 627 kg ha-1 (Anonymous, 2006) due to which the availability of pulses declines to 37 grams capita-1 day-1 as against 70 grams capita-1 day-1 as recommended by WHO for a working youth. To meet out the short comings; there is an urgent need for increasing pulses production in the country.

Grasspea (Lathyrussativus L.) commonly known as khesari, teora, lakh and lakhadi in India, guaya in Ethiopia, san li dow in China and pois care in France has been cultivated in South Asia and Ethiopia for over 2500 years and is used as food and feed. It is a popular drought-tolerant crop grown for food and feed in drought-prone areas of Africa and Asia. Its ability to provide economic yield under adverse conditions has made it a popular crop in subsistence farming in many developing countries and it offers great potential for use in marginal low-rainfall areas. Despite its tolerance to drought, grasspea is not affected by excessive rainfall and can be grown on land subject to flooding (Sinha, 1980) [8]. In Bangladesh, India, Nepal and Pakistan it is often broadcasted into a standing rice crop where it flourishes on the residual moisture left after harvest of the rice. It is a very hardy crop with penetrating root-system and can be grown on a wide range of soils. This hardiness and its ability to fix atmospheric nitrogen make the crop one that seems designed to grow under adverse conditions. It has unique ability to sustain under harsh conditions of excessive moisture/ standing water at sowing and moisture stress at later stages of crop growth. Hence, it is extensively grown as relay/ utera crop with rice.

Material & Methods:
The present investigation was conducted during the Rabi 2007-08 at Instructional and Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. Sixteen lathyrus genotypes were grown under four environments, which were created through combination of irrigation and date of sowing viz. irrigated and timely sown environment (E1), non-irrigated and timely sown environment (E2), non-irrigated with late sown environment (E3) and irrigated with late sown environment (E4).The field layout was done in Randomized Block Design with four replications and sixteen treatment. Spacing was maintained as 10 cm between plant to plant and 30 cm between row to row. Experiment was sown in three rows on November 14, 2007 for the environment E1 and E2 and November 17, 2007 for E3 and E4. Recommended agronomical practices were adopted to raise a good crop.

Observations were recorded for seven characters, which were days to 50% flowering, days to maturity, plant height, branches plant-1, pods plant-1, seeds pod-1 and seed yield plot-1. Observations were recorded on single plant basis on five randomly selected competitive plants separately from each replication.

Whereas observation on days to 50 per cent flowering and days to maturity were recorded on plot basis.

The data collected on individual plants were statistically analyzed for estimation of genetic variability. The data obtained from the individual plots were statistically analyzed as per the procedure given by Cochran and Cox (1957) [3]. Genotypic and phenotypic coefficients of variation were calculated as perthe formula suggested by Burton (1952) [2]. The estimates of genotypic and phenotypic coefficients of variation were classified as low, moderate and high as suggested by Sivasubramaniam and Madhavamenon (1973). Heritability was estimated by using the formula suggested by Burton (1952) [2]. Expected genetic advance (GA) was calculated as per method suggestedby Grafius (1959) [4].

Results and Discussion

The analysis of variance for different environment viz, E1, E2, E3, and E4 revelead that mean sum of squares for genotype was significant & highly significant for all the characters except days to 50 % flowering in E1 environment, under study showed that the genotypes performed differently from each other for all the chracters studied.

The phenotypic coefficients of variation were higher than the genotypic coefficients of variation indicating the influence of environment in the expression of characters. High heritability was recorded for seed yield plot-1 in E1, E2 and E4 and also in pooled analysis while, least was recorded for days to 50 % flowering in E1 and E3 for days to maturity in E2 for number of seeds pod-1 in E4 and in pooled analysis least heritability was noted for plant height. The high magnitude of genotypic coefficient of variation revealed the presence of high genetic variability among the genotypes. The highest GCV and PCV was noted for seed yield plot-1 in E1, whereas only PCV was high in E2 and E4.

High heritability (h^2) coupled with high genetic advance was observed for seed yield in E1, E2 and E4. Selection based on this character will be more reliable for the improvement of lathyrus due to major contribution of additive gene effects as indicated by high heritability and high genetic advance as a percent of mean. Simlar results was reported by Kashyap *et al.*, (1991) [5] & Vedna kumara *et al.*, *(*1997) [9]. Moderate h^2 coupled with moderate genetic advance was observed for number of seeds pod-1 and branches plant-1 indicating the performance of additive gene action in the expression of these characters, which could be utilized through selection for the genetic improvement. In pooled analysis, high h^2 coupled with high genetic advance was observed for seed yield and low for days to 50 % flowering followed by days to maturity, plant height, number of branches plant-1, pods plant-1 and seeds pod-1. Simlar results was reported by Nanda (2000) [6], Bhasavarajaiah (2000) [1] and Shinde *et al.*, (2003) [7]. The moderate genetic advance as a percent of mean was recorded for number of pods per plant in Environment E_3. The genetic advance as percent of mean in pooled analysis was moderate for number of branches plant-1 and the low genetic advance as percent of mean was recorded for days to 50 % flowering followed by days to maturity, plant height, pods plant-1 and seeds pod-1. The high values for heritability and genetic advance suggested that selection in desired direction for the respective characters would be effective in crop improvement programme.

Table 1: Genetic parameter of variation over four environments for seed yield and its components

SN	Parameter Characters	Range		Mean (X)	Coeefficient of Variation (%)		Heritability h^2 % (Broad sense)	GA as % of Mean
		Min.	Max.		GCV	PCV		
1	Days to 50% flowering	51	53	52.23	0.24	1.65	14.54	3.90
2	Days to maturity	106	113	109.66	0.51	2.45	20.56	1.13
3	Plant height (cm)	35.90	69.30	47.00	0.07	11.90	0.58	5.76
4	Branches per plant	3.50	7.03	5.00	1.45	12.26	11.82	22.4
5	Pods per plant	26.95	32.85	22.03	3.51	10.89	32.23	6.85
6	Seeds per pods	2.45	3.45	3.03	0.89	8.81	10.10	13.53
7	Seed yield per plot (g)	84.25	430.80	248.26	24.58	32.3	76.09	38.36

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