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Genetic variability and correlation studies in local collections of grass pea (*Lathyrus sativus* L.)

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ABSTRACT: *Variability and correlation are basis for any crop improvement programme. For assessment of variability and correlation, hundred grass pea local collections were collected from the tribal farmers of Eastern Vidarbha Zone (Gadchiroli, Chandrapur, Gondia, Bhandara and Nagpur) of Mahrashtra, India and evaluated in augmented design for yield and it's contributing characters along with checks viz., Ratan, Prateek and Mahateora at College of Agriculture, Gadchiroli during 2011-12. The highest coefficient of variability was observed in seed yield per plant (19.93) which was followed by pod per plant (16.76) and number of branches per plant (13.37). Local collection showed significant variation for yield per plant (1.68 to 3.89 g), pods per plant (13 to 26), height of plant (24.4 to 34.7), 100 seed weight (6.36 to 9.66), number of branches per plant (4.7 to 7.4), days to flowering (53 to 64) and days to maturity (88 to 99).*

Correlations between traits were investigated that revealed highly positive and significant correlations were between seed yield/ plant and number of pods per plant. Hundred seed weight was highly positively and significantly correlated with number of branches per plant, days to 50% flowering and days to maturity. Correlation between plant height and number of branches per plant was highly positive and significant. Similarly, seed yield/plant was also positively and significantly correlated with 100 seed weight but negatively correlated with days to 50% flowering and days to maturity.

Kew word: *Lathyrus sativus(L.), Grasspea, Local collection, Variability and Correlation.*

INTRODUCTION

Grass pea is one of the most important legume crops grown in Asia. The crop can be used as a food for human and feed for cattle or green manure. Genus *Lathyrus* is large having 187 species (Allkin *et al*. 1983). *Lathyrus sativus* L. is the only species being widely cultivated in India as grain legume. However, L. *cicerra*, *L. gorgani* and *L. mormoratus* seem to be closely related with this species.

Presently it is third important legume after chickpea and pigeon pea, predominantly grown in India, Bangladesh, Nepal, Pakistan, Ethiopia and Syria. Grass pea is rich in protein and minerals especially calcium, phosphorus and iron. But, the utilization of grass pea grain is limited by the presence of a water soluble, non protein amino acid β-N-oxalyldiaminopropionic acid (β-ODAP) which acts as a neurotoxin crippling the lower limbs when consumed in large amounts during a prolonged period can cause the disease neurolathyrism (Sharma *et al.* 2000). The grass pea has a very hardy and penetrating root system and therefore can be grown on a wide range of soil types, including very poor soil and heavy clays. This hardiness, together with its ability to fix atmospheric nitrogen, makes the crop one that seems designed to grow under adverse conditions. Compared with other legumes, the grass pea is resistant to many pests including storage insects. Being hardy, it is mainly grown in dry areas and relay cropping or utera system of cropping with paddy. *Relay or utera system*: This is the most prevalent system in rice growing regions of India, particularly in south-eastern Madhya Pradesh, Vidarbha region of Maharashtra, parts of Orissa and West Bengal. Under these conditions, farmers give more emphasis for its fodder and consider grain yield as bonus (Pandey *et al.* 1995). And most of farmers grow low yielding and high ODAP content local varieties. Hence, for replacement of low yielding and high ODAP content local varieties of grass pea and for

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getting genotypes with high seed yield along with low toxicity and more fodder yield. In this present investigation, seed of grass pea local varieties have been collected from the triable farmers of Eastern Vidarbha region and evaluated to estimate variability and correlations between yield and it's contributing characters. The variability provides a valuable genetic material to develop genotypes with high seed yield whereas correlation is essential to understand the nature of association of the yield components for agronomic manipulation to achieve goal of the maximum yield.

MATERIAL AND METHOD

For assessment of variability and correlation, hundred grass pea local collections were collected from the tribal farmers of Eastern Vidarbha Zone (Gadchiroli, Chandrapur, Gondia, Bhandara and Nagpur) of Mahrashtra India. District wise collection of local collections is given table 1. All local collections were evaluated in augmented design along with checks viz., Ratan, Prateek and Mahateora at College of Agriculture, Gadchiroli during 2011-12. Each local collection within the block was grown in a four rows of 4m lengths. Distance between rows was 30 cm and 10 cm between plants in a row. All the recommended cultural practices and packages were followed to raise a good and healthy crop. In each entry, five competitive plants were selected randomly, data recorded on seven quantitative viz., seed yield per plant, pods per plant, plant height, 100 seed weight, days to 50 % flowering and days to maturity. Data was statistical analysed for augmented design II as per procedure described by Sharma (1998). The simple correlations for all characters were calculated and test for significance as per the procedure given by Singh and Chaudhary (1985).

Table 1
District wise collection of seed of local varieties from tribal farmers of Eastern Vidarbha Zone.

SN.	*District*	*No. of germplasm lines collected*
1.	Gadchiroli	64
2.	Chandrapur	10
3.	Bhandara	16
4.	Gondia	10
5.	Nagpur	–

RESULT AND DISCUSSION

Mean, standard error, coefficient of variability and range of variation estimated for each trait in local collection are shown in table 2. Result showed that local collections showed highly significant variation for all traits under investigation. The highest coefficient of variability was observed in seed yield per plant (19.93) which was followed by pod per plant (16.76) and number of branches per plant (13.37). (Table 2) High coefficient of variability for these traits has been previously reported by (Kumar and Dubey 2001). Grass pea is cultivated for many purposes but main objective of it's cultivation is seed. Improvement in seed yield is important objective grass pea breeding programme. Variation for seed yield should be present. In present investigation, variation for seed yield per plant ranged from 1.68 to 3.89 g with mean value 2.58 g. Earlier, variation for seed yield was reported between 0.5 to 19.7 g by Pandey *et. al.* (1997) for 100 lines of Indian grass pea whereas it was between 7.20 and 21.19 g for 32 lines (Rybinski *et. al.* 2008). Basaran *et. al.*(2013) observed 4.58 to 15.59 g seed yield per plant in for 52 lines of Turkish grass pea. Pods per plant were 13 to 26 showing mean value of 18.22. A range of 6.52 and 46.80 was observed by Kumar and Dubey (2001) for pods per plant whereas Pandey *et. al.* (1997) reported 7 to 257 pods per plant and Basaran *et. al.*(2013) observed 14.40 to 45.00 pods per plant with mean of 26.94.

Height of plant showed variation ranging from 24.4 to 34.7 cm with mean value 31.33 cm. In earlier studies, variation for plant height was between 31.4 and 67.4 cm (Rybinski *et. al.* 2008) and 30.14 and 56.00 with mean of 37.43 (Basaran *et. al.*2013). Hundred seed weight was more variable, ranging from 6.36 to 9.66 g and showed mean value of 7.49. Variability for seed weight was observed by various researchers. Variations for 1000 seed weight of European genotypes of grass pea were ranged from 120 to 660g (Grela *et. al.* 2010) for 31 accessions and 87 to 510 g with mean of 271 g for 32 accessions (Rybinski *et. al.* 2008). The range for 1000 seed weight was reported by Basaran *et. al.* (2013) from 79.93 to 152.3 g. Joshi (1997) observed that 1000 seed weight varied from 27 to 65 g for the lines from Nepal. The range for number of branches per plant was 4.7 to 7.4 exhibiting mean value of 6.08. Kumar and Dubey (2001) observed up to 40 numbers of branches in plant. Range of this trait was 4.00 to 6.46 reported by Rybinski *et. al.* (2008) and 6.10 to 13.00 reported by Basaran *et. al.*(2013). Variation for days to 50 % flowering ranged from 53 to 64 with mean value 60 and for days to maturity ranged from 88 to 99 with mean value 94.12. Number of the days to flowering was 58 to 66 observed by (Grela *et. al.* 2010) from 104 to 129 days in 24 Indian genotypes by Kumari 2001. In the present

Table 2
Mean value, standard error, coefficient of variability and range for seed yield and its contributing characters in local collections of grass pea

	Mean	*Standard error*	*C. V.*	*Range*	
				Min.	*Max.*
Seed yield per plant (g)	2.58	0.29	19.93	1.68	3.89
Pods per plant	18.22	1.94	16.76	13.00	26.00
Plant height (cm)	31.33	3.36	5.34	24.4	34.7
100 seed weight (g)	7.49	0.89	7.52	6.36	9.66
Number of branches / plant	6.08	0.96	13.37	4.7	7.4
Days to 50 % flowering	60.00	3.52	4.89	53	64
Days to maturity	94.12	2.46	2.52	88	99

Table 3
Correlations between yield and its contributing characters in local collections of Eastern Viderbha Zone

	Yield per plant	*Number of pods per plant*	*Plant height*	*100 seed weight*	*Number branches per plant*	*Days to 50% flowering*
Number of pods per plant	0.92**					
Plant height	0.14	0.17				
100 seed weight	0.21*	0.22*	0.07			
Number branches per plant	0.17	0.21*	0.26**	0.33**		
Days to 50 % flowering	-0.33**	-0.30**	-0.05	0.40**	0.22*	
Day to maturity	-0.36**	-0.32**	-0.07	0.34**	0.12	0.92**

*, **Correlation is significant at the 0.01 and 0.05 level respectively.

investigation, high amount morphological variations were observed for all traits under study, which suggest existence of genetic variability in local collections of grass pea. Hence, these variations for traits will be useful for developing high yielding in future.

Correlations for different characters of local collections of grass pea are shown in table 3. The result revealed that strong positive and significant correlations were observed for most of the characters. Seed yield/plant was highly positively and significantly correlated with number of pods per plant and positively and significantly correlated with 100 seed weight. These characters are indicating their major role in determining seed yield of grass pea. Similar observations were reported by Kumar and Dubey (2001) and Basaran *et al.* (2013). Likewise, Kumar and Dubey (1996) and Kaul *et al.*(1982) reported that seed yield significantly and strongly positively correlated with number of pods per plant. Similarly, a positive correlation of seed yield with 1000 seed weight was reported by Rybinski *et. al.* (2008). However, correlations of days to 50% flowering and days to maturity with seed yield/plant were strongly negative but significant.

Number of pods per plant was significantly positive correlated with number of branches per plant and 100 seed weight. But, it was significantly but negatively correlated with days to 50% flowering and days to maturity. Correlation of plant height and number of branches per plant was highly significant and positive. Hundred seed weight was strong positive and significantly correlated with number of branches per plant, days to 50% flowering and days to maturity. Correlation between number of branches per plant and days to 50% flowering was positive and significant. Days to 50% flowering and was strongly positive and significantly correlated with days to maturity. Kumar and Dubey (2001) studied correlation in yield contributing traits and reported significantly positive correlations of number of pods per plant with number of branches per plant, plant height with number of branches and 100 seed weight with number of branches per plant.

In present study, highly positive and significant correlations were between seed yield/plant and number of pods per plant and 100 seed weight. The hundred seed weight was highly positively and significantly correlated with number of branches per plant, days to 50% flowering and days to maturity. Correlation between plant height and number of branches per plant was highly positive and significant. These positive correlations would be favourable to breeders for their simultaneous genetic improvement.

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