INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE & TECHNOLOGY
© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)
www.vmsindia.org

Identification of Phenotypicaly Stable Lathyrus Genotypes over Years

S. R. Kamdi[1], Shanti Patil[2], R. D. Deotale[3] V. B. Kalamkar[4], R. R. Kamdi[5], A. V. Thul[6] and V. S. Madke[7]

College of Agriculture, Nagpur, Dr. PDKV, Akola (MH)
sandeepkamdi@gmail.com,

Abstract

For assessment of Genotypes x Environmental interaction, six grass pea local collections *viz.*, CAGL- 19, CAGL- 93, CAGL- 86, CAGL- 43, CAGL- 94, CAGL- 62 along with three checks viz., Ratan, Prateek and Mahateora were evaluated in randomised block design with three replications over three years 2013-2014, 2014-2015 and 2015-16 in College of Agriculture, Gadchiroli, for number of pods plant^{-1} and yield plot^{-1} (g) using Eberhart and Russell Model (1966). Significant differences were observed among the genotypes under all the environments. Mean sum of squares due to environment (linear) and genotype – environment interaction were highly significant. Based on high mean, b_i=1 and minimum S^2di value, genotype CAGL-94 was identified as stable genotype for both number of pods plant^{-1} and yield plot^{-1} (g) Therefore, this genotype could be suitable for cultivation in Vidarbha (Maharashtra) over the years

Key words: Grass pea, *Lathyrus sativus* L., stability analysis, G x E interaction)

INTRODUCTION

Grasspea is valued for its high protein content, high degree of adaptability under extreme conditions, disease resistance and low input requirement for its cultivation. In India the crop is largely grown in Madhya Pradesh, Maharashtra, West Bengal and Bihar and many instances of a 'crippling disorder have been reported in these states. In the state of Himachal Pradesh, grasspea is a minor crop grown by marginal farmers as a rainfed crop in mid hill region conditions of the northwestern Himalayas. The climate of this region is sub humid and temperate wet, characterized by dry conditions at the time of sowing and terminal drought. Cultivation of grasspea has not been completely abandoned and the marginal farmers continue to grow it on a small scale for domestic consumption and as a forage crop. Grass pea (*Lathyrus sativus* L.) is mainly grown as *utera* crop after paddy in *Rabi* season on residual moisture in Eastern Vidarbha region on approximately 60,000 ha area. But, the yield potential of Vidarbha is nearly half as compared to India. Because most farmer use local varieties for cultivation which have low yield potential, poor plant type and high neurotoxin content this is unstable over environment. So, there is urgent need to develop varieties having high yield potential, tolerance to drought, low neurotoxin content and stable over environment. The genotype which can precisely maintain consistent yield performance over a wide range of climate and fluctuating environment is said to be stable genotype. The stability of genotype has always been a matter of great concern to plant breeders. Keeping these things in view, present study was conducted to identify potential genotypes having stable performance over years in lathyrus.

MATERIALS AND METHODS

Six grass pea local collections viz., CAGL- 19, CAGL- 93, CAGL- 86, CAGL- 43, CAGL- 94, CAGL- 62 and three checks viz., Ratan, Prateek and Mahateora were evaluated in randomised block design with three replications during three years ie. 2013-14, 2014-15 and 2015-16 at College of Agriculture, Gadchiroli, for number of pods plant^{-1} and yield plot^{-1} (g) . Every genotype was sown with 4 rows of 5 m length with a plot size of 5.00 × 1.20. The row to row and plant to plant spacing was maintained as 30 cm and 10 cm respectively. Recommended package of practices were followed to raise a healthy and disease free crop. Observation on five randomly selected plants for number of pods plant^{-1} and yield plot^{-1} (g) were recorded. The data were analysed for stability using Eberhart and Russell (1966) model.

RESULTS AND DISCUSSION

Year-wise analysis of variance revealed significant differences among the genotypes under each environment for both the characters ie. number of pods plant^{-1} and yield plot^{-1} (g) (Table 1). The pooled analysis of variance also revealed significant differences among genotypes for both the characters (Table 2) indicating that environments were differently exerted influence on different genotypes in their expression of characters. The Variety x Environments interaction was also significant indicating all the genotypes were effectively interacted against environments. The existence of G x E interaction for yield has also been reported by Kamaluddin and Ahmad (2012) in soybean and Kumari (2001) in lathyrus.

The mean sum of squares due to environment (linear) was found significant (Table 3). Therefore, it is concluded that the environments were random and different variation could have arisen due to the linear response of regression. The significance of linear component of variance due to environment has also been reported by Verma *et* al. (2011), Solanki *et al.* (2014) and Idhole *et al.* (2016) in soybean and Kumari (2001) in lathyrus, The mean sum of squares due to G x E (linear) was found to be significant for number of pods plant^{-1} and yield plot^{-1} (g) indicating the presence of genetic difference among the genotypes for their regression on the environmental index making the prediction for the performance of these traits. Similar to this findings significant G x E (linear) was reported by Solanki *et al.*(2014) and Idhole *et al.* (2016) in soybean . The non-linear component (pooled deviation) arising due to heterogeneity measured as mean squares due to pooled deviation was significant which revealed the presence of non-linear response of the genotypes to changing environments. The significance of pooled deviation confirmed contribution of non-linear component to total G x E interaction. The genotypes differed with respect to stability of these traits making its prediction more difficult. However, the magnitude of linear component ie. Environment (linear) and Environment + (G x E) was many times higher than the non-linear component (pooled deviation) indicating the prediction of stability could be reliable though it may get affected to some extent. In accordance to this result, Verma *et al.* (2011) and Idhole *et al.* (2016) also reported higher magnitude of linear component over the non-linear component in soybean. Significance of the deviation of each genotype from its regression when tested by 'F'test revealed that all the nine genotypes recorded significant deviation.

Estimates of S^2di for number of pods plant^{-1} was non-significant and regression co-efficient b_i closer to unity for two genotypes *viz.,* CAGL-86 and CAGL-94 (Table 4) for number of pods plant^{-1}which revealed that these genotype had better stability for number of pods plant^{-1}. Similarly Estimates of S^2di for yield plot^{-1} (g) was non-significant and regression co-efficient b_i closer to unity for only one genotypes CAGL-94 (Table 4) for yield plot^{-1} (g) which revealed that this genotype had better stability for yield plot^{-1} (g). These two genotypes CAGL-86 and CAGL-94 also showed non significant deviation from regression as observed from table 3.

Out of the two genotypes CAGL-86 and CAGL-94 only one genotype CAGL-94 recorded maximum number of pods plant^{-1} and high yield plot^{-1} (g) and was observed to be significantly superior over Ratan (Ch) and Mahateora for number of pods plant^{-1} and high yield plot^{-1} (g) . Solanki *et al.* (2014), Verma *et al.,*(2011) and Idhole *et al.* (2016) in soybean and Kumari (2001) in lathyrus also identified stable genotypes for seed yield plant^{-1}.

It is inferred from this study that genotypes CAGL-94 was found to be stable and suitable for cultivation in Vidarbha (Maharashtra) over years..

REFERENCES

Kamaluddin, M. N. and S. Ahmad, 2012. Stability analysis of soybean genotype for yield and yield traits sown under temperature condition in Kashmir Valley. J. Food Leg. **25** (3): 175-178.

Eberhart , S. A. and W. A. Russell, 1966. Stability parameters for comparing varieties. Crop Sci. **6:** 36-40.

Kumari, V. 2001. Field evaluation of grass pea (*Lathyrus sativus* L.) germplasm for its toxicity in the northwestern hills of India. Lathyrus Lathyrism News lett. **2**: 82-84.

Verma, N., R. P. Sah, R. Kumar and J. Ghosh,2011. Stability analysis in soybean (*Glycine max* (L.) Merril). J. Soybean Res. **9**: 86-94.

Solanki, S. C., R. K. Parmar, L. M. Ahirwar and S. R. Ramgiry, 2014. Stability analysis in soybean (*Glycine max* (L.) Merril). J. Soils and Crops. **24** (2): 268-274.

Idhole, G. M., S. K. Dhapke, G. D. Chandankar, S. R. Patil and V. R. Sapkal, 2016. Stability analysis in soybean for seed yield and its components. J. Soils and Crops. **26** (2): 243-248.

Table 1. Analysis of variance location wise for yield (kg ha^{-1})

Sources of variation	df	Mean squares					
		No. of Pods plant^{-1}			Yield Plot^{-1} (g)		
		2013-14	2014-15	2015-16	2013-14	2014-15	2015-16
Replication	2	6.56	0.14	1.59	361.99	367.35	1549.27
Varieties	8	33.77**	56.98**	16.66**	20060.34**	13093.22**	14051.34**
Error	16	2.30	1.76	1.21	544.22	602.66	886.07

Note: ** Significant at 1 % level

Table 2. Pooled analysis of variance over three locations for yield (kg ha^{-1})

Sources of variation	df	Mean squares	
		No. of Pods plant^{-1}	Yield Plot^{-1} (g)
Environments (E)	2	326.86**	56847.15**
Varieties	8	32.10**	16872.69**
Varieties x Environments	16	37.66**	15166.10**
Pooled error	48	1.76	677.65

Note: ** Significant at 1 % level

Table 3. Analysis of variance for stability for yield (kg ha^{-1})

Source of variation	df	Mean squares	
		No. of Pods plant^{-1}	Yield Plot^{-1} (g)
Varieties	8	32.10**	16872.69**
Environment + (G x E)	18	23.26**	6599.11**
Environments (Linear)	1	217.90**	37898.09**
Genotype X Environments (Linear)	8	3.92**	34439.71**
Pooled Deviation	9	18.82**	5929.79**
CAGL- 19	1	0.56	2.41
CAGL-93	1	26.97	4141.42
CAGL-86	1	0.26	10824.71
CAGL-43	1	32.58	6149.17
CAGL-94	1	4.04	521.38
CAGL-63	1	10.27	7472.23
Ratan (Ch)	1	64.45	8734.74
Prateek (Ch)	1	2.82	792.13
Mahateora (Ch)	1	27.46	14729.91
Pooled Error	48	0.70	257.53

Note: ** Significant at 1 % level

Table 4. Stability parameters for number of pods plant^{-1} and yield plot^{-1}(g) in local collections of Grass Pea (*Lathyrus sativus* L.)

Genotypes	No. of Pods plant^{-1}			Yield Plot^{-1} (g)		
	Mean	bi	s^{2}di	Mean	bi	s^{2}di
CAGL- 19	17.42	0.48*	-0.0579	270.64	2.19**	-226.49
CAGL-93	20.40	1.33	26.34*	302.98	0.47	3912.51**
CAGL-86	19.95	**1.28****	**-0.35**	300.84	0.44	10595.79**
CAGL-43	20.75	1.40	31.95*	357.31	0.94	5920.26**
CAGL-94	**22.42**	**1.12****	**3.42**	**370.85**	**1.47****	**282.46**
CAGL-63	17.62	1.33	9.65	256.55	- 0.84	7243.31**
Ratan (Ch)	17.37	0.89	63.83**	297.92	1.74	8505.83**
Prateek (Ch)	21.73	0.86	2.19	378.85	0.98	563.21**
Mahateora (Ch)	19.02	0.28	26.84*	312.07	1.57	14500.99**
Mean	19.63	-	-	316.45	-	-
SE_m ±	0.48	-	-	9.26	-	-
CD	1.45	-	-	27.80	-	-

*, ** Significantly different from zero at 1 and 5 per cent level respectively

❖❖❖❖