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ESTIMATION OF GENETIC PARAMETERS IN F_2 POPULATION OF LATHYRUS (*Lathyrus sativus* L.)

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ABSTRACT

The study of 21 F_2 crosses in lathyrus was undertaken with a view to estimate the genetic parameters in F_2 population. The F_2 crosses along with ten parents were raised during *rabi* 2017-18 and data were recorded on seven yield and yield contributing characters. The genetic coefficient of variation was high for number of pods plant^{-1} and yield plant^{-1}. The estimates of heritability (h^2) in broad sense was high for yield plant^{-1} (40.12 - 92.14%) and moderate to high for number of pods plant^{-1}(21.89 - 85.70%). The expected genetic advance among all F_2 populations indicated significant progress under selection for plant height at maturity (15.88 - 26.83), number of pods plant^{-1} (10.72 - 47.49) and yield plant^{-1}(4.22 - 13.62).The fourteen crosseswere identified on the basis of high mean, genotypic coefficient of variation, heritability in broad sense and genetic advance for economic traits like number of pods plant^{-1} and yield plant^{-1}.

(Key words: Lathyrus, heritability, genetic advance, genetic coefficient of variation)

INTRODUCTION

Lathyrus (*Lathyrus sativus* L.*)* also known as grass pea, khesari, Indian pea, blue sweet pea, white pea, teora and chickling pea. Lathyrus has 130 species occurring all over temperate region of northern hemisphere and the higher altitude of tropical Africa. The most probable origin of lathyrus is Europe and Western Asia. In India lathyrus crop can be cultivated in Maharashtra, Bihar, Chhattisgarh, M. P. and West Bengal as reported by Khandare *et al.* (2014). Lathyrus contains 28-32% protein and other essential micro-nutrients and may provide nutritional security to the low income people in the society. Lathyrus leaves about 36-48 kg ha^{-1} nitrogen economy for the succeeding cereals.

Designing efficient and desirable plant type requires the existence of genetic variability in the material. In order to incorporate desirable characters to maximize economic yields, the information on the nature and extent of genetic variability present in population for desirable characters, their association and relative contribution to yield constitutes the basic requirement. F_2 generation provides an active breeding material from which desirable plant may selected. There have been varying reports about the reliability of early generation selection.Therefore, the present study was planned and undertaken to find genetic variability, available heritability and genetic advance in different characters.

MATERIALS AND METHODS

The experimental material comprised of twenty one F_2 crosses selected on the basis of different yield contributing characters from F_1 and their ten parents in which seven lines (female) *viz.,*NLK-06, NLK-48, NLK-12, NLK-73, NLK-17, LL-14-2, LL-14-5 and three testers (male) *viz.,*Ratan, Prateek, NLK-40 were crossed in a line x tester mating design in *rabi* 2015. This material were grown during *rabi* 2017-2018 in randomized complete block design with three replications. Five rows of each F_2 cross and one row of each parent were allotted during sowing. These rows sown with 45 cm x 15 cm spacing consisted of twenty plants in each row. Data were recorded on two hundred plants from each individual F_2 cross and five randomly selected plants from each parent for seven characters *i.e.*days to first flower, days to maturity, plant height at maturity, number of primary branches plant^{-1}, number of pods plant^{-1}, 100 seed weight and seed yield plant^{-1}. The data recorded were subjected to various statistical and biometrical analysis *viz.,* Analysis of variance (Panse and Sukhatme, 1954), estimation of genetic parameters *i.e.* genotypic and phenotypic coefficient of variability, heritability in broad sense (Hanson *et al.,*1956) and genetic advance (GA) (Robinson *et al*., 1949).

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RESULTS AND DISCUSSION

Data regarding analysis of variance for seven characters are presented in table 1. Mean squares due to genotypes (crosses + parents) were significant for all five characters studied except number of primary branches plant^{-1} and days to maturity indicating a substantial genetic variability among the genotypes. This reveals that except number of primary branches plant^{-1} and days to maturity the genetic parameters can be estimated for the other five characters *i.e.* days to first flower, plant height at maturity, number of pods plant^{-1}, 100 seed weight and yield plant^{-1}. The same result was obtained by Shinde *et al.* (2003) for significant variability among the genotypes (F_2 crosses and parents) for all the above mentioned characters in lathyrus.

Days to first flower

The F_2 cross NLK-06 × Prateek flowered earliest in (50.90 days) followed by LL-14-2 × NLK-40 (50.93 days), NLK-06 × Ratan (51.05 days) and NLK-17 × NLK-40 (51.05 days).The highest F_2 variance was observed in NLK-06 × NLK-40 (7.24) followed by NLK-06 × Ratan (6.99) and NLK-73 × NLK-40 (6.82).Genotypic coefficient of variation is found maximum in F_2 cross NLK-06 × Ratan (4.78%) followed by NLK-06 × NLK-40 (4.77%) and NLK-73 × NLK-40 (4.52%). The F_2 cross NLK-06× NLK-40 was found maximum phenotypic coefficient of variation (5.26%) followed by NLK-06 × Ratan (5.18%) and NLK-73 × NLK-40 (5.07%). Estimation of heritability was maximum in NLK-06 × Ratan (85.29%) followed by NLK-06 × Prateek (84.25%), NLK-06 × NLK-40 (82.08%), LL-14-2 × Ratan (80.26%) and NLK-73 × NLK-40 (79.50%). Maximum genetic advance was recorded in NLK-06 × Ratan (4.55) followed by NLK-06 × NLK-40 (4.55) and NLK-06 × Prateek (4.30).

Among the twenty one F_2 crosses most of the crosses having high genetic coefficient of variation and heritability for days to first flower character and genetic advance were found low indicating significant role of non-additive gene action and high heritability observed in these crosses is due to the influence of environment and hence selection of early flowering plants are not effective for days to first flower character in F_2 segregating generation on the basis of table 2. Similar to this result Chakrapani *et al.* (2008) also reported ineffectiveness of selection for days to first flower in F_2 generation of lathyrus.

Plant height at maturity (cm)

The F_2 variance was recorded maximum in the F_2 cross NLK-06 × Ratan (232.12) followed by NLK-17 × Ratan (220.21) and NLK-06 × Prateek (206.55).According to mean performance of F_2 crosses, NLK-17 × Prateek (74.00 cm) followed by crosses NLK-06 × NLK-40 (71.59 cm) and LL-14-5× Ratan (70.80 cm) observed highest plant height.Genotypic coefficient of variation was found maximum in F_2 cross LL-14-2 × NLK-40 (20.49%) followed by crosses LL-14-5 × NLK-40 (20.37%) and NLK-73 × NLK-40 (19.93%). Phenotypic coefficient of variation was recorded maximum in NLK-73 × NLK-40 (23.34%) followed by LL-14-2 × NLK-40 (22.49%) and LL-14-5 × NLK-40 (22.37%).Maximum heritability estimate was observed in the F_2 cross NLK-06 × Ratan (85.12%) followed by NLK-48 × Ratan (84.16%) and LL-14-5 × Ratan (84.09%). Maximum genetic advance was recorded in the F_2 cross NLK-06 × Ratan (26.84) followed by NLK-06 × Prateek (24.48) and NLK-48 × Ratan (24.35).

As shown in table 3 most of the crosses having high genotypic coefficient variation, variance of F_2 cross, heritability and genetic advance indicating effectiveness of selection for plant height in the crosses. Crosses having high heritability coupled with high genetic advance and selection in these crosses are effective as reported by Talekar *et al.* (2017) for this trait.

Number of pods plant^{-1}

The crosses of NLK-06 × Prateek, LL-14-2 × NLK-40, NLK-12 × Ratan, NLK-12 × Prateek, LL-14-2 × Prateek, NLK-06 × NLK-40, NLK-48 × Prateek, NLK-12 × NLK-40, NLK-73 × Ratan, NLK-73 × Prateek, LL-14-2 × Ratan, LL-14-5 × Ratan and LL-14-5 × NLK-40 had high F_2 variance, genotypic coefficient of variation, heritability and genetic advance as presented in table 3. High heritability coupled with high genetic advance in the above crosses indicates that number of pods plant^{-1} trait is under the control of additive gene action and directional phenotypic selection for this trait is genetically diverse genotypes or in the segregating populations could be effective for desired genetic improvement.

Low heritability associated with low genetic advance along with low genetic coefficient of variation and F_2 variance in the crosses NLK-06 × Ratan, NLK-73 × NLK-40, NLK-17 × NLK-40 and LL-14-5 × Prateek and low genetic advance besides presence of high heritability in the crosses NLK-48 × Ratan, NLK-48 × NLK40 and NLK-17 × Ratan, may be due to non-additive gene effect and presence of high genotypic x environment interaction. Therefore, simple selection would not be rewarding. Similar findings were also reported by Shinde *et al.* (2003) for F_2 crosses having high heritability coupled with high genetic advance for making selection on the basis of number of pods plant^{-1}.

100 seed weight (g)

In F_2 cross LL-14-5 × Ratan (8.06 g) followed by NLK-12 × Ratan (7.96 g) and NLK-12 × Prateek (7.86 g) recorded highest 100 seed weight and highest variance of F_2 was observed in the F_2 cross NLK-17 × Ratan (2.03) followed by LL-14-5 × Ratan (1.69) and LL-14-5 × Prateek (1.68). Genotypic coefficient of variation were found maximum in F_2 cross NLK-17 × Ratan (18.30%) followed by NLK-73 × NLK-40 (16.06%) and LL-14-5 × Prateek (15.31%). The F_2 cross NLK-17× Ratan recorded maximum phenotypic coefficient of variation (19.84%) followed by LL-14-5 × Prateek (17.56%) and LL-14-2 × Ratan(17.04%). Maximum

Table 1. Analysis of variance for seven characters in lathyrus

Source of variation	d.f.	Mean Square						
		Days to first flower	Days to maturity (cm)	Plant height at maturity plant^{-1}	No. of primary branches plant^{-1}	No. of pods plant^{-1}	100 seed weight (g)	Yield plant^{-1} (g)
Replications	2	0.309	0.806	144.83	1.089	11.89	0.177	10.62
Genotypes	30	0.289*	0.672	98.90**	0.17	382.61**	0.492**	7.24**
Error	60	0.172	0.545	46.10	0.365	153.56	0.235	3.54

Note: *,** Significant at 5% level and 1% level respectively.

Table 2. Estimation of genetic parameters in each F_2 cross for days to first flower

F_2 crosses/ Parents	Mean±SE$_{(m)}$	Range	VF_2	GCV(%)	PCV (%)	h^2 (%)	GA
NLK-06 × Ratan	51.05 ± 2.64	14.00 (45 - 59)	6.99	4.78	5.18	85.29	4.55
NLK-06 × Prateek	50.90 ± 2.47	14.00 (44 - 58)	6.15	4.47	4.87	84.25	4.30
NLK-06 × NLK-40	51.16 ± 2.69	12.00 (46 - 58)	7.24	4.77	5.26	82.08	4.55
NLK-48 × Ratan	51.23 ± 2.31	12.00 (46 - 58)	5.36	4.03	4.52	79.47	3.79
NLK-48 × Prateek	51.12 ± 2.23	10.00 (46 - 56)	4.99	3.89	4.37	79.15	3.64
NLK-48 × NLK-40	51.38 ± 2.34	11.00 (46 - 57)	5.48	3.95	4.56	74.99	3.62
NLK-12 × Ratan	51.06 ± 2.43	12.00 (45 - 57)	5.95	4.17	4.78	76.12	3.84
NLK-12 × Prateek	51.16 ± 2.42	12.00 (46 - 58)	5.87	4.15	4.73	76.78	3.83
NLK-12 × NLK-40	51.70 ± 2.22	12.00 (46 - 58)	4.94	3.49	4.29	65.77	3.01
NLK-73 × Ratan	51.72 ± 2.22	12.00 (46 - 58)	4.93	3.77	4.29	77.09	3.53
NLK-73 × Prateek	51.40 ± 2.14	10.00 (46 - 56)	4.60	3.66	4.17	76.76	3.39
NLK-73 × NLK-40	51.56 ± 2.61	15.00 (45 - 60)	6.82	4.52	5.07	79.50	4.28
NLK-17 × Ratan	51.07 ± 2.52	12.00 (46 - 58)	6.37	4.38	4.94	78.62	4.09
NLK-17 × Prateek	51.11 ± 2.43	13.00 (44 - 57)	5.94	4.21	4.77	78.06	3.92
NLK-17 × NLK-40	51.05 ± 2.49	13.00 (43 - 56)	6.21	4.19	4.88	73.73	3.78
LL-14-2 × Ratan	51.17 ± 2.26	12.00 (46 - 58)	5.14	3.97	4.43	80.26	3.77
LL-14-2 × Prateek	51.28 ± 2.09	10.00 (46 - 56)	4.37	3.61	4.08	78.17	3.37
LL-14-2 × NLK-40LL-14-5 × Ratan		50.93 ± 2.3251.52 ± 2.16		13.00 (43 - 56)10.00 (46 - 56)		5.394.70	3.983.44	4.584.21
76.1866.85	3.642.99							
LL-14-5 × Prateek	51.48 ± 2.12	12.00 (46 - 58)	4.50	3.36	4.12	66.69	2.91
LL-14-5 × NLK-40	51.06 ± 2.11	10.00 (46 - 56)	4.46	3.18	4.14	59.03	2.57
NLK-06	51.40	-	-	-	-	-	-
NLK-48	51.47	-	-	-	-	-	-
NLK-12	51.40	-	-	-	-	-	-
NLK-73	50.73	-	-	-	-	-	-
NLK-17	51.73	-	-	-	-	-	-
LL-14-2	51.00	-	-	-	-	-	-
LL-14-5	51.07	-	-	-	-	-	-
Ratan	51.60	-	-	-	-	-	-
Prateek	51.07	-	-	-	-	-	-
NLK-40	52.13	-	-	-	-	-	-
Grand mean	51.26						
SE(m)±	0.24						
CV (%)	0.81						

Table 3. Estimation of genetic parameters in each F_2 cross for plant height at maturity and number of pods plant^{-1}

F_2 crosses/ Parents	Plant height at maturity							Number of pods plant^{-1}						
	Mean±SE$_{(m)}$	Range	VF_2	GCV(%)	PCV (%)	h^2(%)	GA	Mean±SE$_{(m)}$	Range	VF_2	GCV (%)	PCV (%)	h^2(%)	GA
NLK-06 × Ratan	68.40 ± 15.23	94.50 (24.5-119)	232.12	12.59	22.27	85.12	26.84	48.32 ± 23.76	150 (10 - 160)	564.94	23.02	49.19	21.89	10.72
NLK-06 × Prateek	69.02 ± 14.37	77.00 (35 - 112)	206.55	18.93	20.82	82.68	24.48	54.75 ± 30.81	169 (18 - 187)	949.63	39.01	56.28	48.04	30.49
NLK-06 × NLK-40	71.59 ± 13.86	72.00 (38 - 110)	192.25	17.22	19.37	78.99	22.56	52.29 ± 26.61	156 (13 - 169)	708.60	31.44	50.91	38.13	20.91
NLK-48 × Ratan	69.52 ± 14.04	65.00 (49 - 104)	197.30	18.54	20.21	84.16	24.35	47.49 ± 19.89	105 (15 - 120)	395.97	27.18	41.91	42.08	17.25
NLK-48 × Prateek	66.24 ± 14.07	82.00 (30 - 112)	198.00	19.37	21.24	83.13	24.09	53.07 ± 25.83	139 (19 - 158)	667.52	37.02	48.69	57.82	30.77
NLK-48 × NLK-40	69.82 ± 13.48	71.00 (32 - 103)	181.89	17.18	19.32	79.10	21.98	47.88 ± 19.32	109 (14 - 133)	373.64	25.33	40.37	39.37	15.68
NLK-12 × Ratan	67.78 ± 13.90	70.00 (34 - 104)	193.42	17.79	20.52	75.14	21.53	57.91 ± 26.89	197 (12 - 209)	723.51	47.06	50.84	85.70	47.49
NLK-12 × Prateek	67.70 ± 13.57	71.00 (31 - 102)	184.40	17.11	20.06	72.76	20.35	52.65 ± 27.86	195 (11 - 206)	776.70	47.33	52.93	79.95	45.90
NLK-12 × NLK-40	65.72 ± 12.20	70.00 (34 - 104)	148.95	14.76	18.57	63.18	15.88	45.44 ± 19.45	100 (14 - 114)	378.37	36.67	42.80	73.39	29.41
NLK-73 × Ratan	66.66 ± 13.29	68.00 (36 - 104)	176.85	17.04	19.95	72.92	19.98	47.49 ± 23.57	175 (12 - 187)	555.62	35.42	49.63	50.93	24.73
NLK-73 × Prateek	60.82 ± 13.18	77.00 (26 - 103)	173.81	18.29	21.68	71.21	19.34	47.24 ± 24.90	186 (12 - 198)	620.05	36.37	52.71	47.60	24.42
NLK-73 × NLK-40	60.84 ± 14.20	73.00 (31 - 104)	201.71	19.93	23.34	72.91	21.33	44.71 ± 19.30	106 (12 - 118)	372.87	22.70	43.19	27.63	10.99
NLK-17 × Ratan	66.51 ± 14.83	75.00 (34 - 109)	220.21	19.78	22.21	78.61	24.03	53.18 ± 27.18	174 (12 - 186)	739.20	29.11	51.13	32.41	18.15
NLK-17 × Prateek	74.00 ± 13.80	69.00 (37 - 106)	190.65	16.07	18.66	74.17	21.09	46.40 ± 20.86	117 (10 - 127)	435.30	—	44.97	—	—
NLK-17 × NLK-40	67.74 ± 12.87	66.00 (38 - 104)	165.79	15.62	19.01	67.52	17.91	51.67 ± 26.46	156 (12 - 168)	700.28	27.61	51.21	29.06	15.84
LL-14-2 × Ratan	64.48 ± 12.64	68.00 (39 - 106)	159.86	17.56	19.61	80.23	20.90	44.70 ± 26.13	246 (11 - 257)	682.83	47.88	58.46	67.08	36.11
LL-14-2 × Prateek	62.87 ± 13.78	78.00 (32 - 110)	190.03	19.88	21.93	82.24	23.35	48.65 ± 26.92	187 (12 - 199)	725.21	43.52	55.36	61.80	34.28
LL-14-2 × NLK-40L	67.74 ± 12.87	66.00 (38 - 104)	165.79	15.62	19.01	67.52	17.91	51.67 ± 26.46	156 (12 - 168)	700.28	27.61	51.21	29.06	15.84
LL-14-5 × Prateek	60.18 ± 12.51	79.00 (27 - 106)	156.74	18.86	20.80	82.19	21.19	47.42 ± 19.77	118 (14 - 132)	390.91	21.67	41.67	27.04	11.01
LL-14-5 × NLK-40	57.91 ± 13.10	79.00 (28 - 107)	171.71	20.37	22.63	81.06	21.88	49.54 ± 24.84	144 (12 - 156)	617.37	39.74	50.15	62.76	32.13
NLK-06	80.40	-	-	-	-	-	-	94.53	-	-	-	-	-	-
NLK-48	75.87	-	-	-	-	-	-	69.67	-	-	-	-	-	-
NLK-12	75.13	-	-	-	-	-	-	41.20	-	-	-	-	-	-
NLK-73	76.47	-	-	-	-	-	-	70.93	-	-	-	-	-	-
NLK-17	75.07	-	-	-	-	-	-	73.07	-	-	-	-	-	-
LL-14-2	73.47	-	-	-	-	-	-	62.40	-	-	-	-	-	-
LL-14-5	76.60	-	-	-	-	-	-	68.67	-	-	-	-	-	-
Ratan	75.13	-	-	-	-	-	-	65.93	-	-	-	-	-	-
Prateek	75.93	-	-	-	-	-	-	63.27	-	-	-	-	-	-
NLK-40	71.73	-	-	-	-	-	-	51.87	-	-	-	-	-	-
Grand mean	69.19							54.87						
SE(m)±	03.92							07.15						
CV (%)	09.81							22.58						

Table 4. Estimation of genetic parameters in each F_2 cross for 100 seed weight and yield plant

F_2 crosses/ Parents	100 seed weight (g)							Yield plant^{-1} (g)						
	Mean±$SE_{(m)}$	Range	VF_2	GCV(%)	PCV (%)	h^2(%)	GA	Mean±$SE_{(m)}$	Range	VF_2	GCV (%)	PCV (%)	h^2(%)	GA
NLK-06 × Ratan	7.78 ± 1.26	5.9 (5.0 - 10.9)	1.61	14.48	16.29	79.04	2.06	13.96 ± 5.98	40.5 (4.8 -45.3)	35.87	36.33	42.89	71.74	08.85
NLK-06 × Prateek	7.72 ± 1.18	5.0 (5.2 - 10.2)	1.41	12.77	15.39	68.83	1.68	13.69 ± 7.38	48.2 (4.8 - 53.0)	54.60	49.54	53.97	84.26	12.83
NLK-06 × NLK-40	7.38 ± 1.15	5.0 (5.2 - 10.2)	1.34	14.05	15.72	79.91	1.91	13.16 ± 5.91	32.5 (4.5 - 37.0)	35.03	30.08	44.98	75.49	09.20
NLK-48 × Ratan	7.22 ± 1.20	6.0 (4.2 - 10.2)	1.46	15.18	16.70	82.59	2.05	12.91 ± 5.00	33.8 (5.3 - 39.1)	26.06	25.05	39.54	40.12	04.22
NLK-48 × Prateek	7.68 ± 1.15	6.5 (5.4 - 11.9)	1.33	12.85	15.01	73.26	1.44	14.60 ± 6.84	43.8 (5.4 - 49.2)	46.90	39.26	46.92	70.02	09.88
NLK-48 × NLK-40	7.67 ± 1.02	6.0 (5.0 - 11.0)	1.05	12.14	13.38	82.28	1.74	13.56 ± 5.73	42.2 (5.8 - 48.0)	32.89	32.01	42.30	57.28	06.77
NLK-12 × Ratan	7.96 ± 1.20	5.7 (5.3 - 11.0)	1.45	13.82	15.14	83.33	2.07	14.27 ± 7.16	51.2 (4.8 - 56.0)	51.40	47.72	50.24	90.20	13.32
NLK-12 × Prateek	7.86 ± 1.17	6.1 (5.0 - 11.1)	1.39	13.05	15.04	75.34	1.83	13.93 ± 6.65	51.6 (4.5 - 56.1)	44.34	45.87	47.79	92.11	12.63
NLK-12 × NLK-40	7.55 ± 1.10	6.3 (5.3 - 11.6)	1.21	13.44	14.54	85.44	1.93	12.93 ± 5.72	40.5 (4.6 - 45.1)	32.77	41.85	44.28	89.35	10.54
NLK-73 × Ratan	7.75 ± 1.22	5.9 (5.1 - 11.0)	1.51	14.52	15.85	83.95	2.12	13.11 ± 6.50	39.2 (3.9 - 43.1)	42.34	43.18	49.64	75.67	10.14
NLK-73 × Prateek	7.72 ± 1.24	6.3 (4.8 - 11.1)	1.56	14.31	16.20	77.97	2.01	13.40 ± 6.76	43.0 (4.0 - 47.0)	45.71	45.37	50.46	80.83	11.26
NLK-73 × NLK-40	7.58 ± 1.28	7.2 (4.8 - 12.0)	1.66	16.06	16.98	89.41	2.37	12.30 ± 5.30	26.0 (4.0 - 30.0)	28.13	35.79	43.12	68.88	07.53
NLK-17 × Ratan	7.17 ± 1.42	7.3 (4.3 - 11.6)	2.03	18.30	19.84	84.92	2.49	12.95 ± 6.07	38.2 (4.6 - 42.8)	36.85	37.56	46.88	64.18	08.03
NLK-17 × Prateek	7.64 ± 1.11	5.4 (5.4 - 10.8)	1.24	11.94	14.58	67.08	1.54	13.01 ± 6.14	44.5 (4.5 - 49.0)	37.74	39.24	47.20	69.11	08.75
NLK-17 × NLK-40	7.55 ± 1.17	6.3 (5.0 - 11.3)	1.38	14.13	15.55	82.63	1.99	13.84 ± 5.75	27.6 (4.5 - 32.1)	33.15	33.51	41.61	64.86	07.69
LL-14-2 × Ratan	7.20 ± 1.22	7.0 (4.5 - 11.5)	1.50	14.52	17.04	72.62	1.83	12.26 ± 5.84	37.0 (5.0 - 42.0)	34.15	43.59	47.66	83.65	10.07
LL-14-2 × Prateek	7.43 ± 1.24	7.4 (4.2 - 11.6)	1.55	13.69	16.75	66.81	1.71	13.25 ± 7.17	50.2 (4.9 - 55.1)	51.46	51.99	54.16	92.14	13.62
LL-14-2 × NLK-40	7.64 ± 1.13	5.1(52-10.3)	1.28	12.69	14.83	73.16	1.71	13.60 ±6.29	39.2 (4.8 - 44.1)	39.59	43.86	46.28	89.81	11.64
LL-14-5 × Ratan	8.06 ± 1.30	6.7 (5.3) - 12.0)	1.69	14.68	16.18	82.29	2.21	14.69 ± 3.79	36.0 (5.0 - 41.0)	43.37	42.03	44.96	87.40	10.43
LL-14-5 × Prateek	7.38 ± 1.29	6.9 (4.2 - 11.1)	1.68	15.31	17.56	76.03	2.03	12.28 ± 5.74	42.4 (4.0 - 46.4)	33.04	43.93	46.79	88.12	10.43
LL-14-5 × NLK-40	7.61 ± 1.16	6.1 (4.3 - 10.4)	1.35	13.88	15.27	82.67	1.98	13.58 ± 6.22	34.1 (4.0 - 38.1)	38.70	43.43	45.81	89.88	11.52
NLK-06	7.31	-	-	-	-	-	-	14.57	-	-	-	-	-	-
NLK-48	6.55	-	-	-	-	-	-	16.67	-	-	-	-	-	-
NLK-12	7.15	-	-	-	-	-	-	10.01	-	-	-	-	-	-
NLK-73	6.69	-	-	-	-	-	-	15.25	-	-	-	-	-	-
NLK-17	7.07	-	-	-	-	-	-	13.50	-	-	-	-	-	-
LL-14-2	7.17	-	-	-	-	-	-	13.01	-	-	-	-	-	-
LL-14-5	7.25	-	-	-	-	-	-	11.69	-	-	-	-	-	-
Ratan	7.09	-	-	-	-	-	-	14.07	-	-	-	-	-	-
Prateek	6.87	-	-	-	-	-	-	12.62	-	-	-	-	-	-
NLK-40	6.42	-	-	-	-	-	-	11.77	-	-	-	-	-	-
Grand mean	7.38							13.53						
$SE_{(m)}$±	0.28							01.09						
CV (%)	6.57							13.90						

heritability was recorded in NLK-73× NLK-40 (89.41%) followed by NLK-12 × NLK-40 (85.44%) and NLK-17 × Ratan (84.92%). Maximum genetic advance was observed in NLK-17 × Ratan (2.49) followed by NLK-73 × NLK-40 (2.37) and LL-14-5 × Ratan (2.21).

The results on 100 seed weight presented in table 4 revealed that for maximum crosses having high genetic coefficient of variation and heritability, the genetic advance found to be low indicating non-additive gene action. The high heritability is being exhibited due to favourable influence of environment rather than genotype and selection in such crosses for 100 seed weight may not rewarding in F_2 segregating generation. Similar result of non-additive gene effect and presence of high genotypic x environment interaction for 100 seed weight were found by Yusufzai *et al.* (2017) in F_2 crosses.

Yield plant^{-1} (g)

High heritability with moderate genetic advance were found for yield plant^{-1} in the F_2 crosses *viz.,* NLK-06 × Prateek, NLK-12 × Ratan, NLK-12 × Prateek, LL-14-2 × Prateek, LL-14-5 × Ratan, LL-14-2 × NLK-40, LL-14-5 × Prateek, LL-14-5 × NLK-40, NLK-73 × Prateek, LL-14-2 × Ratan, NLK-12 × NLK-40 and NLK-73 × Ratan(Table 4). This trait was under additive gene action and rewarding selection in these crosses. Similar finding for presence of predominance additive gene action were recorded by Pradhan *et al.* (2011) in crosses of lathyrus. The crosses NLK-06 × Ratan, NLK-06 × NLK-40, NLK-48 × Ratan, NLK-48 × Prateek, NLK-48 × NLK40, NLK-73 × NLK-40, NLK-17 × Ratan, NLK-17 × Prateek and NLK-17 × NLK-40 having high heritability and low genetic advance indicating that there is non-additive gene action. The high heritability is due to influence of environment and selection in such crosses were ineffective for yield plant^{-1}. The same result of high heritability and ineffectiveness of selection was found by Turk *et al.* (2007) for yield plant^{-1} in lathyrus crosses.

Out of seven characters studied five characters were found significant variation among crosses. Hence, for genetic parameters five characters were evaluated for twenty one crosses during the study of F_2 population in lathyrus. Among these five characters number of pods plant^{-1} (22.58%) and yield plant^{-1} (13.90%) exhibited high and moderate coefficient of variation, respectively whereas, days to first flower (0.81%), plant height at maturity (9.81%) and 100 seed weight (6.57%) were found low coefficient of variation. Therefore, for selection of crosses only number of pods plant^{-1} and yield plant^{-1} characters were considered. Crosses NLK-06 × Prateek, LL-14-2 × NLK-40, NLK-12 × Ratan, NLK-12 × Prateek, LL-14-2 × Prateek, NLK-06 × NLK-40, NLK-48 × Prateek, NLK-12 × NLK-40, NLK-73 × Ratan, NLK-73 × Prateek, LL-14-2 × Ratan, LL-14-5 × Ratan, LL-14-5 × NLK-40 and LL-14-5 × Prateek were found to exhibit high mean, genetic coefficient of variation, heritability and genetic advance for both number of pods plant^{-1} and yield plant^{-1} or any one of these two traits. Hence, these fourteen crosses were identified for further advancement.

REFERENCES

Chakrapani, K., S. Patil, V. Kalamkar, C. Pavithran and R. Ranjan, 2008.Genetic analysis in F_2 population of lathyrus (*Lathyrus sativus* L.). Crop Res. Hisar. **35**(1/2): 83-87.

Khandare, A. L., J. J. Babu, M. Ankulu, N. Aparna, A. Shirfule and G.S. Rao, 2014. Grass pea consumption & present scenario of neurolathyrism in Maharashtra State of India. Indian J. Med. Res **140**(1): 96–101.

Hanson, G. H., H. F. Robinson and R. E. Comstock, 1956. Biometrical studies of yield in segregating populations of Korean Lespedza. Agron. J. **48**: 268-272.

Panse, V. G. and P. V. Sukatme, 1954.Statistical methods for Agricultural workers.ICAR.Publication, New Delhi.**2**: 63-66.

Pradhan, T. K. 2011. Genetic analysis of yield and its components of high yielding and low ODAP grasspea (*Lathyrus sativus* L.) germplasm accessions.Unpublished M.Sc. Thesis, Deptt. of Plant Breeding and Genetics, IGKV, Raipur, (C.G).

Robinson, H. F., R. E. Comstock and V. H. Harvey, 1949.Estimates of studies on yield in segregating populations.Agron. J. **41**: 268-272.

Shinde, S. M., R. S. Sakhare, J. N. Parmar and S. A. Bhongle, 2003. Heritability and F_2 population potential in (*Lathyrus sativus* L.) from three way cross. Ann. Pl. Physio.**17**(2): 164-166.

Talekar, S. C., K. P. Viswanatha and H. C. Lohithaswa, 2017.Assessment of genetic variability, character association and path analysis in F_2 segregating population for quantitative traits in chickpea. Int. J. Curr. Microbiol. App. Sci. **6**(12): 2184-2192.

Turk, M., S. Albayrak and N. Celik, 2007.Estimates of broad-sense heritability for seed yield and yield components of grasspea (*Lathyrus sativus* L.).Turk. J. Agric. For.**31**(3): 155-158.

Yusufzai, S. A., M. S. Pithia, L. J. Raval and Z. N. Vora, 2017.Genetic variability, heritability and genetic advance for seed yield and its components in F_2 generations of mungbean (*Vigna radiata* (L.) R. Wilczek). Int. J. Pure App. Biosci.**5**: 532-535.

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