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Khemlata Thakur
Department of Genetics and Plant Breeding, I.G.K.V, Raipur, Chhattisgarh, India

Karabi Biswas
Department of Genetics and Plant Breeding, I.G.K.V, Raipur, Chhattisgarh, India

Nandan Mehta
Department of Genetics and Plant Breeding, I.G.K.V, Raipur Chhattisgarh India

Correspondence
Khemlata Thakur
Department of Genetics and Plant Breeding, I.G.K.V, Raipur Chhattisgarh, India

Variability analysis for seed yield and its contributing traits among flax type Linseed (*Linum usitatissimum* L.) genotypes in Chhattisgarh

Khemlata Thakur, Karabi Biswas and Nandan Mehta

Abstract
An experiment was conducted during *rabi* season 2017-18 and 2018-19 the experiment was carried out in a Randomized Complete Block Design with three replications. Twenty-five flax type (height more than 70 cm) linseed genotypes along with check (Nagarkot) were collected from AICRP on Linseed, Department of Genetics & Plant Breeding, College of Agriculture, IGKV, Raipur (C.G.) to evaluate the amount of genetic variation among the flax type linseed accessions. Analysis of variance indicated that flax type linseed genotypes were highly significant for all the traits taken under study such as, plant height (cm), technical plant height (cm), days to 50 % flowering, days to maturity, number of capsules per plant, number of seeds per capsule, 1000 seed weight (g), seed yield per plant (g), harvest index (%), number of primary branches per plant, number of secondary branches per plant, total number of branches per plant. Highest mean performance for plant height is recorded for FLAX-2018-12 which was followed by FLAX-2018-9 (98 cm) and FLAX-2018-14 (95.7 cm.) whereas, highest mean performance for seed yield (g) is observed in NAGARKOT (5.94 g) which was followed by MEERA (5.44 g) and SHEELA (5.09 g). Phenotypic Coefficient of Variation for all the traits under investigation was found to be higher than their corresponding Genotypic Coefficient of Variation, indicating masking effect of environment in the expression of traits. In variability studies the PCV and GCV showed a smaller amount of variation, which signifying influence of genetic causes in the expression of these traits thus, there is possibility of improvement through selection of these traits taken under study.

Keywords: Flax type linseed genotype, genetic variability, PCV, GCV

Introduction
Flax (*Linum usitatissimum* L.) is a self-pollinated crop, 2n= 30, also known as 'Alsi' or 'Linseed' broadly personalized to temperate climates of the world. The scientific name for flax is "*Linum usitatissimum*". *'Usitatissimum'* literally means "most useful". Flax also known as "linseed" and its oil is known as "linseed oil". Linseed is a member of the genus "*Linum*" in the family "Linaceae". Flax may also call as "unspun fibers of the flax plant" which has many uses, seed used for industrial, food and feed purposes. Textile prepared from flax are well known in the western countries as "linen". It is an important crop among oilseeds and well known economically significant in the country for its diversified application in various areas. Flax type linseed is cultivated as an annual *rabi* oilseed crop, it is grown dual purposely for both stem fiber and oil seeds but flax type linseed (height more than 70 cm) is majorly cultivated for fiber. Most of the part of linseed is marketable. Flax fibers are boon for textile industries known as 'linen'. Flax is grown-up for its oil or its fiber. Improved cultivation practices of flax type linseed along with improved flax type varieties will help to enhance the production status of flax, which will increase farmers income as well as generate employment for rural and urban masses. Linseed occupy 3.25 lakh ha. area with a production of 1.84 lakh tonnes and productivity 567 kg/ha respectively during year 2016-17 and inundated production for year 2018-19 will be 2.01 lakh tonnes (Ministry of Agriculture and farmers welfare, GOI)." India ranks third in the world in respect to area and production of linseed**.** In India flaxseed is largely produced in Madhya Pradesh, Maharashtra, Chhattisgarh and Bihar. Linseed is a staple food of India and it is very interesting to know that it is also native to India. "Linseed is the principal oilseed crop grown in Chhattisgarh under *utera* in rainfed conditions. It occupies 34% contribute to total oilseeds production in the state and 17% in India.

Raipur, Durg, Rajnandgoan, Bastar, Bilaspur, Raigarh and Sarguja are majorly linseed growing district in Chhattisgarh (Agashe *et al.*, 2018) [1]. Flaxseed has been the center of growing interest for the nutritionists and medical researchers due to its potential health benefits related with its biologically active components ALA, lignan, SDG and dietary fiber (Toure and Xueming 2010)". It has emerged as an attractive nutritional food because it having about 55% ALA, 28-30% protein and 35% fiber (Carter, 1993; Rubilar *et al.*, 2010 and Rabetafika *et al.*, 2011) [4, 5]. The main benefit of linseeds in livestock feeding is that they are the highest source of omega-3 fatty acids among all oil seeds, omega-3 fatty acid shows an important role in decreasing the cholesterol level in the human body, helps in reducing the inflammatory disorder like rheumatoid, arthritis, providing immunity and cardiovascular benefits.

Chhattisgarh state had short growing season for growth of flax varieties, still there is considerable demand for currently growing linseed varieties for flax purpose through manipulating agronomical practices. This eventually leads to development of few cottage industries for production of linen clothes. There is growing demand to develop "Flax type linseed" varieties even for short growing winter season, the present study found to be valuable for several desirable flax type characters in the genotypes taken under study. The information made available would be used to collaborate the present breeding material for development of flax type varieties

Materials and Methods

Field trials was conducted during *rabi* season 2017-18 and 2018-19. The flax type linseed genotypes were collected from AICRP on Linseed Department of Genetics & Plant Breeding functioning at the Research Cum Instructional Farm, College of Agriculture, IGKV, Raipur (C.G.) The biological materials used in the research work comprises of twenty-five flax type (height more than 70 cm) linseed genotypes along with check (Nagarkot). The experiment was carried out in a Randomized complete block design with three replications. All the flax type linseed genotypes were sown on 3rd November, 2018 in plots of two rows each of 3 m length with row to row spacing of 30 cm and plant to plant spacing approximately 10 cm. All the recommended package of practices was carried out to raise the good crops. The data were recorded for seed yield and its contributing traits *viz*., plant height (cm), technical plant height (cm), days to 50% flowering, days to maturity, number of capsules per plant, number of seeds per capsule, 1000 seed weight (g), seed yield per plant (g), harvest index (%), number of primary branches per plant, number of secondary branches per plant, total number of branches per plant, accompanied by morphological descriptors as per Catalogue on linseed germplasm published at Project Coordinating Unit (Linseed), Kanpur (2010).

Results and Discussion

Present investigation entitled "Assessment of genetic variability in flax type linseed (*Linum usitatissimum* L.)" was conducted with the main objective to study the variation present among the flax type linseed genotypes. Analysis of variance exhibited significant amount of variation for all the traits in each of the genotype taken under study. Analysis of variance for seed yield and its component traits in flax have been given in Table No.1

Results regarding genetic variation under present investigation revealed that generally, phenotypic coefficient of variation for all the traits under investigation was found to be higher than their corresponding genotypic coefficient of variation, indicating masking effect of environment in the expression of traits represented in Table No.2.

The information based on the nature and extent of genetic variation for desirable traits is helpful in selection which provide ample scope for genetic improvement of the crop. The understanding of genotypic and phenotypic coefficient of variation is being useful in deciding selection criteria for variable population. Genotypic & phenotypic coefficient of variation of different characters is presented in the Table No.2

The higher genotypic coefficient of variation observed for seed yield per plant (g) (37.6%) which was followed by number of capsules per plant (30.3%), number of primary branches per plant (24.3%) and number of secondary branches per plant (21.2%) whereas, phenotypic coefficient of variation was higher in seed yield per plant (g) (41.6%) which was followed by number of capsules per plant (31.3%), number of primary branches per plant (30.9%) and number of secondary branches per plant (26.1%). In variability studies the PCV and GCV showed a smaller amount of variation for days to 50% flowering and days to maturity which signifying influence of genetic causes in the expression of these traits. This signifies that direct selection of these traits provide greater opportunity for genetic enhancement of flax type linseed.

Heritability estimates the degree of resemblance between phenotypic and breeding value. It is the heritable portion of phenotypic variance. Heritability plays an important role in selection of superior genotypes from genetically diverse populations.

Broad sense heritability was evaluated for each of the yield attributing trait under study. (Table No. 2). The highest heritability was recorded for days to maturity (97%) which was followed by number of capsules per plant (93%), days to 50% flowering (91%), seed yield per plant (g) (81%) and harvest index (%) (77%) whereas, the lowest value for heritability was calculated for number of seeds per capsule (53%)

Genetic advance is an improvement in the mean genetic value of selected plants over the parental population. It measures the expected genetic progress that would result from selecting the best performing genotypes for a character being evaluated (Allard, 1960) [2]. It was suggested by Johnson *et al*., (1995) that high heritability coupled with high genetic advance in the phenotypic expression of a character would increase the ease of selection as compared to estimates of heritability alone.

The highest value of genetic advance was observed for number of capsules per plant (24.0), followed by days to maturity (24.0), plant height (cm) (20.3), technical plant height (cm) (14.9) and days to 50% flowering (12.2) whereas, The least value of genetic advance was seen for 1000 seed weight (g) (0.8g).

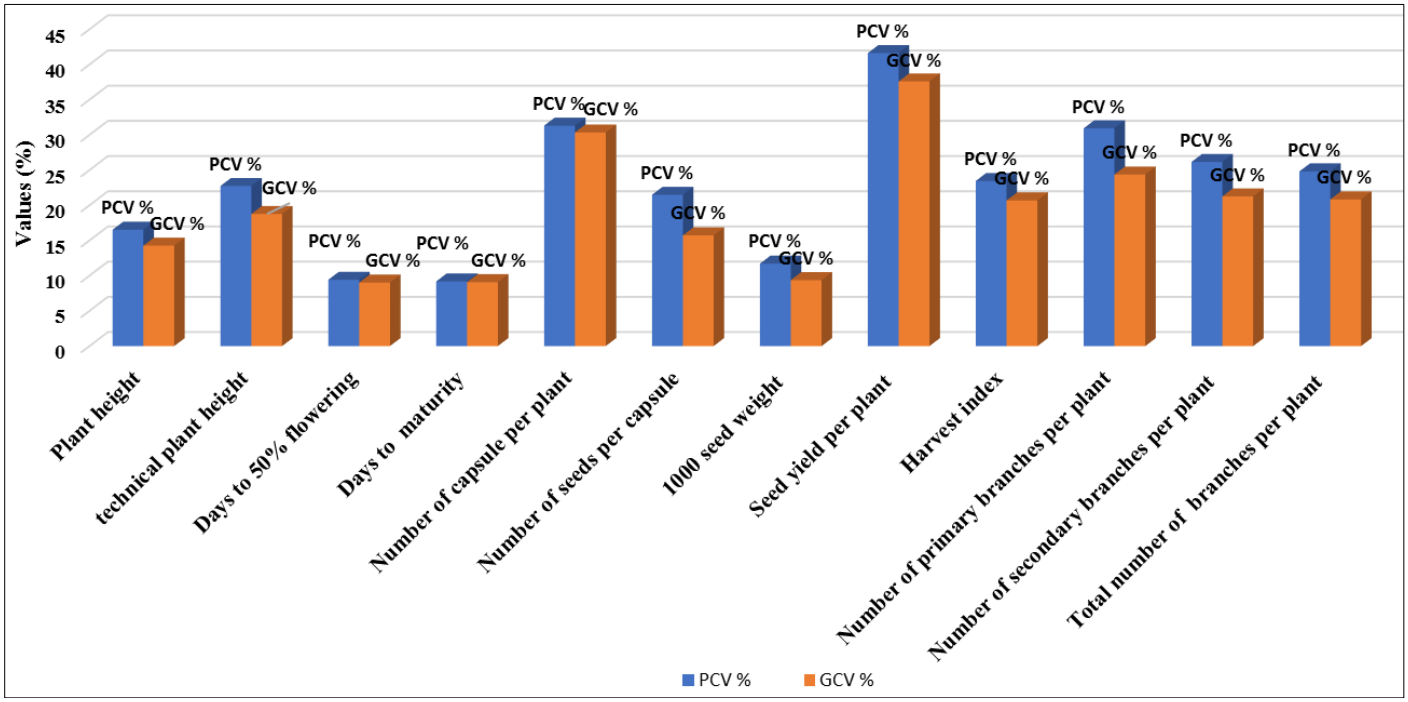

Fig 1: Comparison of genotypic coefficient of variation and phenotypic coefficient of variation for seed yield and its contributing characters in flax type linseed 2018-19 at Raipur (C.G.)

Table 1: Analysis of variance for seed yield and its contributing traits in flax type linseed genotypes 2018-19 at Raipur (C.G.)

S.N.	Source of variation	d. f.	Mean sum of squares											
			Plant height (cm)	Technical Plant height (cm)	Days to 50% flowering	Days to maturity	No. of capsules Per Plant	No. of seeds per capsule	1000 seed weight (g)	Seed yield per Plant (g)	Harvest index (%)	No. of primary branches Per plant	No. of secondary branches per plant	Total no. of branches per plant
1.	Replication	2	28.7	1.9	2.5	2.2	3.7	0.2	0.2	0.1	46.5**	0.1	27.0**	30.6**
2.	Genotype	24	437.2**	269.6**	117.8**	421.9**	445.5**	4.2**	0.8**	4.2**	83.2**	2.1**	22.1**	33.2**
3.	Error	48	44.6	36.4	3.3	3.58	9.4	0.9	0.1	0.2	7.2	0.3	3.2	4.0

* 5% level of significance
**1% level of significance

Table 2: Genetic parameters of variation for seed yield and its contributing characters in flax type linseed 2018-19 at Raipur (C.G.)

S.N.	Parameters Characters	Mean	Range		CD (%)	Coefficient of variation (%)		h^2 (bs) (%)	GA	GA as % of mean
			Max.	Min.		PCV (%)	GCV (%)			
1.	Plant height (cm)	80.1	99	53.9	11.0	16.5	14.2	74	20.3	25.3
2.	Technical plant height (cm)	46.9	70.1	32.3	9.9	22.7	18.7	68	14.9	31.8
3.	Days to 50% flowering	68	81	61	3.0	9.4	9.0	91	12.2	17.9
4.	Days to maturity	130	142	109	3.1	9.1	9.0	97	24.0	18.4
5.	No. of capsule/plant	39.7	79.6	24.3	5.0	31.3	30.3	93	24.0	60.5
6.	No. of seed /capsule	6.6	8.0	5.0	1.6	21.4	15.7	53	1.5	23.7
7.	1000 seed weight (g)	5.3	6.7	4.7	0.6	11.7	9.3	63	0.8	15.4
8.	Seed yield /plant (g)	3.0	5.9	1.6	0.9	41.6	37.6	81	2.1	69.9
9.	Harvest index (%)	24.3	37.5	16.1	4.4	23.4	20.6	77	8.6	35.4
10.	Number of primary branches/plants	3.1	5.0	1.5	0.9	30.9	24.3	62	1.2	39.5
11.	Number of secondary branches/plant	11.7	18.9	7.4	2.9	26.1	21.2	66	4.1	35.9
12.	Total number of branches/ plant	14.9	23.2	9.0	3.3	24.8	20.8	70	5.3	36.0

Conclusion

In conclusion, it was clear that in the genetic variability analysis, Analysis of variance showed significant difference for all the traits under study in each of the flax type linseed genotypes. The phenotypic coefficient of variation and genotypic coefficient of variation for days to flowering and days to maturity showed less difference signifying influence of genetic causes in the expression of these traits.

The 'days to maturity' recorded high broad sense heritability coupled with low genetic advance as percent of mean. Moderate heritability coupled with moderate genetic advance as percent of mean observed for plant height and technical plant height (cm) while, moderate heritability coupled with low genetic advance as percent of mean was observed for 1000 seed weight (g). Hence, direct selection can be done in these characters for future improvement of genotypes for best plant height and higher seed yield per plant (g).

References

1. Agashe DR, Sastri ASRAS, Bobade P, Agashe R. Trends of Area, Production and Productivity of Linseed in Different Districts of Chhattisgarh, India. Int. J Curr. Microbiol. App. Sci. 2018; 7(07):711-718.

2. Allard RW. Principle of Plant Breeding. John Willey and Sons. New York, 1960.
3. Altman DG, Bland JM. Standard deviations and standard errors. BMJ, 2005, 331:903.
4. Carter JF. Potential of faxseed and faxseed oil in baked goods and other products in human nutrition. Cereal Food World. 1993; 38(10):753-759.
5. Rabetafika HN, Remoortel VV, Danthine S, Paquot M, Blecker C. Flaxseed proteins: food uses and health benefits. Int. J Food Sci. Technol. 2011; 46:221-228.