Int.J.Curr.Microbiol.App.Sci (2019) *8*(6): 2633-2637

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 8 Number 06 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.806.316

Assessment of Variability among Flax Type Linseed Genotypes (*Linum usitatissimum* L.) of Chhattisgarh Plains

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Keywords

Flax type linseed genotypes, Variability

Article Info

Accepted:
20 May 2019
Available Online:
10 June 2019

A B S T R A C T

Twenty five (25) flax type linseed genotypes taken from AICRP on linseed, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) along with three checks (Surabhi, R-552, RLC-92) were evaluated for variability among yield and yield contributing traits in yellow seeded linseed at Raipur (C.G.). Analysis of variance implied that significant differences exist among the genotypes exist for all the characters under study. The magnitude of PCV was higher than the corresponding GCV for all the traits. Close correspondence between phenotypic and genotypic coefficient of variation were observed i.e. sufficient variability among the traits is present among the genotype. Hence, the ample scope of improvement of these traits. The significant genetic variability in any breeding material is a prerequisite as it does not only provide a basis for selection but also provide some valuable information regarding selection of diverse parents for use in hybridization programme.

Introduction

The name *Linum* originated from “lin” or “thread” and the species name *Usitatissimum* is a Latin word meaning “most useful”. It is also called flaxseed or linseed when it is used as oilseed and referred to as fiber flax or just flax (in Europe) when it is used for fiber (Vaisey-Genser and Diane, 2003). Linseed or flax is one of the oldest crops cultivated by man. Linseed is an annual herb with 6,000–7,000 years planting history. Flaxseed is rich in fat, protein and dietary fibre. An analysis of brown flax averaged 41% fat, 20% protein, 28% total dietary fibre, 7.7% moisture and 3.4%ash, which is the mineral-rich residue left after samples are burned. The protein content of the seed decreases as the oil content increases. The oil content of seed generally varies from 33 to 45 per cent (Gill, 1987). If we consider the nutritional properties of linseed, the foremost thing to be mentioned is the presence of a high amount of omega fatty acids. There are two groups of omega fats: omega-3 and omega-6 fatty acids. Linolenic acid, eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) are three types of omega-3 fatty acids and are nutritionally important. Flaxseed is a rich source of dietary fiber (accounting 28%), both soluble as well as insoluble fibers. Flaxseed is the richest source of plant lignans (Thompson *et al.,* 1991). Besides having such a rich nutritional profile, the edible use of linseed in the country remains stagnant and the health benefits of the crop could not reach to people's diet.

The 'Linen' obtained from flax fibre is one of the best raw materials for textile.The best grades are used for linen fabrics such as damasks, lace and sheeting. Flax fibre is strong, non-lignified, soft, flexible, lustrous, shining, pale yellow colour and possesses high water absorbency quality. Flax contains 80-90% cellulose. It is valued for strength and durability excelling cotton and stronger than cotton, rayon or wool

Materials and Methods

The experimental materials comprised of 25 lines of flax type linseed genotypes in the germplasm accession of AICRP on linseed, Indira Gandhi Krishi Vishwavidyalaya, Raipur. The genotypes were obtained by phenotypic selection from the linseed germplasm pool. The experiment was laid out in a randomized block design with three replications. The entries were sown in one row each of 3m length with spacing of 30 cm between rows and 10 cm approximately between the plants the recommended packages of practices were followed for raising a healthy crop and all necessary plant protection measures were taken to control the pest and diseases. The observations were recorded for different qualitative and quantitative characters in linseed (based on Catalogue on linseed germplasm, Project Coordinating Unit (Linseed), C.S.A.U.A.&T. campus, Kanpur, 2010

Results and Discussion

The purpose of the present investigation was to generate information on morphological traits, which can throw light on the chances of further improvement of these genotypes either through selection or through hybridization programme. Analysis of variance for yield and yield attributing traits in linseed have been given in Table 1.

The table 2 indicated that the mean sum of squares due to genotypes was found to be significant for all the traits except for number of seeds per capsule. This indicates the presence of variability among linseed genotypes for yield and its contributing traits.

Genetic variability

Results of genetic variability revealed that in general, phenotypic coefficient of variation for all the traits under study was higher to their corresponding genotypic coefficient of variation indicating substantial influence of environment in the expression of characters (Table 2).

Estimation of genetic variability parameters

The information based on the nature of extent of genetic variation for desirable traits in selection for improvement of the crop.

The knowledge of genotypic and phenotypic coefficient of variation is being useful in designing selection criteria for variable population. Genotypic & phenotypic coefficient of variation of different characters is presented in the table.

Phenotypic and genotypic coefficient of variability

In general, it was noted that the value of phenotypic coefficient of variation were higher than genotypic coefficient of variation. The highest GCV was recorded for number of seeds per plant (17.16%) followed by seed yield per plant (16.39%), number of seeds per capsule (15.21%), 100 seed weight (14.90%), number of capsules per plant (8.61%), plant height (4.90%), days to 50% flowering(3.80%) and days to maturity (2.07%).. The highest PCV was recorded for number of seeds per plant (18.30%) followed by seed yield per plant (18.12%), number of seeds per capsule (16.80%), 100 seed weight (16.20%), number of capsules per plant (12.45%), plant height (5.17%), days to 50% flowering(3.94%) and days to maturity (2.12%).

The magnitude of PCV was higher than the corresponding GCV for all the traits. This might be due to the interaction of the genotypes with the environment to some degree or environmental factor influencing the expression of these traits. Close correspondence between phenotypic and genotypic coefficient of variation were observed i.e. sufficient variability among the traits is present among the genotype. Hence, the ample scope of improvement of these traits (Fig. 1).

Fig.1 Graphical representation of coefficient of variation for yield and its attributing traits in linseed

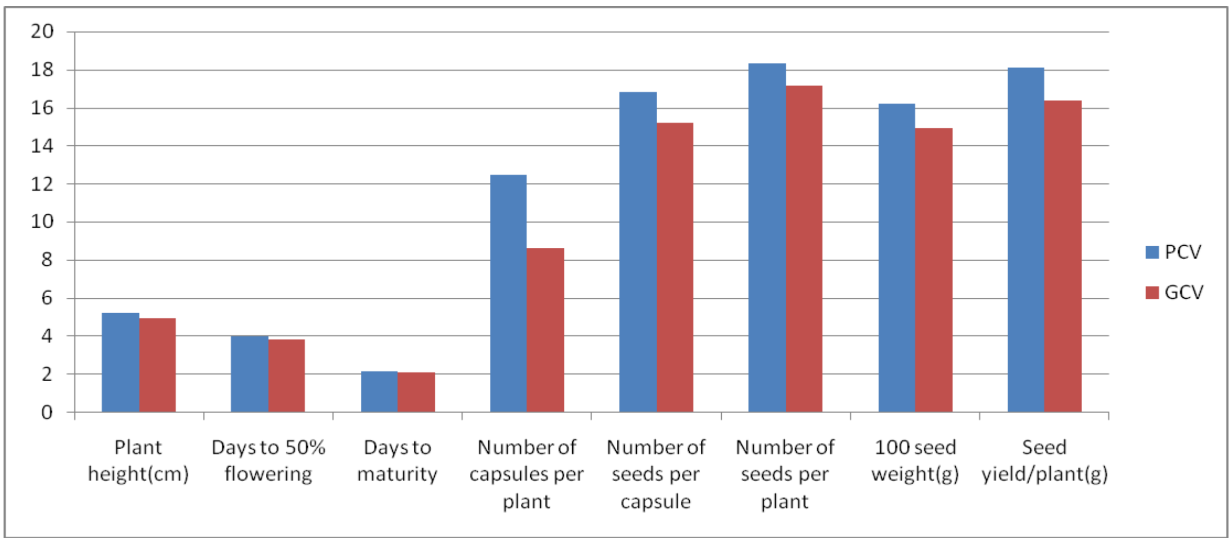

Table.1 Analysis of variance for yield and its contributing traits in flax type linseed genotypes at Raipur (C.G.)

S. no.	Source of variation	Df	Mean sum of squares							
			Plant height	Days to 50% flowering	Days to maturity	No.of capsules/plant	No.of seeds /capsule	No.of seeds /plant	100 seed weight	Seed yield/plant
1	RMSS	2	2.40	0.29	0.71	4.84	0.62	81.68	0.19**	43.55*
2	Genotypes MSS	24	57.20**	57.30**	61.02**	15.12**	4.07	2302.68**	0.75**	88.15**
3	EMSS	48	2.08	0.17	0.20	4.03	0.17	237.76	0.01	6.74

*-significant at 5% level of significance; **- significant at 1% level of significance

Table.2 Genetic parameters of variation for yield and yield contributing characters in flax type genotypes of linseed

s.no.	parameters → characters ↓	Mean	Range		Critical difference	Coefficient of variation		H^2 (bs)%	GA as percent of mean
			Max.	Min.		Pcv	Gcv		
1	Plant height(cm)	83.37	100.50	80.90	3.18	5.17	4.90	0.89	9.58
2	Days to 50% flowering	61.36	63.00	57.33	0.19	3.94	3.80	0.98	4.01
3	Days to maturity	110.48	118.00	103.00	0.13	2.12	2.07	0.87	7.07
4	Number of capsules per plant	22.32	28.33	17.67	4.38	12.45	8.61	0.47	93.48
5	Number of seeds per capsule	6.88	9.00	4.69	0.93	16.80	15.21	0.87	30.21
6	Number of seeds per plant	152.82	201.90	98.22	34.04	18.30	17.16	0.74	27.63
7	100 seed weight(g)	1.00	1.53	0.43	0.30	16.20	14.90	0.80	47.92
8	Seed yield/plant(g)	15.53	23.69	5.05	5.61	18.12	16.39	0.83	59.67

Heritability

The nature and extent of inherent capacity of a genotype for a character is an important parameter that determines the extent of any crop species. Genetic improvement of any character is difficult without having sufficient heritability. Estimates of heritability give some idea about the gene action involved in the expression of various polygenic traits. The selection should be effective if variance due to additive genes, estimated in terms of heritability. Heritability estimates remain extremely useful in the inheritance studies of quantitative traits.

The highest heritability estimate was observed for days to 50% flowering (98%) followed by plant height (89%), days to maturity (87%) and seed yield per plant (83%) indicating predominance of additive gene action in the expression of these traits. This being fixable in nature considerable progress is expected through appropriate selection scheme to be adopted. The findings are in agreement with the findings for days to 50 % flowering by Rao and Singh (1985); Singh (2001); Adugna and Labuschagne (2004); Ahemad *et al.*, (2014), for plant height Muhammad *et al.*, (2003), for number of capsules per plant Muhammad *et al.*, (2003); Kandil *et al.*, (2012), for 1000 seed weight Muhammad *et al.*, (2003); Kandil *et al.*, (2012); Ahemad *et al.*, (2014) and for seed yield per plant Muhammad *et al.*, (2003); Kandil *et al.*, (2012).

Genetic Advance (GA) as percent of mean

Genetic advance was calculated as % of mean. Genetic advance and heritability are the major factor in the improvement of mean genotypic value of selected plants over the parental population.

The success of genetic advance depends on genetic variability, heritability, selection intensity

The highest amount of genetic advance as percent of mean was observed for number of capsules per plant (93.48%) followed by seed yield per plant (59.67) and 100 seed weight (47.92%)

The minimum value of genetic advance was seen for days to 50% flowering (4.01%)

In conclusion, it was clear from the analysis of variance that variability existed among the yellow seeded linseed genotypes taken under study. The significant genetic variability in any breeding material is a prerequisite as it does not only provide a basis for selection but also provide some valuable information regarding selection of diverse parents for use in hybridization programme.

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How to cite this article:

Sonal Upadhyay, Nandan Mehta and Ashish Kumar Tiwari. 2019. Assessment of Variability among Flax Type Linseed Genotypes (*Linum usitatissimum* L.) of Chhattisgarh Plains. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 2633-2637. doi: https://doi.org/10.20546/ijcmas.2019.806.316