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ASSESSMENT OF ASSOCIATION ANALYSIS IN LINSEED FOR FLAX VARIETIES

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ABSTRACT

In light of the foregoing, 15 flax genotypes of linseed in the investigation, including check (JRF-5). The experiment was set up at RCBD with three replications. Observations for numerous agro-morphological features were conducted based on the linseed descriptor According to the association research, “a positive and significant relationship of flax fiber yield is favorably and significantly related to technical height. The longest flax fiber is measured 44.8 cm (FLAX-2018-5) and each plant produced 0.009g of fiber (FLAX-2018-1, FLAX-2018-9 and FLAX-2018-1). Plant height and technical height are positively and significantly correlated ,which implies that maximization of straw weight/plant may be obtained by selection for these two component variables. Genetic correlations along with phenotypic associations not only provide the idea about the extent of inherent association but also indicate how much of the phenotypically expressed correlation is influenced by the environment.

Key words : Correlation, Fiber, Flax, Technical height.

Introduction

Flax (*Linum usitatissimum* L.) belongs to the Linaceae family and is commonly referred to as “Alsi” or “Linseed.” 2n=30 is found in flax (*Linum usitatissimum* L.). It’s an annual *Rabi* oilseed crop that’s self-pollinated. It is grown for food, fiber, oil (yellow seeded linseed), and fiber (flax type linseed). Flax stem fibers are two to three times stronger than cotton fibers. Brown and yellow are the two primary colors/varieties of flax seeds (golden linseeds). The oil obtained from linseed, often known as linseed oil, come from flax seeds and is one of the oldest commercial oils. Flax fiber is obtained from the bast under the surface of the flax plant’s stem. Flax fiber is pliable, smooth and lustrous. Flax (*Linum usitatissimum* L.) belongs to the Linaceae family and is commonly referred to as “Alsi” or “Linseed.” 2n = 30 is found in flax (*Linum usitatissimum* L.). It’s an annual *Rabi* oilseed crop that’s self-pollinated. It is grown for food, fiber, oil (yellow seeded linseed) and fiber (flax type linseed). Flax stem fibers are two to three times stronger than cotton fibers. Brown and yellow are the two primary colors/varieties of flax seeds (golden linseeds). The oil obtained from linseed, often known as linseed oil, come from flax seeds and is one of the oldest commercial oils. Flax fiber is obtained from the bast under the surface of the flax plant’s stem. Flax fiber is pliable, smooth, and lustrous. It is a food and fiber crop that is grown in colder climates across the world. Flax is also known as “unspun fibers of the flax plant” and it has a wide range of applications, including seed for industrial, food, and feed purposes. Flax is largely utilized in the manufacturing of oil in North America, which is often utilized in coating goods like paints and varnishes. Linoleum flooring is made from flax oil, which is also utilized in the production process. Furthermore, because of its health advantages, interest in flax oil and seed as food items has grown. Flax seeds have a high concentration of á-linolenic acid and omega-3 fatty acid that is considered important for human health. The fiber is commonly used in linen for textiles, thread/rope, and packaging materials; paper for cigarettes, currency notes and artwork; and paper for cigarettes, currency notes and artwork (Mackiewicz-Talarczyk *et*

al., 2008). The strength, repeating flexibility, non-elasticity, and recyclable nature with a low density made it ideal for use as a rope or thread. The oil derived from the seeds has special drying qualities that make it useful in varnish, inks, paints and linoleum flooring manufacture (Newkirk, 2008 and Czemplik *et al*., 2011).

Materials and Methods

During the *rabi* season 2020-21, field tests were carried out in 15 flax linseed genotypes, including one check (JRF-5), using a randomised full block design with three replications. The genotypes were acquired from the All India Coordinated Research Project (AICRP) on Linseed, which is based at the Research Cum Instructional Farm, Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. All Flax-type linseed genotypes, including one check (JRF-5). The genotypes were acquired from the All India Coordinated Research Project (AICRP) on Linseed, which is based at the Research Cum Instructional Farm, Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. In this experiment, findings on features linked to fiber yield and its components Traits based on linseed descriptor, Kanpur (2010) "National guidelines for the conduct of tests for distinctness, uniformity, and stability in linseed, India" issued as per Catalogue on linseed germplasm, Project Coordinating Unit (Linseed), Kanpur (2010) must be recorded. The following characteristics were considered. Plant height (cm), technical height (cm), stem diameter (mm), fibre length (cm), fibre yield per plant (g) and linear density (tex).

Genetic statistical analysis

Correlation coefficient analysis have been carried out with the aid of following formula given by Miller *et al*. (1958), Hanson *et al*. (1956) and Johnson *et al*. (1955).

The component of genotypic co-variance among two characters and the component of phenotypic co-variance were obtained in the same way like for the component of variance. This co-variance was utilized to evaluate phenotypic and genotypic association among the pair of traits are as follows:

Genotypic correlation coefficient between character x and y

$$r_{xy(g)} = \frac{Cov(g)X.Y}{\sqrt{\sigma}(g)X \times \sigma^2(g)Y}$$

Where,

$r_{xy}(g)$ = Genotypic correlation coefficient between x and y

$Cov_{(g)}xy$ = Genotypic covariance between x and y

$\sigma^2_x(g)$ = Genotypic variance of character x

$\sigma^2_y(g)$ = Genotypic variance of character y

Phenotypic correlation coefficient between character x and y

$$r_{xy}(p) = \frac{Cov_{(p)}X.Y}{\sqrt{\sigma}(p)X \times \sigma^2(p)Y}$$

$r_{xy}(p)$ = Phenotypic correlation coefficient between x and y

$Cov_{(p)}xy$ = Phenotypic covariance between x and y

$\sigma^2 X_{(p)}$ = Phenotypic variance of character x

$\sigma^2 Y_{(p)}$ = Phenotypic variance of character y

Testing for significance of correlation coefficients

't' test was applied to test the significance of correlation coefficients. 't' values were estimated by using the following formula:

$$T = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

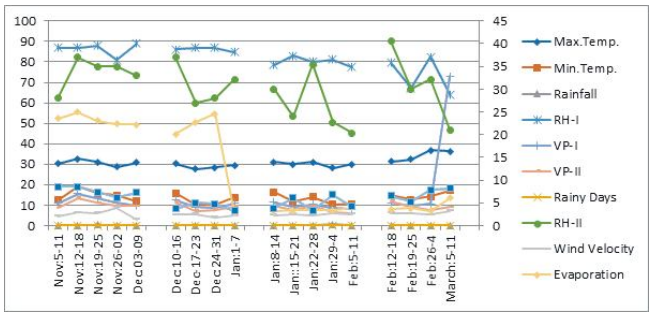

Fig. 1 : Graphical representation of weekly meteorological data during *Rabi* crop periods (2020-21).

Table 1 : List of Genotypes.

S. no.	Genotypes	S. no.	Genotypes
1.	FLAX-2018-1	9.	FLAX-2018-9
2.	FLAX-2018-2	10.	FLAX-2018-10
3.	FLAX-2018-3	11.	FLAX-2018-11
4.	FLAX-2018-4	12.	FLAX-2018-12
5.	FLAX-2018-5	13.	FLAX-2018-13
6.	FLAX-2018-6	14.	FLAX-2018-14
7.	FLAX-2018-7	15.	JRF-5©
8.	FLAX-2018-8		

Comparing the 't' values at (n-2) degree of freedom, we test the significance of correlation coefficient (r). If calculated value of t is higher than the tabular value of 't' at (n-2) degree of freedom at given probability level, the coefficient of correlation is considered significant.

Results and Discussion

Estimation of genetic correlations along with phenotypic associations not only provides the idea about the extent of inherent association but also indicate, how much of the phenotypically expressed correlation is influenced by the environment. The genotypic correlation reflects either the pleiotropic action of genes or linkage or both. Correlation coefficient measures the mutual relationship between various characters and determines the component characters on which selection can be based for genetic improvement of yield. From the results, it was clear that the genotypic correlation was greater than the phenotypic correlation, indicating environmental influence on the association of characters correlation coefficients. Plant height is positively and significantly correlated (r_g = 0.50**) with technical height genotypically. "Straw weight per plant was significant and positive correlated with each of plant height, technical length". Also, plant height exhibited positive correlation with technical length indicating that maximization of straw weight/plant may

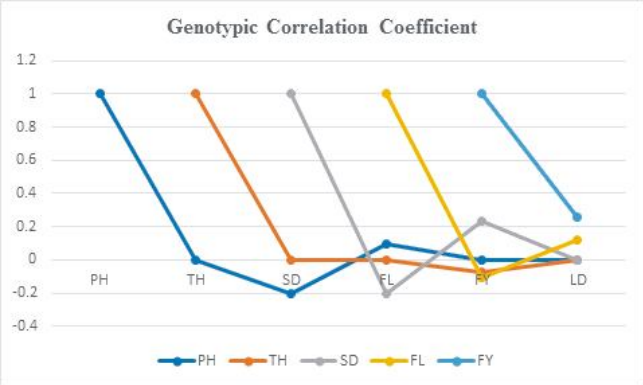

Fig. 2 : Graphical representation of Genotypic Correlation coefficient.

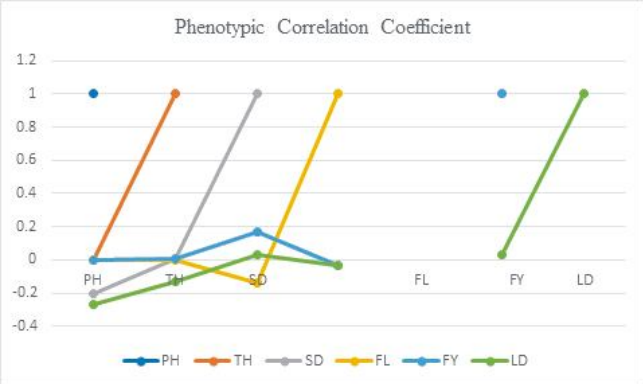

Fig. 3 : Graphical representation of Phenotypic Correlation Coefficient.

Plate 1 : Linseed Field view. **Source:** Research cum Instructional Farm, Department of Genetics & Plant Breeding Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh.

Table 2 : Genotypic correlation coefficient for fibre yield and its contributing characters for flax during 2020-21, Raipur (C.G.), India.

	PH	TH	SD	FL	FY	LD
PH	1.00	0.50**	-0.20	0.10	-0.64**	-0.42**
TH		1.00	0.00	-0.37*	-0.07	-0.31*
SD			1.00	-0.20	0.23	-0.45**
FL				1.00	-0.11	0.12
FY					1.00	0.26

Table 3 : Phenotypic correlation coefficient for fibre yield and its contributing traits of flax during 2020-21, Raipur (C.G), India.

	PH	TH	SD	FL	FY	LD
PH	1.00	0.46**	-0.20	0.00	-0.44**	-0.27
TH		1.00	0.01	-0.31*	0.01	-0.13
SD			1.00	-0.14	0.17	0.03
FL				1.00	-0.03	-0.03
FY					1.00	0.03
LD						1.00

PH- Plant height
TH- Technical height
SD- Stem diameter
FL- Length of fibre
FY- Fibre yield
LD- Linear density
Significant at 5%-(*)
Significant at 1%-(**)

be obtained by selection for these two component variables. These results are in harmony with both of Abo El-Zahab *et al.* (1994) and Abo-kaied *et al.* (2006). Technical height is positively correlated with stem diameter (r_g = 0.00) genotypically. Stem diameter is negatively correlated with fibre length (r_g = -0.20) genotypically.Fibre length is negatively correlated with fibre yield (r_g = -0.11) genotypically. Fibre yield is positively correlated with linear density (r_g = 0.26) genotypically. Range of technical plant height lies between "56.7cm in FLAX-2018-12 to 46.0 cm in FLAX-2018-4", which shows better performance than the best performing JRF-5© (54.0cm). The higher value for technical plant height was observed in "FLAX-2018-12" is 56.7cm. Plant height

is positively and significantly correlated with technical height (r_p = 0.46**), technical height is positively correlated with stem diameter (r_p= 0.01),stem diameter is negatively correlated with fiber length (r_p= -0.14). Fiber length is negatively correlated with fiber yield (r_p= -0.03), fiber yield is positively correlated with linear density (r_p= 0.03).

Conclusion

Flax type linseed genotypes were identified with good agro-morphological characters. This will help to initiate the research work with flax type linseed genotypes in our state.The considerable amount of variability in any breeding material is essential, as it is having an added benefit, which will not only provide basis for selection but also provide some valuable information about selection of diverse parents used in hybridization programmes. In order to make the selection effective one has to give emphasis on the yield attributing traits.

References

Abo El-Zahab, A.A., Mourad N.K. and AboKaied H.M.H. (1994). Genotype – environment interaction and evaluation of flax genotypes. 1 straw yield. *Proc. 6th Conf Agron., Al-Azhar Univ., Egypt*, **1**, 129-152.

Abo-Kaied, H.M.H., Abd El-Dayem M.A. and Afaf E.A. Zahana (2006). Variability and covariability of some agronomic and technological flax characters. *Egypt J. Agric Res*., **84**, 1117-1132.

Burton, G.M. (1952). Quantitative inheritance in grasses. *Grassland Cong.*, **1**, 277285.

Czemplik, M., Boba A., Kostyn K., Kulma A., Mitula A., Sztajnert M., Wróbel Kwiatkowska, Zuk M., Jan J, Szopa J. and SkórkowskaTelichowska K. (2011). Flax engineering for biomedical application. In: *Biomedical Engineering, Trends, Research and Technologies* (eds. Komorowska, M.A. and Olsztynska-Janus S.). *InTech, Rijeka, Croatia*, pp. 407–434.

El-hariri, D.M., Hassanein M.S. and El-Sweify A.H.H. (2002b). Evaluation of some flax genotypes. 1- Seed yield, yield components and oil percentage. *Annals Agric. Sci., Moshtohor*, **40(1)**, 13-25.

Johnson, H.W., Robinson H.F. and Comstock R.E. (1955 a). Estimates of genetic and environmental variability in linseed. *Agron. J.*, **47**, 477-483.

Mackiewicz-Talarczyk, M., Barriga-Bedoya J., Mankowski J. and Pniewska I. (2008). Global Flax Market Situation. *ID 97 International Conferences on Flax and Other Bast Plants*, 408-412.

Newkirk, R. (2008). Flax Feed Industry Guide. *Flax Canada*, 2015.

Panse, V.G. and Shukatme P.V. (1967). *Statistical methods for agricultural workers*. 2nd ed. New Delhi: Indian Council of Agricultural Research, 381p.

Patel, N. and Rao S.S. (2009). Association analyisis for seed yield and its components in linseed (*Linum usitatissimum* L.). *J. Agril. Issues*, **14(1)**, 93- 96.