Electronic Journal of Plant Breeding,
ISSN 0975-928X
Vol 7 No 2 DOI: 10.5958/0975-928X.2016.00053.3

Correlation and path coefficient analysis of economically important traits in Linseed (*Linum usitatissimum* L.) germplasm

R.B.Gudmewad[1], S.G.Khandagale[1], Kumara Swamy R.V [2], Swati[2]

[1]Department of Genetics and Plant Breeding, VNMKV, Parbhani- 413 403, India;
[2]Department of Agricultural Biotechnology, MPUAT, Udaipur- 313 001, India.
e-mail: sgkhandagale@yahoo.com

(Received: February 2015, Accepted: November 2015)

Abstract
Correlation study with 105 linseed germplasms showed that seed yield exhibited highly positive significant correlation with number of primary branches per plant, number of secondary branches per plant, number of capsule per plant, number of seed per capsule. Significantly inter correlation among traits is useful for breeding programme to improve of yield and its components. Path analysis revealed that the characters *viz.,* 1000 seed weight, number of seed per capsule, number of primary branches per plant, plant height had highly positive direct effect with seed yield. The inter-relationship among these characters might be used in the breeding programme to exploit the yield potential and to develop high yielding improved varieties with ease and target oriented research.

Key words: Linseed, Correlation, Path Coefficient.

Introduction

Linseed, (*Linum usitatissimum* L.) n=15, also called flax is an important oilseed crop grown for both seeds and fibers which belongs to the family linaceae having 14 genera and over 200 species. *Linum usitatissimum* is the only widely grown and economically important species. It is believed that this crop species may have originated from *Linum angustifolium* Huds (n=15), native to the Mediterranean region. is one of the oldest plant species cultivated for oil and fiber. The crop is predominantly self-pollinated, but out crossing (less than 2%) occasionally results from insect activity. Linseed seed contains good percentage of oil which varies from 33 – 47 percent in different varieties. Linseed is the best source of omega-3 fatty acid and it is essential as it cannot be synthesized by body but must be supplemented directly by foods. Selection is an integral part of a breeding programme by which genotypes with high productivity in a given environment could be developed. However, selection for high yield is made difficult because of its complex nature. Yield per unit area is the end product of components of several characters, which are polygenic in inheritance and thus are highly influenced by environment. Therefore, only little progress could be made over a long span of time through direct selection for yield. Indirect selection of yield components has been proved more effective. Yield is governed by many physiological processes within the plant and influenced by many environmental factors. Therefore, direct selection for yield as such will not give proper result. Knowledge of correlation and path analysis help plant breeder to ascertain the real components of yield and provide an effective basis of phenotypic selection.

Materials and Methods

The present investigation was carried out on linseed germplasm at experimental farm of Oil seed Research Station, Latur. (Maharashtra) India during winter (*rabi*) season of 2011-2012 under irrigated and normal soil condition. The experiment was laid in Augmented Block Design with 100 genotypes of linseed and five checks *viz.,* NL-97, INDIRA ALSI-32, JLS-9, PADMINI and T-397. Each plot was consisted of single row of 3 m length consisting five blocks, following inter and intra row spacing of 30 cm and 5 cm, respectively. The data were recorded from 5 randomly selected competitive plants from each plot on 10 distinct morphological characters. The data on Days to 50% Flowering, Days to maturity, Plant height (cm), No. of Primary Branch per plant, No. of Secondary Branch per plant, No. of capsules per plant, No. of seeds per capsule, 1000 seed weight, oil content,

seed yield per plant were recorded for statistical analysis. The correlations between yield and its contributing traits were estimated using the method described by Johnson *et al.* (1955) and the estimates of direct and indirect contribution of various characteristics to seed yield were calculated through path coefficient analysis as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

Results and Discussion

Correlation

The correlation coefficient provides symmetrical measurement of degree of association between characters. It determines character association for improvement yield and other economic characters. Seed yield is being an important and complex character and it is a function of several component characters. It is also essential to find out relative contribution of each of the component character to yield, so as to give weightage during selection. In the present investigation, simple correlation coefficients were computed among 10 characters presented in Figure 1 and Table 1.

The results revealed that significant positive association of seed yield per plant existed with number of primary branches per plant (0.363), number of secondary branches per plant (0.317), number of seed per capsule (0.235) and 1000 seed weight (0.319) where as it was negative with days to 50 percent flowering which allows early flowering. These results are in conformation with Muhammad Akbar *et al* (2001), S J Savita *et al* (2011), Tadele Tadesse *et al* (2009), Deepak Gaurah and S S Rao (2011). Days to 50 percent flowering ~~was~~ had positively significant association with days to maturity and plant height, whereas negative significant association with number of secondary branches per plant and 1000 seed weight. Number of primary branches per plant positively and significantly associated with number of secondary branches per plant. Number of capsule per plant exhibited positive and highly significantly associated with number of seeds per capsule. Similar results were ~~report~~ also reported by Khem singh and Gill (1959), S J Savita *et al* (2011). Days to maturity had negative association with 1000 seed weight. These results are in agreement with previous results by Joshi *et al.* (1960) and ~~S G~~ Savita *et al.* (2011).

Plant height was significantly and positively associated with number of capsule per plant while it had positive but non-significant correlation with number of secondary branches per plant, number of seed per capsule and yield per plant. Similar result also reported by Muhammad Akbar *et al* (2001), Kurt (1996) and Mahato (1998). Number of capsule per plant had positive significant association with number of seed per capsule and positive non-significant with oil content. 1000 seed weight was positive and highly significant with seed yield per plant. Number of seed per capsule was positively significant with seed yield per plant and oil content showed positively non-significant with seed yield per plant. Same result was reported by Muhammad Akbar *et al* (2001). Correlation does not reflect the clear picture of contribution of each component traits. At the same time, as more variables are included in association studies, the direct association becomes complex. Under such situation, path coefficient analysis permits separation of correlation coefficients into components of direct and indirect effects. Partitioning of total correlation into direct and indirect effects provides actual information on contribution of characters and thus forms the basis for selection to improve the yield.

Path coefficient analysis

The linear relationship between yield and its component traits can sometime posea confusing pic ture as correlations are calculated often without taki ng into account the precise nature of interrelationsh ip of the variables in question. Therefore the path analysis gives much more realistic interpretation of the factors involved. To establish a cause and effect relationship, genotypic and phenotypic correlation coefficients were portioned into direct and indirect effects by path analysis as suggested by De Wey Lu (1959).

The result of path coefficient analysis revealed that the character plant height (0.114), number of primary branches per plant (0.267), number of seed per capsule (0.193) and 1000 seed weight (0.282) had highest direct effect on seed yield followed by number of secondary branches per plant (0.050), number of capsule per plant (0.084) and oil content (0.072) confirming the positive association and are the major determinants of seed yield. The above results are confirming with the finding of Deepak Gauraha and S S Rao (2011), Singh (1980) and Yadav (2001). The plant height had positive direct

effect on seed yield as well as positive association with seed yield. The negative direct effect of days to 50 percent flowering was observed on seed yield per plant (-0.116) confirming the negative correlation with seed yield as presented in Figure 2 and Table 2. The characters identified above as important direct and indirect contributors on seed yield are helpful for consideration in formulating selection in linseed for developing high yielding varieties.

Future breeding programme

In this investigation desirable variability has been observed. Estimates of genotypic and phenotypic coefficient of variation indicated significant variability for the traits like seed yield per plant, 1000 seed weight, number of capsule per plant, number of secondary branches per plant which indicates good scope for genetic improvement of these traits. Yield contributing characters like number of seed per capsule, number of capsule per plant, 1000 seed weight, number of primary branches per plant, plant height had highest direct positive effect on seed yield. Based on the studies of association and path effects, the traits *viz.*, number of capsule per plant, 1000 seed weight, number of secondary branches per plant, number of seed per capsule and plant height ~~are are~~ the major determinants of seed yield.

References:

Johanson. H.W., Robinson, H.F. and Comstock R.C. (1955). Genotypic and phenotypic correlation in soybean, Agron. 47:477-483

Dewey D. R. and Lu K. H. (1959). Correlation and path coefficient analysis of component crested wheat grass seed production. Agron. J. 51: 515 – 518.

Muhammad Akbar; Norul Islam khan & Khalid Mahmood Shabir (2001). Correlation and Path coefficient studies in *linseed; J. of biological sci*. 1 (6): 446-447.

Savita S. J; Kenchanagoudar P. V; Rudranaik V. (2011). Correlation and path analysis in linseed. *Karnataka J. Agric. Sci.* 24(3): 382-386.

Tadesse T; H. Singh and B. Weyrssa (2009). Correlation and Path coefficient analysis among seed yield traits and oil *International J. Crop Production* 4(4) 08-16

Deepak Gaurah and S. S. Rao (2011). Analysis of yield Characters in linseed *Res. J. of Agric. Sci.*, 2(2):258-260.

Khem Singh Gill and Gursham Singh (1959). Correlation study in a cross between K2 and improved variety and a local Punjab variety of linseed. *Indian J. of Genetics and Plant Breeding.24 (3)* 210 – 219.

Joshi A. B; S. Kedarnath and M. G. B. R Batcha (1960). Correlation studies in *Linum usitatisimum.* Effect of morphological grouping of types on the correlation coefficients relating to oil content and oil quality. *Indian J. of Genetics and Plant Breeding.* 20; 69-78.

Kurt O. (1996). Study on the yield and yield component and agronomic characters of linseed cultivars. *Ondokuzmays Universities. Ziraat Fakultesi dergisi.* 11(1); 87-92.

Mahato J. L. (1998). Correlation and genetic divergence in rainfed linseed. *Madras Agric. J.* 85 (3):154 – 157.

Singh K. N. (1980). Path analysis in linseed under sodic soil conditions. *Indian J. of Genetics and Plant Breeding*. 40 (2) 385-387.

Yadav R. K. (2001). Association studies over locations in linseed, *Progressive Agriculture*, 1(1); 11-15.

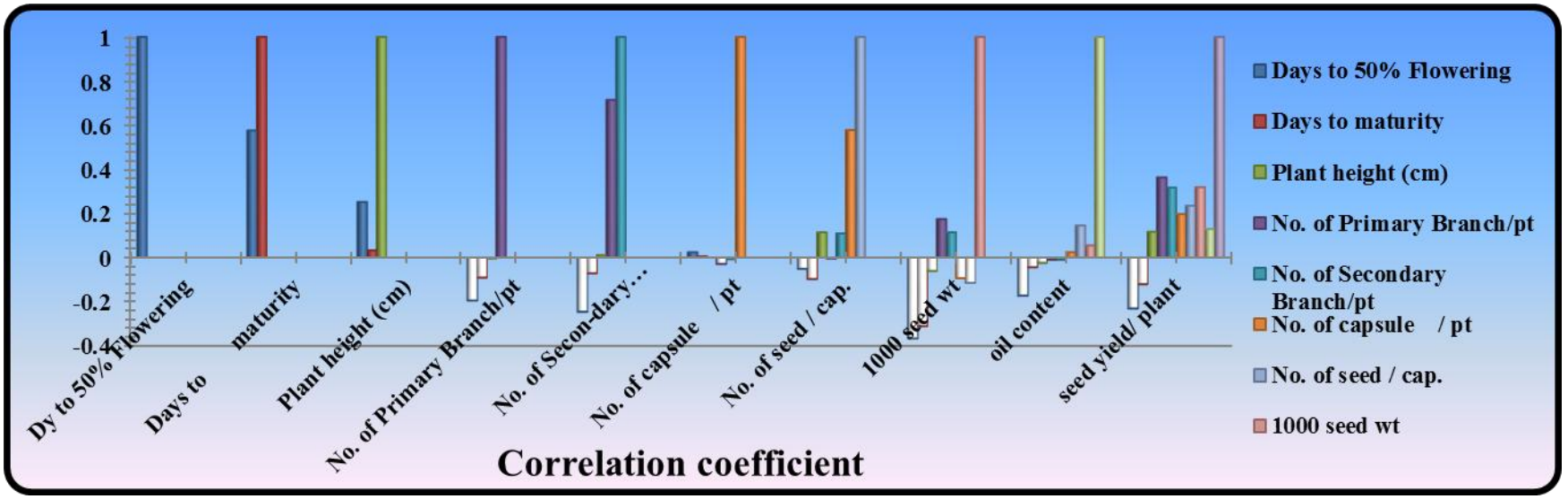

Figure 1: *Shows the correlation among yield contributing traits*

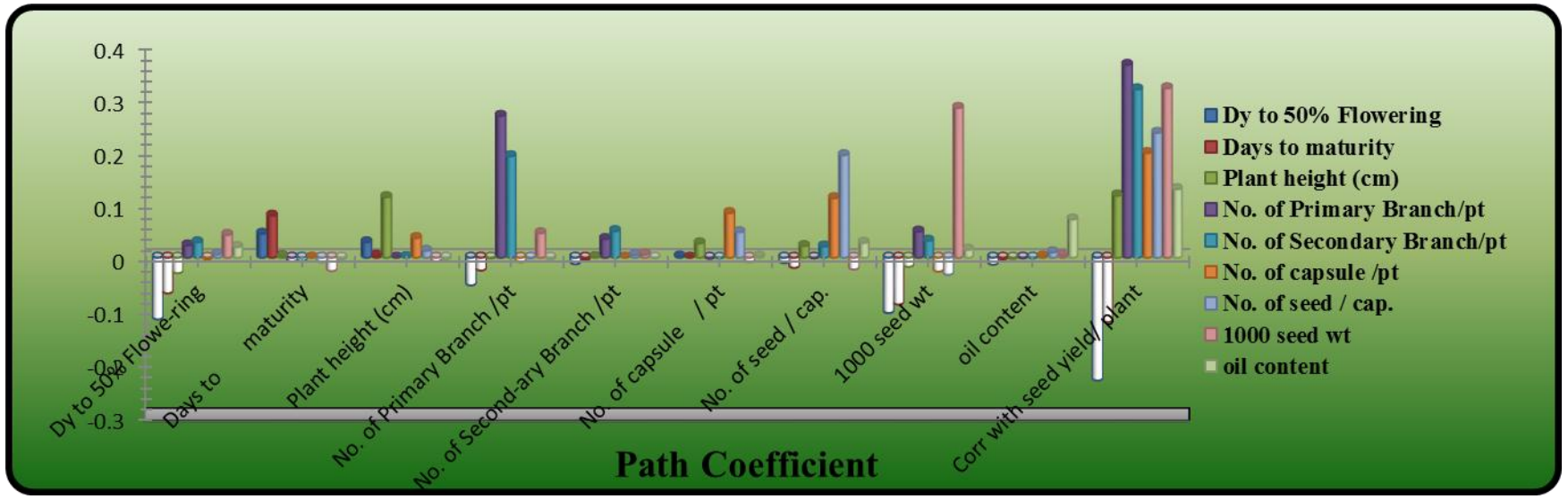

Figure 2: ***Shows the direct and indirect effects of different traits***

Table 1: Correlation coefficient of yield with yield contributing characters

Sr. No.	Characters	Days to 50% Flowering	Days to maturity	Plant height (cm)	No. of Primary Branches/plant	No. of Secon-dary Branches/ plant	No. of capsules / plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	seed yield/ plant (g)
1	Days to 50% Flowering	1.000	0.576**	0.252*	-0.195	-0.246*	0.024	-0.051	-0.367**	-0.173	-0.231*
2	Days to maturity		1.000	0.033	-0.091	-0.071	0.005	-0.097	-0.311**	-0.044	-0.121
3	Plant height (cm)			1.000	-0.004	0.011	0.323**	0.114	-0.061	-0.024	0.117
4	No. of Primary Branches/plant				1.000	0.715**	-0.029	-0.004	0.174	-0.010	0.363**
5	No. of Secondary Branches/plant					1.000	-0.007	0.109	0.114	-0.010	0.317**
6	No. of capsules / plant						1.000	0.578**	-0.094	0.024	0.197
7	No. of seeds / capsule							1.000	-0.115	0.145	0.235*
8	1000 seed weight(g)								1.000	0.055	0.319**
9	oil content (%)									1.000	0.129
10	seed yield/ plant (g)										1.000

Table r (5%) = 0.2074
Table r (1%) = 0.270
* - significant at 5% level
** - significant at 1% level

Table 2: Path analysis of direct and indirect effects of different quantitative characters

Sr. No.	Characters	Days to 50% Flowe-ring	Days to maturity	Plant height (cm)	No. of Primary Branches/plant	No. of Secon-dary Branches/ plant	No. of capsules / plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	seed yield/ plant (g)
1	**Days to 50% Flowering**	**-0.116**	0.045	0.029	-0.052	-0.012	0.002	-0.010	-0.104	-0.013	-0.231*
2	**Days to maturity**	-0.067	**0.079**	0.004	-0.024	-0.004	0.000	-0.019	-0.088	-0.003	-0.121
3	**Plant height (cm)**	-0.029	0.003	**0.114**	-0.001	0.001	0.027	0.022	-0.017	-0.002	0.117
4	**No. of Primary Branches/plant**	0.023	-0.007	0.000	**0.267**	0.035	-0.002	-0.001	0.049	-0.001	0.363**
5	**No. of Secondary Branches/plant**	0.029	-0.006	0.001	0.191	**0.050**	-0.001	0.021	0.032	-0.001	0.317**
6	**No. of capsules / plant**	-0.003	0.000	0.037	-0.008	0.000	**0.084**	0.112	-0.026	0.002	0.197
7	**No. of seeds / capsule**	0.006	-0.008	0.013	-0.001	0.005	0.048	**0.193**	-0.032	0.010	0.235*
8	**1000 seed weight(g)**	0.043	-0.025	-0.007	0.046	0.006	-0.008	-0.022	**0.282**	0.004	0.319**
9	**oil content (%)**	0.020	-0.003	-0.003	-0.003	-0.001	0.002	0.028	0.015	**0.072**	0.129

Residual effect = 0.834

$\mathbf{R^2}$ = 0.304558

*** - significant at 5% level**

**** - significant at 1% level**