http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet

Asian Network for Scientific Information

308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (2): 328-329, 2000

Factor Analysis of Seed Yield in Linseed

Noor-ul-Islam Khan, Nasim Iqbal Sajid Rasul and Shazia Fazal[1]
Ayub Agricultural Research Institute, Faisalabad.
[1]University of Agriculture, Faisalabad, Pakistan.

Abstract: Correlations in twenty genotypes of linseed (*Linum usitatissimurn* L.) were used for factor analysis, based on seed yield and five yield contributing traits, through the principal component method. The seed yield was positively associated with other traits, however, significantly only with number of seeds per pod and number of pods per plant. Three factors accounted for 94 percent of the variation. Factor-I included number of branches per plant; Factor-II, number of seeds per pod and Factor-III, 1000 seed weight and plant height. Thus, traits related with seed yield were affected by different factors. Number of seeds per pod in Factor-II appeared to be the most important yield component. Direct improvement in this character would improve seed yield potential without affecting other plant characters.

Key words: Factor Analysis, Linseed, Correlation Analysis.

Introduction

Linseed oil and seed is traditionally being used in Pakistan since long for various therapeutic purposes and in special dishes. Its demand has increased manifold due to extensive potential diversified uses particularly in paints and instant drying inks. To meet industrial demand of linseed, current breeding efforts have to be accelerated to achieve vertical increase in production.

Sound linseed breeding endeavor requires information on the correlation structure of yield components (Agrawal *et al*., 1994; Muduli and Patnaik, 1994). Walton (1972) found that factor concerned with the flag leaf area and duration was the most important among the 14 traits. Tikka and Asawa (1978) used correlations in 28 genotypes for factor analysis in lentil through the principal component method and found that all traits related with yield were affected by a common factor. A multivariate factor analysis based on grain yield and 7 yield contributing characters in 31 genotypes of triticale showed spikes/plant to be the most important yield component (Sethi *et al*., 1979).

Factor analysis is a powerful method because of its ability to evoke underlying multivariate structures and for the clean cut conciseness with which these may be delineated (Draper and Smith, 1981; Harman, 1968; Siegel, 1992). Selection pressure modifies the relative contribution of character composition in factor in crop plants. The study of such factors is of importance in scarcely studied crop such as linseed to develop a meaningful method of selection of desirable genotypes. The present paper contains the results of such a study.

Materials and Methods

Twenty linseed genotypes were evaluated for six agronomic trials i.e., plant height (cm), number of branches per plant, number of pods per plant, number of seeds per pod,1000-seed weight (gm) and seed yield per plant (gm). Experiment was laid out following randomized complete block design under three replications keeping plot size of 4m x 1.8m per entry maintaining between row and plants within row spacing of 30 and 10 cm, respectively. Data on six traits were recorded from 10 well guarded plants and their mean values were used for factor analysis using statistics 4.0 package (Siegel, 1992), based on procedure out-lined by Harman (1968) and further elaborated by Draper and Smith (1981). In factors analysis, correlations were used for computing factors through the method of principal component analysis. The high factor loadings of various characters under a factor were grouped together and on the basis of the extent of variability explained in the dependent structure (grain yield), these factors were ranked. The factor analysis was terminated when nearly 95% of the total variation was accounted for.

Results and Discussion

The correlation coefficients matrix for six characters estimated in 20 linseed genotypes are shown in Table 1. Out of 15 pairs of characters, correlations of number of pods per plant with seed yield per plant and number of seeds per plant with seed yield per plant were highly significant while remaining 13 were non-significant. Furthermore, the correlations of plant height, number of branches per plant and number of pods per plant with 1000-seed weight were negative whereas other 12 were positive. Agrawal *et al*. (1994) and Harman (1968) observed the characters affecting yield are themselves intricately correlated and selection pressure on any one may affect the other, resulting in slow progress from selection. Therefore, intensity of selection for more pods per plant and more seeds per pod should be keeping in view both traits association with other traits affecting yield. Draper and Smith (1981) and Harman (1968) applied factor analysis which removes effect of multi collinearity on character association enabling breeders to apply selection per changing population structure in favourable direction.

The results of Factor analysis are shown in Table 2. Four factors accounted for 94 percent of the variability in the seed yield per plant. Factor-I which explained 37.3 percent of the variability included number of branches per plant as a major factor loading besides number of pods per plant and plant height with positive factor loadings, while this factor had negative effect on 1000-seed weight.

Factor-II explained 26.8 percent of the variation and included per-dominantly number of seeds per pods loading. This factors affected all other characters positively except negative low effect on plant height.

The third factor accounted for 19.2 percent of the variability and included two positive factor loading i.e., plant height and 1000-seed weight. This factor had negligible effect on other 3 characters. Factor IV which accounted for 10.6 percent of the variation included no major positive factor loading but it has high positive effect on number of branches per plant and number of seed per plant. However, it included main negative factor loading contributed by number of pods per plant. Therefore, due to such extreme contrasting values, factor IV is of little practical significance.

In this study number of branches per plant were affected by three factors (I, II, IV) and it had low positive correlation with seed yield. It is of little selection value as Sethi *et al*. (1979) explained that a

Table 1: Estimates of correlation coefficients between six characters in linseed.

Characters	Plant height	Branches/ plant	Pods/ plant	Seeds/ pod	1000 seed weight	Seed Yield/plant
Plant height	-	0.329[NS]	0.214[NS]	-0.257[NS]	-0.043[Ns]	0.113[NS]
Branches/plant	-	-	0.436[NS]	0.096[NS]	-0.415[NS]	0.301[NS]
Pods/plant	-	-	-	0.252[NS]	-0.209[NS]	0.855**
Seeds/pod	-	-	-	-	0.296[NS]	0.635**
1000-seeds weight	-	-	-	-	-	0.196[NS]
Seed yield/plant	-	-	-	-	-	-

NS = Non-significant ** = Significant at 1% level.

Table 2: Factor analysis in linseed.

	Factors			
Characters	I	II	III	IV
Branches/plant	0.615	0.134	-0.058	0.609
Pod/plant	0.501	0.417	0.047	-0.735
Plant height	0.398	-0.253	0.762	0.069
Seeds/pod	-0.060	0.805	-0.024	0.287
1000-seed weight	-0.456	0.311	0.642	0.037
Eigen Value	1.866	1.342	0.960	0.531
Variance (%)	37.30	26.80	19.200	10.600
Cumulative percent of variance.	37.30	64.20	83.300	94.000

The underlined net correlations are the highest correlations for the concerned character.

character affected by a large number of factors may not be easily manipulated as only one factors. Number of pods per plant (r with yield = 0.855**) displayed contrasting values to that of number of seeds per pod and 1000-seed weight in 3 factors. In such scenario as observed by the Tikka and Asawa (1978), gain in yield improvement is difficult.

Selection pressure on number of seeds per pod may be the best strategy as it is the main factor loading in Factor-II with no major effect on other trials and it had positive correlation with all other traits except plant height. Selection for one or two traits influencing yield is more desirable in the absence of multi collinearity (Tikka and Asawa, 1978; Walton, 1972). Factor analysis in the present study proved helpful in suggesting emphasis on improvement in number of seeds per pod for improvement in yield while selection in linseild populations.

References

Agrawal, K.K., J.P. Tiwari and K.K. Jain, 1994. Correlation and regression analysis in linseed (*Linum usitatissimum* L.). Adv. Plant Sci., 7: 351-355.

Draper, N.R. and H. Smith, 1981. Applied Regression Analysis. 2nd Edn., John Wiley and Sons, New York, pp: 709.

Harman, R.H., 1968. Modern Factor Analysis. 2nd Edn., University of Chicago Prress, Chicago, pp: 135-185.

Muduli, K.C. and M.C. Patnaik, 1994. Character association and path-coefficient analysis in linseed (*Linum usitatissimum* L.). Orissa J. Agric. Res., 7: 5-11.

Sethi, G.S., B.M. Aswa, H.B. Singh and R.K. Asawa, 1979. Factor analysis of grain yield in triticale. Indian J. Agric. Sci., 49: 506-508.

Siegel, J., 1992. Statistics: Analytical Software. Version 4.0, SAS Institute Inc., St. Paul, MN., USA., Pages: 318.

Tikka, S.B.S. and B.M. Asawa, 1978. Factor analysis in lentil. Indian J. Agric. Sci., 48: 643-646.

Walton, P.D., 1972. Factor analysis of yield in spring wheat (*Triticum aestivum* L.). Crop Sci., 12: 731-733.