Corelation and regression studies in flax

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Two field experiments were laid out in the field of Giza Agric.Exp. Station to evaluate sixteen flax genotypes for total weight! plantand other eleven attributed characters during the two successiveseasons 1995/ 96 and 1996/ 97. The sixteen flax genotypes comprisedthe two commercial varieties Giza 7 and Giza 8, twelve localpronusmg strains introduced to microyield trails in addition to theIndian introduction Gawhar 552 and the Belgium introduction ArianeR3. The breeding materials can be classified as fourteen of dualpurpose type, one of oil type and one of fiber type.The objectives of this study were: (i) to throw the light on themagnitude of variability for total weight and its two main components,.i.e. straw yield and seed yield! plant in addition to earliness and otheryield component characters, (ii) to study the nature of phenotypic,genotypic and environmental correlation coefficients among totalweight/ plant and several important agronomic traits, (iii) to find outthe component characters that can be used as selection criteria toImprove total weight, straw and seed yields through path coefficientanalysis, (iv) to set up a prediction model for total weight! plant usingstepwise regression analysis, and (v) to use factor analysis todetermine the dependence structure of component characters whichcould be related to total weight! plant.- 102 -The results and conclusions obtained could be summarized asfollows:5. 1. Analysis of variance revealed that the sixteen flax genotypesdiffered significantly for total weightl plant, earliness, straw yieldand seed yield as well as their eight component characters in bothseasons.5.2. Mean performance of Giza 8 variety was higher than that ofGiza 7 for all characters under study except total weight and seedyield! plant where the mean values of the two varieties werealmost the same. However, the differences between the twocommercial varieties did not reach the level of significance for allstudied characters.5. 3. The four strains 2821 371 141 8, 329/21 18/7, 402/3/ 5/ 10 and402/ 211 201 3 gave higher total weight! plant than tile twocommercial varieties Giza 7 and Giza 8 in both seasons. However,the differences in total weight! plant between the four strians andthe two commercial varieties Giza 7 and Giza 8 only reached thelevel of significance in the second season, The former twostrains characterized by their relative earliness to the twoconunercial varieties. Therefore, these four strains arereconunended for commercial release as new outstandingcultivars.5. 4. The two flax strains 3291 2/ 23/ 6 and 402/ 3/ 3/ 10 were supenorin seed yield and its two main components, number of capsules/plant and 1000- seed weight for the first season or capsulesnumber and basal branches number/ plant for the second one. TheIndian introduction Gawhar 552 was the earliest genotype andexceeded all other genotypes for this character in both seasons.5. 5. Combined analysis for the data of the two seasons showedsignificant differences among the sixteen genotypes for totalweight! plant and its eleven related characters over both seasons.The component of variance due to years was significant for allcharacters under study except earliness and 1000- seed weight.On the other hand, genotype x year component of variance wasinsignificant for total weight! plant ant its eleven attributes.5. 6. Variability measurements exhibited wide range of means wihintotal weight! plant, earliness, straw yield and seed yield! plant aswell as their eight component characters. Heritability estimates inbroad sense ranged form 75.41 % for stem diameter to 99.88 % for1000- seed weight and almost similar values of PCV and GCV forall characters studied. Maximum genetic advance expressed aspercentage of mean was recorded in number of basal branches/plant followed by seed yield! plant, technical length and 1000-seed weight. On the other hand, values of expected geneticadvance for stem diameter, number of seeds/ capsule and earlinesswere comparatively low, however, these three characters hadhigh heritability estimates.5. 7. Significant positive phenotypic and genotypic correlationcoefficients were detected between: Total weight! plant and eachof straw yield, seed yield, stem diameter and 1000- seed weight.Straw yield! plant and each of earliness, plant height, technicallength, fruit zone length and stem diameter. Seed yield! plant andeach of capsule number and 1000- seed weight. Earliness andeach of plant height, teclmical length, fruit zone length and stemdiameter. Plant height and each of technical length, fruit zonelength, stem diameter, and seeds/ capsule. Technical length andeach of stem diameter and seeds/ capsule. Number of capsules/plant and 1000- seed weight.5. 8. Significant positive environmental correlations were detectedbetween total weight! plant and each of straw yield, seed yield!plant, stem diameter and number of basal branches/ plant. Strawyield with each of seed yield! plant, stem diameter, number ofcapsules and number of basal branches. Seed yield with stemdiameter, number of capsules and number of basal branches/plant. Stem diameter with number of capsules and number ofbasal branches/ plant. Number of capsules and number of basalbranches.5.9. Genetic path coefficient analysis of total weight! plant and itsrelated characters indicated that straw yield had the strongestpositive direct path to plant total weight followed by seed yield.The sources of both straw and seed yields as well as theirinteraction accounted for about 93.0 % of the total plant weightvariation. Adding up this value to the interaction of straw yieldwith earliness increased the contribution percentage to 97.29 % oftotal weight! plant variation.5. 10. Genetic path coefficient analysis of straw yield! plant and its fourcomponents showed that plant height had the strongest positivedirect effect followed by stem diameter. The direct path in percentof both plant height and stem diameter, in addition to theirinteraction accounted for 36.69 of plant straw yield variation. So,flax breeder should make efforts to combine in one plant genesthat are responsible for maximum plant height and large stemdiameter.5. 11. Genetic path coefficient analysis of seed yield! plant and its fourcomponents revealed that number of capsules/ plant had the largestpositive direct effect on plant seed yield, followed by 1000- seedweight and number of seed! capsule. The direct effects of numberof capsule/ plant and 1000- seed weight and their interactionaccounted for 68.18 percent of the total seed yield variation. Thisindicates that during the selection process more stress must be laidon capsules/ plant and 1000- seed weight to enhance seed yield inflax.5. 12. The stepwise regression analysis for total weight! plant and itseleven component characters indicated that the three variables, i.e,straw yield! plant, seed yield! plant and number of seeds/ capsulewere responsible for reducing most of the total weight! plantvanance. These three traits were responsible for reducing 98.08 %of the total weight! plant. On the basis of reducing time andefforts by using fewer characters, the equation which combinesstraw and seed yield! plant as well as number of seeds/ capsuleis considered the best prediction equation for total weight! plantsince they accounted for 96.94 % of the total weight! plant.5. 13. Factor analysis divided the eleven variables affecting totallyweight! plant into two groups or factors. Factor 1 consisted ofearliness, straw yield! plant, and its four components, i.e. plantheight, technical length, fruit zone length and stem diameter andaccounted for 55.18 5 of the total variability in the dependencestructure of total weight! plant. Factor 2 consisted of seed yield!plant and its two main components, i.e. number of capsules/ plantand 1000- seed weight, and accounted for 29.0 % of the totalvariability in the dependence structure of total weight! plant. Thusnearly 84.18 % of the variation in the dependence structure of totalweight! plant was explained by these two factors and theremammg 15.82 % being attributable to trait- specific effects anderrors.Generally, the three statistical methods used to investigate therelationship between total weight! plant and yield determining traitsemphasized that both straw yield and seed yield! plant are the mostimportant factors affecting total weight! plant, and that the firstcharacter was of higher importance than the second one. However,factor analysis provided more information than either path- coefficientanalysis or stepwise multiple linear regression due to groups ofvariables (factors) and percentage contribution of variables to eachfactor. Moreover, factor analysis clarified the relationship betweencorrelated characters in the dependence structure.