1. INTRODUCTION

Flax is grown in Egypt for two distinct products the linen fiber obtained from the stem and its seeds, which yield linseed oil and linseed meal. Lately, flax area in Egypt has been decreased and reached about 13,000 feddans in 1997/ 1998. The obvious fall in flax area is mainly due to the high competition between flax and other winter crops such as wheat and clover. To encourage flax cultivation it is necessary to increase yield per unit area and reconsider the price of flax.

In the course of the last thirty years, flax marketing has been entirely changed. Flax growers used to market the crop in two separate products, i.e. straw yield and seed yield, but now it is being sold as straw carrying capsules to flax processors. So, flax yield has become the total weight of harvested plants in tons per feddan.

The common aim of flax breeding programs is to increase yield potentiality. Flax breeders exerted efforts to improve both seed and straw yields through their components. However, studies which tackle the relative contribution of flax yield components and their importance to the total weight of flax plant are seldom done.

Since most of the characters of economic importance, such as yield are complex in inheritance and may involve several related characters the degree of genotypic and phenotypic correlation of characters is also important. These correlations are of interest from a practical value since selection is usually concerned with changing two or more traits simultaneously (Robinson *et al.*, 1951).

Usefulness of information obtained from correlation coefficients can be enhanced by partitioning them into direct and indirect effects for a set of a cause- and – effect interrelationship (Board *et al.*, 1997), A path coefficient is a standardized, partial regression coefficient that measures the direct effect of one trait upon another trait and permits the separation of a correlation coefficient into components of direct and indirect effects (Dewey and Lu, 1959). However, in path analysis when more variables were considered the indirect associations become more complex. Also, path analysis can not construct a prediction equation for a dependent variable such as yield. From this point of view, Draper and Smith (1966) suggested the stepwise multiple linear regression to overcome these limitations.

The stepwise multiple linear regression has been used by several researchers in different crops to determine the best variables that mostly reduced the variance of yield. This is done by introducing the variables in order of importance through a sequence of multiple regression equations in a stepwise manner. At each step variable is added to the regression equation, it is the one that causes the maximum reduction in the residual sum of squares and also the one having the highest partial correlation with the dependent variable adjusted for the variables added previously. Thus the order of adding more variables to the prediction equations is the one that has the highest relative contribution to the total variation of yield (R^2 %) and relatively includes fewer variables in order to reduce the time and efforts of measurements.

Although path- coefficient analysis and stepwise multiple linear regression are more informative and useful than simple correlation coefficients, Walton (1972) criticized these techniques. He demonstrated that partial and multiple regression are used to investigate a complexed and interlocking system made up from many traits. Such calculations yield information concerning the relative contribution of a number of independent variables to a dependent variable. So they require, however, that certain roles be assigned to some or all these factors. He warned of the possibility of reaching false conclusions by making incorrect choices which depend on the nature of the traits. He advocated the use of factor analysis as a statistical technique for grouping a large number of correlated variables into groups or main factors and their contribution percentage to the total variation in the dependence structure. Also, factor analysis is used to analyze the relationship between correlated characters .

Therefore, the main objectives of this investigation were:

(1) To throw the light on the magnitude of variability for total weight, straw yield and seed yield/ plant and other related traits.

(2) To study the nature of phenotypic, genotypic and environmental associations between plant total weight and other traits.

(3) To find out the component characters that can be used as selection criteria to improve total weight.

(4) To set up a prediction model for total weight/ plant, and

(5) To determine the dependence structure of total weight per plant.