CO-EFFICIENT OF DETERMINATION, COR-RELATION AND TREND ANALYSIS OF OKRA YIELD AND ITS YIELD COMPONENTS UNDER VARIOUS COMMERCIAL FERTILIZERS

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ABSTRACT

The statistical tools for co-efficient of determination, cor-relation and trend analysis were applied to predict the okra yield under different commercial fertilizers at Department of Statistics, Sindh Agriculture University, Tandojam. The results showed that okra yield was closely associated with branches per plant (r=0.67), plant height (r=0.93), fruit length (r=0.79), number of fruits per plant (r= 0.65) and weight of fruits per plant (r=0.95). The coefficient of determination between okra yield and branches per plant was $R^2=0.45$*, plant height* $R^2=0.87$*, fruit length:* $R^2=0.63$*, number of fruits per plant:* $R^2=0.42$ *and weight of fruits per plant:* $R^2=0.89$*. The regression model* $\hat{Y}=46.097+54.29x$ *showed that an increase of 54.29 kg* ha^{-1} *in okra yield was induced to unit increase in branches per plant. The regression model* $\hat{Y}=122.51+53.33x$ *showed that an increase of 53.33 kg* ha^{-1} *yield was accounted for unit increase in plant height. The regression model* $\hat{Y}=112.47+38.61x$*, that an increase of 38.61 kg* ha^{-1} *in okra yield was induced to increase in fruit length. The regression model* $\hat{Y}=36.89+278.59x$ *showed that an increase of 278.59 kg* ha^{-1} *in yield was induced by a unit increase in number of fruits per plant. The regression model* $\hat{Y}= 2.1068+34.632x$*, showed that an increase of 34.632 kg/ha of okra yield by unit increase in weight of fruits per plant. Thus, it was concluded that application of commercial fertilizer has significant role in the growth and yield contributing parameters which contribute to final fruit yield of okra.*

Keywords: Okra, Regression, Correlation, Trend Analysis, Coefficient of determination, R^2 -value, r, Height, Branches, Fruit, Yield.

INTRODUCTION

Okra, *Abelmoschus esculentus* L. Moench belongs to the family Malvaceae, originated from Abyassinia, an area that includes present day Ethiopia. Then okra was taken to North Africa, the eastern Mediterranean Arabia, and India (Rhodes, 2005). It is one of the important vegetable crops in Pakistan and many other countries of the world, and is a popular warm-season, annual vegetable. Its young tender pods are cooked in curries, stewed and used in soups. Okra is a good source of vitamins A, B, C and also rich in protein, minerals and iodine. The stem of the okra plant provides fiber that is used in the paper industries (Baloch, 1994). It is a power house of valuable nutrients, nearly half of which is soluble fiber in the form of gums and pectin. Soluble fiber helps to lower serum cholesterol, reducing the risk of heart diseases. The other half is insoluble fiber which helps to keep the intestinal tract healthy decreasing the risk of some forms of cancer, especially colorectal cancer. About 10 % of the recommended levels of vitamin B_6 and folic acid are present in a half cup of cooked okra. The ripe seeds of okra are sometimes roasted, ground and brewed as a substitute for coffee (Anonymous, 2005). Okra is often grown as a perennial in many tropical areas. Cultivars vary in plant height, shape and color of the pod. Most cultivars are adapted to high temperature and wide range of soil types. It is also tolerant to wide variations in rainfall (Anonymous, 2005). The yield of this crop is not satisfactory in Pakistan as well as many other countries of the world due to some constraints. Among those, fertilizer management plays an important role for obtaining satisfactory yield. In order to increase vegetable productively nutrient management may be achieved by the involvement of organic sources, bio-fertilizers and micronutrients (Singh and Kalloo, 2000). Modern vegetable fertility programs are complex in nature, resulting from the interactions of many factors. One important factor is fertilizer cost, which is a large portion of the crop production expenses. Application of unneeded nutrients contributes to farming inefficiency and ground water pollution (Hochmuth and Hanlon, 2005).

Foliar feeding is the practice of applying liquid fertilizers to plant leaves. Leaves are green factories where the complex chemical processes of photosynthesis produce the compounds, plants needed for plant growth. Foliar fertilizers are absorbed right at the sites where they will be used and are quite fast acting. Much soil fertilizers may never get used by plants. For instance, 80% of the phosphorus applied through conventional fertilizers may get locked up in the soil, but, up to 80% of foliar-added phosphorus directly absorbed by the plants (Donelon, 2005). Ca and B which are immobile in the plant should be applied in small amounts at high frequency rather than in one application for correcting temporary ·deficiencies in vegetables (Maynard and Hochmuth, 1996).

Trend analysis is an attempt to observe the degree and extent of relationship between the dependent and independent variables. By using regression methods the trend analysis model takes into account the fact that usage patterns have been changing over time. The assumption is that these changes will continue into the future at the same or similar rate. Thus, trend analysis is based on the idea that what has happened in the past gives traders an idea of what will happen in the future. Rosse and Ferreira (2002) suggested that the statistical advantage of the non-linear model make it recommendable for future studies on stability. Sadrana and Das (2001) reported that regression techniques must be carried out to indicate the fluctuations of the yield parameter due to environmental factors. (Neter *et al.*, 1989) thus regression should be carried out to predict the variance in an interval dependent, based on linear combinations of interval, dichotomous, or dummy independent variables. Multiple regressions can establish that a set of independent variables explains proportion of the variance in a dependent variable at a significance level and can establish the relative predicative importance of the independent variables. Gomez and Gomez (1984) reported that functional relationship between crop performances is very important. Looking the importance of okra vegetable in the country, this study is an attempt to predict the yield and its association with yield components for future investigations.

MATERIALS AND METHODS

The present study was conducted to observe the effects of commercial foliar fertilizers alone and with combination of recommended NP levels on growth and yield potentials of okra at experimental area of Faculty of Crop Protection, Sindh Agriculture University, Tando-jam during Kharif-2004. The experimental design and treatments applied were as under:

Exp. Design: RCBD

Replications: Four

Treatments = T1=NP levels (170-85 kg NP/ha^{-1}), T2=Super Dawn + NP levels (170-85 kg NP/ha^{-1}), T3=Super Dawn (625-750 ml/ha^{-1}), T4 =Agripower + NP levels (170-85 kg NP/ha^{-1}), T5=Agripower (750-1250 ml/ha^{-1}), T6=UniGrow-c + NP levels (170-85 kg NP/ha^{-1}) and T7=UniGrow-c (1250 ml/ ha^{-1})

Method of fertilizer application

The N and P were obtained from Urea and Single Super Phosphate (SSP) sources, however commercial foliar fertilizers (integrated in the treatments) were collected from the local market. The nitrogen fertilizer from urea was applied in three splits i-e. during 2nd, 3rd and 4th irrigations, respectively. Whereas, whole P_2O_5 was incorporated during furrow preparation. The application of commercial foliar fertilizer was made by spraying on the foliage as per recommendations of the product.

Label Description of Foliar Fertilizer

AGRIPOWER

Ingredients	mg per liter
Nitrogen	180,000
Iron	1000
Magnesium	100
Manganese	100
Boron	100
Copper	20

Zinc	100
Potash	1000

SUPER DAWN

Ingredients	mg per liter
Nitrogen	180,000
Iron	1500
Boron	300
Potash	1500
Manganese	100
Magnesium	300
Zinc	900
Copper	10
Molybdenum	0.002
Cobalt	0.002

UNIGROW-C

Ingredients	mg per liter
Nitrogen	2, 00,000
Iron	1000
Magnesium	100
Manganese	100
Boron	100
Zinc	50
Copper	10

RESULTS AND DISCUSSION

Regression of okra yield on branches per plant

The cor-relation co-efficient worked out between okra yield and branches per plant was (r=0.67), which exhibited a close relationship between the variables. The co-efficient of determination (R^2=0.45) showed 45% association in okra yield with branches per plant. The regression model $\hat{Y}$=46.097+54.29x showed that an increase of 54.29 kg ha^{-1} okra yield was induced to unit increase in branches per plant. The regression line is shown in (Fig 1). The student T-value for regression between okra yield and branches per plant was recorded as 4.69, which was statistically significant. The present research is supported by Paliwal *et al.*

(1999) reported same highest number of branches per plant due to foliar feeding of nutrients, in contrast the the yield of okra was found higher.

Regression of okra yield on plant height (cm)

The cor-relation co-efficient worked out between okra yield and plant height (cm) was r=0.93 which exhibited a positive relationship between the variables. The co-efficient of determination recorded was 87% which exhibited superior association between okra yield and plant height (cm). The regression model $\hat{Y}$=122.51-53.33x showed that an increase of 53.33 kg ha^{-1} yield was accounted for unit increase in plant height. The regression line is fitted in (Fig 2).The student T-value for regression between okra yield and plant height (cm) was recorded as 13.24, which were statistically significant Shanke *et al.* (2003) and Tuncay *et al.* (2004) all were in the view that commercial fertilizers produced taller plants which subsequently increased the okra yield.

Regression of okra yield on fruit length (cm)

The cor-relation co-efficient worked out between okra yield and fruit length (cm) was r=0.79 which recorded a positive relationship between the both the characters. The co-efficient of determination showed 63% association between okra yield and fruit length (R^2= 0.63). The regression model $\hat{Y}$=112.47+38.61x that an increase of 38.61 kg ha^{-1} in okra yield was induced to increase in fruit length (Fig 3).The student T-value for this combination has been obtained as 6.73 which was statistically significant. This result is supported by Anjum and Amjad (1999) that commercial fertilizers should be applied for achieving lengthy okra fruits and yield.

Regression of okra yield on number of fruits per plant

The cor-relation co-efficient worked out between okra yield and number of fruits per plant was observed as r= 0.65 which showed a positive significant relationship between okra yield and number of fruits per plant. The coefficient of determination (R^2)

showed that 42% association between both okra yield and number of fruits per plant. The obtained regression model was $\hat{Y}$= 36.89+278.59x which showed that an increase of 278.59 kg ha^{-1} in yield was induced by a unit increase in number of fruits per plant (Fig 4).The student T-value for regression between okra yield and number of fruits per plant was recorded as 4.29 which was statistically significant.

Regression of okra yield on weight of fruits per plant

The cor-relation co-efficient observed between okra yield and weight of fruits per plant was r=0.95 which showed significantly a closer relationship between the characters. The coefficient of determination recorded 89% associations between both parameters. The regression model $\hat{Y}$= 2.1068+34.632x showed that an increase of 34.632 kg ha^{-1} in okra yield was due to unit increase in weight of fruits per plant. The regression line fitted in (Fig 5).The student T-value for regression between okra yield and weight of fruits per plant was obtained as 42654557.545 which was statistically highly significant @ 95% C.I. This study confirms that maximum fruit weight per plant and yield has significant effect of foliar fertilizers.

CONCLUSION

It was concluded that all the crop parameters significantly increased with the application of commercial fertilizers. The okra growth and yield components contributed positively found related with application of fertilizers. Thus, these foliar commercial fertilizers should be used in conjunction with the recommended NPK fertilizers for obtaining qualitative and quantitative okra yield.

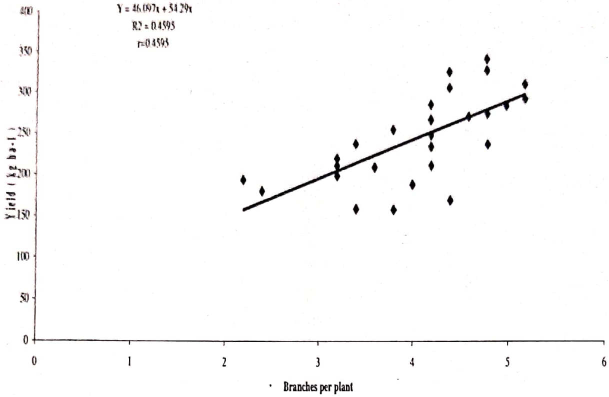


Fig 1: Regression of okra yield on Branches per plant under different commercial fertilizers.

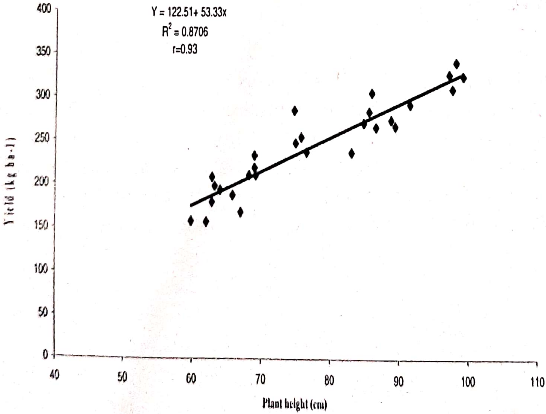


Fig 2: Regression of okra yield on plant height (cm) under different commercial fertilizers

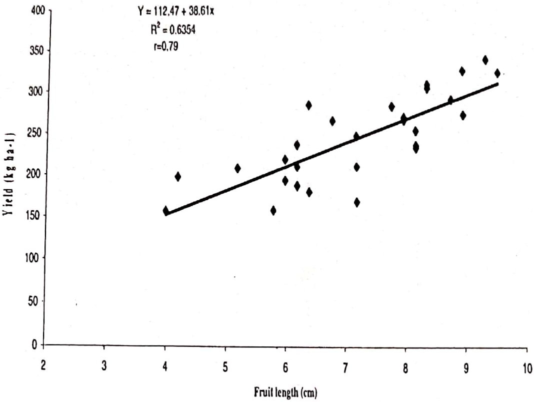
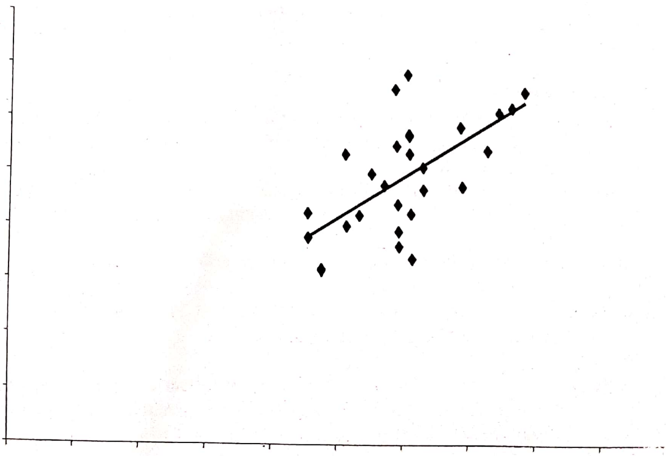


Fig 3: Regression of okra yield on fruit length (cm) under different commercial dertilizers.



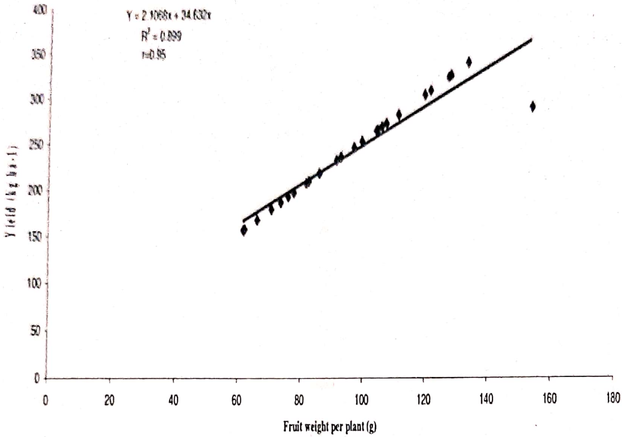


Fig 5: Regression of okra yield on weight of fruits per plant (g)

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