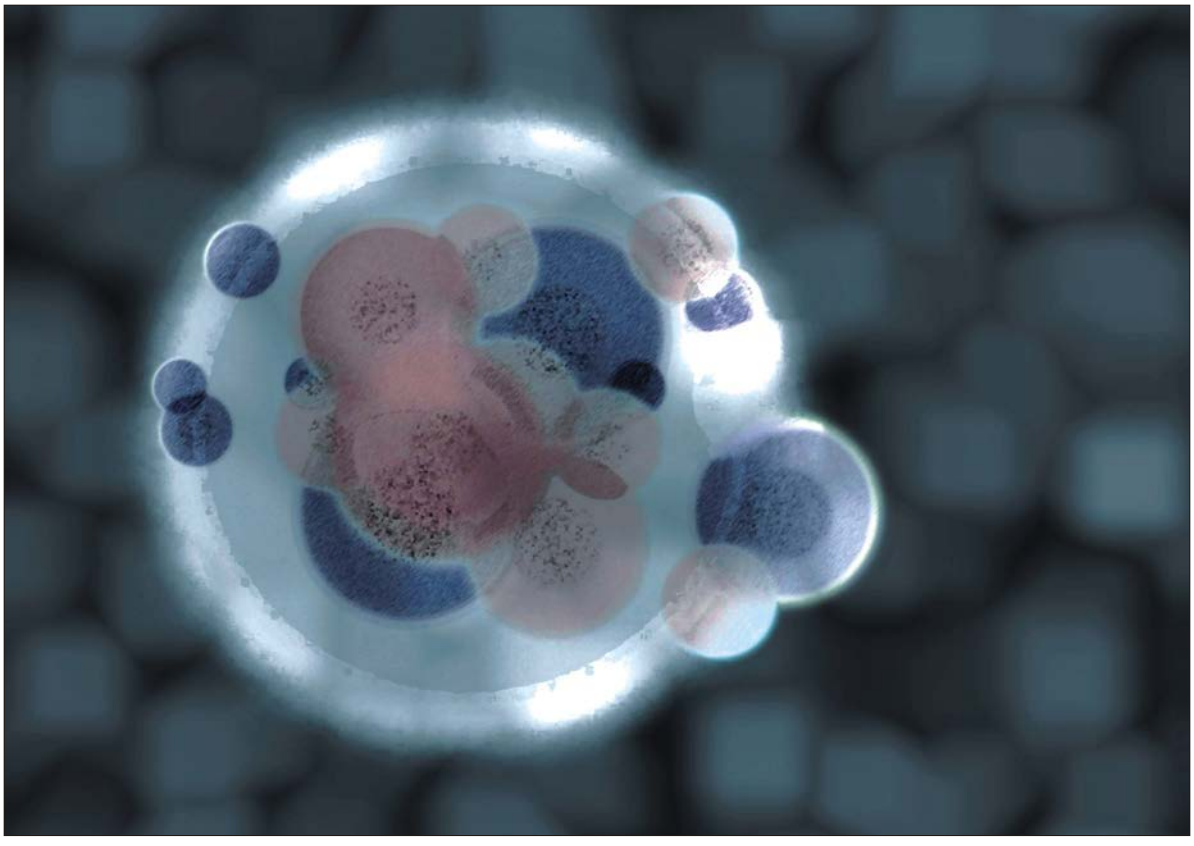

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Influence of Seed Size on Yield, Yield Components and Quality of Three Maize Genotypes

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Abstract: A field experiment was conducted to determine the effect of seed size on maize (*Zea mays* L.) performance. Among three genotypes under study the seed size categories and their interaction showed non significant effect on yield, yield components, photo biomass production and quality of maize under Faisalabad agro-meteorological conditions. All the parameters including germination, number of plants per plot, plant height, number of cobs per plant, number of rows per cob, number of grains per cob, 1000 grain weight, seed yield, stalk yield biological yield, harvest index and protein contents were increased with Golden variety, bold seed sizes but the difference were non significant.

Key words: genotype, maize, quality, seed size

Introduction

In Pakistan, maize (*Zea mays* L.) is cultivated on an area of 0.88 million hectares, giving an annual production of 1.30 million tons and its average yield is 1.47 tons per hectare (Anonymous, 1999). It is a short duration crop and it is well suited to cropping rotation followed in our country and is grown twice a year in spring and autumn.

The average corn yield per hectare in Pakistan is very low (1.47 t ha^{-1}) as compared to other important maize growing countries of the world (New Zealand 9.78 t ha^{-1}, Chile 9.40 t ha^{-1}, Italy 9.33 t ha^{-1}, Austria 9.186 t ha^{-1}, USA 8.44 t ha^{-1}). There are many factors responsible for this low yield, some of these are low quality seed, poor seed germination, poor seedling vigour, and poor varietal performance based on different agro-ecological zones. Among these germination and seedling vigour are greatly influenced by seed sizes. It is also necessary to harvest maximum yield of existing maize varieties, therefore due attention should be given to selection of good quality seed.

So main objective of present study is to investigate the effect of seed size on yield, yield components and quality of three maize genotypes under agro-ecological conditions of Faisalabad for achieving maximum yield.

Materials and Methods

The experiment was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1999 on a sandy clay loam soil. Experiment was laid out in randomized complete block design with split plot arrangement with 3 replications. The net plot size was 3×7 m. Soil upto 30 cm layer was sampled before the start of experiment and subjected to physicochemical analysis. The data showed 0.40 percent N, 8 ppm P_2O_5 and 173 ppm K_2O. The soil pH was 7.6. At the time of harvesting climatic data of crop growing season showed slight differences, however the growing season remained normal. The maize genotypes i.e. EV 1089, Gohar and Golden were randomized in main plot whereas seed grades of control, large and small (1000 grain weight basis) were randomized in sub plot. Crop was sown 75 cm apart rows with the help of dibbler. Seed rate used was 30 kg ha^{-1}. Nitrogen and phosphorus were applied at the rate of 160 kg ha^{-1} and 100 kg ha^{-1} in the form of urea and single super phosphate respectively. The whole quantity of phosphorus and 1/3 rd nitrogen were applied at the time of sowing, 1/3 rd nitrogen was applied at knee height stage and 1/3 nitrogen was applied at tasseling stage. Furadon 22 kg ha^{-1} was applied to avid the attack of borers. All other agronomic practices were kept normal and uniform for all treatments. Nitrogen percentage of maize seed samples collected from each sub plot was determined by micro Kjeldahl method (AOAC, 1980). Nitrogen percentage was multiplied by a constant factor (6.25) for calculating protein contents.

Statistical Analysis: First of all data obtained was transformed, which was applied on those tables in which the values were less than ten or in percentage. Arcsin square root method was applied for transformation of data. Data obtained from the experiment after transformation was analyzed by Fisher's analysis of variance technique using least significance difference test (LSD) at 0.05 probability level (Steel and Torrie, 1984).

Results and Discussion

Yield: As regard seed size effects, statistical analysis of transformed data showed a non significant effect on seed yield (Table 1). However, maximum yield of 11.922 t ha^{-1} was obtained from bold seed size and minimum seed yield of 11.620 t ha^{-1} was achieved from ungraded seed size. In case of genotypes, transformed data depicted that genotypes had non-significant effect on the economic yield. However, maximum yield of 12.176 t ha^{-1} and minimum yield of 11.28 t ha^{-1} were achieved from Golden and 'Gohar' respectively. Similar results were obtained from their interaction.

It is concluded that variety Golden with bold seed size increase seed yield but non significantly over other treatments. However, bold seed size must be used to get maximum yield. These results are agreement with Graven and Carter (1990).

Yield Components: The relationship between the growth yield and its components is shown in Table 1. Number of cobs at the time of harvest is the key component in the final seed yield of maize crop. The results of transformed data showed that genotypes had non significant effect on number of cobs per plant. In case of seed sizes, data showed non significant effect on the number of cobs per plant. However, maximum number of cobs of 76.39 and minimum number of cobs per plant 75.25 were achieved from bold and small seed size respectively. These results are in conformity with Reddy *et al.* (1989). Data pertaining the number of rows per cob in presented in Table 1.

The results showed that maximum number of rows per cob was obtained from the genotype 'Gohar' but these results showed a non significant effect. As regard seed sizes, statistical analysis of data gave a non significant results. However, maximum number of rows of 15.22 were obtained from ungraded seed size. In case of interaction data also showed a non significant trend.

Non significant maximum number of seeds were achieved from the variety Golden followed by Ev 1089 and Gohar respectively (Table 1). As regard seed sizes, the statistical

Table 1: Effect of different seed sizes on yield, yield components of three maize genotypes.

Treatment	Seed yield (t ha^{-1})	No. of cobs plant^{-1}	No. of rows cob^{-1}	No. of grains cob^{-1}	1000 grains wt. (g)
a) Seed size					
Ungraded	11.62^{NS}	75.43^{NS}	15.45^{NS}	463.45^{NS}	236.07^{NS}
Large	11.92	76.39	15.56	464.56	238.33
Small	11.71	75.52	14.66	458.206	232.68
b) Genotypes					
EV-1089	11.79^{NS}	76.592^{NS}	15.24^{NS}	471.56^{NS}	236.99^{NS}
Gohar	11.28	74.27	14.91	429.428	232.18
Golden	12.17	76.47	14.94	485.227	237.92
C.V. (%)	5.73	6.18	3.62	12.77	4.82

Table 2: Effect of different seed sizes on photo biomass production and quality of three maize genotypes

Treatments	No. of plants plot^{-1}	Plant height (cm)	Germination (%)	Stalk yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)	Protein contents (%)
a) Seed size							
Ungraded	84.11^{NS}	205.502^{NS}	69.67^{NS}	15.97^{NS}	11.75^{NS}	36.42^{NS}	17.45^{NS}
Large	86.44	213.82	70.89	16.560	12.53	35.977	17.47
Small	85.66	208.704	68.27	16.35	12.13	35.976	17.39
b) Genotypes							
EV-1089	84.44^{NS}	201.43^{NS}	69.15^{NS}	16.43^{NS}	12.27^{NS}	35.84^{NS}	18.037^{NS}
Gohar	83.88	195.46	65.92	15.58	11.17	36.42	17.083
Golden	87.88	231.132	73.76	16.90	12.98	36.10	17.208
C.V. (%)	7.45	16.02	9.00	7.88	9.61	8.08	5.11

analysis of data showed a non significant trend. These results are in favor of Reddy *et al*. (1989). As regard interaction the statistical analysis of data also showed a non significant trend. Data showed that 1000 grains weight was not affected by genotypes as well as seed sizes (Table 1). Though minute differences were observed yet they remained statistically non-significant. These results are in agreement with Reddy *et al*. (1989).

Photobiomas Production: Economic yield, through indirectly is the outcome of photo biomass production. It is determined by the following parameters.

It is clear from the data (Table 2) that number of plants of each sub plot was non significantly affected among the genotypes as well among seed sizes. Their interaction was also found to be non significant. In case of seed sizes data also showed a non significant trend. These results are in agreement with da Silva and Filho (1982).

The data pertaining to plant height is tabulated in Table 2. It is clear form the statistical analysis of data that seed sizes had non significant effect on plant height. These results are in line with Sanchez and Carballo (1983). Similarly, genotypes and interaction showed a non significant trend.

The statistical analysis of transformed data of germination (Table 2) depicted that genotypes, seed sizes as well as interaction had non significant effect on germination percentage. Similar results were obtained by Krzyzanowski *et al*. (1991). Transformed data proclaimed that there were non significant effect in stalk yield per hectare of different genotypes, seed sizes and interaction. Data regarding biological yield (Table 2) depicted that genotypes showed a non significant effect. In same way, seed sizes had non significant effect. These results are in agreement with Hoy and Gamble (1987). Data regarding interaction also showed a non significant trend. However, maximum biological yield of 13.433 t ha^{-1} were achieved from the combination of variety Golden and bold seed size. These results are in favour of Johnson and Luedders (1974).

The efficiency of a crop is reflected by its harvest index value. A perusal of the transformed data (Table 2) indicated that harvest index of all genotypes, seed sizes and interaction was non significant. These results are in agreement with Reddy *et al*. (1989).

Quality: Transformed Data showed that genotypes had no effect on protein content (Table 2). However, maximum protein content of 18.0375%, were achieved from EV 1089 but non significantly over other genotypes. Transformed data about seed sizes and interaction showed a non significant effect on protein contents. However, it is concluded that EV 1089 with bold seed size is the best for giving more protein content but not significantly over other treatment.

Overall concluded that Golden variety with bold seed size is the best but in case of quality parameter only, EV 1089 with bold seed size is the best. It means that whatever variety is used, bold seed size must be uses to get maximum yield and protein contents. At the end, it may be inferred from this research that further research may be conducted at different locations on different type of soil and in different years.

References

AOAC., 1980. Official Methods of Analysis. 10th Edn., Association of Official Agricultural Chemists, Washington, DC., USA.

Anonymous, 1999. Economic survey, 1998-99. Government of Pakistan, Finance Division, Economic Advisors Wing, Islamabad, pp: 23-24.

Graven, L.M. and P.R. Carter, 1990. Seed size/shape and tillage system effect on corn growth and grain yield. J. Prod. Agric., 3: 445-452.

Hoy, D.J. and E.E. Gamble, 1987. Field performance in soybean with seeds of differing size and density. Crop Sci., 27: 121-126.

Johnson, D.R. and V.D. Luedders, 1974. Effect of planted seed size on emergence and yield of soybeans (*Glycine max* (L.) Merr.). Agron. J., 66: 117-118.

Krzyzanowski, F.C., J.D.B.F. Neto and N.P. Costa, 1991. [Effect of seed grading by size on soybean seed quality and sowing precision]. Revista Brasileira de Sementes, 13: 59-68.

Reddy, P.N., K.N. Reddy, S.K. Rao and S.P. Singh, 1989. Effect of seed size on qualitative and quantitative traits in soybean (< ="" i="" ""> (L.) Merrill). Seed Sci. Technol., 17: 289-295.

Sanchez, G.P. and C.A. Carballo, 1983. Effect of seed size and sowing depth on yield and agronomic characteristics of maize. Centro, Genetica Colegio Postgraduados, Chapingo, Mexico, Revista Chapingo, 8: 60-64.

Steel, R.G.D. and J.H. Torrie, 1984. Principles and Procedures of Statistics. 2nd Edn., McGraw Hill Book Co. Inc., New York, pp: 172-177.

da Silva, W.R. and J.M. Filho, 1982. [Influence of weight and size of corn seeds on field performance]. Pesq. Agropec. Bras., 17: 1743-1750.