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EFFECT OF SEED QUALITY AND PLANTING PATTERNS ON THE PRODUCTIVITY OF SPRING MAIZE

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ABSTRACT

The effect of seed quality and geometry of planting on the productivity of spring maize was investigated on a sandy clay loam soil. Seed quality treatments included top, mid, bottom and whole cob seed while the planting geometry comprised 60 cm apart single rows, 90 cm apart paired rows, with 30 cm space between the rows of a pair and 60x60 cm hills with two plants per hill. The results revealed that paired row planting (30/90 cm) on account of wider grain-pith ratio produced the highest grain yield of 44.59 quintals as against 40.99 and 40.38 quintals per hectare in case of single row and hill planting systems, respectively. Amongst the various seed grades, the mid cob seed although tended to produce higher grain yield but statistically was at par with the top, bottom and whole cob seed. It was further observed that maize crop in 90 cm apart paired rows, besides allowing effective interculture and sound earthing up, affected substantial saving in labour and time as a result of 50 per cent reduction in the number of irrigation furrows after earthing up compared to the conventional single row planting system and thus resulting in efficient use of irrigation water.

INTRODUCTION

Maize (Zea mays L.) is one of the most important cereals and ranks second after wheat. Being a short duration crop, it fits well in the cropping system and provides good economic returns to the growers in relatively lesser time. In Pakistan, it is grown on an area of 739.1 thousand hectares with an annual production of 930.4 thousand tonnes giving on an average 1259 kg per hectare which is not only far below the level of other maize growing countries of the world but also lower than the potential yield of our existing varieties.

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Inspite of its high yied potential, efforts have seriously lagged in this country to reap matching grain harvest with the application of present maize agro-techniques.

To bridge-up this gap in maize productivity, the latest production technology which emphasises the use of quality seed, balanced and timely fertilization and appropriate planting geometry needs to be applied resourcefully and resolutely. Since crop stand and yield is mainly a function of the quality seed and geometry of planting, hence a systematic study of the interactive relationship of planting system and seed quality will generate valuable information which will help promote understanding of the most productive technology for maize. The present study was, therefore, designed to get information on these aspects of spring maize cultivation in an irrigated environment.

REVIEW OF LITERATURE

The mid cob seed should be used to get the maximum grain yield of maize (Casal, 1948 and Osorio, 1948). Abalo (1950) studied the influence of various planting patterns on the growth and yield behaviour of maize crop and concluded that maize planted in the pattern of 70 x 30 cm gave the highest grain yield/ha as a result of reduced number of infertile plants and high cob weight, whereas Chipman (1960) stated that the sweet corn planted in the pattern of 90 x 15 cm produced the highest number of marketable cobs and the maximum cob weight. However, Ugarcinski (1962) was of the opinion that maize planted in 2-row bands at a spacing of 120 x 40 cm with one to two plants per hill gave the highest grain yield. On the other hand, Fan *et al.* (1963) conducted experiment on corn seeds in various combinations of 45,000 to 90,000 plants per hectare with 1-4 plants per hill at hill spacings of approximately 90-143 cm between and 18-36 cm within the rows and observed that the geometry of planting had a little effect on grain yield.

Hunter (1970) concluded that the grain yield of 5 shortseason maize hybrids grown in 91 cm and 46 cm apart rows at plant population of 48,000, 62,000 and 72,000 per hectare, increased progressively with increasing plant population and decreasing row spacing, whereas Blasl (1974) obtained the highest grain yield of maize with a plant population of about 85,000 per hectare planted

in the pattern of 90 x 13 cm. On the other hand, Tianu (1976) reported that maize planted in narrow row spacing and wider sowing density (60 x 40 cm) gave the maximum grain yield per hectare. Pathore, *et al.* (1980) reported that maize planted in 30 cm wide paired rows and intercropped with black gram (*Vigna mungo*) gave the highest grain yield of 2.49 t/ha with an additional yield of 330 kg/ha as against 1.81-2.61 t/ha of maize grain in pure stands. Bonciarelli (1982) planted maize in the patterns of 22 x 22 cm or 22 x 20 cm and found a significant correlation between the plant distance and cob weight or cob grain weight.

MATERIALS AND METHODS

The studies on the effect of seed quality and planting geometry on the yield potential of a new maize cultivar Sunehri, were carried out at the University of Agriculture, Faisalabad, during the spring of 1983 on a sandy clay loam soil. The experiment was quadruplicated using split plot design with a net plot size measuring 2.40 x 6.90 m. The main and sub plots comprised the seed quality and planting geometry, respectively. Seed quality treatments included top, mid, bottom and whole cob seed while the planting geometry comprised 60 cm apart single rows, 90 cm apart paired rows (30/90 cm) and 60 x 60 cm hills with two plants per hill. The crop was sown on second of March, 1983 with the help of a dibble using a basal dose of 150 kg N and 75 kg P_2O_5 per hectare. The crop was irrigated 9 times @ 7.5 acre-centimeters each as and when required. All other agro practices except the ones under study were kept normal and uniform in all the treatments. Standard procedures were followed for recording the data on different gowth and yield parameters. The crop was harvested on June 24, properly sun-dried and then cobs were removed from the stalks and unsheathed. The grain yield was recorded after shelling the cobs at a moisture level of about 15 per cent and Duncan,s New Multiple Range Test was used at 5 per cent probability to compare the treatment means (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The results pertaining to different growth and yield parameters of spring maize as affected by seed quality and planting geometry presented in the table 1 revealed that both the seed quality and planting patterns had non-significant

Table 1. *Effect of seed quality and geometry of planting on the yield and yield components of spring maize*

Treatment	Plant height at harves (cm)	Cob bearing plants per unit area (2.40x6.90m)	No. of cobs per plant	No. of grains per cob	Grain weight per cob (gm)	Grain yield (Q/ha)
A. *Seed quality*						
	NS	NS	NS	NS	NS	NS
1. Top cob	132.20	72.83	1 012	463.05	108.09	41.44
2. Mid cob	131.82	75 58	1.013	491.61	106.06	43,17
3, Bottom cob	131 98	74.92	1.017	484.85	105.35	42.22
4. Whole cob	132.61	70.42	1.011	457.08	104.99	41.11
B. *Planting geometry*						
		(1)			(1)	(1)
1. 60 cm apart single rows	131.23	75.44a	1.012	478.88	101.38b	40.99b
2. 90 cm apart paired rows (30/90 cm)	132.54	72.81b	1.013	476.28	112.68a	44.59a
3. 60 x 60 cm hills with two plants per hill	132 70	72.06b	1.014	467.28	104.32b	40.38b

N.S. = Non-significant.

(1). Any two means not sharing a letter differ significantly. Duncan's New Multiple Range Test at 5% level of probability.

effect on the height of maize plants. The non-significant differences are probably due to high fertility status of the soil and normal growth conditions, during the potential growth period of the crop. As regards the cob bearing plants per unit area there were significant differences among the various planting system but non-significant differences among the seed quality treatments.

The crop planted in 50 cm apart single rows produced significantly higher number of cob bearing plants per unit area than that of paired rows and hill planting systems which were at par with each other. Cob bearing plants per unit area, on the other hands, were not influenced to a measurable extent by the various seed quality treatments. It was further observed that the highest number of cob bearing plants were obtained in hill planting system seeded with mid cob seed, closely followed by paired rows planting seeded with bottom cob seed. These findings are in agreement with those of Abalo (1950) and Chipman (1960) The data on number of cobs per plant showed that there were non-significant differences among the various treatments under study. The average number of cobs per plant, however, varied from 1.011 to 1.017. The data regarding the number of grains per cob also indicated non-significant differences among the planting patterns and seed quality treatments.

The number of grains per cob, however, ranged between 457.08 to 491.61. The weight of grains per cob, on the other hand, was affected significantly by the various planting systems. The planting patterns significantly affected the weight of grains per cob irrespective to the other factors under study, which did not interact. Planting in 90 cm apart paired rows with 30 cm space between the rows of a pair produced significantly higher grain per cob than that of the single row and hill planting systems which were at par with each other. The higher grain weight per cob in case of paired row planting system was attributed to probably better grain development as a result of favourable micro-environment created by the mutual shading of the closely growing plants which helped them escape high temperature stress particularly during the period of grain filling and its development. A significant correlation between the plant distance and cob weight or cob grain weight was also reported by Bonciarelli (1982).

Grain weight on the contrary was not influenced to a measurable extent

by the different seed grades. The data pertaining to grain yield as affected by the different planting patterns and seed grades revealed that paired row planting (30x90 cm) produced significantly higher grain yield per hectare than that of hill and single row planting systems which did not differ significantly from each other. Higher grain yield in paired row planting was attributed to higher grain weight per cob and wider grain-pith ratio. Higher grain yield in 2-row band planting was also reported by Abalo (1950), Ugarcinski (1962), Blasi (1974), Tianu (1976) and Pathore *et al.* (1980). However, these results were not supported by the findings of Fan *et al.* (1963) who stated that the geometry of planting had little effect on grain yield. As regards seed grades, although there were visible differences in grain yields per hectare among the various seed grades but the differences were not large engough to reach the level of significance. However, the maximum grain yield of 43.17 quintals per hectare was obtained in plots seeded with mid cob seed as against 42.22 and 41.44 quintals per hectare in plots seeded with bottom and top cob seed, respectively. These results are supported by the findings of Casal (1948) and Osorio (1948).

In the light of the above mentioned results it may be concluded that for obtaining higher grain yield of spring maize, it should preferably be planted in 90 cm apart paired rows with 30 cm space between the rows (30/90 cm) instead of planting in 60 cm apart single rows as it not only facilitates interculture and earthing up but also helps alleviating the heat stress in the months of May/June as a result of mutual shading created by the closely growing plants in paired rows besides permitting easy and systematic inter-cropping and handling of the intercrops. Furthermore, planting in paired rows resulted in substantial saving of irrigation water by reducing the number of irrigation furrows upto about 50 per cent compared to the conventional single rows planting system.

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