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Fodder Yield and Quality of Four Cultivars of Maize (*Zea mays* L.) Under Different Methods of Sowing

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Abstract

Response of maize (*Zea mays* L.) cultivars viz., Sadaf, Sultan, Sarhad White and Golden to two sowing methods, i.e., broadcast and line sowing was studied under field conditions. Significant differences were observed amongst the cultivars for plant height, leaf area per plant, stem diameter, fresh fodder yield and ether extractable fat percentage. Cultivar 'Sultan' proved superior to all other cultivars with respect to higher fodder yield of better quality. Plant population was significantly higher under line sowing where as fodder yield and all other yield parameters studied were not significantly affected by sowing methods.

Key words: *Zea mays*; cultivars; sowing methods; Leaf area; fodder yield; Extractable fat percentage

Introduction

Maize (*Zea mays* L.) is grown almost throughout the world and has two main agricultural uses. The first and the most important is the production of grain for animals, human consumption and various industries. Secondly, maize is used as forage for milch and draft animals. Maize fodder is relished by the animals as it is very succulent and palatable. Fodder scarcity is considered a major limiting factor for the development of livestock industry in Pakistan and the problem was identified long ago in the feed balance sheet that the animals are deficient both in energy as well as protein (Sial and Alam, 1988).

The use of high yielding cultivars is one of the major contributing factors for increased yield on per unit basis. However, yield potential and quality traits of cultivars vary under different environmental conditions (Roth, 1994; Hussain *et al.*, 1995). Sencor *et al.* (1993) compared six maize cultivars for different growth and yield parameters. They found that maize cultivar Composite Arifiye had the highest plant height, stem diameter and number of leaves per plant, whereas cultivar DK-698 and XL-7288 had the highest fodder and hay yield.

Maize cultivars have also shown variability in their yield and quality when grown under different sowing methods (Farnworth and Said, 1983). However, Gautam and Kumar (1992) reported that fodder yield of maize, sorghum and pearl millet were not affected by sowing methods. The research work on the effect of different sowing methods on fodder yield and quality of maize in Pakistan is limited. Present study was, therefore, planned to determine the effect of sowing methods on fodder yield and quality of four maize cultivars under Faisalabad conditions.

Materials and Methods

Experiment was conducted under field conditions, during kharif season 1996, on a sandy clay loam soil having 0.046

percent nitrogen, 10.67 ppm available phosphorus and 277 ppm available potassium. Four cultivars of maize, viz., Sadaf, Sultan, Sarhad White and Golden were sown by broadcast and in 30 cm apart lines by using single row hand drill. Experiment was triplicated in a split plot design with a net plot size of 3.0 x 5.0 m. The sowing methods and cultivars were randomized in the main and sub-plots, respectively. A basal dose of 80 kg nitrogen and 60 kg P_2O_5 ha^{-1} was applied in the form of urea and DAP at the time of seed-bed preparation. Forty kg nitrogen was also applied with first irrigation. The crop was sown on August 26, 1996 on a well prepared seed-bed. Seed rate used was 100 kg ha^{-1} . All other cultural practices were kept normal and uniform for all the treatments. Data on growth, fodder yield and yield parameters, viz., plant population/ m^2 , plant height, leaf area per plant and stem diameter were recorded by using standard procedures. Quality parameters like crude protein percentage, crude fibre percentage and ether extractable fat percentage were determined by using methods recommended by AOAC (1984) methods. Data collected were analyzed statistically by using Fisher's analysis of variance technique and Duncan's New Multiple Range Test at $p < 0.05$ was used to compare the significance of treatments means (Steel and Torrie, 1984).

Results and Discussion

Growth and Yield Parameters: Data regarding growth and yield parameters of four maize cultivars are given in Table 1. The interactive effect of sowing methods and cultivars on the yield and quality parameters was not significant.

Plant Population (m^{-2}): Sowing the crop in 30 cm apart rows gave significantly higher plant density (17.94 plants m^{-2}) as compared to broadcast (16.55 plants m^{-2}). The reason for better germination in line sowing might be the even distribution and proper depth of seed.

Table 1: Growth and yield parameters of four cultivars of maize as influenced by sowing methods

Treatments	Plant Population (m ⁻²)	Plant height (cm)	Leaf area per plant (cm ²)	Stem diameter (cm)	Fresh fodder yield (t/ha)
Sowing Methods					
Broadcast	16.55b	170.37NS	426.10NS	1.92NS	37.18NS
Line sowing	17.94a	179.75	427.48	1.88	39.16
Cultivars					
Sadaf	17.10NS	186.40a	451.04a	1.92a	38.24b
Sultan	17.50	174.70a	453.78a	2.14a	43.30a
Sarhad White	17.44	181.50a	374.81b	1.81c	36.15bc
Golden	16.94	157.60b	427.53a	1.73d	34.99c

Any two means within each character followed by the same letter are not significantly different at 5% level using Duncan's New Multiple Range Test.

Significant difference for plant stand under different sowing methods has also been reported by Khan (1985). The differences among cultivars for plant population were not significant. Plant population in all cultivars ranged between 16 to 18 plants per m². The non-significant differences among cultivars may be attributed to similar seed size and viability.

Plant Height (cm): Plant height was not significantly affected by the sowing methods. Line sowing, however, produced taller plants (179.75 cm) than the broadcast method (170.37 cm). The results are in agreement with those of Ashraf *et al.* (1995). The maize cultivar 'Sadaf' produced highest plants, but was statistically at par with 'Sarhad White'. 'Golden' exhibited shortest plants (157.60 cm). Similar results have been reported before by Naeem *et al.* (1992).

Leaf Area per Plant (cm²): Leaf area per plant was not significantly altered by the sowing methods which agree with the findings of Shah (1984). Significant differences were observed amongst the cultivars. Maximum leaf area per plant (453.78 cm²) was recorded in 'Sultan' which was not statistically different from that of 'Sadaf' (451.04 cm²) and Golden (427.53 cm²). Rehman *et al.* (1992) have also reported significant differences amongst the maize cultivars for leaf area per plant.

Stem Diameter (cm): Sowing methods did not significantly influence the stem diameter. There was, however, a slight gain in stem thickness under broadcasting (1.92 cm) as compared to line sowing (1.88 cm).

All the cultivars were found to be statistically different from one another. Maximum diameter was measured in 'Sultan' (2.14 cm) and was followed by 'Sadaf' (1.92 cm) and 'Sarhad White' (1.81 cm). Cultivar 'Golden' produced the thinnest plants (1.73 cm). Similar results have also been reported by Zahid and Bhatti (1994).

Fodder Yield (t/ha): Sowing methods did not significantly influence the fresh fodder yield. However, line sowing produced slightly higher yield (39.16 t/ha) than broadcasting (37.18 t/ha). Similar results have also been

reported by Jabbar (1986). Maize varieties significantly differed from one another. 'Sultan' gave significantly higher fodder yield (43.30 t/ha) than all other cultivars and was followed by 'Sadaf' (38.24 t/ha) and 'Sarhad White' (36.15 t/ha). Minimum yield of fresh fodder (34.99 t/ha) was obtained for 'Golden'. 'Sarhad' White was statistically at par with 'Sadaf' and 'Golden', whereas differences between 'Sadaf' and 'Golden' were significant. The findings are in agreement with those of Mohammad *et al.* (1994).

Quality Parameters

Crude Protein (%): Crude protein contents were not influenced both by the cultivars and the sowing methods. The maximum value of crude protein (7.21%) was recorded for 'Sultan'. Similar protein contents may be due to the reason that all varieties have similar potential for amino acid formation and it can also be attributed that the varieties were grown on soil having similar nutrient status. The results are in accordance with those of Kim *et al.* (1992).

Crude Fibre (%): Neither the sowing methods nor the cultivars affected the crude fibre contents to a significant extent. The maximum (33.52%) and minimum (32.60%) crude fibre values were noted for cultivars 'Sultan' and 'Sarhad White', respectively. Similar crude fibre contents might have been due to the reason that all cultivars were almost at the same growth stage. The results are supported by the findings of Pereira *et al.* (1990).

Ether Extractable Fat (%): Fat percentage was 1.21 and 1.20 for broadcast and line sowing, respectively and did not differ significantly from each other. Cultivar 'Sultan' gave significantly higher fat percentage (1.39) than all other cultivars. The differences between 'Sadaf' and 'Golden' were non-significant. The minimum value of fat percentage (1.01) was recorded for 'Sarhad White'. Similar results have been reported before by Roth (1994).

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