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EFFECT OF SPACING AND WEED FREE PERIODS ON THE PRODUCTIVITY OF MAIZE (*ZEA MAYS* L.)

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ABSTRACT

An experiment was conducted to study the effects of competition on growth behavior of maize. Plant height, grains per cob and 1000 grain weight were maximum at 1.5 feet spacing followed by 1.0 and 0.5 feet spaced treatments. No significant changes were observed for percentage fertility. Days to 50% tasseling and silking prolonged with increasing plant density. The weeding 34 days after sowing had non significant impact on different plant parameters.

Key words: Plant competition; weeds free periods;, maize, yield parameters

INTRODUCTION

Maize (*Zea mays* L.) is a tall annual short day, cross pollinated kharif crop belonging to Family Poaceae and tribe Maydeae. Maize is a popular food, feed and fodder crop.

Maize grain is a valuable source of protein (10.4%), fat (4.5%), starch (71.8%), fiber (3%), vitamins and minerals like Ca, P, S and small amounts of Na. Its flour is considered to be a good diet for heart patients due to its low gluten (protein) content. Maize ranks third largest cereal crop after wheat and rice on hectarage basis in Pakistan. In Pakistan, maize occupied 868.6 thousand hectares with a production of 1251.2 thousand tons, while in NWFP, maize was cultivated on 533.6 thousand hectares of land producing 814 thousand tons grain during the year 1997-1998 (Anonymous, 1998). It indicates that more than 50% of the total maize is produced in N.W.F.P. About 55% of the maize area is dry land and the remaining 45% is irrigated in N.W.F.P.

Maize yield on per hectare basis in Pakistan is very low as compared to other maize growing regions of the world, especially in the developed countries. There is a greater scope for improvement in maize productivity. Important factors that should be considered seriously for enhancing maize production include high yielding, disease and pest resistant varieties, favorable planting date, rate and methods of sowing, application of optimum production inputs and protection of crop from weeds, insects and pests.

Maize plants show pronounced competition among themselves and with the weeds, resulting in low yields. If this competition is intense then large number of plants will fail to produce seeds while the production will dwindle in others.

The instant project was undertaken at Peshawar University Campus during 1997 kharif season with the objective to evaluate the effects of competition on different growth and yield components of maize.

MATERIALS AND METHODS

An experiment was designed and at the Peshawar University Campus during Kharif season of 1997. The field was prepared by thorough ploughing followed by planking. Plotting was done according to the Randomized Complete Block Design with a split plot

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arrangement. Each sub-plot measured 6 square feet. Seeds a local maize cultivar Tarowal were sown on 26th June, 1997 at 1.5 feet, 1.0 and 0.5 feet spacing. In 1.5 feet spaced plots both row to row and plant to plant distance was 1.5 feet. Same strategy was adopted for 1.0 and 0.5 feet plots, respectively. Each spacing (main-plot) included five different weed competition duration treatments with three replications. In each main-plot, one sub-plot each was kept season long weed free and weeded, while in other treatments weeding was carried out 17, 34 and 51 days after emergence (DAE).

The experiment was irrigated four times during the growth period. The herbage cover was recorded through quadrate method. A quadrate of 30×30 cm^2 was used. The plants were harvested on 18th September, 1997.

The following observations were recorded during the course of studies:

1. Number of plants emerging per plot
2. Days to 50% silking
3. Days to 50% tasseling
4. Plant height (cm)
5. Number of grains per cob
6. 1000-grain weight (g)
7. Weeds cover

The data were subjected to the ANOVA for the individual trait and means were separated (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The results indicated that there was non significant differences in the number of plants emerged per plot in all treatments. Germination is generally not affected unless plants are heavily overcrowded. Rate of germination mainly depends upon time of sowing, water, air and temperature. All these factors were almost similar in this case. The small difference present in mean germination might be due to soil moisture difference as the seeds were sown randomly and thus seed depth might be different. These results coincide with that of Vecchio and Bertone (1984) who reported that optimum soil moisture promotes emergence of seedlings.

Significant differences were observed for days to 50% tasseling among different plant spacing treatments. The plants at 0.5 feet spacing took the maximum days to 50% tasseling followed by those spaced at 1.0 feet and 1.5 feet, respectively. Days of 50% tasseling depends upon the light, soil moisture and nutrients. As at 0.5 feet spacing the plants were much closed to each other therefore they competed among themselves for light, water and nutrients severely. Therefore they remained stunted and weak. This caused late tasseling as compared to other treatments where competition was not severe. Similar results were reported by Zada (1998) and Akbar (1998).

For 50 % silking, there were differences among the plants at three different spacing treatments. It was observed that plants with 0.5 feet spacing took longer period (48 days) to 50% silking while it was 44 and 42 day for 1.0 and 1.5 feet spaced plants. In maize, the number of days to silking is an important trait in a particular cropping system. This parameter too is primarily affected by temperature, elevation and fertilizers. But in this experiment as all these factors were similar for all spacing treatments, so this difference

might be attributed to severe competition among them and also within maize and weeds. Similar results were reported by Zada (1998) and Akbar (1998).

The plants height was also significantly affected at different plants spaced treatments. The maximum plant height (152.52 cm) was shown by plants grown at 1.5 feet followed by those grown at 1.0 feet (142.27 cm) and 0.5 feet (116.35 cm) spacing respectively. It was observed that a rapid increase in plant height took place during 30 to 50 days from the date of mean germination. In this experiment the most rapid increase in plant height was observed during tasseling and silking time and just before tasseling. Competition among 0.5 feet spaced plants might be responsible, as the competition was severe at 0.5 feet spacing comparatively to 1.0 and 1.5 feet spacing. So it resulted in minimum mean plant height at the end of the season. The weeds presents also increased the competition for water and nutrients. The results agree with those of Lozanovski *et al.* (1975) who reported that strong weed competition reduces the dry weight of maize by two-third and decrease the leaf surface area and photosynthesis compared with weeds free crops.

The number of grains per cob was significantly affected at three different spacing treatments and also at different weed duration treatments with in the same spacing. The maximum mean number of grains per cob (228.16) were observed in 1.5 feet spaced plants, followed by those of 1.0 feet spaced plants (136.37) and the maximum mean number of grains/cob (67.70 grains/cob) were produced in 0.5 feet plots. The different in mean number of grain per cob were due to the different plants spacing and weed competition. The competition was severe in 0.5 feet spaced plants followed by 1.0 feet plants. In each spacing treatment, the weed free treatment exhibited the maximum number of grains per cob. The result coincide with those of Karim *et al.* (1983) who reported that period of weed free maintenance required to produce maximum yield of sweet corn. Similar results were also observed by Zada (1998) and Akbar (1998) who reported that cob length and number of cobs/plant decreased linearly with in the plant population and cob weight gave a curvilinear response.

The 1000-grain weight was also affected by maize competition and different weeding treatments. It was maximum (130.149) for 1.0 feet spaced plants followed by 1.5 feet spaced plants (122.30 g). The lowest weight (102.7 g) was recorded for 0.5 feet spaced plants. The weed treatment at 1.5 feet spacing showed the maximum weight (160.00 g) while un-weeded treatment at 0.5 feet spacing recorded the least weight (90.0 g). The results agree with those of Czimber et al (1981) who reported that grain yields of maize in weeds free plots was higher than those plots infested with weeds. Jaffer *et al.* (1988), Akbar (1998) and Esechie (1992) also reported that the number of grains per cob and grain yield per hectare was significantly influenced by different planting patterns.

The ear weight was also significantly affected by the competition resulted from weeding and spacing treatments. The maximum ear weight was recorded for 1.5 feet spaced plots (781.29 g), followed by 1.0 feet plots (450.7 g) while 0.5 feet spaced plots showed the least ear weight of 205.21 g. The results showed that with an increase in weeds free period, the ear weight increased. Similar results were reported by Wies et al (1980) and Burnside and Wicks (1980). However, Gleason (1980) disagreed with the results who reported that with an increase in weeds period, the yield increased.

Table-1. Mean values for seed germination, 50% tasseling, 50% silking, plant height, grains per cob and 1000 grain weight at different spacing and weeding periods

Weed Free (DAE)	Spacing (feet)	Germ. (%)	Days to 50% tasseling	Days to 50% silking	Plant height (cm)	Grains per cob	1000 grain wt. (g)
Full Season	1.5	86.68	37.33	41.0	175.7	329.46	160.0
17	1.5	84.0	37.33	41.33	141.3	240.0	144.0
34	1.5	89.32	38.33	42.0	152.66	197.68	125.5
51	1.5	85.32	38.66	42.66	150.6	188.52	97.0
0 (check)	1.5	85.32	39.0	43.0	142.34	184.67	85.0
Full Season	1.0	80.95	39.0	42.33	155.78	153.50	153.0
17	1.0	82.46	39.33	43.66	133.03	151.33	139.23
34	1.0	87.08	40.0	44.33	140.63	150.47	135.0
51	1.0	84.20	41.0	44.66	144.66	149.09	130.5
0 (check)	1.0	83.0	41.66	45.0	137.29	77.50	93.0
Full Season	0.5	80.47	43.0	47.0	125.47	84.30	120.5
17	0.5	78.30	43.66	47.33	122.36	83.80	104.0
34	0.5	81.46	44.67	48.0	116.48	67.51	105.0
51	0.5	77.31	44.67	48.66	110.73	52.54	94.0
0 (check)	0.5	77.71	45.0	49.0	106.73	50.37	90.0

DAE = Days after sowing

Table-2. Mean herbage cover (%) of weeds at different spacing and weeding periods

Weed Free (DAE)	Spacing (feet)	*Echinochloa-crusgalli*	*Cyperus rotundus*	*Trianthema portulacestrum*	*Euphorbia hispida*	Total (%)
Full Season	1.5	-	-	-	-	-
17	1.5	20	31	-	-	51
34	1.5	42	33	1	2	78
51	1.5	50	35	3	3	91
0 (check)	1.5	51	35	5	3	94
Full Season	1.0	-	-	-	-	-
17	1.0	15	27	-	-	42
34	1.0	40	32	2	1	75
51	1.0	46	34	4	3	87
0 (check)	1.0	48	35	4	3	90
Full Season	0.5	-	-	-	-	-
17	0.5	12	21	-	-	33
34	0.5	19	29	-	1	49
51	0.5	25	37	2	3	67
0 (check)	0.5	28	38	2	4	72

DAE = Days after sowing

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