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PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Weed-Crop Competition in Maize in Relation to Row Spacing and Duration

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Abstract

A field experiment comprising two row spacing viz. 60 and 75 cm and five durations of weed-crop competition i.e. competition for 20, 30, 40, 50 days after emergence and till harvest was conducted to observe growth and yield response of maize. There was gradual increase in dry weight of weeds with increased weed-crop competition duration. Decrease in number of grains per cob and 1000-grain was recorded with increased competition duration of weeds. Maize grain yield was increased from 1911.61 kg ha⁻¹ in plots where weeds competed with crop till harvest to 3708.33 kg ha⁻¹ in plots where weeds were allowed to compete for 20 days after emergence.

Introduction

Among the various factors responsible for low yield of maize, presence of weeds is one of the main reasons. Weeds reduce the maize yield by 82 percent (Spitters *et al.*, 1989). Weeds can compete aggressively with maize sown in wide row spacing due to more availability of space. In Pakistan, maize is mainly grown during summer season. Due to monsoon rainfall in summer, weeds growth is very luxuriant which compete severely with maize for environmental resources. Beckett *et al.* (1988) reported that weed-crop competition begins 20 days after maize sown and continued up to maturity but severe competition lies in between 30-60 days after sowing. Ferrero *et al.* (1991) observed the critical period for weed competition in maize to be from 2nd to 3rd weeks after crop emergence, when heavy infestations reduced maize yields by up to 23 percent. Mongia (1991) stated that grain yield of maize cultivar Gunge-5 was not significantly affected by spacings (50x25 or 75x20 cm).

Shad *et al.* (1993) reported that critical period for weed competition in maize was from 3-6 weeks after planting. Kazmi (1993) studied the competition of weeds with maize for 3, 4, 5, 6, 7, 8 weeks after emergence and till harvest. Number of grains per cob, 1000-grain weight and grain yield increased as the duration of weed-crop competition decreased. Number of cobs per plant was not significantly affected by weed-crop competition. According to Ansar *et al.* (1990) maize plots with higher (12 m⁻²) density of *Trianthema monogyna* gave lower maize yield (3544 kg ha⁻¹) than weed free plots (3891 kg ha⁻¹).

The objective of the present study was to find out the impact of weeds competition on growth and yield of maize grown in different row spacings.

Materials and Methods

The present study was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad on loam soil. The experiment was laid out in a split plot design by randomizing row spacings in main plots and weed-crop competition durations in sub-plots having three replications.

The net plot size was 10x3 m. Maize cv. "Golden" was sown with a single row hand drill using a seed rate of 30 kg ha⁻¹. Phosphorus in the form of single super phosphate and N in the form of urea was applied at 50 and 100 kg ha⁻¹, respectively. Whole of P was applied at sowing time. Nitrogen was applied in two splits, half with 1st irrigation and remaining half at the time of tasseling. A plant to plant distance of 23 cm was maintained by thinning. The experiment comprised row spacings of 60 and 75 cm and five competition durations i.e. weed competition for 20, 30, 40, 50 Days After Emergence (DAE) and competition till harvest. After each prescribed period weeds were removed by hoeing and respective plots were kept weed free for the remaining growth period. All other practices were kept uniform for all the treatments.

At the end of each competition period a unit area of 1 m² was selected at random from each plot at three different sites to record fresh weight of weeds. These weeds were dried in an oven at 80°C till a constant weight was achieved. Average dry weight of weeds m⁻² was recorded. Ten cob bearing plants were selected at random from each plot to record average number of cobs per plant. Number of grains per cob was counted by taking ten cobs from each plot at harvesting. For 1000-grain weight, two samples of 1000-grains were taken randomly from bulk of each plot yield after shelling and weighed on an electric balance, then averaged. The cobs of each plot were shelled by means of a maize sheller and the grain weight per plot was converted into kg ha⁻¹.

The data collected were analysed statistically by using the Fisher's analysis of variance and differences among treatment means were compared by using least significant difference (LSD) test at 5 percent probability level (Steel and Torrie, 1984).

Results and Discussion

Common weeds found in the maize field were *Trianthema monogyna*, *Digera arvensis*, *Dactyloctenium aegyptium* and *Cyperus rotundus*. Dry weight of weeds was non-significantly affected by row spacing but significantly by

Tanveer *et al.*: Maize, weeds, row spacing, duration and grain yield

Table 1: Effect of row spacing and competition on dry weight of weeds, yield and yield components of maize

Treatment	Dry weight of weeds (g m ⁻²)	No. of cobs plant ⁻¹	No. of grains cob ⁻¹	1000-grain weight (g)	Grain yield (kg ha ⁻¹)
Row spacing					
60 cm	141.57 ^{NS}	1.18 ^{NS}	319.24 ^{NS}	227.10 ^{NS}	2877.67 ^{NS}
75 cm	146.81	1.21	335.06	231.31	2719.49
Competition period					
Competition for 20DAE	054.68d*	1.27 ^{NS}	388.25a*	245.00a*	3708.33a*
Competition for 30DAE	111.38c	1.20	356.78b	236.67b	3234.07b
Competition for 40DAE	163.72b	1.20	328.56c	228.67c	2761.77c
Competition for 50DAE	188.35a	1.17	295.07d	221.00d	2377.11d
Competition till harvest	202.83a	1.15	267.08e	214.00e	1911.61e

DAE = Days after emergence; NS = Non-significant; * = In a column, mean having different letters differ significantly 5% probability level

weed competition duration (Table 1). Maximum dry weight of weeds (202.83 g m⁻²) was recorded when weeds competed with crop till harvest and was statistically at par with the treatment, where weeds were allowed to compete with crop for 50 DAE. Generally there was gradual increase in dry weight of weeds with increase in weed-crop competition duration. Increase in dry weight of weeds with increased competition duration would be attributed to their presence in the field for a longer period. Ultimately they utilize the environmental resources for their better growth and development. As regards the number of cobs per plant, it was not affected significantly both by row spacing and weed competition duration. It indicates that number of cobs per plant is a genetic character and is not influenced by management practices. These results are also supported by the findings of Kazmi (1993).

Row spacing had non-significant effect on the number of grains per cob and 1000-grain weight. These parameters were significantly affected by weed competition duration. Significantly the highest number of grains per cob (388.25) and the heavier grains (245.00 g) were recorded where weeds competed with crop for 20 DAE. The treatment where weeds competed with crop till harvest gave minimum number of grains (267.08) per cob and 1000-grain weight (214 g). There was decrease in above cited two parameters as the duration of weed-crop competition increased. It could be due to enhanced utilization of nutrients, water, CO₂ and light by weeds which otherwise would be taken by crop plants. Ultimately maize plants failed to achieve number of grains per cob and 1000-grain weight according to their potential. Another reason for lower 1000-grain weight might be lower photosynthetic rate which decreased carbohydrate supply to developing grains in the presence of weeds which competed with crop plants for factors affecting photosynthesis. Kazmi (1993) observed increased number of grains per cob and 1000-grain weight with decreased in duration of weed-crop competition.

The results pertaining to grain yield reveal non-significant effect of row spacing on grain yield of maize. It might had resulted from non-significant effect of row spacing on number of grains per cob and 1000-grain weight. These

results are in line with those of Mongia (1991). Grain yield was significantly affected by the duration of weed competition. The maximum grain yield (3708.33 kg ha⁻¹) was achieved when weedy period was 20 DAE. It was followed by weedy period of 30 DAE. Statistically, minimum grain yield (1911.61 kg ha⁻¹) was achieved where weeds competed the crop plants for full season. Decreased grain yield with increased duration of weed-competition could be attributed to decreased number of grains per cob and 1000-grain weight. These results are in line with those of Beckett *et al.* (1988), Ferrero *et al.* (1991) and Shad *et al.* (1993).

From these results it can be concluded that weeds must be controlled within 20 days after emergence to harvest maximum yield potential of maize Cv. "Golden".

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