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***Short Communication***

# Influence of *Trianthema portulacastrum* Infestation and Plant Spacing on the Yield and Quality of Maize Grain

MAHMOOD A. RANDHAWA[1], MUHAMMAD ATHER JAVED KHAN, NAZAR HUSSAIN KHAN AND M. ASIF†
*Department of Continuing Education, Division of Education & Extension, University of Agriculture, Faisalabad, Pakistan*
†*Department of Agricultural Extension, Division of Education & Extension, University of Agriculture, Faisalabad, Pakistan*
[1]Corresponding author's e-mail: randhawa_contedu@yahoo.com

## ABSTRACT

Studies into the influence of *Trianthema portulacastrum* and maize plant spacing on maize grain yield and quality parameters were carried out under field conditions at Faisalabad. Interactive treatments comprised maize plant spacings i.e., $S_1$ (60 x1 5 cm), $S_2$ (60 x 25 cm), $S_3$ (60 x 35 cm) and *Trianthema* density i.e., $D_0$ (Control), $D_1$ (5 plants $m^{-2}$), $D_2$ (10 plants $m^{-2}$), $D_3$ (15 plant $m^{-2}$), $D_4$ (20 plant $m^{-2}$). The results showed that amongst all the interactive treatment, $S_1D_0$ (S1 i.e., maize plant at 60 x 15 cm spacing and D0 i.e., 5 plants of *Trianthema* per square meter) produced the maximum grain yield (3.68 t $ha^{-1}$), where as the highest grain starch (70.21%), protein (3.68%) and oil contents (8.11%) was produced in the $S_3D_0$. $S_3D_0$ also produced excellent results in the form of 1000 grain weight (272.15 g) and weight per cob (58.0 g). Results showed that maize sown at narrow spacing yields better due to more population but the grain quality improves at wider maize plant spacing with better use of growth resources.

**Key words:** Maize; *Trianthema portulacastrum;* Plant spacing; Yield; Quality

## INTRODUCTION

Maize (*Zea mays* L.) is the 3rd most important cereal and is grown in spring and autumn in Pakistan. In general, weeds restrict potential yield harvest of the maize crop level up to the level of 24-47% (Ashiq & Ata, 2005). Among the maize weeds, *Trianthema portulacastrum* is the major weed, which not only reduces maize yields to the tend of 32% (Balayan & Bhan, 1989) but also affects the quality of its grain and causes reduction in yield of peanut 70-80% (Gricher, 1993, 2007 & 2008). Friesen *et al.* (1960) reported that the *Trianthema* adversely affects the quality of maize particularly it reduces protein contents in maize grains.

The trend of weeds affecting grain quality of crops may be more under heavy weed density. Narrowly spaced rows of maize increase only its grain yield (Barbieri *et al.,* 2008). However, Khan (1992) reported that maize planted at wider spacing increases the quality of grain. The closer spacing in maize usually suppresses the weed density and weed biomass (Maqbool *et al.,* 2006). So the effects of *T. portulacastrum* on grain quality of maize may be modified with the management of plant spacing at various levels of *T. portulacastrum*. Maize plant spacing may also reduce the adverse affects of *T. portulacastrum* competition on grain quality of maize with better use of growth resources.

Keeping this in view, this study was conducted to evaluate the effects of *Trianthema portulacastrum* on the yield and quality of maize grain as influenced by its plant spacing under field condition.

## MATERIALS AND METHODS

The proposed study was conducted on a sandy loam soil during autumn 2004 and 2005 at University of Agriculture, Faisalabad, using maize (*Zea mays* L.) variety Akber as a test crop. Maize plant spacing was used in main plots and *Trianthema portulacastrum* density in the sub plots. Maize plant spacings were: $S_1$ (15×60 cm) $S_2$ (25×60 cm) and $S_3$ (35×60 cm), while *T. portulacastrum* density comprised $D_0$ (control), $D_1$ (5 plants $m^{-2}$), $D_2$ (10 plants $m^{-2}$), $D_3$ (15 plants $m^{-2}$) and $D_4$ (20 plants $m^{-2}$). Treatments were replicated four times in split plot-arrangement. The crop was sown on a plot heavily infested with *T. portulacastrum* previous year just to ensure the growth of this weed as part of study, the density of which was maintained manually according to the treatments. A basal dose of nitrogen, phosphorus and potash @ 100 kg $ha^{-1}$ as $N_2$ O, $P_2O_3$ and $K_2O$, respectively was applied at sowing. Fifty kg N $ha^{-1}$ was broadcasted with 1st irrigation. Other agronomic practices for all the treatments were kept uniform.

Observations on the yield, yield parameters and quality parameters were collected using standard procedures. Grain starch, oil content and protein content were determined following the methods of Juliano (1971), Low (1990) and Anonymous (1980), respectively. Recorded data were analyzed by using MSTATC statistical package (Anonymous, 1986) and differences among the treatment means were compared by the least significant difference (LSD) test (Steel & Torie, 1980).

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## RESULTS AND DISCUSSION

Data revealed diversified interactive effects of plant spacing and *Trianthema* density on the yield and yield parameters of maize (Table I). Although the interactive effect of plant spacing and *Trianthema* density on maize grain yield was statistically non-significant, higher grain yield was recorded in narrowly spaced plant (60×15 cm) than widely spaced (60×35cm). Various yield influencing parameters like 1000-grain weight and grain weight per cob were better in widely spaced (60×35 cm). Plants produced higher grain yield at close spacing (60×15 cm), which may be attributed to more number of plants per unit area. In line with our data, Barbieri *et al.* (2008) reported that high yield may be obtained at narrowly spaced plants due to more plant population per unit area. These results, however, are contrary to those of Maqbool *et al.* (2006), who reported non significant effect of spacing on grain yield of maize.

The lowest *T. portulacastrum* density (5 plants $m^{-2}$) reduced starch contents greater than control and the lowest grain starch was found in the highest *T. portulacastrum* density (20 plants $m^{-2}$). This trend was observed at all maize plant spacings. Likewise, maize plant spacing also exhibited pronounced effect on grain starch contents. Increased plant spacing resulted in increased grain starch content over the preceding level. This clearly suggested a direct relationship between the plant spacing and starch content of maize grain. However, neither *Trianthema* density nor plant spacing affected oil of maize grain. These results contradict the previous findings of Khan (1992) who stated that maize plants planted in double-row strips produced higher grain oil contents (%) than those planted narrow spaced. The contradiction might be attributed to difference in agro-climatic conditions under which experiments were conducted.

With regard to effect of these factors on grain protein content, significantly higher grain protein was found in $S_3D_1$ which was equal to $S_3D_0$ showing that wider plant spacing (60×35 cm) with lowest density of *T. portulacastrum* (5 plants $m^{-2}$) had no adverse effect on protein content. While weed density even at the lowest level (5 plant $m^{-2}$) reduced grain protein content as compared to control at (60×25 cm) maize plant spacing. Reduction in grain protein content in response to higher density *T. portulacastrum* might be due to reduced crop growth and hence poor grain protein content. Improvement in grain protein content of maize in widely spaced plants can be attributed to better light, moisture and nutrients utilization (Earley *et al.,* 1966).

**Table I. Influence of *Trianthema portulacastrum* infestation and maize plant spacing on the yield and yield parameters of maize**

| Spacing | Quality | Yield (t $ha^{-1}$) | 1000 grain wt. (g) | Grain wt. (g $cob^{-1}$) |
|---|---|---|---|---|
| | $D_0$ | 3.69 | 245.50 | 45.06 |
| | $D_1$ | 3.50 | 240.25 | 41.5 |
| $S_1$ | $D_2$ | 3.47 | 231.13 | 38.3 |
| | $D_3$ | 3.35 | 228.76 | 36.4 |
| | $D_4$ | 3.23 | 222.75 | 32.4 |
| | $D_0$ | 3.66 | 266.75 | 51.8 |
| | $D_1$ | 3.52 | 260.25 | 49.9 |
| $S_2$ | $D_2$ | 3.56 | 255.25 | 48.3 |
| | $D_3$ | 3.26 | 250.25 | 43.2 |
| | $D_4$ | 3.07 | 244.43 | 40.2 |
| | $D_0$ | 3.44 | 272.15 | 58.0 |
| | $D_1$ | 3.24 | 267.5 | 55.8 |
| $S_3$ | $D_2$ | 3.06 | 261.02 | 51.8 |
| | $D_3$ | 2.92 | 255.79 | 49.6 |
| | $D_4$ | 2.77 | 246.65 | 46.5 |

**Table II. Influence of *Trianthema portulacastrum* infestation and maize plant spacing on the quality parameters of maize grain**

| | *Quality* | *Grain starch (%)* | *Grain oil (%)* | *Grain protein (%)* |
|---|---|---|---|---|
| | $D_0$ | 66.35 | 3.65 | 6.84 a |
| | $D_1$ | 66.14 | 3.64 | 6.75 ab |
| $S_1$ | $D_2$ | 66.04 | 3.61 | 6.70 b |
| | $D_3$ | 65.95 | 3.62 | 6.52 c |
| | $D_4$ | 65.88 | 3.59 | 6.41 c |
| | $D_0$ | 68.22 | 3.64 | 7.85 a |
| | $D_1$ | 68.02 | 3.63 | 7.24 b |
| $S_2$ | $D_2$ | 67.75 | 3.63 | 7.18 b |
| | $D_3$ | 67.54 | 3.60 | 6.98 c |
| | $D_4$ | 67.21 | 3.63 | 6.94 b |
| | $D_0$ | 70.21 | 3.68 | 8.11 a |
| | $D_1$ | 70.08 | 3.66 | 7.95 a |
| $S_3$ | $D_2$ | 69.71 | 3.61 | 7.81 c |
| | $D_3$ | 69.52 | 3.60 | 7.63 d |
| | $D_4$ | 69.34 | 3.60 | 7.69 cd |

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