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STUDIES INTO INFESTATION OF *TRIANTHEMA PORTULACASTRUM* (HORSEPERSLANE) ON THE GROWTH AND QUALITY BEHAVIOUR OF MAIZE CROP

Mahmood A. Randhawa

Department of Continuing Education, Division of Education & Extension, University of Agriculture, Faisalabad
Corresponding author's e.mail: randhawa_contedu@yahoo.com

An experiment pertaining to studies into *Trianthema protulacastrum* infestation was conducted focusing for its effect on growth, yield and quality of maize crop. Experimental field was sandy loam with having infestation of *Trianthema protulacastrum. Different densities of Trianthema protulacastrum* like D_0 (weed free), D_1 (5plants m^{-2}), D2 (10 plants m^{-2}), D_3 (15 plants m^{-2}), D_4 (20 plants m^{-2}) were maintained at standard maize spacing i.e., Row to Row = 60cm and plant to plant distance = 15 cm. Other than specific treatment (Trianthema density), all agronomic requirements were kept normal and uniform. The results clearly indicated that *Trianthema* weed is so damaging that it even smaller level (5 plants m^{-2}) posed loss to the growth behaviour i.e., maize plant height, leaf area index (LAI), crop growth rate (CGR), Dry weight (DW). Similarly, trend of loss was noted on yield and yield quality in terms of protein, oil and starch. The results suggest that (i) the maize crop must be kept free of *Trianthema* to avoid the loss in terms of yield and its quality (ii) studies may be conducted even below to 5 *Trianthema* plants m^{-2} to explore its effects.
Keywords: Maize, Horseperslane, density, yield, quality

INTRODUCTION

Maize (*Zea mays* L.) is generally grown in two seasons i.e. spring and autumn in Pakistan conditions. But its most cultivation is in autumn due to best adaptability of environment. The weeds also being well adapted to this season, imposes loss on this crop and reduces its yield considerably. In general made loss is even up to the level of 24-47% (Ashiq and Ata, 2005) which is challenging to this crop. Maize seems to be more susceptible to *Trianthema protulacastrum* seed as it causes losses to maize yield to the time of 32% (Balyan and Bhan, 1989). Gricher (1993,2007, 2008) has also found this weed very damaging due to its 70-80% effects on grain yield and quality of peanut. Randhawa *et al.* (2007) concluded that enhancement in quality of maize grain show probably due to proper utilization of light, moisture and nutrition. A decrease in plant spacing resulted in a decrease in grain starch oil and protein of maize crop. Randhawa *et al*. (2009) concluded that maize sown at narrow spacing yield better due to more population but the grain quality improves at wider maize plant spacing with better use of growth resources. According to results found by Friesen *et al*. (1960) the *Trianthema* not only restricts the yield of maize but also adversely affects the maize quality in terms of protein contents. Involvement of specific weed management needs to be developed through exploring its density wise effects (Tollenaar *et al*., 1994) because the trend of weeds affecting grain quality of maize may be high under heavy weed density. It utilizes the growth resources and solar radiation with great efficiency and potency. A high density of weeds affects the morphology and phenology, hence growth behavior of crops. So the effects of *Trianthema portulacastrum* at different densities may be studied on the growth behavior, yield and grain quality in order to understand the threshold level for better management of it under field conditions. This may help utilizing the growth resources to enhance the production of maize crop.

Keeping this all in view, this study was conducted to explore the influence of *Trianthema protulacastrum* on the growth behavior, yield and grain quality of maize under field conditions.

MATERIALS AND METHODS

Field experiment was conducted in 2009 at the University of Agriculture, Faisalabad. The soil was sandy loam. The site under trail was heavy infested with *Trianthema protulacastrum* in order to maintain its densities. Experiment was located on the site with previous crop wheat (*Triticum aestivum L.*). The maize variety (Akbar) was used as a test crop. Fields were given as a basic dose of Nitrogen, Phosphorus and Potash at the rate of 100 kg as N, P_2O5 and K_2O per acre respectively at the time of sowing. The remaining 50 kg Nitrogen per acre was broadcasted in the field just before the 1st irrigation to the crop. Plant spacing was maintained as standard with row to row distance at 60 cm and plant to plant at 15 cm.

The treatment of *Trianthema protulacastrum* density comprised D_0 (control), D_1 (05 plant $m^{-2)}$, D_2 (10 plant m^{-2}), D_3 (15 plant m^{-2}), and D_4 (20 plant m^{-2}). Treatment was replicated four times in same arrangement. All the agronomic practices were kept uniform in all treatments. Observations on the growth behavior yield and yield quality parameters were collected using standard procedure. The parameters regarding grain starch, oil and protein contents were determined following the methods of Juliano (1971) and Low (1990) respectively. Recorded data were analyzed by using MSTATC statistical package (MSTATC, 1986) and differences among the treatment means were compared by the least significant difference (LSD) test (Steel and Torie, 1980)

RESUTLS AND DISCUSSION

Table 1 shows that the influence of different densities of *Trianthema protulacastrum* was significant on the maize plant height. Maximum height of 193.1 cm was observed in the *Trianthema* free plots and the lowest height in plots with D_4 density (20 weed m^{-2}). However, statically it was at par with D_3 density (15 weed m^{-2}). Decrease in plant height with an increase in *Trianthema* density may be attributed to competition caused for nutrition and moisture which resulted in less plant development of maize crop. These results are line with Khalid and Shahid (1987). Similarly the leaf area index was also affected by the *Trianthema* density almost with the same trend. Statistically maximum LAI was found in *Trianthema* free (D_0) plots but each increase in *Trianthema* density caused reduction in LAI. The impact with weed free and low weed density might be attributed to greater number of Maize plant per unit area and less competition by weed. Zanin *et al.* (1986) has also reported that LAI of maize crop reduces with increase in weed population.

Regarding the effect of *Trianthema* density on Crop Growth Rate (CGR) as shown Figure 1, it was recorded maximum in *Trianthema* free plots while D_4 (20 *Trianthema* plants 20 weed m^{-2}) resulted in the minimum CGR. These results suggest that *Trianthema* density even at lower level (5 plants m^{-2}) reduced CGR of maize. The Fig II regarding Net Assimilation Rate (NAR) shows clearly that during early growth stages, the *Trianthema* density had no significant effect. However, at later stages, *Trianthema* free plots produced higher NAR of maize at low level of weed density. Same has also been reported by Zanin *et al.* (1986).

The maximum Dry Weight (DW) per plant was recorded in *Trianthema* free plots. The next better treatment was where the lowest density of *Trianthema* (5 plants m^{-2}) was maintained. The Table-1 shows the gradual decrease in maize weight per plant with successive increase in *Trianthema* density which might be due to the reduction in plant size as is evident from the decreased plant height. *Trianthema* density at different levels also influenced the grain yield with significant level. The lowest *Trianthema* density level (5 plants m^{-2}) significantly decreased the maize yield (2.53%) compare to control (D_0). Similarly, the grain yield was further decreased with gradual increase in weed density. However, the results of D_1 and D_2 remained non significant within each another statistically. Similarly D_3 and D_4 also exhibited within treatment non significant results statistically. Reduction in maize grain yield due to increase in weed densities are in line with the results of Young *et al.* (1984), Beckat *et al.* (1985) and Zanin and Sattin (1988). Grain starch contents were also affected by *Trianthema* density significantly. The lowest *Trianthema* density, i.e. 5 plant m^{-2} reduced the starch contents significantly than control. Similarly the lowest *Trianthema* density, i.e. 5 plant m^{-2} also reduced the starch contents significantly than control and the lowest grain starch was found in the high *Trianthema* density (20 plant m^{-2}). However, difference between D_2 &D_3 was statistically non significant. Lower quality of maize grain in terms of starch content in the plots with high weed infestation may be attributed to low CGR and hence relatively less photosynthetic activity which resulted in less accumulation of starch. The influence of *Trianthema* density on the maize grain oil contents was non significant. The possible season for non significant of results in this case might be due to the specified agro-climatic condition under which experiment was conducted. Where as the effect of *Trianthema* density on maize grain protein was found pronounced in weed free and low weed plots showing that the weed density even at lower levels makes significant reduction in protein contents. In spite of the gradual decrease in grain protein contents with successive increase in

Table 1. Effect of population density of *Trianthema portulacastrum* on maize growth and quality parameters

Parameters	D_0	D_1	D_2	D_3	D_4
Plant Height cm(4.89)	193.10a	185.50b	180.10c	173.50d	173.10d
Leaf Area Index	2.24a	2.04b	1.96b	1.96b	1.81c
Maize Dry Weight g/plant (3.12)	116.75a	101.65b	98.00c	91.40d	87.13e
Grain Yield t ha^{-1} (0.165)	3.71a	3.49b	3.43b	3.21c	3.07c
Grain Starch %age (0.094)	68.25a	68.14b	67.67c	67.67c	67.47d
Grain Oil %age	3.66 Ns	3.64	3.62	3.61	3.61
Grain Protein %age (0.772)	7.60a	7.32b	7.23c	7.04d	7.08d

Trianthema density, the result with D3 and D4 remained statistically equal. The improvement in grain protein contents by no or lesser weed pressure might be attributed to better light, moisture and nutrition utilized by the maize crop.

Fig. 1 and Figure 2 show the trend of plant growth of maize crop in response to Trianthema density.

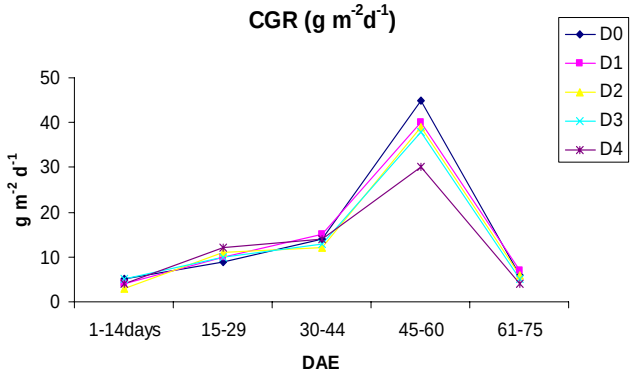

Figure 1. Effect of plant spacing and population density of *Trianthema portulacastrum* on maize CGR (g m^{-2} d^{-1})

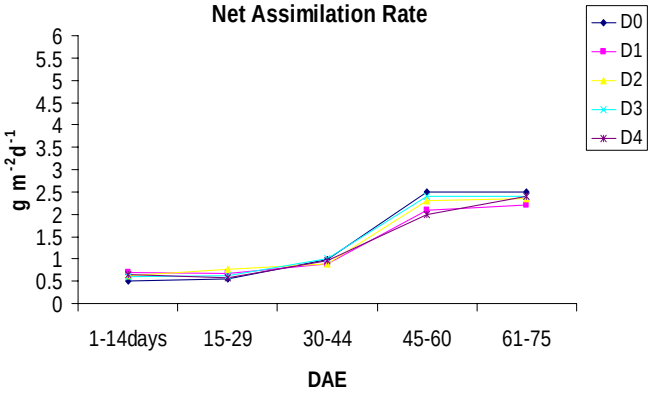

Figure 2. Effect of plant spacing and population density of *Trianthema portulacastrum* on maize NAR (g m^{-2} d^{-1})
DAE: Days After Emergence

CONCLUSION

The density of *Trianthema portulacastrum* has c crop. Even the lesser no. of Trianthema has significantly negative effect as compared to Trianthema free plots.

The study shows that Trianthema must be controlled even at lower number to avoid losses to the growth, yield and quality of maize crop.

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