

# Influence of *Trianthema portulacastrum* Infestation and Nitrogen on Quality of Maize Grain

MAHMOOD A. RANDHAWA, ZAHID A. CHEEMA† AND MUHAMMAD ANJUM ALI‡

Departments of Continuing Education and †Agronomy, University of Agriculture, Faisalabad–38040, Pakistan

‡Department of Agriculture Extension, Government of Punjab, Lahore–Pakistan

## ABSTRACT

Effect of *Trianthema portulacastrum* and nitrogen application on grain quality parameters of maize was investigated under field conditions at Faisalabad. Interactive treatments comprised N<sub>0</sub> (control), N<sub>1</sub> (100 kg ha<sup>-1</sup>), N<sub>2</sub> (150 kg ha<sup>-1</sup>), N<sub>3</sub> (200 kg ha<sup>-1</sup>) and W1 (weeding 2 weeks after emergence), W2 (weeding 4 weeks after emergence), W3 (weeding 6 weeks after emergence) and W4 (weeding 8 weeks after emergence). The results showed that among all the interactive treatments, N<sub>3</sub> x W1 produced highest grain starch (68.92%) and protein (7.71%) while the maximum oil (3.71%) was noted in treatment N<sub>1</sub> x W1.

**Key Words:** *Trianthema portulacastrum*; Maize; Nitrogen

## INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal of Pakistan and is grown in two seasons i.e. spring and autumn. In general, weeds restrict potential yield harvest of the maize crop. Among maize weeds, *Trianthema portulacastrum* is the major weed causing significant reduction in maize yields. Balyan and Bhan (1989) reported 32% losses in maize grain yield due to unweeded *Trianthema*. *T. portulacastrum* also affects the quality of maize grain as it reduces protein in maize crop (Friesen *et al.*, 1960). Such effect of *T. portulacastrum* on grain quality of maize may be modified with the use of nitrogen as suggested by Blackman and Templeman (1938). They concluded that competition between crop and weeds was primarily for nitrogen. So, the protein contents of the maize grain were improved by applying nitrogen. Time of weed removal and nitrogen application may reduce the adverse effects of weed competition on grain quality of maize.

Keeping this in view, this study was conducted to evaluate the effects of *T. portulacastrum* infestation on the quality of maize grain as influenced by nitrogen application under field conditions of Faisalabad.

## MATERIALS AND METHODS

A field study was conducted at the University of Agriculture, Faisalabad during 1994 and 1995. It was replicated four times in split plot arrangement. Nitrogen doses comprised N<sub>1</sub> (100 kg ha<sup>-1</sup>), N<sub>2</sub> (150 kg ha<sup>-1</sup>) and N<sub>3</sub> (200 kg ha<sup>-1</sup>) in addition to control i.e. N<sub>0</sub> (no nitrogen) while weeding treatments comprised W1 (weeding 2 weeks after emergence), W2 (weeding 4 weeks after emergence), W3 (weeding 6 weeks after emergence) and W4 (weeding 8 weeks after emergence). Nitrogen was kept in main plots

while weeding in the sub-plots. Maize variety "Akbar" was sown on August 6 and August 7 in 1994 and 1995, respectively. Weeding was done manually according to treatment schedule. A basal phosphorus and potash dose @ 100 kg ha<sup>-1</sup> as P<sub>2</sub>O and K<sub>2</sub>O was applied at sowing. While half of nitrogen was applied at sowing and remaining half nitrogen was broadcasted with first irrigation. Other agronomic practices for all the treatments were kept normal and uniform.

Observations on yield quality parameters were recorded using standard procedures. Grain starch, oil content and protein content were determined following the methods of Juliano (1971), Low (1990) and Anonymous (1980), respectively. All the data collected 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 & Torrie, 1984).

## RESULTS AND DISCUSSION

Quality of maize grain in terms of grain starch, protein and oil due to interaction of *Trianthema* duration and nitrogen levels was significantly influenced (Table I). Maximum starch content (68.52%) was recorded in crop fertilized @ 200 kg N ha<sup>-1</sup> and weed eradication 2 WAE (weeks after emergence). Similarly, early weeding (2 WAE) produced significantly higher grain starch content than the prolonged infestation duration with nitrogen @ 100 kg ha<sup>-1</sup>. Probably less weed competition and adequate nitrogen supply resulted in more photosynthetic harvest and thus higher grain starch content. Davidescu (1965) also reported similar results of his study. While oil content were maximum in crop fertilized @ 100 and 150 kg N ha<sup>-1</sup> and weeded 2 WAE. Oil content were reduced at higher rates of

**Table I. Influence of *Trianthema portulacaestrum* infestation and nitrogen on quality of maize grains**

Yield	N0				N1				N2				N3			
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
Grain starch (%) {0.29}	65.53a	64.90b	46.86b	64.66b	66.03a	65.45b	65.15b	65.20b	67.99a	67.24b	67.04b	66.34c	68.92a	67.43b	67.15bc	67.13c
Grain oil (%) {0.03}	3.59b	3.63a	3.61ab	3.61ab	3.71a	3.61b	3.60b	3.61b	3.71a	3.70ab	3.67b	3.60c	3.69a	3.63a	3.68a	3.63b
Grain protein {0.18}	6.89a	6.71b	6.71b	6.69b	7.27a	7.03b	6.77c	6.77c	7.41a	7.08b	6.82c	7.00bc	7.74a	7.72a	7.60a	7.60a

The values in {} are LSD values

nitrogen which indicated than nitrogen application at lower rates had promotive effect on grain oil content of maize. Davidescu (1965) also found that N applied in addition to PK increased the grain oil content of maize.

Maximum grain protein content was noted in plots where weed was removed 2 WAE and where nitrogen was applied @ 200 kg ha<sup>-1</sup>. Grain protein content was improved with early weeding at all levels of nitrogen i.e., 100 and 150 kg ha<sup>-1</sup>. These results revealed that although early control of *Trianthema* at each level of N improved grain protein content but nitrogen at higher rate (200 kg ha<sup>-1</sup>) appeared to be better in improving grain protein content and effect of *Trianthema* infestation duration was reduced with application of nitrogen at higher level. An increase in protein content of maize grain with increased application of N ha also been reported by Negrila *et al.* (1984) and Thiraporn *et al.* (1992).

## REFERENCES

- Anonymous, 1980. *Official Methods of Analysis*, Hromitz, W. (ed.), 10<sup>th</sup> Ed., Assoc. Offic. Agri. Chemists, Washington, D.C.
- Anonymous, 1986. "MSTATC" *Micro-computer Statistical Programme*. Michigan State Univ. of Agriculture, Michigan Lansing, USA.
- Balyan, R.S. and V.M. Bhan, 1989. Competing ability of maize, pearl millet, mung bean and cowpea with carpet weed under different weed management practices. *Crop Research Hisar*, 2: 147–53.
- Blackman, G.E. and W. Templeman, 1938. The nature of competition between cereal crops and annual weeds. *J. Agri. Sci.*, 28: 247–27.
- Davidescu, D.D., 1965. Effect of NP and NPK fertilizers on grain protein, starch and oil content percentage in dry grains. *Proc. 4th Regional Coll. Int. Potash Ist. Bern*, pp: 85–97 (*Pb. Bull.* No. 5).
- Friesen, G., L.H. Shebeski and A.D. Robinson, 1960. Economic losses caused by weed competition in Manitoba grain fields. Effect of weed competition on the protein content of cereal crops. *Canadian J. Plant Sci.*, 40: 652–8.
- Juliano, B.O., 1971. A simplified assay for maize analysis. *Cereal Sci. "Today"*, 16: 334–40.
- Low, N.H., 1990. Food analysis, 417/717 Laboratory manual, Deptt. of Applied Microbiology and Food Science. Univ. Saskatchewan, Canada, pp: 37–8.
- Negrila, M., S. Stan and E. Vegnila, 1984. Effect of N and P fertilizer on maize yield and quality on the combric chernozem at Draganesti-Vlasca. *Problem de Agrofitoteloric Teoretica Si Aplicata*, 6: 255–68 (*Field Crop Absts*; 166; 2909; 1985).
- Steel, R.G.D. and J.H. Torrie, 1984. *Principles and Procedures of Statistics*. McGraw Hill Book Co., Tokyo, Japan.
- Thiraporn, R.B. Feil and P. Stemp, 1992. Effect of nitrogen fertilization on grain yield and accumulation of N, P and K in grains of tropical maize. *J. Agron. and Crop Sci.*, 169: 9–16.

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