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Effect of different treatment combinations on quality characteristics of wheat crop (*Triticum aestivum*)

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Abstract
The results achieved revealed that combinations of different treatments caused significant difference in protein, lysine and starch content of grain during 1998-99 and 1999-2000 both years on wheat var. HD-2285 at Fertilizer Research Station, Pura (Kanpur Nagar), C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh. On the basis of values of quality parameters, the different treatment combinations could be arranged in the following sequence: 40 kg K+ 30 kg Mg+ Azotobacter + 40 kg S + 5025 kg Zn ha^{-1} > 40 kg K + 30kg Mg + 40kg S ha^{-1} > 40 kg K + 30 kg Mg + 5.25 kg Zn ha^{-1} > 40 kg K + 30 kg Mg + Azotobacter ha^{-1}).
Keywords: Zinc, Phosphorous, Sulphur, Magnesium, Wheat crop, Azotobacter.

Introduction

Application of different chemical fertilizers either alone or in combinations have shown disastrous effects on soil health causing deterioration in productivity of crops. On the other hand, addition of chemical fertilizers along with organics/ biofertiliizers are responding significantly in increasing crop yields and maintaining soil health (Tiwari *et al.* 987, Tripathi *et al.* 1995). Therefore, attempts have been made to evaluate the effect of application of K, Mg, S, and Zn along with Azotobacter on quality characteristics of wheat Variety HD2285.

Material and methods

Afield experiment was conducted during two consecutive Rabi season of 1998-99 and 1999-2000 on wheat var. HD-2285 at Fertilizer Research Station, Pura (Kanpur Nagar), C. S. Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh. The treatments consisted of: (i) 40 kg K_2O + 30 kg Mg + Azotobacter (ii) 40 kg k_2O + 30 kg Mg + 40 kg S (iii) 40 kg k_2O + 30 kg Mg + 5.25 kg Zn and (iv) 40 kg K_2O + 30 kg Mg + 40 kg S +5.25 kg Zn + Azotobacter (@ 200 g culture for one kg seed) ha^{-1}. These treatments were quadruplicated in factorial randomized block design. The soil of experimental field was TypicHaplusteps loam in texture and pH 7.9 and 7.8, organic carbon 2.44 and 2.38 g kg^{-1}, available K_2O 135 and 170 kg ha^{-1}, available S 16.70 and 17.40 kg ha^{-1} and exchangeable Mg 1.70 and 1.80 C mol (p^+) kg^{-1} during 1998-99 and 1999-2000, respectively. The seeds were sown on Nov. 30 and Dec. 13 during 1998-99 and 1999-2000, respectively. The crop was harvested on April 20 and May 7, during 1998-99 and 1999-2000, respectively. The grain and straw yields were recorded separately. The protein content in seed was obtained by multiplying N content in seed with the factor 5.70. lysine content in grain was determined calorimetrically (Tsai et al.1972), and starch by method as suggested by Hodge & Hofreiter (1962).

Result and Discussion

Tables 1, and 2 show that quality characteristics i.e. protein, lysine and starch contents were significantly influenced by different treatment combinations on wheat var. HD-2285 at Fertilizer Research Station, Pura

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Table1 Effect of different treatment combinations on protein content (%) in grain

Treatment combinations (kg ha^{-1})	Year	
	1998-99	1999-2000
K_{40} Mg_{30} + Azotobacter	12.03	11.50
K_{40} Mg_{30} S_{40}	13.03	12.07
K_{40} Mg_{30} $Zn_{5.25}$	12.43	11.68
K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter	13.23	12.13
Average	12.68	11.60
SE (diff)	0.216	0.194
CD5%	0.436	0.392

Table 2 Effect of different treatment combinations on lysine content (%) in grain.

Treatment combinations (kg ha^{-1})	Year	
	1998-99	1999-2000
K_{40} Mg_{30} + Azotobacter	2.75	2.68
K_{40} Mg_{30} S_{40}	2.86	2.83
K_{40} Mg_{30} $Zn_{5.25}$	2.80	2.75
K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter	2.92	2.89
Average	2.83	2.79
SE (diff)	0.038	0.032
CD 5%	0.077	0.065

The highest protein contents of 13.23% and 12.13% with K_{40}, Mg_{30}, S_{40}, $Zn_{5.25}$ + Azotobacter per hectare and lowest of 12.03% and 11.50% during 1998-99 and 1999-2000 were obtained , respectively. On the basis of protein contents the different treatment contents showed the sequence: K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter > K_{40} Mg_{30} S_{40} > K_{40} Mg_{30} $Zn_{5.25}$ > K_{40} Mg_{30} + Azotobacter (Table 1). The treatment combinations consisting of K, Mg, S, Zn and Azotobacter have been reported positive effect on protein content (Krishna & Khera 1993, Tripathi *et al.* 1997, Sakal *et al.* 2000).

Due to positive effects of K, S, Zn and Azotobacter on lysine contents, the lysine content was also higher in K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter followed by K_{40} Mg_{30} S_{40}, K_{40} Mg_{30} $Zn_{5.25}$ and K_{40} Mg_{30} + Azotobacter treatment combinations during both the years (Table 2).

On the basis of starch content, the treatment combinations could be placed in the ascending order: K_{40} Mg_{30} + Azotobacter, K_{40} Mg_{30} + $Zn_{5.25}$, K_{40} Mg_{30} + S_{40} and K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter (Table 3). Potassium is known to have positive effect on sugar synthesis (Pathak *et al.* 1999), and magnesium being integral constituent of chlorophyll help in the synthesis of sugar (starch). Similarly, Sulphur is alsoknown to be involved in the formation of chlorophyll, and, intern, increased the starch content. The results showed the usefulness of integrated nutrient management.

Table 3 Effect of different treatment combinations on Starch content (%) in grain.

Treatment combinations (kg ha^{-1})	Year	
	1998-99	1999-2000
K_{40} Mg_{30} + Azotobacter	69.71	69.89
K_{40} Mg_{30} S_{40}	70.93	70.84
K_{40} Mg_{30} $Zn_{5.25}$	70.34	70.27
K_{40} Mg_{30} S_{40} $Zn_{5.25}$ + Azotobacter	72.84	72.72
Average	70.84	70.93
SE (diff)	0.524	0.401
CD 5%	1.055	0.808

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