

Effects of Zinc Fertilizer on the Yield and Quality of Two Winter Varieties of Canola

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INTRODUCTION

Canola (*Brassica napus L.*) is one of the oil-seed crops that is becoming an attractive source of vegetable oil in Iran since 90% of the consumed vegetable oil is imported (Rezaee and Malakouti 2000). The increase in plant protein is linearly related with increasing soil- Zn concentrations. Conventionally, 20 kg Zn ha⁻¹ are recommended to canola growers in the Northern part of Iran. Kimber and McGregor (1995) reported that the Zn content of canola leaves were highest when compared with other micronutrients. Zinc deficiency in soils can result in stunted growth with fewer branches and can reduce canola seed yield by 20 to 30%. Zinc deficiency can also result in lower oil contents. This study was conducted to determine the rates of Zn applications necessary for a favorable canola yield and quality.

METHODS

A completely randomized block experiment with 10 treatments and 3 replications was conducted in the Ahar region of the East Azerbaijan province during the 2004-2005 growing season. The effect of Zn fertilization on the performance of winter canola was studied. The variable factors included five rates of Zn (0, 5, 10, 15, 20 kg Zn ha⁻¹), and two winter canola varieties, Okapi and SLM₀₄₆. Yield and yield parameters of canola seed were determined. The statistical analyses were performed using MSTATC software and Duncan tests. The results of soil and irrigation water analysis can be found in Table 1 and 2, respectively.

Table 1. Soil analysis results.

Depth cm	pH	EC dS m ⁻¹	T.N.V. %	Organic carbon %	Nutrients						
					P	K	Fe	Zn	Mn	Cu	B
0-30	7.8	1.38	10	0.38	12	195	8.5	0.32	2.6	0.5	0.87

Table 2. Irrigation water analysis data.

EC	pH	HCO ₃ ⁻	Cl ⁻	SO ₄ ²⁻	Ca ²⁺ + Mg ²⁺
0.73	7.6	1.5	2.9	me l ⁻¹ 3.5	6.9

RESULTS AND DISCUSSION

The analysis of variance showed that the application of Zn had a significant effect (at the 1% level) on canola yield. The best yield of 2606.25 kg ha⁻¹ was obtained with the highest Zn-application rate (Fig. 1). The effect of Zn on canola oil content was significant (at the 1% level). The best oil content (43.7) was also obtained with the application of 20 kg Zn ha⁻¹.

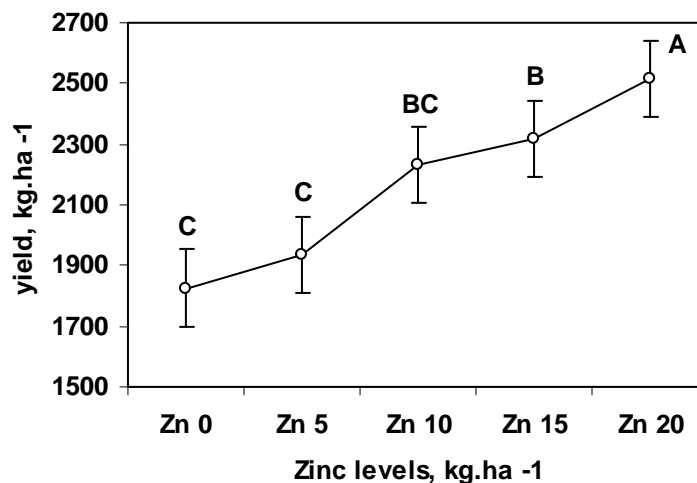


Fig. 1. The effect of Zn levels on canola yield.

CONCLUSIONS

Zinc deficiency lowered content of fatty acids in canola by 50%. This decrease can be attributed to fatty acid biosynthesis processes and to carotenoid levels. Increasing Zn levels provides better conditions for the formation of Zn-containing proteins resulting in more protein from photosynthetic processes. The effect of Zn on the Weight of Thousand Seeds (TSW) was found significant (at the 1% level). The highest TSW (4.44g) was obtained with 20 kg Zn ha⁻¹. Taking the maximum yield and the most favorable oil content as primary objectives into consideration, the best protein content was also obtained with an application of 20 kg Zn ha⁻¹. However, there were no significant differences in treatment effects between the two canola varieties.

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