

The Agronomical Aspects of Zinc Sulfate Application on Soybean in Iranian Condition "Gonbad region"

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INTRODUCTION

Gonbad is located in the Northern part of Iran and is climatologically classified as a temperate area. Soybean is one of the most important crops in the area. Produced oil crops provide only 10% of the country's consumption. Therefore, any attempt to increase oil-crop production could be a matter of importance. Adequate crop nutrition plays an important role in this regard. The present study was conducted to investigate the effects of soil and foliar applications of Zn on soybean production in 2002.

METHODS

The experiment was laid out in a randomized complete block design. Factorial combinations of the two factors, soil and foliar Zn applications, were included. Four different levels of Zn sulfate (0, 20, 40, 60 kg ha⁻¹) were applied to the soil. Foliar-Zn was applied at four levels (no application, once before flowering, once at grain formation, twice before flowering and at grain formation) as 0.005 solution. Each treatment was replicated four times. The soil was characterized as a silty clay loam with no salinity limitation and nutrient enriched. The available Zn concentration was about 1.05 mg kg⁻¹ soil. Plant height, number of seeds per pod, pods per plant, grain yield, oil percentage, seed test weight, dry matters at various stages and Zn absorption were recorded.

RESULTS AND DISCUSSION

The means of important parameters of soybean yield are displayed in Table1. Results revealed that an application of 40 kg Zn sulfate ha⁻¹ soil before planting could significantly improve grain yield, seed test weight and other yield parameters of soybean. Spraying Zn sulfate as 0.005 solution also improved significantly some yield parameters. The interactions between soil and foliar Zn applications were found to be significant. Results revealed that an application of 40 kg Zn sulfate ha⁻¹ soil followed by two foliar applications, carried out before flowering and during grain information, improved quantitative parameter of soybean yield significantly, but the treatment had no effect on oil percentage.

Table1. Zinc sulfate quantity and method application interaction

Treatments	Grain Yield ton ha ⁻¹	Grain Weight gr	Pods per Plant No.	Leaf Zn mg gr ⁻¹
Zn ₀ S ₀	1.95 ^e	132 ^d	128 ^{de}	20 ^e
Zn ₀ S ₁	1.95 ^e	140 ^{bcd}	124 ^e	30 ^{de}
Zn ₀ S ₂	1.98 ^{de}	140 ^{bcd}	124 ^e	60 ^{bc}
Zn ₀ S ₃	2.07 ^{cde}	142 ^{bcd}	128 ^{de}	100 ^a
Zn ₂₀ S ₀	2.13 ^{bcde}	135 ^{cd}	144 ^{abc}	25 ^{de}
Zn ₂₀ S ₁	2.23 ^{bc}	137 ^{cd}	140 ^{bc}	35 ^{cde}
Zn ₂₀ S ₂	2.25 ^{bc}	140 ^{bcd}	144 ^{abc}	70 ^b
Zn ₂₀ S ₃	2.30 ^b	144 ^{bc}	136 ^{cd}	110 ^a
Zn ₄₀ S ₀	2.17 ^{bcd}	145 ^{bc}	152 ^a	32 ^{cde}
Zn ₄₀ S ₁	2.33 ^b	150 ^{ab}	144 ^{abc}	42 ^{bcde}
Zn ₄₀ S ₂	2.55 ^a	145 ^{bc}	152 ^a	100 ^a
Zn ₄₀ S ₃	2.55 ^a	160 ^a	148 ^{ab}	120 ^a
Zn ₆₀ S ₀	2.05 ^{cde}	140 ^{bcd}	136 ^{cd}	46 ^{bcde}
Zn ₆₀ S ₁	2.13 ^{bcde}	142 ^{bcd}	140 ^{bc}	52 ^{bcd}
Zn ₆₀ S ₂	2.15 ^{bcde}	140 ^{bcd}	144 ^{abc}	102 ^a
Zn ₆₀ S ₃	2.15 ^{bcde}	140 ^{bcd}	140 ^{bc}	110 ^a
CV %	3.5	3.0	9.5	16.3

CONCLUSIONS

The response of soybean to Zn in soils with concentrations higher than 1 mg Zn kg⁻¹ soil reveals its sensitivity to this micro nutrient. The same has been reported by Al. Samerria (1998), Nedic (1997) and Gupta and Vyas (1994). Zinc application at a rate higher than 40 kg ha⁻¹ did not increase yield and yield reduction was observed in some cases. However, foliar application of Zn could promote its soil application.

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