

Effect of Nitrogen Levels and Microelements on Physiological Indices and Forage Yield of Maize (s.c704)

Nour Ali Sagedi¹ and Mohammad Reza Ardakani²

¹ Islamic Azad University, Arak, IRAN

² Nuclear Research Center for Agriculture and Medicine, Atomic Energy Organization of Karaj, IRAN

INTRODUCTION

A field experiment was conducted at Agricultural Research center of Markazi province in 2002 to investigate the effects of different N, Fe and Zn levels on physiological indices and forage yield of maize (s.c 704 var).

METHODS

A split plot experiment was arranged following a complete randomized block design with 12 treatments and four replicates. The treatments consisted of three levels of N (150, 225 and 300 kg N ha⁻¹) as main plots and four levels of Fe and Zn (including 4 kg ha⁻¹ Fe sulfate, 45 kg ha⁻¹ Zn sulfate, 4 kg ha⁻¹ Fe sulfate + 45 kg ha⁻¹ Zn sulfate) as sub plots.

RESULTS AND DISCUSSION

Physiological indices were affected by N rates. Raising N levels from 150 to 225 and 300 kg N ha⁻¹ increased Leaf Area Indices (LAIs) and crop growth rates. A maximum LAI of 5.7 was observed during growth season after 1100 Growing Degree Days (GDD) at N levels of 300 kg N ha⁻¹. The dry weights were normal during the growth season until 400 GDD. After 400 GDD, dry weights of plants under the highest N treatment increased linearly to a maximum of 1754.16 g cm⁻² after 1150 GDD.

Among physiological indices, the net assimilation rate was affected less by N application. Net assimilation rates declined during the growth season. Increased leaf areas in the field improved light interception and the photosynthesis-capacity of plants and increased forage yield. A maximum forage yield with the highest protein percentage was produced at N levels of 300 kg N ha⁻¹.

The results also show that an application of microelements, particularly Zn, did not significantly increase LAIs, crop growth rates and total dry weights. Maximum LAI, Top Dry matter Weight (TDW), Crop Growth Rate (CGR = TDW / growing period) were obtained with the application of Zn sulfate and Zn sulfate + Fe sulfate. A maximum amount of morphological characteristics and protein percentages were obtained with both treatments, but Zn sulfate had a stronger effect.

The highest forage yield of 88.46 ton ha⁻¹ was obtained with 300 and 45 kg ha⁻¹ of N and Zn sulfate, respectively. The combined application of 300, 45, and 4 kg ha⁻¹ of N, Zn sulfate and Fe sulfate, respectively, produced a yield with the maximum protein percentage of 12.53.

CONCLUSIONS

Considering the importance of LAI and CGR for forage yield, it was concluded that forage yield was highest under high N and Zn sulfate levels due to the entailed improvement of physiological indices.