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Effects N Management on Maize Grain Yield and its Component under Deficit Irrigation

S. A. Mohammadi[1]- H. R. Khazaei[2*]- A. Nezami[2]

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Introduction

Poor management of irrigation and nitrogen are major factors in reducing yield. Although 94 percent of total water extractable and 64 percent of water used in agriculture, only 21 percent of the cultivated land is irrigated. In such circumstances irrigation to increase production per unit of water and efficient use of scarce water resources will be necessary and inevitable. Nitrogen is a limiting factor in crop production along with water in arid and semiarid regions. Many research have shown that the management of nitrogen during the growing season is essential. The need to establish the proportion of nitrogen and soil moisture availability is essential. In situations where sufficient water is not available, favorable conditions of work and not wasting resources, particularly water and nitrogen use efficiency leads and water and reduces the nitrogen use efficiency. The aim of this study, was to use chlorophyll meter for determination the timing and amount of nitrogen fertilizer plant in order to optimize the use of nitrogen under deficit irrigation.

Materials and Methods

An experiment was conducted as split split plot based on randomized complete block design with three replications at the Research Farm of Ferdowsi University of Mashhad during 2013 cropping season. Irrigation treatments were arranged in main plot with two levels including: 70 and 100 percent water supply, Nitrogen Index in sub plots by two levels including: 90 and 95 percent and sub-sub factor in both the 50 and 100 kg of nitrogen per hectare. Density of 66,600 plants per hectare was considered. In each block a control plot was considered that the amount of nitrogen that was always at an optimal level, so that the total amount of nitrogen, 25 percent more than the amount recommended by soil test (360 kg per hectare).The control plot was used for the comparison with other treatments SPAD device. According to the nitrogen index was determined with using of 1 equation (Arshadi and Khazaei, 2008):

$$NI = \frac{SPAD\ Reading\ in\ Treatment}{SPAD\ Reading\ in\ Control} \times 100$$

Analysis of variance was performed using SAS computer software packages. The main effects and interactions were tested using the Duncan's multiple range test at 5% level.

Results and Discussion

The results showed that the highest leaf area index number of kernels per ear (435), biomass (814 $g.m^{-2}$) and economic yield (397 $g.m^{-2}$) obtained for full irrigation and nitrogen index of 95%. The interaction between irrigation and nitrogen fertilizer on leaf area index, grain weight per ear, biomass and harvest index was significant. Although 95% of nitrogen index and 100 kg of nitrogen per hectare compared to 90 percent of nitrogen index and 50 kg of nitrogen per hectare, 11% leaf area index, 41% number of grain per ear and 18% biomass increased but it was not significant. Although the highest leaf area index, grain weight per ear, biomass and economic yield has been in treatment of 100 percent irrigation, 95 percent nitrogen index and nitrogen fertilizer 100 $kg.ha^{-1}$ it was not significant. It seems that in full irrigation and defficit irrigation, 100 kg nitrogen per hectare and 95 percent nitrogen index has high effect on economic yield.

Conclusions

The results showed that the water requirement of 100 and 70%, 95% of nitrogen index and 100 kg of nitrogen per hectare compared to the, 90% nitrogen index and 50 kg of nitrogen per hectare increased leaf area index,

1- M.Sc. Student, Department of Agronomy, Ferdowsi University of Mashhad, Mashhad, Iran
2- Prof. Department of agronomy and Breeding Plant Scince, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran
(*- Corresponding Author Email: Khazaei 41@yahoo.com)

grain weight, biomass. When the index is less than 95% nitrogen, it can be used to detect a lack of nitrogen in corn. In this experiment, rate of nitrogen and N timing showed significantly affect on qualitative and quantitative yield and some agronomic characteristics.

Keywords: Economic yield, Nitrogen index