Proceedings of the 2nd World Congress on Civil, Structural, and Environmental Engineering (CSEE'17)
Barcelona, Spain – April 2 – 4, 2017
Paper No. AWSPT 101
ISSN: 2371-5294
DOI: 10.11159/awspt17.101

Nitrate Adsorption and Potential Nitrate Leaching Under Partial Root Zone Drying Irrigation

Feizollah Shams Govarchingala[1], Sina Besharat[2]
[1]Water and Soil Manager, Ministry of Agriculture
Urmia, Iran
shams.feizollah@gmail.com
[2]Department of Water Engineering, Faculty of Agriculture, Urmia University
Urmia, Iran
s.besharat@urmia.ac.ir

Extended Abstract

In order to achieve efficient use of nitrogen (N) and minimize pollution potentials, producers of irrigated maize (Zea mays L.) must make the best use of N from all sources [1]. Many studies suggest an increased rate of absorption of nutrients from the soil so the roots have been applied to deficit irrigation [2]. Further increase the absorption of nitrogen from the soil by corn and lower amounts of residual N incomplete root in treatment compared with full irrigation, lack of irrigation have been reported [3]. A typical effect of irrigation on corn nitrogen absorption and increased nitrogen uptake by corn plant roots in a greenhouse study also reported deficit irrigation [4].

The aim of this study was to investigate the effect of partial irrigation on nitrate uptake and water use efficiency (WUE) on the corn. Thus, despite many researches on the effects of fertilizers and irrigation on nitrogen uptake and leaching from the root zone of the plant is corn, but the effect is less normal and deficit irrigation management, crop nitrogen uptake, nitrogen remains potential nitrate leaching in the soil and in corn plants, the pot has not been investigated. This study was to investigate the effect of minor irrigation on nitrate uptake and water use efficiency on pot cultivation of corn.

The study site was in the Faculty of Agriculture, Urmia. According to the desired location coordinates of longitude 45 degrees east and 37 degrees north at a height of 1332 meters above sea level. In order to compare several management practices for irrigation, planting flowers in pots with Randomized complete block design with three replications. Irrigation treatments included the fixed partial root-zone irrigation (FPRI), the alternate partial root-zone irrigation (APRI), conventional irrigation (CI) and deficit irrigation (DI). FPRI treatment, at 0-47, 0-52, 0-57-0, 0-62 and 0-82 days during irrigation, total water consumption by 10%, 17%, 25%, 29% and 32% compared to CI treatment was reduced [5].

Water use efficiency of APRIL treatment was 4.88 that is statistically significantly different at the 5% level with two treatments is CI and FPRI. Statistical analysis using Duncan test showed that the amount of residual nitrogen in the soil, in the treatment FPRI is more than the other two treatments [6]. Nitrogen use efficiency was obtained in different conditions and treatments CI presented the highest. Despite the results obtained for treatments CI and APRI, the results showed that reducing the depth of water in FPRI treatment significantly decreased nitrogen uptake in plants at a level of 5 percent. At the same time, according to the indices of productivity and water use efficiency, whereby the preferred option is APRI treatment. The potential for nitrate leaching at 40 cm depth was CI> DI>FPRI for different treatments [7]. Thus, more nitrogen was available to the plant in deficit irrigation treatments (DI, FPRI). This method of irrigation management could very well protect groundwater from nitrate contamination. For both methods, partial root-zone irrigation reduced N luxury uptake but increased N use efficiency of maize. This was achieved at much reduced irrigation and higher water use efficiency.

References

[1] J. A. Zegbe, A. Serna-Pérez, "Partial root-zone drying maintains fruit quality of 'Golden Delicious' apple at harvest and postharvest," *Science of Horticulture*,vol. 127, pp. 455-459, 2011.

[2] T. Hu, Sh. Li. F. Kang, J. Zhang, “Effects of partial root-zone irrigation on the nitrogen absorption and utilization of maize,” *Agricultural Water Management*, vol. 96, pp. 208-214, 2009.
[3] H. Liu. F. Wang, M. N. Andersen, C. R. Jensen, “Comparative effects of partial root-zone drying and deficit irrigation on nitrogen uptake in potatoes,” *Irrigation Science*, vol. 27, pp. 443-448, 2009.
[4] B. Zhang, G. Huang, Z. Cheng and Y. Zhang, “Yield performance of spring wheat improved by regulated deficit irrigation in an arid area,” *Agricultural Water Management*, vol. 79, no. 1, pp. 28-42, 2006.
[5] Z. Wang, Sh. Kang, C. R. Jensen, “Alternate partial root-zone drying irrigation improves nitrogen nutrition in maize,” *Environmental Experimental Botany*, vol. 75, pp. 36-40, 2012.
[6] B. Zhang, G. Huang, Z. Cheng and Y. Zhang, “Yield performance of spring wheat improved by regulated deficit irrigation in an arid area,” *Agricultural Water Management*, vol. 79, no. 1, pp. 28-42, 2006.
[7] J. Simunek, K. L. Bristow, S. A. Helalia, A. A. Siyal, “The effect of different fertigation strategies and furrow surface treatments on plant water and nitrogen use,” *Irrigation Science*, vol. 34, pp. 53-69, 2016.