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Interaction of different irrigation strategies and soil textures on the nitrogen uptake of field grown potatoes

S.H. Ahmadi[a,*], M.N. Andersen[b], P.E. Lærke[b], F. Plauborg[b], A.R. Sepaskhah[a], C.R. Jensen[c], S. Hansen[d]

[a]*Department of Irrigation, Faculty of Agriculture, Shiraz University, Shiraz, Iran.*
[b]*Department of Agroecology and Environment, Faculty of Agricultural Sciences, Aarhus University, Denmark.*
[c]*Crop science group, Department of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Denmark.*
[d]*Agrohydrology group, Department of Basic Sciences and Environment, Faculty of Life Sciences, University of Copenhagen, Denmark.*
*Corresponding author. E-mail: seyedhamid.ahmadi@gmail.com

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Abstract

Nitrogen (N) uptake (kg ha^{-1}) of field-grown potatoes was measured in 4.32 m^2 lysimeters that were filled with coarse sand, loamy sand, and sandy loam and subjected to full (FI), deficit (DI), and partial root-zone drying (PRD) irrigation strategies. PRD and DI as water-saving irrigation treatments received 65% of FI after tuber bulking and lasted for six weeks until final harvest. Results showed that the irrigation treatments were not significantly different in terms of N uptake in the tubers, shoot, and whole crop. However, there was a statistical difference between the soil textures where plants in the loamy sand had the highest amount of N uptake. The interaction between irrigation treatments and soil textures was significant, and implied that under non-limiting water conditions, loamy sand is the suitable soil for potato production because plants can take up sufficient amounts of N and it could potentially lead to higher yield. However, under limited water conditions and applying water-saving irrigation strategies, sandy loam and coarse sand are better growth media because N is more available for the potatoes. The simple yield prediction model was developed that could explains *ca.* 96% of the variations of fresh tuber yield based on the plant evapotranspiration (ET) and N uptake in the tuber or whole crop.

Keywords: Potato; Nitrogen uptake; Partial root-zone drying irrigation; Deficit irrigation; Full irrigation; Soil texture.

Introduction

Potato production ranks fourth in the world after rice, wheat, and maize with the production of 321 million tones from 19.6 million hectares (FAOSTAT, 2007). Potato production is expected to continue to increase, providing an important source of food,