

**WATER MANAGEMENT IN SANDY SOIL  
USING NEUTRON SCATTERING  
METHOD**

By

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B.Sc. Agric. Sc. (General), Suez Canal University, 1992

M.Sc. Agric. Sc. (Soil Science), Ain Shams University, 2004

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## ABSTRACT

**Kholood Mahmoud Mohamed: Water Management in Sandy Soil Using Neutron Scattering Method. Unpublished Ph.D. Thesis, Department of Soil Science, Faculty of Agriculture, Ain Shams University, 2011.**

This study was carried out during 2008/2009 at the Experimental Field of Soil and Water Research Department, Nuclear Research Center, Atomic Energy Authority, Inshas in a newly reclaimed sandy soil.

The aims of this work are,

- \* determine soil moisture tension within the active root zone and
- \* detecting the behavior of soil moisture within the active root zone by defining the total hydraulic potential within the soil profile to predict both of actual evapotranspiration and rate of moisture depletion

This work also is aimed to study soil water distribution under drip irrigation system.

- \* reducing water deep percolation under the active root depth.

This study included two factors, the first one is the irrigation intervals, and the second one is the application rate of organic manure.

Irrigation intervals were 5, 10 and 15 days, besides three application rates of organic manure (0 m<sup>3</sup>/fed, 20 m<sup>3</sup>/fed. and 30 m<sup>3</sup>/fed.) in -three replicates under drip irrigation system, Onion was used as an indicator plant.

Obtained data show, generally, that neutron scattering technique and soil moisture retention curve model helps more to study the water behavior in the soil profile.

Application of organic manure and irrigation to field capacity is a good way to minimize evapotranspiration and deep percolation, which was zero mm/day in the treated treatments.

The best irrigation interval for onion plant, in the studied soil, was 5 days with 30m<sup>3</sup> /fad. An application rate of organic manure.

Parameter  $\alpha$  of van **Genuchten's 1980** model was affected by the additions of organic manure, which was decreased by addition of organic manure decreased it. Data also showed that n parameter was decreased by addition of organic manure

Using surfer program is a good tool to describe the water distribution in two directions (vertical and horizontal) through soil profile.

**Key words:** Neutron scattering meter, irrigation intervals, organic manure, drip irrigation, onion yield, WUE.

# CONTENTS

Title	Page
List of Figures .....	i
List of Tables .....	i
1. Introduction .....	1
2. Review of Literature .....	3
2.1. Neutron Scattering Method .....	3
2.2. Sandy soils .....	5
2.3. Organic mater .....	7
2.4. Soil moisture retention curve.....	9
2.4.1. Methods of determining Soil Moisture Retention Curve (SMRC).....	11
2.4.1.1. Laboratory Method .....	11
2.4.1.2. In situ Method .....	12
2.5. Water movement in soils .....	15
2.6. Active Root Depth ARD .....	16
2.7. Evapotranspiration .....	17
2.8. Soil Water Storage .....	19
2.9. Water requirement .....	19
2.10. Irrigation water use efficiency .....	20
2.11. Water Management .....	21
2.12. Irrigation scheduling .....	23
2.13. Drip irrigation system .....	26
2.14. Water distribution under drip irrigation system .....	27
2.15. Crop Description and Climate .....	28
2.17. Onion yield .....	30
3. Materials and Methods.....	31
3.1: The experimental Site .....	31
3.2. Animal manure treatments .....	31
3.3. Irrigation system .....	32
3.4. Irrigation intervals treatments .....	33

3.5. Irrigation scheduling and requirements .....	33
3.6. Experimental design and statistical analysis .....	33
3.7. Cultivated Crop .....	36
3.8. Fertilization program .....	36
3.9. Irrigation water use efficiency (IWUE) .....	36
3.10. Measurements and calculations .....	36
3.10.1. Emission uniformity (EU) of the drip irrigation system .....	36
3.10.2. Field calibration of neutron moisture meter .....	37
3.10.3. Matric and hydraulic potentials .....	39
3.10.3.1. Active root depth (ARD) .....	39
3.10.3.2 Soil water distribution in soil profile .....	40
3.10.3.3 Soil water distribution around the dripper .....	40
3.10.3.4. Direction of soil water .....	40
3.10.3.5. Actual evapotranspiration .....	41
3.10.3.6. Soil moisture retention curves .....	41
3.10.4. Physical and chemical properties .....	41
4. Results and Discussion .....	43
4.1 Effect of animal manure additions on neutron calibration curves (NCCs).....	43
4.2. Effect of animal manure additions on soil moisture retention Curves .....	45
4.3. Effect of animal manure addition and irrigation water intervals on water use efficiency and the yield of onion.....	48
4.3.1. Yield .....	48
4.3.2. Irrigation water use efficiency (WUE) .....	53
4.4. Effect of animal manure addition and irrigation intervals treatments on Soil / Water/ Plant Relationship .....	54
4.4.1. Direction of Soil Water Movement .....	54
4.4.2. Soil Water Distribution .....	57
4.4.3. Direction of Soil Water Movement within the wet area around a dripper. ....	63
4.4.3.1 Under control treatment .....	63

4.4.3.2 Under rate1 treatment .....	64
4.4.3.3 Under rate2 treatment .....	65
4.4.4. Soil Water distribution in two directions within the wet area around a dripper using contour lines.....	66
4.4.4.1. Under control treatment .....	66
4.4.4.2. Under rate 1 treatment .....	69
4.4.4.3. Under rate 2 treatment .....	71
4.4.5. Soil Water distribution as ratio from field capacity in two directions within the wet area around a dripper.....	72
4.4.5.1. Under control treatment .....	72
4.4.5.2. Under rate1 treatment .....	75
4.4.5.3. Under rate2 treatment .....	75
4.4.6. Actual Evapotranspiration at developing and late seasons as affected by animal manure additions and irrigation intervals .....	76
4.4.7. Soil moisture suction within active rooting zone as affected by irrigation intervals and rates of animal manure during development and late season stages.....	78
4.4.8. Rate of soil water deep percolation during developing and late seasons, as affected by irrigation intervals and rate of animal manure additions .....	79
4.4.9. Active root depth (ARD) .....	80
4.4.10. Effect of irrigation intervals on each of soil moisture Tension and onion yield .....	81
5. Summary.....	83
6. References.....	85
Arabic summary	



## LIST of FIGURES

	Title	Page
Fig (1)	Sites of neutron access tube for neutron moisture meter around the dripper.....	34
Fig (2)	Illustration of the experiment design.....	35
Fig (3)	Neutron moisture meter 50-mCi <i>Am-Be</i> source .....	38
Fig (4)	Neutron calibration curves of at 30 cm depth of control, Rate 1 and Rate 2 treatments .....	44
Fig (5)	soil moisture retention curves for the treated soil and control .....	45
Fig (6)	Effect of animal manure and irrigation intervals on onion yield under drip irrigation system .....	50
Fig (7)	Soil moisture suction and onion yield as affected by irrigation interval treatments .....	52
Fig (8)	IWUE of onion as affected by animal manure management and irrigation intervals treatments through (2008/2009) season.....	54
Fig (9)	The relationship between hydraulic potential and soil depth of the studied treatments under 5 day irrigation interval .....	56
Fig (10)	Soil water distribution within the soil profile in control treatment for 5 days irrigation interval of onion yield.....	59
Fig (11)	Horizontal and vertical direction of soil water movement for control treatment, five days interval, along dripper line and vertical direction on dripper line.....	64
Fig (12)	Water distribution under control treatment, after irrigation, five days interval along dripper line and for perpendicular on dripper line .....	67
Fig (13)	Water distribution under control treatment, before irrigation, five days interval along dripper line and for perpendicular on dripper line.....	68
Fig (14)	Water distribution under rate 1 treatment, after irrigation, five days interval along dripper line and for perpendicular on dripper line.....	69
Fig (15)	Water distribution under rate 1 treatment, before irrigation, five days interval along dripper line and for perpendicular	70

	on dripper line .....	
Fig (16)	Water distribution under rate 2 treatment, after irrigation, five days interval along dripper line and for perpendicular on dripper line .....	71
Fig (17)	Water distribution under rate 2 treatment, before irrigation, five days interval along dripper line and for perpendicular on dripper line .....	72
Fig (18)	soil water distribution as a ratio from field capacity under control treatment after irrigation , five days interval along dripper line and perpendicular on dripper line.....	73
Fig (19)	Soil water distribution as a ratio from field capacity under control treatment, before next irrigation for the five days interval along dripper line and perpendicular on dripper line.....	74
Fig (20)	Effect of irrigation intervals on actual evapotranspiration (water consumptive use) through development stage within soil rooting zone for the three treatments.....	76
Fig (21)	Effect of irrigation intervals on actual evapotranspiration (water consumptive use) through late season stage within soil rooting zone for the three treatments.....	77
Fig (22)	Behavior of soil moisture suction within active rooting zone through the developing and late season stages as affected by irrigation intervals and rates of animal manure additions.....	79
Fig (23)	Rate of water deep percolation rate through development stage as affected by irrigation intervals and rates of animal manure additions.....	80
Fig (24)	Rate of water deep percolation rate through late season stage as affected by irrigation intervals and rates of animal manure additions.....	80
Fig (25)	Effect of irrigation intervals on of soil moisture tension within soil rooting zone and onion yield for three treatments.....	80

## LIST of TABLES

	Title	Page
Table (1)	Some physical properties of investigated soil .....	31
Table (2)	Some physical properties of the used animal manure.....	32
Table (3)	Some chemical properties of investigated soil .....	32
Table (4)	Some chemical properties of animal manure (AM).....	32
Table (5)	Regression equations of neutron calibration curves at different soil depths of the treatments under study .....	38
Table (6)	Values of van Genuchten parameters as affected by soil treatment .....	47
Table (7)	Illustrates the IWUF values as affected by both of animal manure and irrigation intervals.....	53
Table (8)	Values of soil hydraulic gradient and the direction of soil water movement in the soil profile.....	57
Table (9)	Values of soil moisture suction values within active rooting zone ARZ, hydraulic parameters and active rooting depth in different sites of wet area around a drinker for control treatment for 5 days interval.....	60
Table (10)	Values of soil moisture suction within active rooting depth, hydraulic parameters and active rooting depth in different sites of wet area around a drinker for rate 1 treatment for 5 days interval .....	62
Table (11)	Values of soil moisture suction within active rooting depth, hydraulic parameters and active rooting depth in different sites of wet area around a drinker for rate 2 treatment for 5 days interval.....	62
Table (12)	The active roots for water absorption under rate 1 treatment and 5 days interval.....	65
Table (13)	The direction of soil water along and perpendicular the drinker under rate 1 treatment and 5 days interval .....	65
Table (14)	The active roots for water absorption under rate 2 treatment and 5 days interval.....	66
Table (15)	The direction of soil water along and perpendicular the drinker under rate 2 treatment and 5 days interval.....	66
Table (16)	Illustrate the values of Eta through development stage.....	77

Table (17) Illustrates the values of Eta through late season stage .... 78

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## 1- INTRODUCTION

Efficient and effective irrigation management is aims to provide sufficient water to a growing crop avoiding both over irrigation and physiological water stress in the growing plants. Consequently saving irrigation water through improving water management.

In Egypt, under sandy soil conditions, Amelioration of these soils is a must to improve their productivity to meet the prominent aim of agricultural strategy in Egypt, i.e., the increase of land productivity and adding new areas for cultivation. The main problem of sandy soils is the high infiltration rate of water through their large pores and its low ability to retain water. Therefore, one of the improvement strategies is the use of animal manure, suitable water management and conservation practices.

Behavior of soil moisture, movement and its distribution within the soil profile were investigated using modern techniques such as neutron scattering technique, combination between neutron probe and soil moisture retention model. Using surfer computer program helped in studying the soil moisture distribution and its movement through soil profile.

These techniques were helpful tools to study the soil/water/plant relationship, such as, direction of soil water movement, estimate different rate of soil moisture in active root depth, and define active rooting depth., as well as, estimating water consumptive use and drainage rate, which leads to water saving and increases irrigation efficiency.

Onion crop (*Allium Cepa*) can be grown on many soils and under a wide range of climates from temperate to tropical. Present world production is about 46.7 million tons of bulbs from 2.7 million ha cited from **Dooernbos and Kassam (1979)**.

Onion is one of the most important vegetable crops in Egypt. It occupies the third cultivated area after tomato and potato, also its

importance lies in exportation and local consumption. However, such consumption reached about 12.5 Kg/person giving one million ton for Egypt **Ghone et al (2007)**

Onion was selected for this study because it is sensitive to water deficit. For high yield, soil water depletion should not exceed 25 percent of available soil water. Frequent irrigation is required to prevent cracking of the bulb and forming of doubles. Also adequate water supply is essential for high quality crop. A good bulb yield under irrigation is 35 to 45 ton/ha. **Dooernbos and Kassam (1979)**.

This current work was carried out at the area of Atomic Energy Authority, Inshas to study the role of adding two rates of animal manure for improving hydraulic properties of sandy soil under the conditions of using three different irrigation intervals with drip irrigation system using the neutron scattering technique. Moreover, the effect of these treatments on yield and water use efficiency of onion as an indicator plant.