

**THE EFFECT OF SOME ENGINEERING FACTORS
ON FLEXIBLE SPRINKLER IRRIGATION
SYSTEMS PERFORMANCE**

By

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B.Sc. Agric. Eng. (Agricultural Engineering), Ain Shams University, 2011

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ABSTRACT

Engy Moslame Mohamed Khair: The Effect of Some Engineering Factors on Flexible Sprinkler Irrigation Systems Performance. Unpublished M. Sc. Thesis, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, 2015.

The engineering factors are necessary to improve sprinkler system efficiency. So, with studying the effect of operating pressure, nozzle diameter and riser height on sprinkler performance such as precipitation rates, distribution uniformity, and coefficient uniformity. This study will be focused in Floppy sprinkler irrigation system comparing with Rotating (pop-up) and Impact sprinklers performance. It has been carried out at the National Irrigation Lab. for on-farm Irrigation Equipment Test in Agricultural Engineering Research Institute. The result indicated to: the floppy sprinkler is the highest precipitation rate. Where under operating pressure 2 bar Precipitation Rates were (9.3, 9.14 and 7.65mm/h), The flow rates were (748.8, 660 and 666 lph), wetted radius (7, 7.2 and 9 m), Coefficient Uniformity “% ” were (53.45, 68.7 and 54.9%) and when using overlap simulation by Excel, the sprinklers achieve at operating pressure (2bar) and 100% overlap 78.05, 81.04 and 57.6% for Floppy, Rotating (pop-up) and Impact sprinklers respectively. From **Private Farm** result, if we applied the Floppy sprinkler system, the operating structure would be as follow: with 72% overlap the system achieved DU% 70.6% (from ASAE it's good design). **At the AEnRI** , The result indicated to the less soil compaction caused from Floppy sprinkler 0.27g/cm^3 under 2 m height, unlike Impact sprinkler caused soil compaction under 1 m height (0.55 g/cm^3). This study can be useful to identify the operational condition like operating Pressure and sprinkler

irrigation system design so using floppy sprinkler is the more efficient flexible sprinkler irrigation system under telescopic riser 2 m height and under operating Pressure 2 bar.

Key words: Sprinkler Irrigation system, Floppy sprinkler, Impact sprinkler, Rotating sprinkler (pop-up).

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1-INTRODUCTION

The sprinkler irrigation system simulates the natural falling rain. The major problem in Egypt is low water management, which effect on sprinklers performance beside water use efficiency. The sprinkler irrigation system is less efficient so we should improve its performance to integrated water management. This indicated to take high crop yield and not to waste water at Evapo-transportation rate or deep percolation and increasing the reclaimed lands.

El-Gindy (2007) reported that, water considered the iterance to agriculture development. Egypt is in arid region due to decrease the rainfall under 400 mm/year. The new irrigation methods have more management in irrigation water with using sprinkler systems and localized systems which used to decrease drainage, improve soil water contents, decrease ground water level and increase crop production. **Hegazi and El-Gindy (2007)**, mentioned that, the pressure and orifice diameter effect at flow rate and wetted diameter and wetted efficiency. **Hunter (2012)**, Water pressure in an irrigation system will affect the performance of the sprinklers. If the system is designed correctly, there will be enough pressure throughout the system for all sprinklers to operate properly. **Rain bird (2004)**, stated that, we have found that conditions which most often interfere with the proper operation of impact sprinklers are low water pressure, foreign materials in the irrigation water, and excessive damage or wear to sprinkler parts. Any one or a combination of these actors can cause the sprinkler to stop rotating completely or rotate to one side and fail to return. **BREYTENBACH A. (2012)**, mention that, the flow of water secured by the flow controller warrants a constant flow of water moving through the silicone tube to cut the stream of water into even medium-sized droplets similar to rain, ensuring a very high efficiency with minimum evaporation loss, due to little or no mist formation.

The main objectives of this study were:

- ⊙ Recommended by appropriate operating conditions for Floppy Sprinkler.
- ⊙ Violation of Floppy software.
- ⊙ Comparison between the performance of Impact Sprinkler, Rotating (pop-up) Sprinkle and flexible Sprinkler.
- ⊙ Studying the effect of difference riser height at soil Profile under many kinds of sprinkler.
- ⊙ Evaluating sprinklers performance at different riser height under different sprinkler.