

EFFICIENCY OF COMPOST APPLICATION FOR MAIZE UNDER DEFICIT IRRIGATION AND TWO TILLAGE SYSTEMS; AND THE IMPLICATIONS ON YIELD AND SOIL PHYSICAL PROPERTIES.

BY

El-Maghraby, T.A.*; Hoda M.R.M Ahmed, *; Abdel-Salam, M.A.A**
 and Ensherah I.M Elmaaz, *

* Soil, Water, and Environment Research Institute, Agricultural Research Center, Giza, Egypt

** Soils Department, Faculty of Agriculture, Moshtohor, Banha University.

ABSTRACT

A field experiment executed for 2 seasons (2006-2007) on maize (*Zea mays*) was carried out to assess effect of compost application as organic amendment at rates of 0, 5.5, 11.0, and 16.5 Mg fed⁻¹ (1 Mg "megagram" = 10⁶ g i.e. metric ton) designated as C₀, C₁, C₂, and C₃ respectively, under irrigation using 2 water-amount treatments of full irrigation of 3300 (I₁), and deficit irrigation (I₂) of 2640 m³ fed⁻¹ (80% of full irrigation). The tillage cultivation methods being M₁ (seeding using row tillage) and M₂ (seeding using straw tillage, i.e. placing seeds in localized hole-spots on untilled field surface). Grain yield in non-amended treatments was 1.766 to 2.318 Mg fed⁻¹ and 2.594 to 6.062 Mg fed⁻¹ in compost-treated soil. Water-use efficiency (in kg grains/m³ water) was 0.617 to 1.165 for un-amended treatments and 1.389 to 2.770 for those amended with compost causing average increases of 33.3, 40.1, and 15.5% for the C₁, C₂, and C₃ respectively. The deficit irrigation I₂ surpassed the I₁ by 57.2%, and the M₁ surpassed the M₂ by 8.0%. Soil moisture curves at tensions of 0.01 up to 15.00 atm, and available water (AW) were determined with compost increasing water retention at most tensions, particularly the 0.33 atm and slightly AW. Compost had a slight effect on bulk density and total porosity, but affected the distribution of pore size fractions creating more water-useful pores (i.e. the quickly drainable-, slowly-drainable-, and water-holding-pores), and decreasing the less- water-useful ones (i.e. the fine capillary pores). Aggregation and aggregate stability increased by compost; the high rate gave 7% large aggregates while the no compost gave 4% only.

Key words: Deficit irrigation; method of agriculture (tillage), organic amendment, compost application, maize, aggregation, soil moisture curve, bulk density, porosity.

INTRODUCTION

Irrigated agriculture is extremely vital for Egypt where rain fed agriculture does not represent any significant part of arable farming in Egypt. Therefore, maximizing the return obtained from irrigation water is very important. Organic manuring has a significant positive effect on improving soil fertility even under conservation tillage (Reeves 1997); it also could increase the efficiency of water application beside its positive effect on yield

increase and soil improvement (Bhattacharyya *et al.*, 2007). The use of different equations to determine irrigation water application is practiced and a number of different equations were proposed for irrigation of arable crops such as maize and other field crops. Elmarsafawy (1991) observed that water evapotranspiration calculated by equation was greater than actually given as consumptive use for maize grown in an alluvial soil.