

**KINETICS OF HUMIC SUBSTANCES IN  
CALCAREOUS SOILS UNDER ORGANIC  
FARMING SYSTEM**

**BY**

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**A Thesis Submitted in Partial Fulfillment**

**Of**

**The Requirements For The Degree of**

**DOCTOR OF PHILOSOPHY**

**IN**

**Agricultural Science**

**(Soils)**

**Soils and Water Department,**

**Faculty Of Agriculture**

**Fayoum University**

**2011**

### **(Kinetics of humic substances in calcareous soils under organic farming system)**

Calcareous soils exist in large areas particularly in arid and semi-arid regions. In Egypt, calcareous soils constitute about 50-60 % of the total desert area. Calcium carbonates ( $\text{CaCO}_3$ ) contents of the calcareous soils vary between 10 and 90%, but mostly between 10 and 50 %. In Fayoum, calcareous soils contents of  $\text{CaCO}_3$  at the soil surface are ranged from 3 to 55 %. These soils are characterized by pH values from 7.6 to 8.3 and variables nutrients losses or reduced availability such as phosphorus, which is fixed by soil calcium or accumulates with time to be as in-soluble forms. Meanwhile, availability of Fe, Mn, Cu and Zn are reduced with the effect of higher pH values. Most of the areas proposed to be under reclamation or that of the new reclaimed land in Egypt are slightly and highly calcareous soils.

#### **The main targets of this study are:**

- 1-To determine and evaluate mathematically the kinetics and mode of inhibition of the decomposition reaction of humic substances (i.e. total extractable carbon, humic acids carbon and fulvic acids carbon) in two calcareous soils (differing in their calcium carbonates contents) under organic farming system i.e. compost and FYM added as 0,10,20,30 and 40%. Concurrently, the associated availability, mode of inhibition and kinetics of the released macronutrients (i.e. N, P and K) and micronutrients (i.e. Fe, Mn, Cu and Zn) were determined and evaluated.
- 2-To determine and evaluate kinetically the obtained biomass yield of the garden beet crop (*Beta vulgaris L. ssp. Vulgaris*) under organic farming system.
- 3- To introduce some applicability concepts of the obtained mathematical kinetics.

In order to achieve these objectives, the present study was carried throughout the years of 2009-2011. Recommended materials and methods were applied in two experiments: the first was an incubation experiment conducted in pots under laboratory temperature conditions and the second was a cultivation pots experiment conducted in a green house at the Department of Soil and Water Sciences, El-Fayoum Faculty of Agriculture, Fayoum University.

The obtained results show attempts to plot  $1/V_0$  versus  $1/S$  (as  $V_0$ =the values of nutrient under investigation  $S$ =levels of organic fertilizer (compost and farmyard manure) with the tested two calcareous soils. Parallel, the results were comprised graphical reciprocal interpretation, mathematical calculations expressions to indicate  $V_{\max}$  (maximum velocity of the reaction) and  $K_m$  (Michaelis constant). Results showed that the mode of

inhibition of calcium carbonates contents on the decomposition reaction, are proved to be an enzyme-catalyzed reaction of reversible competitive inhibition. Furthermore, applicability of the obtained mathematical kinetics concepts for reclaiming new calcareous soils under organic farming systems had been introduced and discussed for local application.