# EFFECTS OF APPLYING DIFFERENT ORGANIC RESIDUES TO CALCAREOUS AND SANDY SOILS ON THE ABSORPTION AND TRANSLOCATION OF CERTAIN MICROELEMENTS

BY

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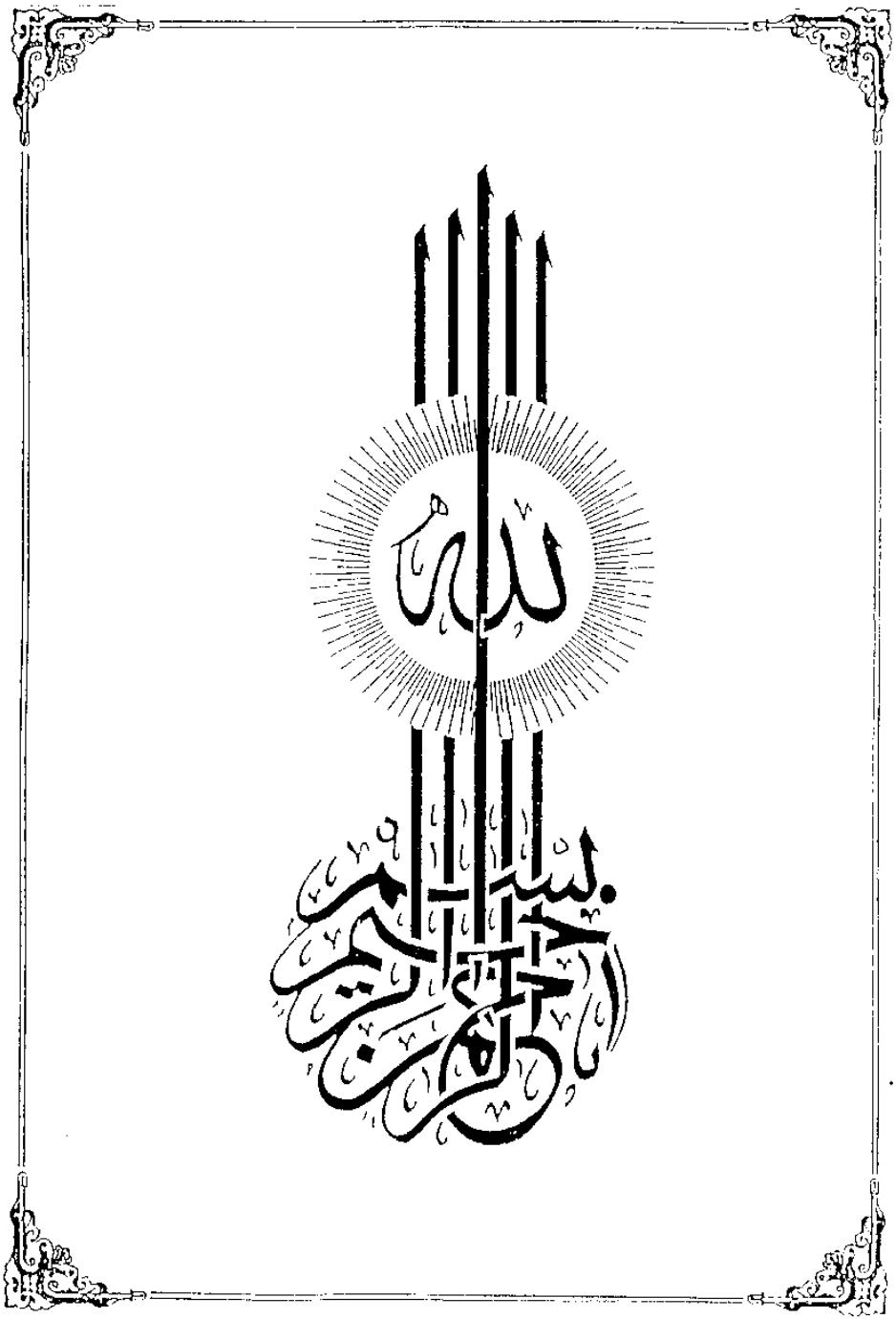

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# 1. INTRODUCTION

The organic matter content of the soil of the A.R.E. ranges from 0.1 to 2.0 percent. The organic matter content decrease in the soils due to high temperature and dry climate beside the shortage of the organic manure used in the meantime.

The Green Revolution, which the Government had undertaken in the last few years to increase the total area of the arable land, aims to reclaim and cultivate more than two million feddan of barren lands. Since areas under reclaimation are mostly calcareous and sandy soils, attention should be taken with respect to its nutritional problems especially micronutrients. Sandy and calcareous soils under our arid climatic conditions are also very poor in its organic matter content which is generally known as a source and a solubilizing factor for the native insoluble forms of certain nutrients such as iron and zinc.

In a large part of the new cultivated areas, the animal manures are not available for soil application as farmyard manure. Therefore, an alternative way to meet the increasing demands for organic manures is to get use of plant residues

through composting. In a short period, an artificial manure (compost) with high decomposing organic compounds and nutritive values could be obtained from these wastes.

In view of the aforementioned reasons, the present work was carried out to study the effect of applying different composted plant residues either single or combined with Fe and Zn salts to calcareous and sandy soils on the absorption and translocation of Fe and Zn by tomato plants at different growth stages. Also Fe and Zn chelate compounds were applied to compare their effects with those of the composted materials.

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## 2. REVIEW OF LITERATURE

### 2.1. Preparation of different compost of plant residues:

The subject was put on to a proper scientific basis in 1921 by Hutchinson and Richards. They came to the conclusion that the amount of nitrogen, in a simple form, necessary for pronounced rotting, varies only between 0.7 and 0.75 parts of N per 100 parts of dry straw. Within these limits, nitrogen could be animal excretions, notably urine as in making farmyard manure, or, alternatively sulphate of ammonia, cyanamide, or similar quick-acting materials. Phosphate might also be needed.

Smith and Thornton (1945) reported that cotton seed meal, $(NH_4)_2\ SO_4$, cyanamide, urea, and horse manure were used as sources of N and rock phosphate and basic slag for P under Florida conditions as acclerator to decomposition of waste plants.

Hende et al.,(1953) described two methods in preparing artificial manure. One using the addition of mineral salts or cyanamide, the other using a fermentation liquid mixed with water used to moisten the straw. Loosened straw packs were spread

on levelled soil and saturated, after 6 days another layer of saturated straw is added. This is repeated at 6-days intervals and the heap is kept completely saturated.

Millar (1955) reported that due to the low percentage of plant nutrient elements in the plant residues and the needed high quantities for decaying organisms, chemicals must be added to plant materials to hasten the decay process. He suggested the following mixture:

45 Pounds of ammonium sulphate
15 ,, of superphosphate
40 ,, of limestone

and 150 pounds of this mixture are used for a one ton of plant materials.

The Ministry of Agriculture. Cairo (1956) published that a mixture of:

30 Kgs ammonium sulphate
6 Kgs superphosphate
30 Kgs calcium carbonate
100 Kgs fine soil.

can be used for one ton of dry plant material to produce

a good compost. The chemical fertilizer must be lowered if the rice and clover straw are used.

Abd El-Gaffar et al. (1960) found that a good artificial manure can be obtained from plant residues after one month with the following chemical mixture for one ton of dry matter materials:

Three parts by weight of ammonium sulphate (20.5% N), and one part of superphosphate (16.5% $P_2O_5$), was used at the rate of 20 Kgs. per ton of dry plant material. They reported that lime addition was not necessary for the composting process under aerobic conditions. Aerobic conditions were maintained by turning the compost piles from time to time. Gutaas (1956) noticed that shreding the plant residues ensures a more uniform and rapid decomposition. Millar and Turk (1954) indicated that the time required to produce a good grade of manure is determined mainly by the conditions of temperature, moisture and aeration in the compost piles.

Zohdy (1965) studied the effect of type and concentration of nitrogen on the composting of rice straw. He found that compost made by ammoniacal-N was superior and economical than that by $NO_3$ - N. The use of 0.3% N as $NH_4$ - N could be used.

Jaiswal (1967) studied the influence of phosphate on composting, and found that the addition of Tata basic slag (a waste product of the steel industry) to city refuse at a rate of 65 lb $P_2O_5$ per ton of organic matter increased the rate of oxidation of C, the N concentration and amount of available N and P.

2.2. Chemical changes occurred during decomposition of compost heaps:

When micro-organisms are allowed to act upon plant residues, they do not attak all the plant components at the same time and with the same velocity. Cuha et al. (1940) came to the conclusion that the residues left after decomposition of rice straw, became gradually poorer in the carbohydrates and abundant in lignins and protein-like substances, approaching the composition of humus. Also, Ashworth (1942) found that all composts showed increases of ammonia, water-soluble N, and water-soluble organic matter during the first month.

Thompson (1957) reported that composting the manure caused an increase in the percentage of N in the organic matter. Moreover, Teucher and Ader (1960) reported that well prepared compost is potentially

richer in readily available plant nutrients as well as better balanced in its composition than the average farmyard manure.

Springer and Seischab (1961) found that turning over of the compost heaps did not increase the amount of humic matter, but led to increase of decomposed carbohydrates.

Springer (1962) studied mixture of straw and green matter decomposition with various addition of nitrogen under green house condition. He found that the solubility and mineralization of N decreased with time of decomposition and most of the mineral nitrogen was transformed into organic-nitrogen.

Tesic, et al. (1966) found that, in compost of fissured vine shoots, temperature rose, the material became brown-black, organic matter content decreased; mineral matter and hygro-scopic moisture increased while pH decreased to increase later. They found also that humic acid and total N content were increased, while fulvic-acid content decreased; P and K increased slightly.

Vuitsik et al. (1966) studied decomposition of rye-straw compost by the addition of $(NH_4)_2 CO_3$ or $NaNO_3$

at 0.7 or 1.4% weight. They found that respective losses of dry matter and C after 60 days of composting were 42.7 and 44.4% with 0.7% $(NH_4)_2 CO_3$, 42.9 and 43-40% with 0.7% Na $NO_3$ and 26.6% without N addition.

2.3. Effect of compost on some physical and chemical properties in soils.

Many of studies were reported on the role of organic matter and its effects on the physical and chemical properties of soils.

El Damaty and Moubarek (1962) found that the application of green manure, compost and Nile mud increased the organic matter content in Tahreer sandy soils, after harvesting either barley or corn crops. Organic matter content of soils treated with 15 tons of compost was found to be higher than that of green manured soil after harvesting owing to higher amounts of uneasily decomposable organic matter and wider C/N ratio in the compost than in green mamure. Also, Abdou et al. (1969) studied the effect of the rates 10, 15, 20 and 5, 7.5 and 10 tons/feddan for farmyard and town refuse respectively on some properties of sandy loam and loamy sand soils of Egypt. They found