UTILIZATION OF FARM WASTES TO PRODUCE ORGANIC FERTILIZERS FOR SOME FEED CROPS AND THEIR EFFECTS ON THE CHEMICAL PROPERTIES OF SOIL

By

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B. Sc. Agric. Sc. (Soil Science), Ain Shams University, 2003

M. Sc. Agric. Sc. (Soil Science), Ain Shams University, 2008

A thesis submitted in partial fulfillment

of

the requirements for the degree of

DOCTOR OF PHILOSOPHY
in
Agricultural Science
(Soil Science)

Department of Soil Science
Faculty of Agriculture
Ain Shams University

2013

Approval Sheet

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ABSTRACT

Ghada Hashem Mohamed Mohamed: Utilization of Farm Wastes to Produce Organic Fertilizers for some Feed Crops and their Effects on the Chemical Properties of Soil. Unpublished Ph. D. Thesis, Department of Soil Science, Faculty of Agriculture, Ain Shams University, 2013.

The present investigation aims to study the cycling of some agricultural wastes i.e. tomato and sugar beet vegetable parts (thrones) which represent the main wastes of field and vegetables crops to produce different organic fertilizers. In addition, the efficacy of organic synthesized fertilizers obtained from tomato and sugar beet thrones on the growth, quality and yield of two important forage crops namely pearl millet (*Pennisetum americanum*) and sorghum (*Sorghum vulgare*) and its effects on some soil properties after harvest were evaluated in an experimental field in Ismailia Research Station, Ismailia governorate, Egypt. The obtained results indicated that wastes of agriculture like tomatoes or sugar beet thrones can be used through hydrolyzing them as sources of amino acids (hydrolysate protein that is known as amino acids liquid) that were mixed with micro and/or macronutrients and applied to the growing plants. In this concern, fertilizers prepared from tomato wastes are somewhat enriched in their contents of amino acids than those from sugar beet wastes, and both of them contain 17 amino acids. The highest amino acids concentration were aspartic, glycine and glutamic acids. The efficacy of these amino acids synthesized fertilizers chelate micronutrients improved the growth and yield of either pearl millet or sorghum and their uptake of macro and micro nutrients when their applied either separately or integrated with mineral NPK fertilization as foliar or soil + foliar application to foliage crops grown in poor sandy loam soil at Ismailiah area. The effect of these synthesized fertilizers on some soil properties, obtained results indicated that organic matter and CEC of soil tended to slightly increase with the use of synthesized

fertilizers as compared with unfertilized check; also they improved the soil content of macro and micro elements. The efficiency of organic synthesized fertilizers were improved when their applied in combination with $1/_2$ unit or one unit of NPK recommended rates. This investigation suggested using these organic synthesized fertilizers which obtained from tomatoes and sugar beet thrones commercially as cheap source of amino acids chelate micronutrients to solve the problem of micro elements in new lands, recycling these wastes and improve soil nutrient conditions.

Key Words:

Agricultural wastes, Tomato and sugar beet thrones, Amino acids, Organic fertilizers, Foliar application, Pearl millet, Sorghum, Growth, Yield, Soil properties

ACKNOWLEDGEMENT

The authoress wishes to express her sincere appreciation and gratitude to **Dr. Mohamed Ahmed Mostafa**, Professor of soils, Soil Department, **Dr. Manal Mobark Mohamed**, Lecturer of soils at the same department, Faculty of Agriculture, Ain Shams University, and **Dr. Nasser Shaban Ali**, Chief Researcher, Regional Center for Food and Feed, Agricultural Research Center (ARC) not only for suggesting the subject of this study, but also owing to their continuous and close supervision, valuable and remarkable scientific advices, creative criticism, in addition to offering all the necessary facilities, materials and equipments during the implement of this investigation and for revising with great attention the manuscript.

Deep thanks are also due to Professor **Dr. El-Hassanein El Shirbini Hassanein**, Chief Researcher of the Weed Research Central Laboratory, and **Dr. Saeeid Dahi,** Professor at the same department, **Dr. Waleed Mohamed**, Professor of the Statistics Research Institute, ARC for their great assistance during the chemical and soil analysis.

Appreciations are also due to the staff members and colleagues in the Regional Center for Food and Feed and the staff members of soil Department, Faculty of Agriculture, Ain Shams University, for their encouragement, and provision of the available facilities during the period of study.

Words can not express my deep feelings and thanks to my beloved parents for their great love, encouragement, truly patience and support throughout the whole period of study.

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1. INTRODUCTION

Globally, about 140 billion metric tons of biomass is generated every year from agriculture. This volume of biomass can be converted to an enormous amount of energy and raw materials which are equivalent to approximately 50 billion tons of oil. Agricultural biomass waste converted to energy can substantially displace fossil fuel, reduce emissions of greenhouse gases and provide renewable energy to some 1.6 billion people in developing countries, which still lack access to electricity **(UNEP, 2009).** On the other hand, in developing countries, about 50% of wastes is not collected and remains scattered around poor areas causing health problems, land degradation, pollution, and water resource contamination. One way for managing this problem is to convert organic wastes into fertilizers for agricultural use. The improper management of waste agricultural biomass is contributing towards climate change, water and soil contamination, and local air pollution. Furthermore, these wastes are high value with respect to material and energy resources. In addition, recycling farm waste can benefit in reducing the risk of pollution, decreasing the amount of wastes going to landfill and saving money, **(Gov.UK, 2012).**

In Egypt the quantity of solid wastes is estimated at 69-77 Million tons/ year included agricultural wastes which reaches 25-30 Million tons/ year (36-39%). However, about seven Million tons of this huge amount used in feed sector, in addition four million tons find practical application in the field as organic fertilizer **(Abou-Elseoud, 2008)**. But most of the remaining portion from these wastes like rice thrones, cotton stalks, maize stalks, sugar cane bagasse, sugar beet leaves, tomato and fruit residues are either burned or utilized in an inefficient way, causing drastic environmental and economic problems.

In modern agriculture, micronutrients are mostly applied to plant leaves by foliar spray in chelated form (like EDTA-EDDHA-Citric acid...etc) or either applied to the soil. So foliar sprays are widely used to apply micronutrients, especially iron and manganese, for many crops. Since amino acids are the basic building blocks of proteins found in all living things, the chelation of minerals with amino acids provides a tremendous advantage in increasing the efficiency of absorption and translocation of minerals within plants. Yet the use of amino acids chelated mineral fertilizers is limited in agriculture. Most commercially available amino acid combinations are used for the preparation of amino acid chelated fertilizers by mixing it with mineral salts **(Sánchez -Sánchez *et al.*, 2002)**.

The idea of the present research was based on reducing environment pollution resulted from following traditional practices deal with agricultural wastes in Egypt, and on the other hand producing new organic fertilizers for plants, aiming to participate in filling the gaps in chemical fertilizers production and /or their environmental impacts. Thus the objectives of this investigation are to prepare organic synthesized fertilizers from tomatoes and/or sugar beet thrones as amino acids composed of macro and/or micro nutrients, also evaluation their effects, under field conditions, either alone or in presence of recommended chemical fertilizers (NPK) on the growth, yield, quality of some forage crops (sorghum and pearl millet) and its effects on some soil properties were taken into consideration.