RECYCLING OLIVE FRUITS-MILL RESIDUES AS AN ORGANIC MANURE IN EL-ARISH AREA-NORTH SINAI GOVERNORATE

BY

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B. Sc. (Plant production), Menoufiya University, 1988

A thesis submitted in partial fulfillment

of

The requirement for the Master Degree

in

Environmental Science

Department of Agriculture Environmental Science
Institute of Environmental Studies and Research
Ain Shams University

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ABSTRACT

Asha El- Sayed Abd El-Nabi Mohamed, Recycling olive fruits-mill residues as an organic manure in El-Arish area – Sinai Governorate. Unpublished Master of Science Thesis.

Department of Agriculture Science, Institute of Environmental Studies and Researches, Ain Shams University.

This work was divided into three main parts:

1-The production of compost from olive-mill waste: The experiment was carried out on compost varieties during season 2006 at the SEKEM company farms, at Bilbies, Sharkia governorate. 2- Germination test to evaluate the elimination of the phytotoxicity using Radish seeds (*Raphanus Sativus*). 3- Cultivating sweet basil (*Ocimum basilicum*) under different levels from compost producer from olive cake under El-Arish conditions during 2007 season.

The main results obtained were as follow:

1- Increasing olive cake percentage from 15 to 45 % resulted in a significant increase in carbon dioxide and moisture content of compost production. While, increasing the percentage of olive cake caused a great reduction in temperature of compost production.

2- Increasing the olive cake percentage had a reducing effect on pH, organic carbon, organic matter, nitrogen and phosphorus percentage in compost production. On the other hand, increasing percentage of olive cakein compost production from 15 to 45 % increased the electrical conductivity, C / N ratio, potassium % and cadmium, lead, copper, zinc and phenol content of compost production.

3- Extending the composting periods from 10 to 90 days reduced the temperature and moisture content and increased carbon dioxide % of compost production.

4- During composting periods pH decreased in the periods from 30 10 to 30 days, the increased after during the period from 30 to 90 days. Organic carbon, organic matter and electrical conductivity decreased significantly with increasing composting periods 10 to 90 days. Widening the compost industrialization interval from 10 to 90 days reduced the cadmium, lead, copper, zinc and phenol content of compost production**.**

5- The interaction between compost types and compost industrialization periods had a significant effect on the temperature, pH,electricalconductivity, organic carbon, organic matter, nitrogen, phosphorus, cadmium, lead, copper, zinc and phenol content of compost production of compost production and not significant on carbon dioxide, moisture content and potassium percentage.

6-Increasing olive cake percentage in compost from 0 to 45 % led to reduce germination percentage of radish seeds.

7- The highest values of growth characters of sweet basil were recorded in plants treated with 20 m^3/fed. C2 treatment **(**15% olive cake + 50% organic manure + 35% plant residues) in the first and second cut.

9- Phenol, copper, zinc, lead and cadmium decreased significantly with decreasing olive cake percentage from 45 % to 15 %. Increasing compost application from 10 to 20 m^3/ fed. chemical composition in plant tissues. The higher value was recorded at first cut comparing with the second one. among the tested sources of different compost piles during first and second cut of study.

Key words: Olive-mill waste, SEKEM, organic manure germination of Radish seeds, sweet basil, growth and yield, El-Arish North Sinai.

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1- INTRODUCTION

In Egypt, area of olive tree planting is about 116824 feddan and the total amount of olive production is 315193 ton per year. Every ton of olive produce 50% moisture, 15% oil and 35% solid waste during the extraction process.

The traditional methods of extraction, based on press, and the continuous three phase decanting processes generate one stream of olive oil and two streams of wastes, an aqueous waste and a wet solid waste .Large quantities of olive mill by-products are obtained when oils are extracted after mechanical and chemical treatments of olive yields. The production of olives varies from one year to other because several factors mainly related to weather and plagues that can affect the trees and olives.

The amount of solid waste produced from olive oil mills in Egypt is estimated to be over 110,000 ton per year. The gradual accumulation or incorrect disposal of these wastes may cause environmental problems. These materials must be treated or re-used if their environmental impact is to be reduce, enabling at the same time some of their primary components to be recovered (organic matter, nutrients, etc.). Olive cake generated by the olive oil extraction industry is a great pollutant because of its high organic load and also because of its high content of phytotoxic and antibacterial phenolic substances, which resist biological degradation. Olive cake is a major environmental problem in the Mediterranean area. The problems created in managing olive cake have been extensively investigated during the last 50 years without finding a solution, which is technically feasible, economically

viable, and socially acceptable. Up-to-date the emphasis has been on detoxifying olive cake.

However, one of the viable solutions to benefit from these organic materials is to be used as soil amendment. Farmers historically have applied animal manure and human wastes to the land to increase their productivity .It was established that organic matter portion of the soil is very important to maintain soil physical and chemical properties to be optimum for crop production. Recently, extensive application of chemical fertilizers is becoming of increasing concern to the environment and human health.

The most of desert soils in North Sinai is sandy soils, which are very poor in organic matter and nutrients, and moreover irrigation in this area depends on the use of saline under ground water. Therefore, the use of such water under conditions of North Sinai led to a decrease in crops productivity.

Therefore, the objectives of this work was designed 1- To use organic wastes like olive oil mill waste (olive cake) as organic fertilizers may reduce the amount of chemical that applied to the soil. Despite of the fact that olive cake is a nutrient rich organic waste, high levels of phytotoxic compounds present in fresh olive cake, which may inhibit seed germination or reduce plant growth. However, it was found that, composting olive cake maturity may reduce its phytotoxicity compared to fresh one. Composting as a method for preparing organic fertilizers and amendments is economically and ecologically sound and may well represent an acceptable solution for disposing of olive cake, at the same time increasing its value. 2- To evaluate the elimination of phytotoxicity through germination using Radish seeds

(Raphanus Sativus). 3- To evaluate the grows characteristicsm yield and chemical composition of sweet basil (*Ocimum basilicum*) under different levels from compost produced from olive cake under El-Arish conditions.

2- REVIEW OF LITERATURE

The review in this work was divided to in three main parts.

2.1. Part I-Physical and chemical analysis of the produced compost from olive-mill waste:

Compost production studies had attracted the attention of various investigators, from ancient time. This is because its importance for human kind and his animals. Recently, extensive application of chemical fertilizers is becoming of increasing concern to the environment and human health.

Paredes *et al.* (1987) observed that higher levels of soil salinity due to potassium and sodium replacement of soil cations were detected in an alkaline soil after pollution with wastewaters from olive oil extraction plants. The pH was practically unchanged and soil carbon/nitrogen ratio was increased. A reversible decrease in the count of sporulated bacteria was noted. The waste is acidic and contains about 10% of organic matter with a preponderance of a phenolic pigment and differing proportions of flavonoids, organic phenolic and nonphenolic acids, together with several minerals (K, Ca, Na salts).

Riccardo *et al.* (1993) indicated that after about twenty days even the soil containing the highest dose of sludge did not show toxicity any longer.

Cormenzana *et al.* (1995) olive oil extraction produces large amounts of residues. These olive-mill wastes are known as alpechín. Alpechín-polluted waste waters are resistant to degradation. They are regarded as a severe environmental problem because of their high organic content, largely simple phenolic compounds that are both antimicrobial and phytotoxic. Moreover, they reported that (1) Bioremediation for use as fertilizer or soil conditioner. (2) The utilization as a

medium for grown edible mushrooms. (3) The application as a growth medium for algae in open basins. (4) Biopolymeric substances production from olive mill wastes, focusing on polysacharide and biodegradable plastics production. (5) The use as a bioenergetic source (or for biogas production). (6) The employment of olive mill wastes as a source of biopharmaceuticals.

Tsadilas *et al.* (1995) study the influence of sewage sludge application on some soil properties and on the growth of wheat and corn plants. They observed that the distribution of heavy metals among the various soil fractions and their availability to plants were also investigated in relation to soil pH. The results showed that sewage sludge application significant influenced pH, organic matter content, electrical conductivity and available phosphorus. Soil pH increased and tended to hold steady near neutrality while organic matter content, electrical conductivity and available phosphorus (P) increased. For the heavy metals investigated, only total copper (Cu) and zinc (Zn) increased but were below the limits set by the EC. A significant increase was observed in the concentrations of cadmium (Cd), nickel (Ni), Cu, and Zn extracted by DTPA while iron (Fe) and manganese (Mn) were reduced showing a strong relationship to soil pH. For the metals sequentially extracted it was observed that chromium (Cr), Ni, Cu, and lead (Pb) extracted by NaOH, EDTA, and HNO3 increased significantly with the increase of sludge application, while the respective forms of Zn and Pb were not affected.

Tomati *et al.* (1995) observed that lignin degradation of about 70% was assayed at the end of the thermophilic phase. No phytotoxicity was recorded on the end product, the