

**Deanship of Graduate Studies
Al-Quds University**



**Effect of Olive Mill Wastewater Pollution on Plant Litter
Decomposition**

Bayan Mohammad Abdullah Abu Alwafa

M.Sc. Thesis

Jerusalem-Palestine

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By:

Bayan Mohammad Abdullah Abu Alwafa

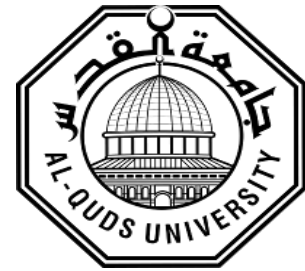
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Thesis Approval

Effect of Olive Mill Wastewater Pollution on Plant Litter Decomposition

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Dedication

To my dear parents who encourage and support me all the time

TO my soul my husband Shoa'a

To my lovely daughter "Reem" who lightens my future and draws the smile
on my face

To my brothers, sisters, friends and all those who stood beside me while
preparing this thesis

To all of these, I wish to accept my dedication

Bayan Abu Alwafa

Declaration

I certify that this thesis submitted for the degree of Master in environmental science is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not be submitted for a higher degree to any other university or institution.

Bayan Mohammad Abdullah Abu Alwafa

Signature:

Date: 5/ 5 /2019

Acknowledgment

As I take my last steps in this stage of education, all the thanks to GOD, who give me the power to finish this work.

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Abstract

Olive mill wastewater (OMW) become a major issue of environmental concern in the countries producing olive oil. Palestine is one of these countries. Applying of olive mill wastewater to soil could cause positive or negative effects. The present study aims to test the effect of olive mill wastewater on plant litter decomposition through testing the Tea Bag Initiative (TBI) under controlled lab conditions. The TBI is a simple, standardized method for measuring decomposition in soils.

In this study, a clay loam soil was collected from Al-Ubeidiya in October 2017, then the soil was incubated in pots each pot contains (500 g) of soil then tea bags (green and rooibos tea) was buried in soil and incubated under controlled lab conditions for nine months (270 day) at room temperature, the incubated soil containing the tea bags was irrigated with olive mill wastewater and the control irrigated with fresh water. A total of 60 tea bags used in the experiment (2 types of plant litter (green tea and rooibos tea) used * 2 types of irrigation used (fresh water as a control and OMW) * 3 replicates of each type of litter * for 5 periods of time).

The Cornell Soil Health Test (CSHT) protocols were used for analyzing physical and chemical soil properties, such as: pH, Ca, EC, K, Mg, Cl-, OM, Na, HCO₃, TOC and TNb.

The results showed that the decomposition of green tea was faster than the decomposition of rooibos tea, and this is a consequence of the chemical composition of the two litter types. Also the decomposition of tea (green and rooibos) litters was higher when tea bags irrigated with fresh water more than that when tea bags irrigated with OMW. Since the decomposition rate constant (k) for the tea litters irrigated with fresh water was (0.01656), and for tea litters irrigated with OMW was (0.01375) and this indicates that the decomposition was faster when the soil was irrigated with fresh water. Also the stabilization factor (S) was (0.35153) for the tea litters irrigated with fresh water and it was higher when the soil was irrigated with OMW (0.39442), since the high S value indicates inhibition of decomposition, this result supports that the OMW decreased the decomposition.

However, the results of soil properties showed that the pH, Ca, EC, K, Mg, Cl⁻, OM, Na, HCO₃, TOC and TNb soil contents increased after applying OMW.

تأثير إضافة الزيبار للتربة على تحلل المادة العضوية في النبات

إعداد: بيان محمد عبدالله ابوالوفا

إشراف: د. جواد شقير

المخلص

أصبح الزيبار الناتج عن معاصر الزيتون قضية بيئية رئيسية في الدول المنتجة لزيت الزيتون وفلسطين هي واحدة من هذه البلدان. ويتسبب اضافة الزيبار إلى التربة بحدوث آثار إيجابية أو سلبية. تهدف هذه الدراسة إلى اختبار تأثير الزيبار على تحلل فضلات النباتات من خلال اختبار مبادرة أكياس الشاي في ظل ظروف المختبر الخاضعة للرقابة، وهذه الطريقة هي طريقة بسيطة وموحدة لقياس التحلل في التربة.

في هذه التجربة تم جمع تربة طينية من منطقة العبيدية في اكتوبر من عام 2017م، ثم حضنت التربة في أوعية كل وعاء يحوي (500غم) تراب وتم دفن أكياس الشاي (الأخضر والأحمر) في هذا التراب وحضنت لمدة تسعة أشهر (270 يوم) في ظروف المختبر الخاضعة للرقابة، في درجة حرارة الغرفة. سقي جزء من الأكياس بماء عذب وجزء آخر سقي بالزيبار. استخدم ما يقارب 60 كيس شاي في التجربة كالتالي: أكياس الشاي المستخدمة في التجربة نوعان (الشاي الأخضر والشاي الأحمر) * استخدمت طريقتين للري (المياه العذبة والزيبار) * كرر كل نوع من أكياس الشاي ثلاث مرات * تمت التجربة على خمس فترات زمنية (14 و 21 و 90 و 180 و 270 يومًا (أي تسعة أشهر)).

تم استخدام بروتوكولات اختبار صحة التربة بناءً على كتاب كورنيل لتحليل الخواص الفيزيائية والكيميائية للتربة، مثل درجة الحموضة، الكالسيوم، الموصلية الكهربائية، المادة العضوية، الصوديوم، المغنيسيوم، الكلور، مجموع الكربون الكلي، مجموع النيتروجين المرتبط و البايكربونات. أظهرت النتائج أن تحلل الشاي الأخضر كان أسرع من تحلل شاي الأحمر وهذا نتيجة لاختلاف للتركيب الكيميائي لكل نوع من الشاي، كما كان التحلل في أكياس الشاي المسقية بالمياه العذبة أسرع من التحلل في أكياس الشاي المسقية بالزيبار، حيث كان معدل ثابت معدل التحلل في أكياس الشاي المسقية بمياه عذبة (0,01656) وفي أكياس الشاي المسقية بالزيبار (0,01375) مما يدل على أن التحلل كان أسرع عندما تم الري بالمياه العذبة، وكان معدل الثبات في أكياس الشاي المسقية بمياه عذبة (0,35153) وكانت أعلى في حالة أكياس الشاي المسقية بالزيبار (0,39442) وحيث أن الزيادة في هذا المؤشر تدل على نقصان معدل التحلل فان هذه النتيجة تدعم أن إضافة الزيبار تقلل من معدل التحلل.

وكما أظهرت نتائج خصائص التربة (درجة الحموضة ، الكالسيوم، الموصلية الكهربائية، المادة العضوية، الصوديوم، البوتاسيوم، المغنيسيوم، الكلور، مجموع الكربون الكلي، مجموع النيتروجين المرتبط و البايكربونات) زيادة بعد اضافة الزيبار اليها.

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List of Abbreviations

Abbreviations	Full Name
Al	Aluminum
Ba	Barium
C	Carbon
Co	Cobalt
Cr	Chromium
Cu	Copper
EC	Electrical conductivity
Gt	Gigantic (giga tone)
GHGs	Greenhouse
Gf	Green tea irrigated with fresh water
Rf	Rooibos tea irrigated with fresh water
Gz	Green tea irrigated with OMW
Rz	Rooibos tea irrigated with OMW
Li	Lithium
µg/g	Microgram/gram
Mo	Molybdenum
Sr	Strontium
SOC	Soil organic carbon
SOM	Soil organic matter
TBI	Tea bag index
%	Percentage

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