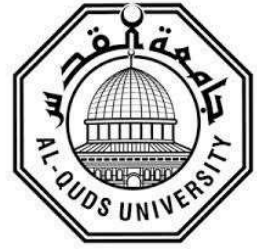


Deanship of Graduate Studies

Al- Quds University



**The effects of unknown dangers compost having on heavy
metal levels in soil and vegetables in Al-Jiftlik.**

Mohammed Sameer Musad Bawwab

M.Sc. Thesis

Jerusalem – Palestine

1440 – 2019

**The effects of unknown dangers compost having on heavy
metal levels in soil and vegetables in Al-Jiftlik.**

Prepared By:

Mohammed Sameer Musad Bawwab

B.Sc. in Material Engineering, Al-Quds University, Palestine

Supervisor: **Prof. Dr. Mutaz Ali Qutob**

A thesis submitted in partial fulfillment of requirements for the
degree of Master of Science in Environmental Studies

Department of Earth and Environmental Studies, Deanship of
Graduate Studies, Al-Quds University

1440 - 2019

Al- Quds University

Deanship of Graduate Studies

Environmental Studies Program



Thesis Approval

**The effects of unknown dangers compost having on heavy metal levels
in soil and vegetables in Al-Jiftlik.**

Student Name: Mohammed Sameer Musad Bawwab

Registration No.: 21612778

Supervisor: Prof. Dr. Mutaz Ali Qutob

Master Thesis submitted and accepted, Date **5/5/2019**

The names and signatures of the examining committee are as follows:

1- Head of Committee: Prof. Dr. Mutaz Qutob

2- Internal Examiner: Dr. Thamin Hijawi

3- External Examiner: Prof. Dr. Issam A. Al-Khatib

Signature
Signature
Signature

Jerusalem – Palestine

1440 – 2019

Dedication:

"To Our Profit Mohammad (Peace be upon him)"

To my family

To my friends

To you

Name: Mohammed Sameer Musad Bawwab

Declaration

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

Signed

Name: Mohammed Sameer Musad Bawwab

Date: **5/5/2019**

Acknowledgments:

Thanks to **Almighty Allah**, who guides me and creates the reasons to finish this study, He gives me strength, determination, perseverance, and patience to complete this research. Peace and blessings be upon the best human being on earth our **Beloved Prophet Mohammed bin Abdullah**. All praise is to **Almighty Allah** for bestowing me with health, opportunity, patience and knowledge to complete this work.

I would like to express my sincere gratitude to my advisor **Prof.Mutaz Al-Qutob** for his support, guidance, encouragement, invaluable helpful advice and for his strong support and guidance during this study and during the preparation of the thesis.

I greatly thank **Al-Quds University** for fulfilling the master program in Palestine which promotes the level of scientific grading level. My special thanks to my teachers who taught me in master at the Department of Applied Earth and environmental

I also offer great thanks to my **Father** and **Mother**

I also offer great thanks to my **brothers** and my **sisters** for their love and encouragements.

I also offer great thanks to **Environmental Authority**

I also offer great thanks to everyone help me to be here

I also offer great thanks to each one who helped me during the preparing of this thesis.

Abstract

Researchers and countries around the world attach great importance to the research of compost being used for agriculture, agriculture's soil, and vegetables themselves in this area because of the great danger to human health and life. Pollution with heavy metals is considered to be an environmental issue because these metals are toxic even at low concentrations. This study is conducted to determine heavy metals concentration in leafy vegetables samples (sage and mint) in situ UDC experiment in home garden at Ramallah city and vegetables samples (Corn, Eggplant, Cucumber, Squash, Bell pepper) at Al-Jiftlik region. In addition, it defines heavy metals concentration in soil field sample which is linked to this vegetable samples (Corn, Eggplant, Cucumber, Squash, Bell pepper) and soil samples that are related to leafy vegetables (sage and mint), which were collected from both regions. Moreover, This study aims to determine heavy metals (Ba, Cu, Pb, Th, Se, Mn, Co, As) concentration in unpolluted and polluted soil field with UDC (at 0 cm and 30cm) and vegetables (Corn, Eggplant, Cucumber, Squash, Bell pepper) that are related to this soil field obtained from Al-Jiftlik rejoin. Besides, it determines heavy metals (Ba, Cu, Pb, Se, Mn, Co, As) from in situ UDC experiments in Polluted Soil Pot (PSP) with UDC and unpolluted Soil Home Garden References (SHGR). Also, it determines heavy metals (Ba, Cu, Pb, Se, Mn, Co, As) from in situ UDC experiments in leaf vegetables (Mint, Sage) which are planted in PSP and SHGR at home garden. Thus, these vegetables and soil samples, had been collected from the same farm at Al-Jiftlik area and home garden and analyzed for this heavy metal by inductively coupled plasma-mass spectrometry (ICP-MS). Moreover, these vegetables leaf vegetables and soil samples, had been collected from home garden and analyzed for this heavy metal by ICP-MS. Moreover, it also determines heavy metals (Ba, Cu, Pb, Th, Se, Mn, Co, As) concentration in Water irrigation from well or pool that used to irrigate vegetables (Corn, Eggplant, Cucumber, Squash, Bell pepper) in all fields at Al-Jiftlik region by analyzing via ICP-MS. the results exceeds WHO/FAO permissible limit for human consumption, however; other samples were found to be according to the safe allowable limit. Heavy metals in all soil field, pot, vegetables and leaf vegetables that are polluted with UDC was found to be higher than WHO/FAO limit, but heavy metals in all vegetables, leaf vegetables, SHGR and soil fields that are unpolluted by UDC were below the limit set by WHO/FAO. Furthermore, in water irrigation in well

and pond, heavy metals were below the limit set by WHO/FAO. Thus, it was shown that the pollution found in leafy vegetables, vegetables, and soil samples is due to UDC at Al-Jiftlik region or in situ UDC experiment. In addition to, the study demonstrates that the pollution which was noticed in leafy vegetables, vegetables, and soil samples was not linked to either water well or pond, but it was come up with that heavy metals polluted leafy vegetables and vegetables was directly because of the usage of UDC, as a result; the elevated levels of metals in vegetables at Al-Jiftlik region and in situ UDC experiment attributed to utilization of UDC. However, the range of pH values in all samples was between 7.15 and 8.05, which indicates Alkaline soils. Finally, it can be stated that the level of heavy metals in all soils, vegetables and leafy vegetables in situ UDC experiment and at Al-Jiftlik region depend on many parameters such as : the amount of UDC, the concentration of uptake heavy metal from vegetables, and the concentration of heavy metal in UDC .

تأثير الأسمدة (الكومبست) المستمدة من النفايات الخطيرة والمجهولة المصدر على تراكيز المعادن الثقيلة في الخضروات والتربة في منطقة الجفتلك

اعداد: م.محمد سمير مسعد بواب

اشراف: أ.د. معتز علي القطب

الملخص بالعربية

أعطى العلماء والباحثون أهمية كبيرة للتلوث الناتج عن المعادن والمعادن الثقيلة لتأثيرها السلبي على صحة الإنسان، خصوصا إذا تسربت هذه المعادن الى الغذاء مثل الخضروات المختلفة، فهذه المعادن سامة حتى عند التراكيز المنخفضة.

تهدف هذه الدراسة الى دراسة تركيز المعادن الثقيلة في الأسمدة المستخدمة في الزراعة والتي مصدرها النفايات الخطيرة أو المجهولة المصدر لأنها قد تكون مصدر لتلوث التربة والخضروات بالمعادن والمعادن السامة، قامت هذه الرسالة بتسليط الضوء على السماد المجهول (الكومبست) والذي يتم توريده من مكبات نفايات تحت السيطرة الإسرائيلية حيث يتم طحنه وتوزيعه بشكل مجاني على المزارعين الفلسطينيين مع العلم أن الكومبست المستمد من المكبات الأخرى مكلف من الناحية المادية، فهذا السماد الخطير قد يكون مخلفات صناعية وطبية خطيرة وسامة، يتوقع أن تحتوي تراكيز غير مقبولة من المعادن الثقيلة مثل (الباريوم، الكوبلت، النحاس، المنغنيس، السيلينيوم، الزرنيخ، الرصاص، الثاليوم).

أخذت عينات من التربة التي تعرضت للتلوث بهذا الكومبست من عشر مواقع مختلفة من عمق 0 سم وعمق 30-0 سم وكذلك أخذت عينات من الخضروات التالية (الذرة، الباذنجان، الكوسا، الخيار، الفليفلة) المزروعة على هذه التربة وذلك من نوفمبر الى ديسمبر حيث تم اخذ 3 عينات في ابريل من الباذنجان والكوسا والفليفلة التي نمت على التربة المعرضة لهذا الكومبست الخطير، وتم مقارنتها مع تربه وخضروات من عشر مزارع مختلفة لم تتعرض لهذا الكومبست الخطير المجهول من نفس الأعماق وب نفس الطريقة وكذلك عينات من نفس الخضروات المذكورة أعلاه في منطقة الدراسة الجفتلك وفي نفس الأوقات،

وفي تجربة أخرى تم دراسة تراكيز هذه المعادن الثقيلة (الباريوم، الكوبلت، النحاس، المنغنيس، السيلينيوم، الزرنيخ، الرصاص) في النعنع والميرمية حيث تم زراعتها في قوارير تحتوي تربه ملوثة ومقارنتها بشتلات مزروعة في تربه سليمة غير ملوثة بهذا الكومبست، علاوة على ذلك لقد قمنا بدراسة تراكيز المعادن الثقيلة في مياه الري سواء من بركة التجميع او من البئر في منطقة الدراسة في منطقة الجفتلك. لقد تم جلب عينات من هذه الخضروات والتربة والمياه وتم تحليلها مخبريا عن طريق جهاز مطياف الكتلة البلازمي لمعرفة تراكيز هذه المعادن الثقيلة.

ولقد خلصت الدراسة ان كل عينات التربة والخضروات التي لم تتعرض لهذا السماد الخطير كان تراكيز المعادن والمعادن الثقيلة اقل بكثير وضمن الحدود المسموح بها من قبل منظمة الصحة العالمية، بالإضافة الى ذلك فان عينات الماء أيضا كانت سليمة وتراكيز المعادن الثقيلة ضمن حدود منظمة الصحة العالمية المسموح فيه، وكانت قليلة جدا،

و على العكس فان جميع عينات الخضروات والتربة التي تعرضت لهذا السماد الخطير الغير معروف كانت تراكيز المعادن فيها عالية جدا وخطيرة و اعلى من المسموح فيه من قبل منظمات الصحة العالمية مما يدل ان مصدر التلوث الوحيد هو هذا السماد المجهول الخطير ومكوناته. و علينا العمل على منع استخدامه.

Table of content Contents

Declaration	i
Acknowledgments.....	ii
Abstract	iii
الملخص بالعربية.....	v
Chapter one.....	1
1.Introduction	1
1.1 Compost	2
1.2 Compost from land fill.....	3
1.3 Unknown Dangerous compost (UDC).....	5
1.3.1 UDC story	6
1.4 Heavy metals.....	6
1.4.1 The toxicity details of some Heavy metal.....	6
1.4.2 Heavy metal in soil and vegetables.....	8
1.5 Objectives of the Study	9
1.6 Significance.....	9
Chapter two.....	11
2.Literature Review.....	11
Chapter three	18
3.Study area.....	18
3.1 Al-Jiftlik (Location Topography).....	18
3.2 Climate.....	21
3.3 Agricultural Soil Types in study area (Deseret alluvial soil)]	21
3.4 Population	22
3.4.1 Age Groups and Gender:.....	22
3.5 Family	22
3.6 Economy	22
Chapter Four	24
4. Materials and Methods.....	24
4.1 Sampling Locations and collections	24
4.1.1 Soil sampling (Al-Jiftlik Location).....	24
4.1.2 UDC sampling.....	27
4.1.3 Vegetables sampling (Al-Jiftlik).....	27

4.1.4 Soil sampling, in situ UDC experiments.....	28
4.1.5 Leafy vegetables sampling, in situ experiment.....	30
4.1.6 Water sampling (Al-Jiftlik region).....	30
4.2 Laboratory analysis	31
4.2.1 ICP-MS analysis	31
4.2.2 pH-soil analysis.....	33
4.3 ICP-MS principle	34
4.4 Statistical analysis	34
Chapter Five:	36
5. Result and Discussion	36
5.1 ICP-MS Result and Discussion.....	36
5.1.1 UDC Part.....	36
5.1.2 Soil part.....	37
5.1.3 Vegetables part.....	53
5.1.4 Water part.....	66
5.2 pH result of soil.....	67
Chapter Six: Conclusion and Recommendations	69
References.....	71
Appendix	77

List of figures		
No.	Title	page
3.1	Al Jiftlik Location co-ordinate in Palestine state	18
3.2	Topographic map of the Study Area Source: GIS Laboratory at Al-Quds University	19
3.3	study area in the south-eastern part of Al-Jiftlik	20
3.4	Ten location for represented study area	21
4.1	Polluted and Polluted random soil samples	25
4.2	samples' collection	25
4.3	polluted and un polluted Random Vegetable's samples	28
4.4	soil's pot polluted sample	28
4.5	soil's home garden unpolluted sample	29

4.6	Ramallah (Home garden) Location	30
4.7	Soil sample analysis	31
4.8	vegetable's sample analysis	33
4.9	pH Analysis	33
4.10	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	34
5.1	Lead concentration (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) & soil,. as compared to WHO.	38
5.2	Lead concentration (mg/kg) for soil UDC in in situ experiments	39
5.3	Barium concentration (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO.	40
5.4	Barium concentration (mg/kg) for soil UDC in in situ experiments	41
5.5	Thallium concentration (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO.	41
5.6	Copper concentration (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO.	43
5.7	Copper concentration (mg/kg) for soil UDC in in situ experiments.	44
5.8	Manganese concentration (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO	45
5.9	Manganese concentration (mg/kg) for soil UDC in in situ experiments.	46
5.10	Selenium (mg/kg) for soil UDC field samples and for the reference soil fields. for surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper(B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO	47
5.11	Selenium concentration (mg/kg) for soil UDC in in situ experiments.	48
5.12	Cobalt concentration (mg/kg) for soil UDC field samples and for the reference soil fields. For surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper (B), Eggplant (E), Cucumber (Cu), Squash(M) and soil,. as compared to WHO.	49
5.13	Cobalt concentration (mg/kg) for soil UDC in in situ experiments	50
5.14	Arsenic concentration (mg/kg) for soil UDC field samples and for the reference soil fields. For surface and for 0-30 cm samples that were related to vegetables types (corn (c), Bell pepper (B), Eggplant (E), Cucumber (Cu), Squash (M) and soil as compared to WHO.	51
5.15	Arsenic concentration (mg/kg) for soil UDC in in situ experiments	52

5.16	Lead concentration in polluted and unpolluted vegetables samples (corn, Bell pepper, Eggplant, Cucumber, and Squash).	53
5.17	Compare concentration of Lead element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	54
5.18	Compare Barium element concentration between contaminated and uncontaminated vegetables (corn, Bell pepper, Eggplant, Cucumber, Squash)	55
5.19	Compare concentration of Barium element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	56
5.20	Compare Thallium element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	56
5.21	Compare Copper element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	57
5.22	Compare concentration of copper element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	58
5.23	Compare Manganese element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	59
5.24	Compare concentration of Manganese element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	60
5.25	Compare Selenium element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	61
5.26	Compare concentration of Selenium element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	62
5.27	Compare Cobalt element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	63
5.28	Compare concentration of Cobalt element between polluted and unpolluted leaf vegetables (sage and Mint); polluted and unpolluted vegetables (Squash, Eggplant, Bell pepper after three month).	64
5.29	Compare Arsenic element concentration between polluted and unpolluted vegetables (corn, Bell pepper, Eggplant, Cucumber, and Squash).	64
5.30	Compare concentration of Arsenic element between polluted and unpolluted leaf vegetables (sage and Mint); contaminated and uncontaminated vegetables (Squash, Eggplant, Bell pepper after three months).	65
5.31	compare concentration of Lead, Manganese, Cobalt, Copper, Arsenic, Selenium, Barium elements in WP and WW to WHO Limit	66
5.32	pH result of soil sample at Al-Jiftlik area	67

List of Table		
No.	Title	page
3.1	study area's coordinate	20
4.1	Soils sample at Al-Jiftlik	26
4.2	Vegetables sample at Al Jiftlik	27
4.3	Soils sample (home garden)	29
4.4	vegetable's sample's (home garden) coordinates	30
5.1	Metals concentration in UDC	36