

THE BEST USE OF FARM WASTES AS MEDIA FOR SOME SEEDLINGS GROWTH

By

Nahla Abd El-Rahman Khalifa Mahmoud

B.Sc. of Agricultural Sciences, (Soils), Faculty of Agriculture,

Ain Shams University, 2004

Diploma of Environmental Sciences, Institute of Environmental Studies & Research

Ain Shams University, 2007

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Science

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

2015

APPROVAL SHEET

**THE BEST USE OF FARM WASTES AS MEDIA
FOR SOME SEEDLINGS GROWTH**

By

Nahla Abd El-Rahman Khalifa Mahmoud

B.Sc. of Agricultural Sciences, (Soils), Faculty of Agriculture,

Ain Shams University, 2004

Diploma of Environmental Sciences, Institute of Environmental Studies & Research

Ain Shams University, 2007

This thesis Towards a Master Degree in Environmental Science
has been approved by:

Name

signature

1- Prof. Dr. Mohamed Ahmed Mahmoud Mostafa

Emeritus Prof. of Soil Science Faculty of Agriculture
Ain Shams University.

2- Prof. Dr. Ezzat Mohamed Soliman

Emeritus Prof. of soil & Water, in Department of Environmental
Agricultural Science, Institute of Environmental
Studies & Research Ain Shams University.

3- Prof .Dr. Mansour El- Dosoky El- Sodany

Prof. of Soil Science, Institute of Soils,
Water & Environment Researches Agricultural Researches Center

2015

THE BEST USE OF FARM WASTES AS MEDIA FOR SOME SEEDLINGS GROWTH

By

Nahla Abd El-Rahman Khalifa Mahmoud

B.Sc. of Agricultural Sciences, (Soils), Faculty of Agriculture,
Ain Shams University, 2004

Diploma of Environmental Sciences, Institute of Environmental Studies & Research
Ain Shams University, 2007

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Science
Department of Environmental Agricultural Science

Under The Supervision of:

1- Prof. Dr. Ezzat Mohamed Soliman

Emeritus Prof. of soil & Water, in Department of Environmental
Agricultural Science, Institute of Environmental Studies & Research
Ain Shams University.

2- Dr. Taha Abd El- Fatah Khdaer (dead)

Teacher .of Microbiology, in Department of Microbiology,
Faculty of Agricultural, Ain Shams University

3- Dr. Esam El-Din Abd El- Aziz Osman

Asses. Prof. of Soil Science, Institute of Soils,
Water & Environment Researches Agricultural Researches Center

2015

Acknowledgement

All praise to ALLAH, the Almighty GOD, the absolute source of knowledge and wisdom. His grace and help were the two main factors that made the completion of this work possible.

Grateful thanks and deep appreciation are due to Emeritus ***Prof. Dr. Ezzat Mohammad Soliman***, Professor of Soil Sciences, Institute of Environmental Studies & Research, Ain Shams University, Agricultural Science Department, for his supervision, encouragement, valuable guidance, valuable advices, and constructive criticism which made the completion of this work possible.

Deep thanks are also presented to ***Dr. Esam El-Din Abd El- Aziz Osman, Asses.*** Prof. of Soil Sciences, Soil, Water and Environmental Research Institute, Agriculture Research Center, Giza, Egypt, for his encouragement, sincere helps, valuable guidance throughout the preparation of this research work.

My prayers are extended to the soul of ***Dr. Taha Abd El- Fatah Khdaer*** who initially supervised me in this research work before his death, may God bless his soul.

Finally I wish to take this opportunity to extend my deep thanks and appreciation to my mother, my brothers, my sister and my friends, for their patience and encouragement.

Last but not least, Deep thanks are also presented to ***Dr. Abd -El Hamid El Ghdban Abd El- Latif Sherif***. Research in Environment Research Department, Soils, Water and Environment Research Institute (SWERI) Agriculture Research Center (ARC), Ministry of Agriculture and Land Reclamation (MALR), Giza, Egypt. And deep thanks for ***Dr. Waleed***

Mohamed Fares. Senior Research central laboratory for design and statistical analysis research.

Abstract

This study was carried out at El-Zohrya garden, Horticulture Research Institute, Agricultural Research Center (ARC), Giza governorate, Egypt, in a plastic house during the period from 2010-2012. To study the effect of using nine treatments of different agriculture wastes with three replicates on vegetable nurseries as replacement of (peat-moss) in the growing medium and to find out the perfect media of cucumber, pepper, eggplant and cestrum diurnum seedlings. The treatments were : compost of bean, rice straw and corn stover + chemical fertilizer (M₁), bean + rice straw and pruning waste + chemical fertilizer (M₂), rice straw+ pruning and banana wastes + chemical fertilizer (M₃), rice straw+ corn stover and banana wastes + chemical fertilizer (M₄), compost after leacheat 1 + compost tea (M₅), compost after leacheat 2 + compost tea (M₆), compost after leacheat 3 + compost tea (M₇), compost after leacheat 4 + compost tea (M₈) and peat-moss (control) (M₉).

Results can be summarized as follows:

- **Cucumber seedlings.** In most treatments, the growing media M₇ and M₂ gave the highest significant values of cucumber shoots and roots growth parameters, while, the lowest ones were obtained by M₅ and M₃.
- Macro and micronutrients content of cucumber shoot improved significantly by using M₁, M₂, M₃ and M₅, whereas, the lowest ones were recorded by using M₆, M₇, M₈ and M₉.
- Results also reveal that the highest significant values of macro and micronutrients content of cucumber root were observed by using M₁, M₂ and M₃, while, the lowest ones were recorded by using M₇, M₈ and M₉.

- **Pepper seedlings.** The highest significant values of most of shoot parameters were obtained by using M7. Vice versa the lowest values of shoot parameters record by M5- M8 and M9.
- The highest significant values of most of root parameters were obtained by using M6. on the other hand the lowest values of root parameters record by M3- M4- M5- M8 and M9
- **Eggplant seedlings.** The highest significant values of most of shoot and root parameters were obtained by using M2, M4 and M9. Whereas the lowest values were obtained by using M1, M3and M7.
- **Cestrum diurnum seedlings.** The highest significant values of most of shoot parameters were obtained by using M1 and M4, while the maximum significant value of most of root parameters was obtained by using M3 and M7. On the other hand the lowest values of most of shoot and root parameters were observed by using M6, M8 and M9.
- Therefore, used media produced by composting of natural materials such as pruning and banana wastes as well as bean, rice straw and corn stover is an approach available to farmers to replace the use of more expensive commercial media.

Contents

Title	Page
1.INTRODUCTION	1
2.REVIEW OF LITERATURE	3
2-1 Soilless culture system	3
2-2 Substrate culture	3
2-2-1 Classification of substrate culture	3
2-2-2 Organic substrates	4
2-2-2-1 Peat-moss	4
2-2-2-2 Compost	4
2-3 Effect of peat-moss and compost as a growing medium on growth seedling	5
2-4 Foliar fertilizer	15
3. MATERIALS AND METHODS	18
3-1- Compost production and characterization	18
3-2- Leaching of composts	19
3-3 Growth experiments	19
3.4. Methods of chemical analysis	21
3-4-1 Plant analysis	21
3-4-2 Compost and tea compost analysis	22
3.5. Statistical methods	23
4. RESULTS AND DISCUSSION	24
4-1 Cucumber seedlings growth	24
4-1-1- Shoot parameters	24
4-1-2- Root parameters	27
4-1-3 Macronutrients content of cucumber shoot seedlings	30
4-1-4 Micronutrients content of cucumber shoot seedlings	33

Title	Page
4-1-5 Macro and micronutrients content of cucumber root seedlings	35
4-1-6 Macronutrients content of growing media after harvest	39
4-1-7 Micronutrients content of growing media after harvesting cucumber seedlings	41
4-2 Pepper seedlings growth	44
4-2-1 Shoot parameter	44
4-2-2 Root parameters	47
4-2-3 Macronutrients content of pepper shoots	50
4-2-4 Micronutrients content of pepper shoots	52
4-2-5 Macronutrients content of pepper roots	54
4-2-6 Micronutrients content of pepper roots	56
4-2-7 Macronutrients content of media after harvesting pepper	58
4-2-8 Micronutrients content of media after harvesting pepper	60
4-3 Eggplant seedlings growth	63
4-3-1 shoot parameter	63
4-3-2 Root parameters	66
4-3-3 Macronutrients content of eggplant shoots	68
4-3-4 Micronutrients content of eggplant shoots	70
4-3-5 Macronutrients content of eggplant roots	72
4-3-6 Micronutrients content of eggplant roots	74
4-3-7 Macronutrients content of growing media after harvest	76
4-3-8 Micronutrients content of growing media after harvest	78
4-4 Cestrum diurnum seedlings growth	80
4-4-1 shoot parameters	80
4-4-2 Root parameters	83
4-4-3 Macronutrients content of cestrum diurnum seedlings shoot	86
4-4-4 Micronutrients content of cestrum diurnum seedlings shoot	89

Title	Page
4-4-5 Macronutrients content of cestrum diurnum seedlings root	91
4-4-6 Micronutrients content of cestrum diurnum seedlings root	93
4-4-7 Macronutrients content of growing media after harvest	95
4-4-8 Micronutrients content of growing media after harvest	98
5. SUMMARY	100
6. REFERENCES	109

List of Tables

No.	Title	Page
Table (1)	Chemical analysis of different growth media before planting	19
Table (2)	Chemical analysis of tea compost producing from different growth media	20
Table (3)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on cucumber shoots growth parameters	25
Table (4)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on cucumber root length, fresh and dry matter	28
Table (5)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of cucumber shoot	31
Table (6)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of cucumber shoot	33
Table (7)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage as well as Fe, Cu, Zn and Mn (ppm) of cucumber root	36
Table (8)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest cucumber seedlings	39
Table (9)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest cucumber seedlings	42
Table (10)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Pepper shoots growth parameters	45
Table (11)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on pepper root length, fresh and dry matter	48

No.	Title	Page
Table (12)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of pepper shoot	50
Table (13)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of pepper shoot	52
Table (14)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of pepper root	54
Table (15)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn (ppm) percentage of pepper root	56
Table (16)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest pepper seedlings	58
Table (17)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest pepper seedlings	61
Table (18)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Eggplant shoots growth parameters	64
Table (19)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Eggplant root length, fresh and dry matter	66
Table (20)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of eggplant shoot	68
Table (21)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of eggplant shoot	70
Table (22)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of eggplant root	72
Table (23)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of Eggplant root	74
Table (24)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest eggplant seedlings	76

No.	Title	Page
Table (25)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest eggplant seedlings	78
Table (26)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on <i>Cestrum diurnum</i> shoots growth parameters	81
Table (27)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on <i>Cestrum diurnum</i> root length, fresh and dry matter	84
Table (28)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of <i>Cestrum diurnum</i> shoot	87
Table (29)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of <i>Cestrum diurnum</i> shoot	89
Table (30)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of <i>Cestrum diurnum</i> root	91
Table (31)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of <i>Cestrum diurnum</i> root	93
Table (32)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest <i>Cestrum diurnum</i> seedlings.	96
Table (33)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest <i>Cestrum diurnum</i> seedlings	98



List of Figures

No.	Title	Page
figure (1)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on cucumber shoots growth parameters	26
figure (2)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on cucumber root length, fresh and dry matter	29
figure (3)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of cucumber shoot	32
figure (4)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of cucumber shoot	34
figure (5)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of cucumber root	37
figure (6)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of cucumber root	38
figure (7)	Effect of different growing media as well as foliar spray by Organic and inorganic fertilizer on macronutrients content of growing media after harvest cucumber seedlings	40
figure (8)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest cucumber seedlings	43
figure (9)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Pepper shoots growth parameters	46
figure (10)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on pepper root length, fresh and dry matter	49
figure (11)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of pepper shoot	51

No.	Title	Page
figure (12)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of pepper shoot	53
figure (13)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of pepper root	55
figure (14)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of pepper root	57
figure (15)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest pepper seedlings	59
figure (16)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on micronutrients content of growing media after harvest	62
figure (17)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Eggplant shoots growth parameters	65
figure (18)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Eggplant root length, fresh and dry matter	67
figure (19)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of eggplant shoot	69
figure (20)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of eggplant shoot	71
figure (21)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on N, P and K percentage of eggplant root	73
figure (22)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on Fe, Cu, Zn and Mn concentration (ppm) of Eggplant root	75
figure (23)	Effect of different growing media as well as foliar spray by organic and inorganic fertilizer on macronutrients content of growing media after harvest eggplant seedlings	77