

**Department of Tropical Agriculture and International Cooperation
National Pingtung University of Science and Technology**

Ph.D. Dissertation

**Use of organic materials as growing media for melon
(*Cucumismelo* L. CV. *Huigu*) production in organic cultivation**

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Abstract

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The Content of Abstract in This Dissertation:

The study was conducted at National Pingtung University of Science and Technology from August, 2013 to May, 2015. The objectives of the study: (1) To evaluate the physical and chemical properties of growing media from vermicompost (VC), spent mushroom substrate (SMS), sulfur (S⁰) and their effects on the growth and nutrient uptake of honeydew melon seedlings; (2) To evaluate efficiency of using cattle manure compost (CaMC) and coconut husk (CH) to replace for VC. And then investigating the effects of combination of SMS, VC, S⁰ with CaMC or CH on physical and chemical properties of growing media and the respond of honeydew melon seedlings; (3) To evaluate the effects of seedlings, mixture of SMS with chicken manure compost (ChMC) on yield, and fruit quality of honeydew melon; (4) To evaluate the effects of SMS, VC, CaMC and their continuous application on the soil properties, growth and yield of honeydew melon. The study includes four parts: The first part, we investigated the effects of mixture

(including SMS, VC, and S⁰) on physical, chemical properties of growing media, their influences on growth and nutrient uptake of honeydew melon seedlings. The second part, based on the results of the first part, we used CaMC and CH to replace some parts of VC. And then, we evaluated the influences of combination between these organic materials on physical, chemical properties of growing media and their effects on growth and nutrient uptake of honeydew melon seedlings. The third part, we used honeydew melon seedlings grown in four different substrates in nursery period and two different rates of organic material mixture (including CaMC and SMS). And then, we investigated the effects of organic material rates on physical, chemical properties of the soil. We also evaluated the effects of different seedlings and different rates of organic materials on the growth, yield, and fruit quality of honeydew melons. The fourth part, in the first season, the experiment was carried out in pots under net house condition. Each pot was filled with a homogenized mixture of 10 kg soil. We mixed VC at the rates of 0.5, 1.0, and 1.5 kg/pot and SMS at the rates of 0.0, 0.2, and 0.4 kg/pot. We investigated the effects of VC, SMS and their combination on the soil chemical properties, growth and yield of honeydew melon. In the second season, we continuously used pots from the first season. SMS was amended with the same rates as the first season. However, VC applied was decreased and replaced by CaMC. We continuously evaluated the effects of SMS, VC, CaMC and their combination on the chemical soil properties and honeydew melon performance. The results indicated that: (1) Increasing VC proportion in the growing media induced increase bulk density and electrical conductivity, while increasing SMS content enhanced aeration porosity, total porosity, water holding capacity, and pH value. Besides, S⁰ addition induced decrease in pH value and increase in EC value of the growing media. Regarding the most suitable media for seedlings, SMS and VC at the ratio of 50% and S⁰ added with a rate of 1.0 g kg⁻¹ substrate was considered as optimum condition for honeydew melon seedling production. (2) All growing media mixed from SMS, VC, CaMC or CH and S⁰ with the EC value from 3.82 dS m⁻¹ to 4.53 dS m⁻¹ were suitable for honeydew melon seedling performance. At the same rate of SMS and VC, using CaMC produced an increase of nutrient concentration (except for Cu)

in the growing media. The growing medium with 50% SMS, 30% VC, 20% CH (pH = 6.41 and EC= 3.95 dS m⁻¹) gave the best optimum condition for honeydew melon seedlings. (3) Increasing SMS and ChMC enhanced soil productivity by increasing chemical, physical properties (pH, EC, OM) and nutrient concentration in the soil. The different seedlings affected on plant height, stem diameter with the significance at 99% but they did not influence on total fruit yield and TSS of fruits. The interaction effect of organic material rates and seedlings on yield and fruit quality also was not found. Based on the found findings, rates which are the most suitable for yield and fruit quality of honeydew melon are SMS (40%) + ChMC (60%) for seedling production and 10 tons SMS + 10 tons ChMC ha⁻¹ (pH = 6.12 and EC = 0.54 dS m⁻¹) for honeydew melon production in net house. (4) There was significant increase in soil properties such as pH, OM, EC and macronutrient concentration as a result of SMS, VC, and CaMC amendment. Application of SMS, VC, and CaMC also showed that it is very useful in honeydew melon production. However, the rates of 0.2 kg SMS + 1.5 kg VC/pot (EC = 1.68dS m⁻¹) in the first season and 0.2 kg SMS + 1.0 kg VC + 1.0 kgCaMC/pot (EC = 1.87 dS m⁻¹) in the second season were the most sufficient for higher productivity of honeydew melon in organic agriculture.

Key words: organic agriculture, spent mushroom substrate, vermicompost, cattle manure compost, chicken manure compost, coconut husk, honeydew melon

LIST OF ABBREVIATION

CaMC	Cattle manure compost
CH	Coconut husk
ChMC	Chicken manure compost
EC	Electrical conductivity
FAO	Food and Agriculture Organization of the United Nations
LSD	Least significant different
OM	Organic matter
PLS	Partial least squares
S ⁰	Sulfur
SPAD	Special products analysis division
SMS	Spent mushroom substrate
TA	Titrateable acidity
TSS	Total soluble solids
VC	Vermicompost
WHC	Water holding capacity

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TABLE OF CONTENTS

CHINESE ABSTRACT

ABSTRACT.....	i
LIST OF ABBREVIATION.....	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xiv
LIST OF PICTURES	xx
CHAPTER 1.....	1
INTRODUCTION.....	1
CHAPTER 2.....	6
LITERATURE REVIEW	6
2.1 Melon (Cucumismelo L.).....	6
2.1.1 Classification.....	6
2.1.2 Characteristic.....	9
2.1.3 Origin	10
2.1.4 Production	11

2.2 Honeydew melon	13
2.2.1 Origin	13
2.2.2 Variety	14
2.2.3 Planting	15
2.2.4 Fertilizing	16
2.2.5 Watering	16
2.2.6 Harvest	16
2.2.7 Common problems	17
2.3 Effects of nutrients on melon production.....	17
2.3.1 Effects of organic fertilizer on melon production.....	17
2.3.2 Effects of inorganic fertilizer on melon production.....	18
2.4 Organic agriculture production	22
2.4.1 The definition of organic agriculture	22
2.4.2 Effects of organic materials on the soil.....	22
2.4.2.1 Effects of organic materials on physical properties of the soil	22
2.4.2.2 Effects of organic materials on chemical properties of the soil.....	25
2.4.2.3 Effects of organic materials on biological properties of the soil	28
2.4.3 Studies on using SMS, VC, manure compost, and CH.....	30
2.4.3.1 Studies on using SMS	30

2.4.3.2 Studies on using VC.....	34
2.4.3.3 Studies on using manure compost.....	37
2.4.3.4 Studies on using coconut husk (CH).....	39
CHAPTER 3.....	41
MATERIALS AND METHODS	41
3.1 The experiment setup	41
3.1.1 Experiment I: Effects of SMS and VC on the growth and nutrient uptake of honeydew melon (<i>Cucumismelo L. inodorus</i>) seedlings.....	41
3.1.2 Experiment II: Use of organic materials as growing media for honeydew melon (<i>Cucumismelo L. inodorus</i>) seedlings in organic agriculture	42
3.1.3 Experiment III: Effects of organic materials on growth, yield, and fruit quality of honeydew melon (<i>Cucumismelo L. inodorus</i>)	44
3.1.4 Experiment IV: Effects of continuously applying organic materials on soil properties, growth and yield of honeydew melon (<i>CucumismeloL. inodorus</i>).....	46
3.1.4.1 The first season (spring 2014).....	46
3.1.4.2 The second season (summer 2014)	48
3.2 Observations recorded.....	49
3.2.1 Stage of seedling production.....	49
3.2.1.1 Physical and chemical properties of substrate	49
3.2.1.2 Morphological growth and nutrient content of seedlings	50

3.2.2 Stage of plant production in net house.....	51
3.2.2.1 Soil properties	51
3.2.2.2 Morphological growth, yield, and quality of honeydew	52
3.3 Statistical analysis	53
CHAPTER 4.....	54
RESULTS AND DISCUSSION.....	54
4.1 Effects of SMS and VC on the growth and nutrient uptake of honeydew melon (<i>Cucumismelo L. inodorus</i>) seedlings	54
4.1.1 Physical and chemical properties of growing media	54
4.1.2 Nutrient concentration of the growing media	61
4.1.3 Morphological growth of honeydew melon seedlings.....	63
4.1.4 Nutritional status of honeydew melon seedlings	71
4.1.5 Conclusion for experiment 1	80
4.2 Use of organic materials as growing media for honeydew melon seedlings in organic agriculture	82
4.2.1 Physical and chemical properties of the growing media	82
4.2.2 Nutrient concentration of the growing media	85
4.2.3 Morphological growth of honeydew melon seedlings.....	87
4.2.4 Nutritional status of honeydew melon seedlings	94
4.2.5 Conclusion for experiment 2.....	99