Proceeding

The Fourth of International Conference on Sustainable Agriculture and Environment (4th-ICSAE)

Surakarta Indonesia, 10-12 August 2017

Faculty of Agriculture
Universitas Sebelas Maret
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Preface

In this nice opportunity, we would like to send bunch of greeting and thank you to all of the conference participants. As informed, this conference is part of the ICSAE conference series which held for the first time in Surakarta Indonesia (2013), Konya Turkey (2015) and Warsaw Poland (2016). In general, the ICSAE aims to serve a forum for researchers, academics and professionals around the globe to communicated their achievement in agriculture area. Various topics have been presented in this conference range from agriculture, environment, food, animal science, social and economic, agriculture product development and other interesting subjects which related to agriculture.

In total, more than 150 working papers came from different countries were submitted, however due to strict selection using specific criteria such as topic, novelty and contents, only small number of papers were selected for publication in this conference proceeding. That doesn’t mean other papers have lower quality, but its more related to the specific criteria applied in screening process.

At the end, a nice collaboration between researchers as well as institutions would enhance the quality of research and work in agriculture area. Agriculture sustainable for better environment, higher farm productivity for future generation must be set as the highest priority. For sure, we will able to achieve that if we are hand on hand into one direction. See you at the 5th ICSAE that will be held in Tunisia.

Surakarta, April 2018

Editors
Table of Content

Preface .................................................................................................................................................. iii
Table of Content ................................................................................................................................. iv

Invited Speaker Abstracts

1. Management Strategies Of Erwinia Amylovora In Sustainable Agriculture [Kubilay Kurtulus Bastas] .......................................................... 1


3. Macro And Micro Element Deficiencies In Almond Trees (Plantations) [Senay Aydin, E. Dilsat Yegenoglu, Halis Sunsek] ........................................... 3

4. Sustainable Development of Smallholder Crop-Livestock Farming in Developing Countries [Serkan Ates, Harun Cicek, Lindsay W. Bell, Hayley C. Norman, Dianne E. Mayberry, Shinan Kassam, David B. Hannaway and Mounir Loulaichi] .......................................................... 4

5. Investigation Of Pea Tolerance To Chromium (IV) In Artificially Polluted Soil [Sukru Dursun, Ramazan Acar, Ade Suminhadi, Mehmet Turkylilmaz] ........................................................................................................................................ 5


Participant Papers

1. Economic evaluation of some safflower (Carthamus tinctiorius, L.) genotypes under upper Egypt condition [Walaa Mahmoud; Hamam. k. Abou Rehab and Eman Taha] ........................................................................................................ 7

2. The Competitiveness of Egyptian exports of grapes in the world market [A M Ahmed, M M Reda] .................................................................................. 22

3. Colchicine quantitation of gloriosa superba seed from different location and season [F Rahmawati, A Yunus and Sugiyarto] .................................................. 34

4. Shoot growth of cavendish banana on tissue culture medium type with coconut water [S L A S Gusti, R B Armipati, Samanhudi and A Yunus] .................................................................................. 38

5. Sustainable agriculture approach all over the world [Mithat Direk] .................................................................................................................. 46


7. A review on ability of the bioremediation processes of crude petroleum-oil in contaminated water [M Maarooif, Y Uysal] .................................................. 71

8. Examining the incidence, depth and severity of food insecurity in South Western Nigeria EGT model revisited [W O Fawole, B Ozkan] .................. 81

9. In-silico analysis on gene sequence encoding type iii effector proteins reflect similar host- speciation for bacterial pathogens infecting tomato [Suleyman Arziman, Talip Zengin, Kubilay Kurtulus Bastas, Onur Baysal] ........................................................................................................ 85
10. Characterization of Erwinia amylovora strains isolated from different hosts [Rüveyda Atasgun, Kubilay Kurtulus Bastas].............................. 89


12. The role of grazing areas in the organic agriculture [Abdullah Özköse, Emine Atalay, Ramazan Acar and Aide Sumiahadi]........................................................................................................ 103

13. Role of biotechnology in the prosperity and food security through sustainable agricultural and environment in developing world [M. Azan, Kakar, Azizullah, Parkha Riaz Nasrullah and Mithat Direk] ........................................................... 109


16. Detecting and distinguishing nitrogen and salinity stress in beans crop (Phaseolus vulgaris, L.) via remotely sensed data [Adel H. Elmetwalli]. ................................................................. 143


19. Comparison of IPARD I and IPARD II programmes as a source of rural development financing in Turkey [Ender Kaya, Aykut Örs] .............................................................................. 170

20. Investigation of pea tolerance to chromium (IV) in artificially polluted soil [Sakru Dursun, Ramazan Acar, Ade Sumiahadi, Mehmet Turkyilmaz] ........................................................................ 179


22. Analysis of Economic Losses Caused by Seed Borne Pathogens [Mithat Direk, Kubilay Kurtulus Bastas] .................................................................................................................. 195

23. Application of bokashi fertilizer dose and type to growth and yield sambiloto (Andrographispaniculata Ness) [Sudarmi, Nugraheni Retnaningsih, Wartini] ........................................................................ 199
Aplication of bokashi fertilizer dose and type to growth and yield sambiloto (Andrographispaniculata Ness)

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Abstract. Growth and yield crops were influenced by soil nutrient content. The purpose of this research to determine the effect of dose and type bokashi fertilizer of growth and yield sambiloto (Andrographispaniculata Ness). The research use methods Randomized Complete Block design arranged in factorial, the treatment was consists two factors : the dose of bokashi (B) and bokashi type (P), with three replications. There were four levels dose bokashi : no bokashi (B1), 5 ton ha⁻¹ (B2); 10 ton ha⁻¹ (B3) and 15 ton ha⁻¹ (B4). Three types of bokashi, namely Goats manure (P1); Cow manure (P2); Chicken manure (P3). Data were analyzed by analysis of variance. It was tested further by Duncan’s Multiple Range Test α = 0.05%. The results indicated that dose and type bokashi fertilizer influenced growth and yield variables such as plant height, number of branches, number of leaves, dry weight of plants and simple weight. Interaction dose 15 ton ha⁻¹ of bokashifertilizer chicken manure was the best for the dry weight 37.78 gr plant⁻¹.

1. Introduction
Sambiloto (Andrographispaniculata Ness) is a traditional medicines to be reviewed for clinical trials [1]. According to WHO, about 65% population of developed countries and 80% population of developing countries has been using traditional medicine. The culture of drinking herbal medicine in Indonesia must be preserved and improved in order to become an alternative medicine [2]. Nowadays people tend to consume drugs derived from plants. This is because medicinal plants have mild side effects and more affordable prices. In addition, there is a global issue “back to nature” for drug consumption, and supporting a strong social culture in the use of traditional medicine. Medicinal plant development prospects quite bright views of the potential aspects of flora, fauna, climate, and soil as well as aspects of industrial development of traditional medicines and cosmetics. Sambiloto is a wild plant, it needs to be cultivated to increase the quantity and quality [3].

Fertilization of medicinal plants is recommended from organic fertilizers to avoid residues with pharmacological effects [4]. Using chemical fertilizers can provide a faster response to growth and yield of plant, but using it in continuously can decrease soil productivity [5-6-7]. Organic fertilizer can improve
the physical and chemical properties of the soil, it has more complete nutrient content both of their macro and micro nutrients [8-9], although fertilizing using organic fertilizer is more slower than chemical fertilizers. The problem can be solved by using Effective Microorganisms-4 (EM-4). The result of fermentation of organic materials by inoculation of EM-4, called "Bokashi" then used as organic fertilizer [10]. Bokashi is an organic fertilizer which able to provide nutrients more quickly in a short time that could fertilize the soil and increase the growth and production of plants [9-11]. EM4 solution contains microorganisms as decomposers of organic material, to speed up and decreases C:N ratio [8-12]. The microorganisms contained in EM4 consist of photosynthetic bacteria, lactic acid bacteria (Lactobacillus sp), Actinomycetes and yeast [13-14]. Materials for making bokashi fertilizer can be obtained easily around farmland, such as: manure, straw, grass, husk, and plant remnants. Making bokashi is strongly supported by the amount of waste organic materials such as straw, husk and manure in research areas that have not maximum processing and can prevent the occurrence of environmental pollution [13].

Based on the above background, it is still necessary to examine the effect of dose and type of bokashi on the growth and the result of sambiloto. The purpose of this research to determine the effect of dose and type bokashi fertilizer of growth and the best yield sambiloto (Andrographispaniculata Ness).

2. Materials and Methods
This research was conducted from April to September 2017 in Gayam Village Sukoharjo Central Java, with altitude of 100 m above sea level, and Veteran University Bangun Nasantara Laboratory.

Tools used breeding pots ø 10 cm, planting pot ø 30 cm, plastic hoses, bucket, hoe, sickle, crop scissors, plastic bags, measuring instruments (unlitik scales, capacity scales 10 kg, rollers meter, ruler) and stationery. Materials used seed sambiloto, bokashi goat dung, bokashi cow dung, chicken manure bocashi, insecticide and herbicide fungicide, soil gromsoil in the research as a planting medium.

The research use methods Randomized Complety Block design arranged in factorial, the treatment was consists two factors: the dose of bokashi (B) and bokashi type (P), with three replications. There were four levels dose bokashi: no bokashi (B0) as a comparison, 5 ton ha⁻¹ (B1), 10 ton ha⁻¹ (B2) and 15 ton ha⁻¹ (B3). Three types of bokashi, namely: Goat manure (P1), Cow manure (P2), Chicken manure (P3). Data were analyzed by analysis of variance. It was tested further by Duncan's Multiple Range Test α = 0.05% [16].

3. Results and Discussion
Sambiloto growth is influenced by environmental factors such as soil nutrient content, rainfall, pest and diseases and so forth. Sambiloto plant that is utilized is vegetative part of plant that is stem, branch and leaf that has been dried more popular called simplicia sambiloto. Sambiloto growth indicators observed include plant height, number of branches and number of leaves, while yield indicators include fresh weight, dry weight and weight of simplicia.

Based on the analysis of variance, dose and type bokashi fertilizer treatment is a significantly affect all growth indicators and yield indicators. There is a combination treatment interaction of dosage and type of bokashi fertilizer to the dry weight of sambiloto. Table 1 and Table 2. show growth indicators on dose and type bokashi fertilizer treatment.

<table>
<thead>
<tr>
<th>Table 1. The average of plant height, branches number, and leaves number on dose bokashi treatments.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dose bokashi</strong></td>
</tr>
<tr>
<td>B₀</td>
</tr>
<tr>
<td>B₁</td>
</tr>
<tr>
<td>B₂</td>
</tr>
<tr>
<td>B₃</td>
</tr>
</tbody>
</table>

**Remarks:** The value followed by same letter at the
Same column is non significant different at 5% DMTT
Based on the results of the observations in Table 1, it was found that the 15 ton ha⁻¹ dosage of bokashi fertilizer showed the most optimum growth with plant height 60.07 cm, the number of branches 24.11 and the number of leaves 121.33 was significantly different with no bokashi fertilizer as control. At other lower doses, the effectivity of bokashi also appears lower but still shows significantly different controls.

Table 2. The average of plant height, branches number, and leaves number on type bokashi treatments

<table>
<thead>
<tr>
<th>Type bokashi</th>
<th>Plant height (cm)</th>
<th>Branches number</th>
<th>Leaves number</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>54.89 a</td>
<td>20.90 a</td>
<td>89.31 a</td>
</tr>
<tr>
<td>P₂</td>
<td>54.71 a</td>
<td>20.98 a</td>
<td>99.72 ab</td>
</tr>
<tr>
<td>P₃</td>
<td>58.68 b</td>
<td>24.13 b</td>
<td>114.42 c</td>
</tr>
</tbody>
</table>

Remarks: The value followed by same letter at the same column is non significant different at 5% DMRT

Table 2 shows that bokashi fertilizer of chicken manure showed the best growth with mean of plant height 58.68 cm, mean of branch number 24.13 and average number of leaf 114.42, significantly different with bokashi of goat or cow daug. Based on the preliminary analysis that gromosol soil in the study has limited nutrient, 0.5% Nitrogen content so that less able to support the growth of sambiloto plants at optimum level [17], said that the nutrient content of bokashi fertilizer is N P K and micro elements also contain active microorganisms for fermentation and decomposition process. Therefore, the more bokashi given to the plants will show a good response to support optimum plant growth.

Table 3. The average of fresh weight, dry weight, simplicia weight of plant on dose bokashi treatments

<table>
<thead>
<tr>
<th>Dose bokashi</th>
<th>Fresh weight (gr)</th>
<th>Dry weight (gr)</th>
<th>Simplicia Weight (gr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B₁</td>
<td>48.46 a</td>
<td>18.59 a</td>
<td>16.58 a</td>
</tr>
<tr>
<td>B₂</td>
<td>73.47 b</td>
<td>25.24 bc</td>
<td>20.73 bc</td>
</tr>
<tr>
<td>B₃</td>
<td>81.21 c</td>
<td>28.92 c</td>
<td>24.34 c</td>
</tr>
<tr>
<td>B₄</td>
<td>83.46 c</td>
<td>34.28 d</td>
<td>31.12 d</td>
</tr>
</tbody>
</table>

Remarks: The value followed by same letter at the same column is non significant different at 5% DMRT

Based on the analysis of variance of the sambiloto results in Table 3, that treatment of 15 ton ha⁻¹ bokashi fertilizer doses gave the best result of fresh weight 83.46 gr plant⁻¹; Dry weight 34.28 gr plant⁻¹ and weight of simplicia 31.12 gr plant⁻¹ is different with control without fertilizer bokashi. This is in accordance with research [18] on carrot plants that the crop is affected by the higher organic fertilizer. The addition of bokashi fertilizer into the soil will increase the element of N and other nutrients. Nitrogen is a very important nutrient because it needs the most for vegetative growth of plants. Nitrogen acts as a constituent of amino acids, proteins, chlorophyll pigment compounds that are important in the process of photosynthesis [17-19].

The result of sambiloto is form of simplicia is the vegetative part of the plant in the form of stems, branches and leaves that have been dried, then the application of bokashi fertilizer can increase the growth followed by increasing the sambiloto result.
Table 4. The average of fresh weight, dry weight, simplisia weight of plant on type bokashi treatments:

<table>
<thead>
<tr>
<th>Type bokashi</th>
<th>Fresh Weight (gr)</th>
<th>Dry weight (gr)</th>
<th>Simplisia weight (gr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>71,14 a</td>
<td>25,39 a</td>
<td>21,18 a</td>
</tr>
<tr>
<td>P2</td>
<td>69,09 a</td>
<td>26,45 a</td>
<td>23,30 a</td>
</tr>
<tr>
<td>P3</td>
<td>74,71 a</td>
<td>28,43 b</td>
<td>25,10 b</td>
</tr>
</tbody>
</table>

Remarks: The value followed by same letter at the same column is non significant different at 5% DMRT.

Table 4, that bokashi fertilizer of chicken manure showed the best result with fresh weight average 74,71 gr tan⁻¹; Average dry weight 28,43 gr tan⁻¹ and mean weight of simplisia 25,10 gr tan⁻¹. Plant growth is very nutrient needs, this is less than the control. Provision of bokashi fertilizer on soil will increase the nutrient content, while the control does not exist. The bokashi fertilizer used contained nitrogen 1.437% in bokashigoats manure, 1.648% in bokashi cow manure and 1.853% in bokashi chicken manure [20]. This caused bokashi from chicken manure to give the best results on fresh weight, dry weight and weight of simplisia.

Table 5. The average dry weight (gr) on dosage and type combinations treatments of bokashi fertilizer:

<table>
<thead>
<tr>
<th>Treatments</th>
<th>B₁</th>
<th>B₂</th>
<th>B₃</th>
<th>B₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>18,81 a</td>
<td>31,24 d</td>
<td>31,54 d</td>
<td>32,14 d</td>
</tr>
<tr>
<td>P₂</td>
<td>16,39 a</td>
<td>20,67 ab</td>
<td>29,82 bc</td>
<td>36,93 d</td>
</tr>
<tr>
<td>P₃</td>
<td>20,55 nb</td>
<td>23,82 bc</td>
<td>25,40 bc</td>
<td>37,78 d</td>
</tr>
</tbody>
</table>

Remarks: The value followed by same letter at the same column is non significant different at 5% DMRT.

Table 5, the highest dry weight was obtained in a combination of treatment of 15 ton ha⁻¹ bokashi dosage and bokashi chicken (B₁P₃) 37.78 gr plant⁻¹, the lowest dry weight in the treatment combination without bokashi and bokashikambing (B₀P₃) of 16.39 gr plant⁻¹.

This means that the application of bokashi fertilizer increases the dry weight of the sambalito plant, because the nutrient content of bokashi affects the vegetative growth of the sambalito plants which in turn can increase the dry weight of the plant. The dry weight of the plant comes from the result of photosynthesis and nutrient uptake processed through the process of biosynthesis. Supported by the opinion of [21] that the addition of dry weight of the plant is closely related to photosynthetic activities that desperately need nutrient plants. [22], said that crop production is more accurately expressed by dry weights than fresh weight of plants because fresh weight is affected by moisture conditions at that time.

4. Conclusions
The results of research indicated that dose and type bokashi fertilizer influenced growth and yield variables such as plant height, number of branches, number of leaves, plant dry weight and simplisia weight. Interaction dose 15 ton ha⁻¹ of fertilizer bokashi chicken manur was the best for the dry weight 37.78 gr plant⁻¹.

Acknowledgements
Reference


