

*Atsugi
2017*

PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON SOIL MANAGEMENT FOR SUSTAINABLE AGRICULTURE 2017



-PART 1-
INTERNATIONAL SYMPOSIUM ON SOIL
MANAGEMENT FOR SUSTAINABLE AGRICULTURE
2017

ORGANIZER:
THE UNITED GRADUATE SCHOOL OF AGRICULTURAL SCIENCE,
GIFU UNIVERSITY

-PART 2-
UGSAS-GU & BWEL JOINT POSTER SESSION
ON AGRICULTURAL
AND BASIN WATER ENVIRONMENTAL SCIENCES

CO-ORGANIZER:
GIFU UNIVERSITY REARING PROGRAM
FOR BASIN WATER ENVIRONMENTAL LEADERS



AUGUST 28 - 30, 2017
6TH FLOOR, UGSAS BLDG. GIFU UNIVERSITY, JAPAN



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International Symposium on Soil Management for Sustainable Agriculture 2017

PROGRAM —PART 1—

DAY ONE: Monday, August 28

Time: 9:30-19:30

Venue: Main Seminar Room (6F in UGSAS Building, Gifu University)

Master of Symposium: Prof. Kohei Nakano (Gifu Univ.)

Time Table

9:30-10:00	Registration
10:00-10:05	Opening Remarks Prof. Masateru SENGE (Dean of UGSAS, Gifu Univ.)
10:05-10:10	Welcome Speech Dr. Fumiaki SUZUKI (Executive Director and Vice President of Gifu Univ.)
10:10-10:50	Keynote Speech 01 Prof. Yasushi MORI (Okayama Univ.): Soil Physical Rehabilitation
10:50-11:30	Keynote Speech 02 Assist. Prof. Yuki KOJIMA (Gifu Univ.): Soil Water and Energy Dynamics
Session 1 11:30-11:55	—General Issue and Solution— Session Chair: Prof. Muhajir Utomo (Lampung Univ.) 01. Prof. Isril BERD (Andalas Univ.)
11:55-12:20	02. Dr. Komariah (Sebelas Maret Univ.)
12:20-12:30	Photo Session
12:30-13:40	Lunch Break (Light meals served)
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14:05-14:30	02. Dr. Afandi (Lampung Univ.)
14:30-14:55	03. Mr. Didin Wiharso, M.Sc. (Lampung Univ.)
14:55-15:20	04. Dr. Nuyen Thi Hang NGA (Thuy Loi Univ.)
15:20-15:30	Coffee Break
Session 3 15:30-15:55	—Watershed Management— Session Chair: Associate Prof. Takeo ONISHI (Gifu Univ.) 01. Dr. Khandra Fahmy (Andalas Univ.)
15:55-16:20	02. Dr. Muhammad MAKKY (Andalas Univ.)



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Soil Properties in Relation with the Incidence of Heart Rot Disease in Pineapple due to *Phytophthora* sp. in Humid Tropical Climate of Lampung, Indonesia

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SUMMARY

This study examined the relationship between soil properties, especially pH and C-organic soil with the incidence of heart rot disease due to *phytophthora* in pineapple plantation. The heart rot disease which was caused by *Phytophthora* sp. was studied in small scale plot experiment. To simulate the amount of C-organic in soil as well as pH, the experiment was done by applying compost with the following treatments: 0 t/ha, 100 t/ha, and 200 t/ha of compost with 5 replicate. Three months after planting, the incidence of disease was very severe in application of 200 t compost per ha, and all the plants were nearly dead 5 months after planting in 100 and 200 t/ha of compost application. Application of compost increased C-organic soil and soil pH in, especially treatment 200 t/ha followed by the increasing disease incidence due to *phytophthora*. The species of *Phytophthora* sp was identified as *Phytophthora nicotianae*.

Keywords: pineapple, compost, heart rot disease, *phytophthora*

Introduction

The soil developed under humid tropical climate generally is characterized with low pH (acid soil), low chemical fertility as well as poor soil physical properties. Farming in such soil conditions have many obstacles, mainly getting high yield of agricultural crop and maintaining the soil health. Application of organic matter or compost and liming usually applied to encounter these problems. However, in pineapple cultivation, increasing pH above 5 would promote disease in the form of heart rot and root rot disease due to *Phytophthora* sp. (Rohrbach and Johnson, 2003; Pegg, 1993; Mite et al., 2010). On the other hand, if the pH is very low, the availability of macro nutrient will be limited.

Understanding the living environment of *Phytophthora* sp. in pineapple could control the incidence of diseases which caused by this microorganism. In Hawai'i, pineapple heart and root rots are most severe in high-rainfall areas and irrigated soils with poor soil drainage (Green and Nelson, 2015). Corcobado et al., (2013) reported that the occurrence of infected trees by *Phytophthora cinnamomi* was higher in soil low bulk densities, fine textured soils and in thick Ah horizons. Morgan and Shearer (2013) showed that the capacity of *P.cinnamomi* to sporulate and release zoospores significantly greater in the jarrah forest soil and Bassendean sand than the mining soils. Shearer

(2014) also reported that sporangia of *P. cinnamomi* grew well in temperatures were between 26 °C to 30 °C.

Afandi et al. (2016) reported that the heart rot disease due to *phytophthora* started attack in pH above 4.4 and soil organic matter above around 1%.

The objective of this research is to investigate the relationship between soil properties, especially pH and C-soil organic with *phytophthora* incidence in pineapple in Lampung, Indonesia.

Material and Method

Research conducted in pineapple plantation, Central Lampung, Lampung, Indonesia, from June 2016 until March 2017. The experiment was done by applying compost with the following treatments as follows :0 t/ha, 100 t/ha, and 200 t/ha compost with 5 replicate planted with pineapple. The plot size was 3 m x 2.5 m with planting distance 56 between rows and 20 cm in row. Planting material of pineapple was sucker with clone GP3. Prior to planting, the base fertilizer were applied with 100 kg Urea/ha, 150 kg KCl/ha, and 250 kg DAP/ha. The disease incidence were investigated 3, 4, 5 month after planting on January, February and March 2017. Chemical soil properties, including in pH and C-organic soil were analyzed 5 months after planting.

The soil used in this experiment was classified as Ufisoils or Red Yellow Podzolic Soils with have the following soil fraction composition: sand 53.8%, silt

8.6%, and clay 37.6% and categorized as sandy clay in USDA Soil Texture Classification. The initial chemical properties of soil have the following values: pH 4.7, C-organic 1.5, and CEC total 19.7 meq/100 g. Compost consisted of 20% cow dung, 20% bamboo chops, and 60% of pineapple bagasse, which already composting and mature. The content of compost were as follows: pH 7.2, C-total 21.59%, N-total 1.68%, C/N ratio 12.89 and CEC total 56.48 meq/100 g.

Result and Discussions

Climate condition

The average rainfall during 1981-2012 was around 2452 mm per year. The dry season, which the rainfall below 100 mm per month, occurred in June until September. The rainy season start on November, until April. The monthly rainfall distribution is shown in Fig.1.

The average air temperature as shown in fig.2 was around 22.5°C to 32.6 °C throughout the year. The maximum temperature occurred in October, while the minimum temperature occurred in July.

This climate character was ideal with phytophthora growth which high rainfall and warm temperature.

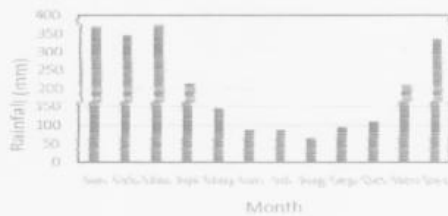


Fig.1 Monthly rainfall in Central Lampung

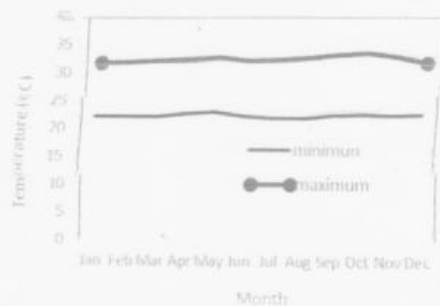


Fig.2 Monthly minimum and maximum temperature

Disease Incidence

The diseases incidence caused by phytophthora was characterized by the leaves which easily pulled from the plant, with foul smell and the plant would finally be dead. Identification of the species in this location by Auliana Afandi in Gifu University showed that the species of Phytophthora is *Phytophthora nicotianae*.

The disease incidence which was observed from 3 after months planting is shown in Fig 3.

Figure 3 showed that 3 months after planting, the incidence of disease was very severe in application of 200 t compost per ha, and all the plants were nearly dead. 4 and 5 months after planting in 100 and 200 t/ha of compost application.

pH, C-organic and disease incidence

Application of compost increased C-organic soil in, especially treatment 200 t/ha. Compost application also increased pH. Increasing pH and C-organic were followed by the increasing of disease incidence (Table 1).

Since compost has high pH, the application of compost would increase pH in soil. In this experiment, the treatment with 0 t/ha of compost has already pH >5, the ideal condition of the *Phytophthora*, so until five month after planting, the incidence of phytophthora disease was around 53%. Combination of high pH and high organic soil in treatment 100 and 200 t/ha compost made almost the all pineapple plant died five months after planting.

Other experiment using 50 t/ha of compost, the disease incidence was not significantly reduced the pineapple population as well as yield.



Fig.3 Disease incidence after planting

Table 1 Disease incidence and soil properties

Compost (t/ha)	C- soil organic (%)	pH	Disease incidence (%)
0	1.72a	5.47a	53a
100	2.35ab	5.71a	99b
200	3.16b	6.25b	98b

*) Means followed by same letters within a column do not differ statistically

Conclusion

Application of high dosage compost with high pH has induced phytophthora attack in pineapple. Five month after planting, all pineapple plant (98-99%) almost died due to heart rot disease caused by *Phytophthora nicotianae*. Compost application below 100 t/ha and liming application not more than until pH 5, is better for pineapple.

Acknowledgement

The authors thanked to PT. *Great Giant Pineapple, Central Lampung, Lampung, Indonesia, for facilitating this research.

Reference

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