PROCEEDING

International Seminar on Tropical Horticulture

2016

"The Future of Tropical Horticulture"

Organized by

ISBN 978-979-18361-5-9

Proceeding International Seminar on Tropical Horticulture 2016 : *The Future of Tropical Horticulture*

ISBN : 978-979-18361-5-9

Editor :
Dr. Awang Maharijaya, SP, M.Si
Dr. Ir. Darda Efendi, M.Si

Layout and Cover Design :
Ferdhi Isnan Nuryana, SP

Publisher :
Pusat Kajian Hortikultura Tropika (PKHT) - LPPM IPB

Editorial :
Pusat Kajian Hortikultura Tropika (PKHT)
Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM)
Institut Pertanian Bogor (IPB)
Kampus IPB Baranangsiang, Jl Raya Pajajaran, Bogor 16144
Telp. (0251) 8326881; Fax. (0251) 8326881

First Edition, May 2017

FOREWORD

The International Seminar on Tropical Horticulture 2016 was held in IPB International Convention Center, Bogor, Indonesia 28 – 29 November 2016. This seminar was organized by Center of Excellence for Tropical Horticulture Studies (PKHT), Center of Excellence in University (PUI-PT), Bogor Agricultural University (IPB), and supported by an excellent collaboration with International Tropical Fruits Network (TF Net).

We're very glad to know the fact that the seminar displayed a very wide discussion about tropical horticulture with delegates from 5 countries (Taiwan, Thailand, Malaysia, Japan and Indonesia) as keynote speech and participants. 24 papers were selected to be included in this proceeding from 28 oral and 31 poster presentation.

This proceeding is contained of three sub chapter, that is fruits, vegetables and miscellaneous. There are 9 papers of fruits chapter, 12 papers of vegetables chapter and 3 papers of miscellaneous chapter. We wish to thank Sanjeet Kumar, Ph.D, Prof. Sobir, Prof Masayoshi Shigyo, Dr. Mohd Desa Haji Hassim, Parson Saradhuldhat, Ph.D for being keynote speech at this international seminar and all participants for very lively atmosphere during and after the seminar.

Bogor, May 2017

Editor

Dr. Darda Efendi
Dr. Awang Maharijaya

SYMPOSIUM PROGRAM

28 November 2016

07.30 – 09.00	*Registration desk open and morning coffee*
09.00 – 09.30	Welcome addresses **Dr. Darda Efendi**, Director of Center for Tropical Horticulture Studies, Indonesia **Prof. Herry Suhardiyanto,** Rector of Bogor Agricultural University, Indonesia
09.30 – 12.00 (20 minutes presentation + 10 minutes discussion)	**Session 1: Introductory Topics** **Dr. Sanjeet Kumar,** World Vegetable Center, Taiwan *"Science and Art of Tropical Horticulture: Stories, Impacts and Prospects"* **Prof. Sobir,** Indonesian Center of Excellence for Tropical Horticulture *"Tropical Horticulture: Past, Present and Future"* **Gregori Hambali, MSc,** Mekarsari, Indonesia *"Managing Tropical Fruit Collection"*
12.00 – 13.00	*Lunch*
13.00 – 14.30 (20 minutes presentation + 10 minutes discussion)	**Session 2: Opportunity in Tropical Horticulture Industry** **Prof. Muhammad Firdaus,** Bogor Agricultural University *"Enhancing the Competitiveness of Tropical Horticulture Products"* **Dr. Mohd Desa Haji Hassim,** International Tropical Fruit Network, Selangor, Malaysia *"Issues and Challenges in The Global Tropical Fruit Market"* **Parson Saradhuldat, Ph.D,** Department of Horticulture, Kasestsart University, Thailand *"Tropical Horticulture Business in Thailand"*
14.30 – 16.00 (20 minutes presentation + 10 minutes discussion)	**Session 3: Quality of Horticultural Products** **Dr. Darda Efendi,** Center for Tropical Horticulture Studies, Indonesia *"Quality Issues in Tropical Horticultural Products"*

	Tatas H. P. Brotosudarmo, PhD, Ma Chung University *"*Non-optical and optical spectroscopy as metabolomics platforms for determining the quality of horticultural products*"* **Dr. Irmanida Batubara,** Tropical Biopharmaca Research Center *" Quality Control on Herbal Medicine"*

29 November 2016

07.30 – 08.30	*Registration desk open*	
08.30 – 10.15	**Parallel session 1**	**Parallel session 2**
10.15 – 10.30	*Coffee Break and Poster Session*	
10.30 – 12.15	**Parallel session 3**	**Parallel session 4**
12.15 – 13.00	*Lunch*	
13.00 – 15.00 (@20 minutes presentation + 10 minutes discussion)	**Session 4 : Technology Needs for Improving Horticulture in The Tropics** **Prof. Masayoshi Shigyo,** Yamaguchi University, Japan *"Proposal for a forwarding model in order to encourage social interaction among HRs and/or PGRs via platform operation based on research collaboration in Indonesian vegetable crops"* **Prof. Sri Hendrastuti Hidayat,** Department of Plant Protection. Faculty of Agriculture. Bogor Agricultural University *"Integrated Disease Management for Vegetable Crops: Concepts and Practices"* **Dr. Catur Hermanto,** Indonesian Vegetables Research Institute (IVEGRI) *"Pest And Disease Threats and Challenges For Future Vegetable In The Tropic*"	
15.00 – 16.00	*Concluding and Remarks*	
16.00 – 18.00	*Farewell Drink*	

ORAL PRESENTATION SCHEDULE

Tuesday, November 29th 2016

Paralel 1

TIME	PRESENTER NAME	CODE	TITLE
08.30 – 08.45	Slamet Susanto	OP 1	Prolong Shelflife of Seedless Pummelo (*Citrus maxima* (L.) Osbeck) Fruit During Storage
08.45 – 09.00	Dini Hervani	OP 2	Cryopreservation of Long-term Plant Germplasm Storage
09.00 – 09.15	Sulassih	OP 3	Variability of Jackfruit Based on Morphology and Molecular ISSR
09.15 – 09.30	Ahmad Solikin	OP 4	Characterization of Local Durian Varieties In Central Java Using Molecular Markers Inter Simple Sequence Repeats (ISSR)
09.30 – 09.45	Nelinda	OP 5	Packaging Design and Postharvest Treatment to Maintain the Quality of Rambutan (*Nephelium Lappaceum* L.) in Distribution System
09.45 – 10.00	Maxmilyand Leiwakabessy	OP 6	Disease Incidence and Molecular Analysis of Banana Bunchy Top Virus in Bogor, West Java
10.00 – 10.15	Ajmir Akmal	OP 7	Transpiration rate of relationship fruit with Gamboge of Mangosteen (*Garcinia mangostana* L.)

Paralel 2

TIME	PRESENTER NAME	CODE	TITLE
08.30 – 08.45	Juang Gema Kartika	OP 8	Growth and Production of Some *Moringa oleifera* Lam. Accession at Several Harvesting Interval
08.45 – 09.00	Lutfi Izhar	OP 9	Conservation Agriculture with Soil Health: Optimal Fosfor Fertilizer Rate for Tomato (*Lycopersicon esculentum* Mill. L) on Inceptisols
09.00 – 09.15	Adhitya Mahendra K	OP 10	Stakeholders Analysis in Seed Provision System Development Originated from True Seed of Shallot
09.15 – 09.30	Endro Gunawan	OP 11	Policy Analysis on Shallot Stock Seed Program Though The Botanical Seed (*True Shallot Seed*) TSS
09.30 – 09.45	Ali Asgar	OP 12	Integrating Understanding of Indigenous Vegetable Nutrients and Benefits
09.45 – 10.00	Marlin	OP 13	Metabolite Changes in Shallot (*Allium cepa* var *aggregatum*) during Vernalization
10.00 – 10.15	Suhesti Kusuma Dewi	OP 14	The Effects of Vernalization and Photoperiod on Flowering of Shallot (*Allium cepa* var. *ascalonicum* Baker) in Lowland Area

Paralel 3

TIME	PRESENTER NAME	CODE	TITLE
10.30 – 10.45	Satriyas Ilyas	OP 15	Study of Phenology and Determination of Seed Physiological Maturity of Long Bean (*Vigna sinensis* L.) Based on Heat Unit
10.45 – 11.00	Endah Retno Palupi	OP 16	Chromosome Number Estimation of Diploid, Autotetraploid and Triploid Hybrid 'Rejang' Banana Using Protoplast from Male Flower (anther)
11.00 – 11.15	Yudiwanti Wahyu	OP 17	Performance of Some First Generation Corn Populations derived from Selfing and Sibbing for Developing Baby Corn Varieties
11.15 – 11.30	Ady Daryanto	OP 18	Inheritance of Chili Pepper Resistance Against Infestation of *Aphis gossypii* Glover (Hemiptera: Aphididae)
11.30 – 11.45	Edi Santosa	OP 19	Variation in Floral Morphology of Agamosporous *Amorphophallus Muelleri* Blume of Natural and Gibberellins Treatment
11.45 – 12.00	Kusuma Darma	OP 20	The Eco-Friendly Technology to Control Pests and Diseases of Shallot
12.00 – 12.15	Filemon Yusuf	OP 21	Phylogenetic Study of Indigenous Pulses Based on Morphological and Inter Simple Sequence Repeat (ISSR) Markers

Paralel 4

TIME	PRESENTER NAME	CODE	TITLE
10.30 – 10.45	Ririh Sekar Mardisiwi	OP 22	Growth and Production of Black Cumin (*Nigela sativa* L.) at Several Composition Media and Watering Interval
10.45 – 11.00	Evi Setiawati	OP 23	Growth and Production of Black Cumin (*Nigela sativa* L.) at Shade Levels and Nitrogen Doses
11.00 – 11.15	Tatik Raisawati	OP 24	The Nutritional Value and Total Flavonoid Content of *Sonchus arvensis* L. Leave
11.15 – 11.30	Dewi Sukma	OP 25	Diversity Analysis of Phalaenopsis by Using SNAP Marker
11.30 – 11.45	Widya Sari	OP 26	Morphological, Molecular Charactheristics and Pathogenicity of *Fusarium* spp. from Some Cultivars of Banana
11.45 – 12.00	Juwartina Ida Royani	OP 27	In Vitro Shoots Multiplication of Sapodilla (*Manilkara zapotta* Van Royen) with Modified MS Media
12.00 – 12.15	Willy B. Suwarno	OP 28	Melon Breeding: Past Experience and Future Challenge

Table of Content

Fruits

Vegetables

Miscellaneous

Characterization and Resistance to Bacterial Wilt Diseases (*Ralstonia solanacearum*) of 20 Eggplant (*Solanum melongena* L.) Genotypes

Heri Harti[1], Teni Widia[2], Pritha[1], Awang Maharijaya[1]

[1]*Center for Tropical Horticulture Studies. Jalan Padjajaran Bogor, Indonesia*
[2]*Department of Agronomy and Horticulture, Bogor Agricultural University, Jalan Raya Darmaga 16680 Bogor, Indonesia*

Abstract

Development of eggplant varieties resistant to bacterial wilt disease is needed to improve the productivity and quality of the eggplant. PKHT IPB have several eggplant genotypes that have the potential to be developed. To get a diversity of information sources in assembling eggplant varieties resistant to bacterial wilt disease is necessary to characterization and test of it resistance of eggplant genotypes. Research objective to obtain information about the morphological characteristics of plant genotypes are tested and to know the response its resistance to bacterial wilt (R. solanacearum). Research was conducted at trial PKHT (Center for Tropical Horticulture Studies) Pasir Kuda. The design used was a complete randomized group design one factors with three replications. Genotype 2013-070, 2013-080, 2013-064, 2013-090 is the genotypes that are resistant to bacterial wilt disease, whereas the susceptible genotype is 2013-059, 2013-076, 2013-043, 2013-043, 2013-049, 2013-021, 2013-046. Results of testing the qualitative characters to plant growth, stem, leaves, flowers and fruit showed the diversity. The color of fruit when it harvest of 20 genotypes tested consists of white, purple, and green. Results of testing the plant on quantitative characters showed it diversity.

Key words: genotype, potential yield,, characterization, Ralstonia solanacearum, bacterial wilt disease

1. Introduction

Eggplant (*Solanum melongena* L.) is one of the vegetable crops that can grow well in tropical countries. Eggplants contain very high water, calcium, phosphorus, potassium, fiber, fulat acid, sodium, vitamins, and vitamin C (Choundhary and Gaur, 2009).

The development of Indonesia's population increase the consumption of vegetables, include eggplant. According to data from FAO (2012), the production of Indonesia eggplant occupied the sixth position in the world with a production value of 518 827 tons, lower than China, which reached production of 28.800.000 tons and India 12.200.000 tons. The low number of production can be caused by a decrease in area planted and low productivity, so that Indonesia needs to improve crop production nationwide.

Eggplants plants can be grown all year in Indonesia. Eggplants production problems in tropical countries such as Indonesia are highly susceptible to pests and diseases from seedling to harvesting stage (Raghuraman, 2008). Disease is one of the main causes losses in the production of Eggplants. The important disease in eggplant is a bacterial wilt caused by *Ralstonia solanacearum* (E.F. Smith). The disease can reduce the production from 15 to 95% (Mahmud, 1985).

The bacterial wilt are difficult to control, because the *R. solanacearum* is a bacteria that highly destructive and have a wide range of host on crop plants (tomatoes, potatoes, peppers, peanuts, papaya, etc.), ornamental plants, and weeds in the tropics and subtropics. This bacterium is a soil-borne pathogens and can survive on alternative hosts (Abdullah and Rahman, 1998). The survival of the bacteria in soil are high, especially on lands planted continuously with the susceptible host

The development of eggplant that is resistant to bacterial wilt disease is needed to improve the productivity and quality. This research was conducted on several numbers of eggplant explorations to determine the level of bacterial wilt plant resistance.

2. Material and Methods

This research was conducted at PKHT (Center for Tropical Horticulture) Pasir Kuda field in January to July 2016. This research used eggplant genotypes of 2013-008, 2013-011, 2013-012, 2013-021, 2013-023, 2013-042, 2013-043, 2013-045, 2013-046, 2013-049 , 2013-050, 2013-053, 2013-059, 2013-060, 2013-064, 2013-070, 2013-076, 2013-079, 2013-080, 2013-090. The experimental design were used by completely randomized design (RKLT) with 20 numbers of eggplant genotypes, three repetitions, and each unit consisted of 20 plants. The data were analyzed by ANOVA using SAS 9.1 software and when the data showed the real effect then continued by advance test DMRT at 5% level, and to test the correlation between quantitative characters using STAR software.

Morphological characters are classified based on the qualitative character. The characters are observed as growth habit, sinuation of margin leaf blade, tip angle, blistering of leaft blade, intensity of green color, number, size and color of flower, general shape of fruit, main color of skin at harvest maturity fruit, color of flesh, stripes of fruit, prominence of stripes fruit, intensity of anthocyanin coloration underneath calyx, size of calyx, spininess of calyx, and creasing of calyx.

Bacterial infections were observed by sampling symptomatic of plants wilt. Observations of bacterial infection carried by isolating the bacteria. Isolation was conducted by Wang (1998). Base of stems were washed with sterile distilled water. Stem cut with sterile knife, and then put in a plastic cup which contains as much as 5 mL sterile distilled water and allowed five to ten minutes. The cuts will be excreting a fluid called oose. Oose can be used to differentiate between the plant that infected bacterial wilt with fungi wilt and wither due to physiological disorders. The incidence of disease was observed starting from one week until eight weeks after planting. The formula of wilt disease incidence is using by Wang (1998).

$$P = n / N \times 100\%$$

P = Disease incidence
N = Number of plants observed
n = Number of infected plants

The level of resistance of every tested genotype based on the percentage incidence of the disease (Maharijaya, 2008), that is:
S = Susceptible (disease incidence > 75%)
MS = Moderately Susceptible (50% < disease incidence ≤75%)
R = Resistant (disease incidence ≤25%)
MR = Moderately Resistant (25% < disease incidence ≤ 50%)

3. Result and Discussion

Morphological Characters

Morphological characterization results showed 18 genotypes successfully characterized. The diversity of eggplant apparent, especially the characters on the fruit. The diversity of dominant color of skin at harvest maturity are green, white and purple. Color of Flesh is greenish and whitish. The general shape of fruit is ovoid, globular and cylindrical. Based on the results of cluster analysis, 18 genotypes of eggplant can be grouped into 3 major groups (Figure 1). The genotypes that are in one group might have had a close genetic distance as they have the same character. Differences in groups showed genetic distance over which a much. According to Singh et al. (2008) different genotypes groups with genetic distance over which a much can be utilized in breeding programs to obtain the enormous variation in segregating generations.

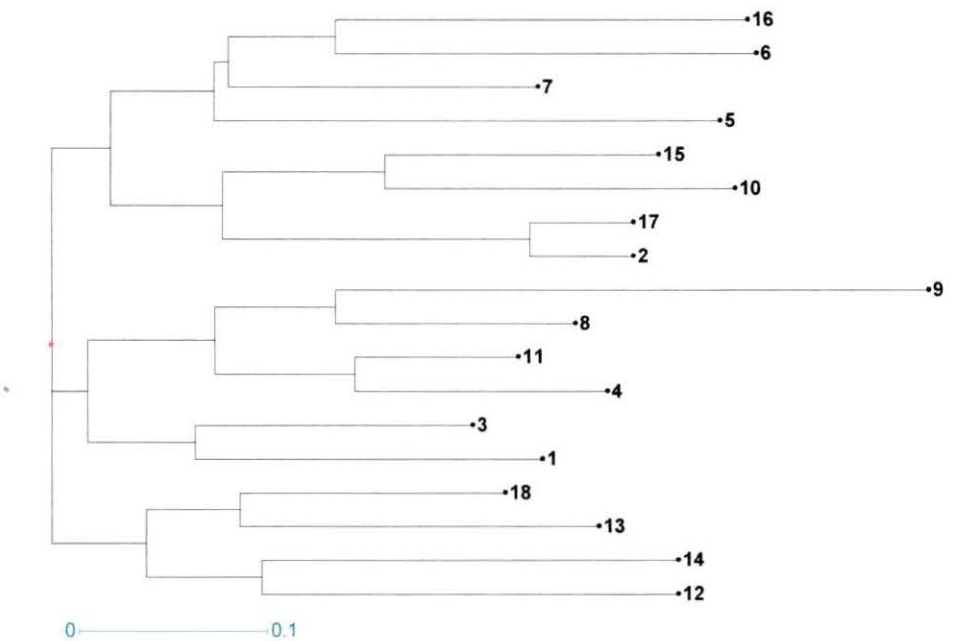

Figure 1. Dendogram based on morphological characters. 2013-008 (1), 2013-011 (2), 2013-012 (3), 2013-023 (4), 2013-042 (5), 2013-043 (6), 2013-045 (7), 2013-049 (8), 2013-050 (9), 2013-053 (10), 013-059 (11), 2013-060 (12), 2013-064 (13), 2013-070 (14), 2013-076 (15), 2013-079 (16), 2013-080 (17), 2013-090 (18).

Disease Incidence

Symptoms of *R.solanacearum* can be seen on three weeks after planting. The symptoms of this disease are leaves wilt (Figure 2a), then the leaves become yellow to brownish (Figure 2b). Heavy attack causes all part of plants be wilt, finally tip of plant be broken (Figure 2c). Symptoms of bacterial wilt disease increases as age of the plant. The disease incidence indicates numbers of eggplant infected in the population were observed. The percentage incidence of disease determines the level of plant resistance to a disease.

Figure 2. Symptoms of R.solanacearum attack. a. leaves wilt; b. leaves become yellow to brownish and c. all part of plants be wilt, finally tip of plant be broken

The infected plants in our study would die within a week or two weeks after infestation. It might be caused of the fact that our plants were infected *R. Solanacearum* at early vegetative stage. The susceptible genotypes was 2013-021 with disease incidence 73,33%. The plant would die because of the clogging xylem by *R. Solanacearum* bacterial mass, so that water transport and minerals were inhibited (Saile *et al.* 1997). The life cycle begins when *R. solanacearum* pathogen infection entry into the roots, either through seed, water, soil and the wounding caused by insects, nematodes or agricultural tools. Upon the *R. Solanacearum* entry into the roots, the bacteria will multiply in timber vessels (xylem) in the root and stem then attack throughout the plant.

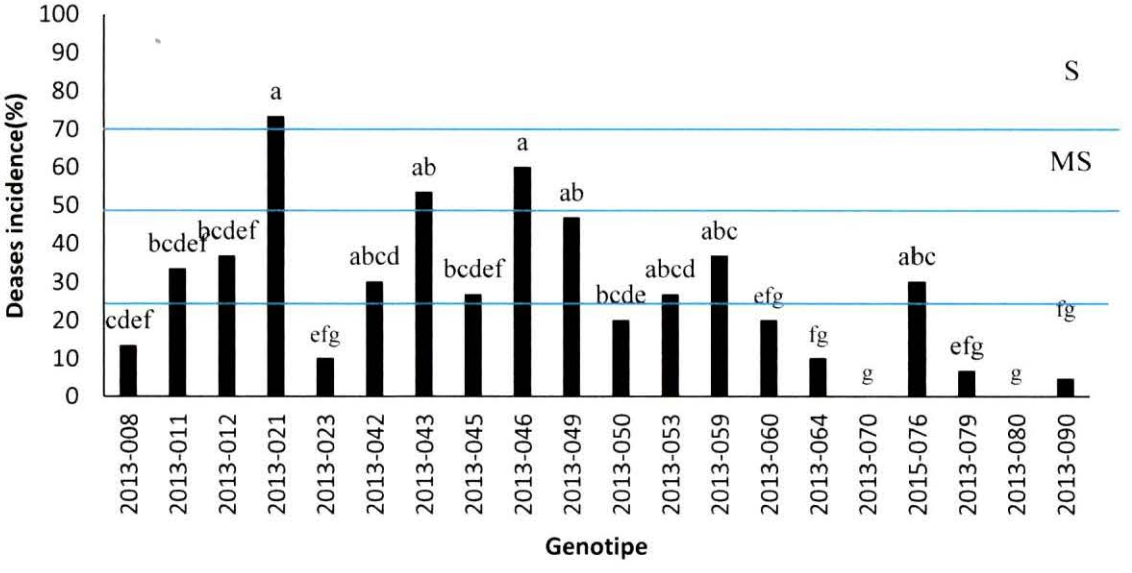

Figure 3. The percentage of disease incidence of 20 genotypes eggplant on 5 weeks after planting. S = Susceptible (disease incidence> 75%), MS = Moderately Susceptible (50% < disease incidence ≤75%), R = Resistant (disease incidence ≤25%), MR = Moderately Resistant (25% < disease incidence ≤ 50%) (Mahariiava et al. 2008)

During this researched the temperature is sufficiently moist with the rainy season. It might be cause *R. Solanacearum* expanding rapidly. According to Kelman (1953) *R. Solanacearum* grow faster at a temperature of 26-27 ° C, in addition to temperature; rainfall and relative humidity also influence in this disease.

Our results indicate that there are two genotypes resistant, that is 2013-070 and 2013-080. Both genotypes resistant to bacterial wilt disease is not showing symptoms of wilt during the

observation (up to 8 weeks of observation). The resistance response on genotypes might be caused of the genetic resistance factors.

4. Conclusion

Resistance test showed that genotype 2013-021, 2013-043, 2013-046, 2013-049, 2013-059, and 2014-076 susceptible to bacterial wilt disease, whereas genotype 2013-064, 2013-070, 2013-080, and 2013-090 resistant to bacterial wilt disease. The observation of qualitative character of the growth of plants (leaves, stems, flowers, and fruits showed a diversity. The results of the eggplant genotypes analysis were divided into three major groups. The differences eggplant group show that the diversity among genotypes. Our research show that eggplant genotypes 2013-064, 2013-070, 2013-080, and 2013-090 have resistant response to bacterial wilt disease.

Reference

Abdullah H, Rahman MA. 1998. Multiplication of *Ralstonia solanacearum* in *Capsicum annuum*. Di dalam: Prior PH, Allen C, Elphinstone J, editor. *Bacterial Wilt Disease Molecular and Ecological Aspects*. Reports of The Second International Bacterial Wilt Symposium held in Gosier, Guadeloupe, France 22 – 27 June 1997. Berlin Heidelberg New York: Springer-Verlag. hlm 309–315.

Choudhary B, Gaur K. 2009. *The Development and Regulation of Bt Brinjal in India (Eggplant/Aubergine)*. Ithaca (US): ISAAA. Brief No.38.

[FAO] Food and Agriculture Organization. 2012. Top production eggplantaubergines. [Internet]. [2016 Oktober 15]. http://faostat.fao.org/site /339/default.aspx

Kelman A. 1953. The bacterial wilt caused by *Pseudomonas solanacearum*. A literature review and bibliography. Bul North Carolina Agric 99-194p

Machmud M. 1985. Bacterial wilt in Indonesia. Di dalam: Persley GJ. editor. *Bacterial Wilt Disease in Asia and the South Pasific*. Proc. International Workshop held at PCARRD, Los Banos, 8 – 10 Okt 1985. Canberra: PCARRD, CIP, SAPPRAD, ACIAR. hlm 30 – 34.

Maharijaya A., Mahmud M., dan Purwito A. 2008.Uji ketahanan *in vitro* klon-klon kentang hasil persilangan kentang kultivar atlantic dan granola terhadap penyakit layu bakteri (*R. solacearum*) dan busuk lunak (*E. carotovora*). Bul. Agronomi. 36(2):133-138.

Raghuraman K, Adiroubane D. 2008. Plant Products and Microbial Formulation in the Management of Brinjal Shoot and Fruit Borer, Leucinodes orbonalis (Guenee.). Journal of Biopesticides. 1(2):124-129

Saile E, McGarvey JA, Schell MA, and Denny TP. 1997. Role of extracellular polysaccharide and endoglucanase in root invasion and colonization of tomato plants by *Ralstonia solanacearum*. Phytopathology, 87:1264-1271.

Sigh S, Pradhan SK, Virk P. 2008. Genetic divergence in new plant type rice under shallow lowland ecosistem. *J SABRAO of Breeding Genetics*. 40(1):1-8

Wang JF. 1998. Basic Protocols for Conducting Research on Tomato Bacterial Wilt caused by *Ralstonia solanacearum*. Shanhua: Asian Vegetable Research and Development Center.

Yabuuchi E, Y. Kosaka, I Yano, H Hotta, dan Y Nishiuchi. 1995. Transfer of two burkholderia and an alcaligenes spesies to *Ralstonia* gen: proposal of *R. pickettii* (Ralston, Palleroni, dan Doudoroff, 1973) comb. nov., *R. solanacearum* (Smith 1896). comb. nov. and *R. eutropha* (Davis 1969) comb.nov. *J.Microbiol. and Immunol.* 39 (11): 897-904.