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PROCEEDINGS of IC-GU 12 UGSAS-GU

"6TH INTERNATIONAL WORKSHOP ON CROP PRODUCTION AND PRODUCTIVITY UNDER GLOBAL CLIMATE CHANGE"

Editors :

Dr. Afandi
Prof. Dr. Ken Hiramatsu

DECEMBER 3-4, 2018

at FACULTY OF AGRICULTURE, LAMPUNG UNIVERSITY
BANDAR LAMPUNG, INDONESIA

PROGRAM

Date : December 3rd,2018

Venue : Hall of Faculty of Agriculture, Lampung University (UNILA),

Plenary Session

Start		Speaker/Chair Person	Title
8:00	Registratio		
8:30	Session 1	Chair: Cicih Sugianti & Auliana Afandi	Welcoming and Introductory Session
8:30		Prof. Dr. RA Bustomi Rosadi,	Committee Report
		Prof. Dr. Irwan S.Banuwa, Dean of Faculty of Agriculture,	Welcome Address
		Prof. Dr. Hasriadi Mat Akin, Rector of UNILA	Welcome Address
		Prof. Masateru SENGE Dean of UGSAS, GU	Declaration of Opening
9:00	Photo Session & Welcome Ceremony		
9:15	Coffee Break		
9:30	Session 2	Chair: Prof. Chihara E., GU	
9:30		Dr. Dwi Hapsoro, Faculty of Agriculture, UNILA	Roles of Plant Tissue Culture on Agricultural Productivity
10:00		Assoc. Prof. Shimadzu M., GU	Airflow resistance of insect screen and evaporative cooling for natural ventilated greenhouse in humid temperate/ tropical climate region
10:30		Supriyono Loekito PT.GGP	Sustainable agriculture, a strategy to maintain the business sustainability of PT. Great Giant Pineapple under Global Climate Change
11:00	Q & A		
11:45	Lunch break		
12:45	Session 3-Paralell at Post Graduate Building, Fac. of Agriculture, Lampung University		
15:15	Coffee Break		
15:35	Session 4	Chair: Dr. Tumiar K Manik	
15:35		Assis. Prof. Tanaka, T., GU	Applications of Structural Equation Modeling in Crop Yield Variability of the Farmers' Fields
15:55		Agustini (Agric.Service, Bandar Lampung City)	Potential of yard Utilization for Supporting the Fulfillment of Food Security in Bandar Lampung City, Indonesia
15:15		Assis. Prof. Noda, K., GU	GIS analysis for vulnerability assessment of salt damage on Taro Patch in Palau
16:45		Prof. K. Hiramatsu, Vice Dean of UGSAS, GU	Closing
18:30		MC: Dr. Afandi UNILA	Banquet , at Bandar Lampung' s mayor house

Study Excursion/field trip, at December 4, to PT.GGP, Central Lampung

Start : 06.30 from Faculty of Agriculture, Lampung University.

Parallel Session

Venue : Post Graduate Building, Faculty of Agriculture, Lampung University

Room 1

Start	Speaker/Chair Person	Title
12:45	Chair: Assis. Prof. Noda,	*Influence of Climate Change on Crop Production*
12:45	T.K.Manik	Predicting Cassava Suitability as Impacted by Climate Change in Indonesia
13:00	Siti Chairani/Afandi	Tracking the fate of organic matter residue using soil dispersion ratio under intensive farming in red acid soil of Lampung, Indonesia
13:15	WARJI	Multi-layered Microcapsules of Biopesticides to Support Sustainable Agriculture
13:30	Q&A	
13:45	Coffee break	
13:55	Priyo Cahyono	Effects of Waterlogging on Pineapple Growth and Soil Properties on Red Acid Soils of Lampung, Indonesia
14:10	Rusdi EVIZAL	Potential Yield of Replanted Trees of Cocoa Clones Introduced in Lampung
14:25	Dudy Arfian (PT GGP)	Effects of aluminum stress on shoot growth, root growth and nutrient uptake of three pineapple smooth cayenne clone [*Ananas comosus* (L.) Merr.]
14:40	Didin Wiharso	The effect of long-term cassava cultivation on organic carbon content and soil physical properties in Central Lampung
14:55	Q & A	
15:15	Coffee break	

Room 2

Start time	Speaker/Chair Person	Title
12:45	Chair: Diding	*Cash Crop productivity and its constraint*
12:45	Siti Nur Rohmah	Corn Yield and Soil Properties under long term conservation tillage in clayey soil tropical upland of Lampung, Indonesia
13:55	Lestari Wibowo	The role of refugia in the wetland paddy ecosystem
13:10	Dwi Oktaria	Soil organic carbon in soil fraction and corn yield under long-term tillage system and nitrogen fertilization
13:20	Ahmad Tusi	Ventilation Flow Rate and Photosynthesis Prediction based on Water Vapor Balance under Ventilated Greenhouse
13: 35	Q & A	
13:50	Coffee break	

14:00	M. A. Fauzan	Aggregate Stability and Root Biomass Affected by Soil Tillage and Mulching in the Gedung Meneng Soil Planting Green Nut (*Vigna radiata* L.) of the Long Term Experiment
14:15	Ayu Wulan Septitasari	Application of induced compost of cellulolitic (*aspergillus fumigatus*) and ligninolitic (*geotrichum* sp.) inoculum on the vegetative growth of red chili (*Capsicum annuum* L.)
14:30	Yogi Irawan	Soil Compaction, Water Content, Bulk Density and Soil Root Biomass Affected by Tillage and Fertilizer on Gedung Meneng Soil under Green Bean Growth
14:45	Tubagus Hasanuddin	Perceptions of farmers, Effectiveness of Farmers Group, and Diffusion of Innovation of Organic Farming System in Lampung Province
15:00	Q & A	
15:15	Coffee break	

Room 3

Start time	Speaker/Chair Person	Title
12:45	Chair: Prof. K. Hiramatsu, GU	*Annual Crop productivity and technology for supporting*
12:45	Novita Desri Wanti	Production and harvested nutrient of cassava (*manihot esculenta l.*) affected by compost and its combination with NPK inorganic fertilizer for the 5th planting period
12:55	Debby N.A	Simulation of Cavendish Banana Transporation
13:10	Cicih Sugianti	The application of hot water treatment in mango cv arumanis
13:20	Maria Viva Rini	The Diversity of Arbuscular Mycorrhiza Fungi at Rhizosphere of Cassava of Thailand Clone Cultivated in Lampung Timur and Tulang Bawang Barat
13:35	QA	
13:50	Coffee break	
14:00	Adinda Kusuma Dewi	Harvested nutrient and production of cassava (*manihot esculenta*) affected by tillage and herbicide in the 4th planting period in Gedung Meneng soil Bandar lampung
14:10	Nurhidayat	Production and Harvested Nutrients of Sugarcane 1st Ratoon (*Saccharum officinarum* L.) Affected by Organic and Inorganic Fertilizer
14:25	Agus HARYANTO	Biogas Production From Oil Palm Empty Fruit Bunches through Dry Fermentation Process: Preliminary Results
14:40	Diding	The Current Status of Authentication of Indonesian Specialty Coffees Using UV-Visible Spectroscopy and Chemometrics
15:55	Q&A	
15:15	Coffee break	

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The role of refugia in the wetland paddy ecosystem

Lestari Wibowo, Setyo Widagdo, Suskandini Ratih Dirmawati, and M. Nurdin

(Faculty of Agriculture, Lampung University)

SUMMARY

To support rice productivity over a long time, paddy cultivation is done with a sustainable farming system that based on conservation. Conservation-based agriculture increase the diversity of agroecosystems with refugia planting. Refugia plants are flowering plants that grow around cultivated plants that have the potential to provide suitable microhabitat that contribute to the conservation of natural enemies.The study was conducted in August to October 2018 in the wetland paddy at Sidosari Village, Natar District, Lampung. Identification of arthropod families in the Plant Pest Laboratory of the Department of Plant Protection, Faculty of Agriculture, Lampung University. Result study are planting refugia and applying IPM to the ecosystem of wetland paddy increase arthropods diversity, the population of pest insects is lower in wetland paddy ecosystem with planting refugia and application of IPM, population density of biological agents higher than conventional wetland paddy fields, and the disease incidence tungro is dependent on *Nephotettix virescens* in wetland that refugia planting and the application of IPM or the conventional paddy fields.

Introduction

To support rice productivity over a long time, paddy cultivation is done with a sustainable farming system that based on conservation. Conservation-based agriculture increase the diversity of agroecosystems with refugia planting. Refugia plants are flowering plants that grow around cultivated plants that have the potential to provide suitable microhabitat that contribute to the conservation of natural enemies. Refugia plants are a place of refuge, are a source of food, or other resources for natural enemies such as parasitoids, predators, and other beneficial insects. Landis *et al.* (2005) state that many plants and wild plants are a direct source of food for natural enemy organisms, for example by providing nectar and pollen and indirectly providing prey and host, in addition to managing microclimates that are in accordance with the life needs of the enemy natural.

Flowering plants can attract the arrival of insects. The mechanism of flowering plants attracts the arrival of insects using the morphological and physiological characters of the flower, the size of the flower, the shape of the flower, the color of the flower, the smell and the fragrance of the flower, flowering period, as well as nectar and pollen content (Kurniawati & Martono, 2015).

Refugia plants are chosen by criteria such as having striking flowers and colors, fast and sustainable plant regeneration, seeds or seedlings are easily obtained, easy to plant, and can be intercropped with other plants. Plants that have the potential as refugia include sunflowers (*Helianthus annuus*), zinnia paper flowers (*Zinnia* spp.), Kenikir (*Cosmos caudatus*), weeds from the asteraceae family such as babadotan (*Ageratum conyzoides),* ajeran (*Bidens pilosa* L.), and kotok(*Tagetes erecta*). This study aims the role of refugia planting on arthropod diversity, population density of biological agents, pest population density and disease incidence tungro that transmitted by green leafhoppers (*Nephotettix virescens*) in wetland agroecosystems

Material and Method

The study was conducted in August to October 2018 in the wetland paddy fields at Sidosari Village, Natar District, Lampung. Identification of arthropod families in the Plant Pest Sciences Laboratory of the Department of Plant Protection, Faculty of Agriculture, University of Lampung.

The treatment is done in a plot namely

K = Control, conventional wetland paddy cultivation (applied by farmers local).

P1 = Cultivation of wetland paddy fields by applying IPM

P2 = Conservation-based wetland paddy cultivation (by applying IPM and planting refugia).

The treatment of IPM are use straw compost 10 tons / ha added with biological fertilizer in the form of MOL (local microorganism). In conventional cultivation, inorganic fertilizers are used Urea 200 kg / ha, SP-36 150 kg / ha, and KCl 150 kg / ha (Urea 50% at planting and 50% at 4 wap, SP-36 and KCl 75% at 4 wap and 25% at 6 wap). Control of pests and plant diseases is carried out in a technical culture *(jajar legowo planting*) and application of vegetable pesticides (3 times).

The Shannon index is calculated by the following formula (Krebs, 1985):

H '= -∑ pi x ln pi

with:

H '= Shannon index

pi = proportion of arthropods to i

The magnitude of the species diversity index is defined as follows:

a. H '> 3: shows that diversity is high

b. 1≤H'≤3: indicates that diversity is moderate

c. H '<1: shows that the level of diversity is low

Equity is calculated by the evenness (Price, 1997) formula as follows: E = H '/ ln S

With

E = evenness index

S = number of arthropod types

With the following criteria:

E <0.3 shows low evenness

E0,3–0,6 shows moderate type evenness

E> 0.6 shows high evenness

Result and Discussions

The arthropods obtained are quite abundant and varied. In paddy fields with conventional treatment, 25 species of Arthropods were found with 294 individuals. The types of arthropods include herbivorous arthropods, predators, parasitoid, and decomposers. Pests in conventional treatment are brown planthopper (*Nilaparvata lugens*), greenleafhopper (*Nephotettix virescens* is necessary as Tungro vector) , white planthopper (*Sogatella furcifera*), *Cnaphalocrocis medinalis, Scotinophara* sp. and *Leptocorisa* sp. Predator found in conventional paddy fields are ladybugs (*Cyrtorhinus* sp., *Andrallus spinidens*), predatory flies (*Tomosvariella* sp.), Predatory spiders (*Oxyopes* sp., *Tetragnatha* sp., *Lycosa* sp.) , predatory dragonflies (*Odonata*), plankton-eating flies (Chironomiidae), decomposer arthopods (Collembola), and various parasitoids from the Hymenoptera order.

In the paddy fields with the treatment of the application of IPM, 28 species of arthropods were found with 243 individuals. In this treatment the number of species found was higher than in the conventional treatment. Insects of natural enemies namely predatory ladybugs (*Microvelia* sp.) and predatory grasshoppers (*Metioche* sp.) were found in IPM treatment and were not found in conventional treatments. The natural enemies controlled the pest populations.

In paddy fields with refugia planting treatment and application of IPM, 30 species of arthropods were found with 238 individuals. In this treatment the number of species found is mostly from natural enemies. The pest insects found in low populations. In this treatment natural enemies are able to suppress pest populations in the field (Table 1 and 2).

Table 1. Types and quantities of insect pest in cosystem paddy fields with conventional patterns, IPM, and conservation patterns (planting refugia and IPM)

No	Ordo	Spesies/ famili	Pest in ecosystem		
			Conventional	IPM	IPM+ Rf
1	Hemiptera	*Nilaparvata lugens*	86	38	19
2	Hemiptera	*Nephotettix virescens*	23	6	5
3	Hemiptera	*Sogatella furcifera*	8	4	3
4	Lepidoptera	*Cnaphalocrocis medinalis*	12	6	5
5	Hemiptera	*Scotinophara* sp.	40	26	11
6	Hemiptera	*Leptocorisa* sp.	35	9	10
7	Thysanoptera	*Thrips* sp.	12	10	8
			216	99	61

The types of arthropoda found in the three ecosystems of rice fields are not different, that is brown planthopper, green planthopper, white back planthopper. Although the types of pest insects in the three ecosystems of rice fields are not different, there are differences in population levels. The pest population is very low in paddy fields with conservation treatment (planting refugia and applying IPM). The highest pest population was found in conventional paddy field. It could be occured because in the field plots with conservation treatment had many types of natural enemies. The natural enemy was able to control pests so that the pest population was low and below the economic threshold.

Table 2. Types and quantities of arthropods in cosystem paddy fields with conventional patterns, IPM, and conservation patterns (planting refugia and IPM)

No	Ordo	Spesies/ famili	Arthropoda in ecosystem conventional	IPM	IPM+Rf
1	Hemiptera	*Nilaparvata lugens*	86	38	19
2	Hemiptera	*Nephotettix virescens*	23	6	5
3	Hemiptera	*Sogatella furcifera*	8	4	3
4	Lepidoptera	*Cnaphalocrocis medinalis*	12	6	5
5	Hemiptera	*Scotinophara* sp.	40	26	11
6	Hemiptera	*Microvelia* sp.	0	12	14
7	Hemiptera	*Leptocorisa* sp.	35	9	10
8	Orthoptera	*Metioche* sp.	0	2	2
9	Hemiptera	*Cyrtorhinus* sp.	4	8	9
10	Hemiptera	*Andrallus spinidens*	2	6	5
11	Coleoptera	*Ophionea nigrofasciata*	4	6	7
12	Coleoptera	*Coccinela* sp.	6	12	12
13	Coleoptera	*Paederus perigrinus*	7	7	8
14	Araneae	*Oxyopes* sp.	2	6	6
15	Araneae	*Tetragnatha sp.*	6	8	8
16	Araneae	*Lycosa* sp	4	6	6
17	Hymenoptera	*Telenomus* sp.	5	5	5
18	Hymenoptera	*Trichogramma* sp.	4	4	8
19	Hymenoptera	*Cotesiaflavipes*	2	8	15
20	Hymenoptera	*Stenobracon* sp.	0	1	3
21	Hymenoptera	*Gonatocerus* sp.	0	0	4
22	Hymenoptera	*Anagrus* sp	2	2	6
23	Diptera	*Tomosvariella* sp.	1	3	4
24	Diptera	Camillidae	0	0	2
25	Diptera	Chironomiidae	1	8	8
26	Thysanoptera	*Thrips* sp.	12	10	8
27	Collembola	Paranolidae	11	14	14
28	Collembola	Entomobrydae	10	13	16
29	Odonata	*Agriocnemis* sp.	3	8	9
30	Odonata	Libelullidae	4	5	6
	Total individu		294	243	238
	H'		**2.51149**	**3.06416**	**3.26203**
	E		**0.7802374**	**0.919558**	**0.959084**

The disease incidence of tungro and another disorder on leaf or grains of paddy can be seen in Table 3.

Table 3. Disease incidence

No	Form of Disorder	Disease Incidence (%) conventional	IPM	IPM+ Rf
1	Leaf disorder	17,3	8,6	6,4
2	Grains disorder	31,7	16,5	14,8
3	Tungro	12,6	0,0	0,0

The relation between the disease incidence tungro with quantities of *Nephotettix virescens* that is the low quantities of *Nephotettix virescens* (6 and 5 individuals) could not caused the disease incidence of Tungro in the application of IPM and conservation by refugia and the application of IPM. The disease incidence of tungro 12,6% related with 29 Nephottettix virescens in conventional wetland paddy ecosystem which sprayed chemical pesticide.

Conclusion

1. Refugia and applying IPM to the wetland paddy ecosystem increased arthropods diversity that ecosystems become stable and balanced.
2. The population of pest insects is lower in paddy fields with planting treatment refugia and application of IPM, and population density of biological agents higher than conventional fields.
3. The intensity of pest and tungro disease attacks on treated rice fields refugia planting and the application of IPM is lower than the plot conventional rice fields.

Acknowledgement

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Reference

1) Krebs, C.J. 1985. *Ecology :The Experimental Analysis of Distribution and Abundance*. Harper & Row, Pub. New York. 800 pp.

2)Kurniawati, N. & Martono, E. 2015. Role Flowering plants as a medium of conservation Natural Enemy Arthropods. Journal of Plant Protection Indonesia, Vol. 19, No. 2, 2015: 53–59 (in Bah.Indonesia).

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