

**The Exploration and Identification of the Parasitoid of the Eggs of the Rice Bug
(*Leptocorisa* spp.) (Hemiptera:Alydide) in Some Centers of Rice (*Oryza sativa* L.)
Farming in the Lowland Swamp of South Sumatera***

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Abstract

The exploration of the parasitoid of the eggs of the rice bug (*Leptocorisa* spp.) (Hemiptera:Alydide) in some centers of rice (*Oryza sativa* L.) farming in the lowland swamp of South Sumatera has been conducted. The objective of this study is to explore the kinds of parasitoid of the eggs of the rice bugs in some centers of rice farming in the lowland swamp of South Sumatera. The study was conducted from May 2008 up to October 2008. The result of the study reveals 27 individual *Ooencyrtus* spp. out of the total 46 (58.69%) eggs of the rice bugs gathered from the rice field, the wild vegetation, and the weeds of the lowland swamp of South Sumatera. The 27 individual *Ooencyrtus* spp. are only found from the collection of eggs of the rice bugs gathered in Musi 2 Gandus of Palembang. The result of the identification of the kind of parasitoid of the eggs of the rice bugs is *Ooencyrtus* spp. The imago of *Ooencyrtus* spp. found has morphological characteristics of having all bodily organs which are black, except for the fore wings and the hind wings which are blackish brown. The length of the imago is around 1 – 2 mm. The antenna of the ♂ and ♀ is in the form of filiform with elbows. The veins of the fore wings and the hind wings have been mostly reduced.

Keywords: *Lowland Swamp, Ooencyrtus* spp, *Leptocorisa* spp.

Introduction

Rice bug (*Leptocorisa* spp.) (Hemiptera:Alydide) is one of the pests which attacks rice crop (*Oryza sativa* L.). *Leptocorisa* spp. is the major pest which attacks rice crop in Indonesia, Malaysia, Pakistan, China, Taiwan, the Philippines, Australia and Solomon Islands (Kalshoven, 1981). The attack of this rice bug on the rice planted on rain fed rice field and irrigated rice field can cause yield loss from 10 – 40 % (Hill,1983). The attack of the rice bugs on the rice stalks at mid-milky stage can cause yield loss from 70-80 % (Kharkongor, 2002).

The attack of this rice bug can decrease the quality of rice grains and the speed of rice sprouting, therefore it can cause yield loss (Jahn *et al.*, 2004). *Leptocorisa* spp. as the major pest must be controlled wisely so that it may not bring adverse effects on the rice crop. The use of pesticides in many cases can cause environmental pollution, the emergence of secondary pest, the emergence of new biotype, the death of pollinating insects and its natural enemies. To lessen the adverse effects of the insecticides, pest control by natural enemies is needed. One of the natural enemies is parasitoid (Pranadja and Saptana, 2005 ; Nugaliadde and Edirisinghe, 2000).

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There are some kinds of parasitoid which have been known as bio control agent of *Leptocoriza acuta* and the rice bugs. Huang and Noyes (1994) states that *Leptocorisa* spp. in the Sub-Saharan Africa, India, Nepal, Thailand, China, Filipina, Malaysia, Indonesia, and Papua New Guinea has a natural enemy of *Ooencyrtus utetheisae* Risbec of Encyrtidae family. Wahyono (2003) reported that *Ooencyrtus malayensis* Ferr. can have an alternative host of *Nezara viridula* (Linnaeus) and *Riptortus linearis* (Fabricius) with the degree of parasitization of 100 % and 70 %. Nubou and Yasuhisa (1999) reported that *Ooencyrtus nezarae* Ishii was a very effective parasitoid of the the eggs of *L. acuta* in parasitizing the eggs of *Riptortus clavatus* (Thunberg) and *Piezodorus hybneri* (Gmelin). Kalshoven (1981) stated that the parasitoid which attacked the eggs of the rice bugs was *Gryon nixoni* Masner from Scelionidae family and *O. malayensis* from Encyrtidae family. According to RRDI (1996) *G. nixoni* was the predominant parasitoid of the eggs of the rice bugs found in Ceylon.

The Information about the kind of the aforementioned parasitoid of the rice bugs is obtained from other location, whereas the information about the kind of parasitoid of the eggs of rice bugs in the rice field of the specific lowland swamp of South Sumatera has not been reported yet. The lowland swamp which covers sufficiently vast areas in South Sumatera is assumed to be very rich in biodiversity, including a number of parasitoids. Therefore, a study about the exploration of the kinds of parasitoids of the eggs of rice bugs in the rice field, the wild vegetations, and the weeds of the lowland swamp of South Sumatera is very important to be conducted. The species of parasitoids obtained from the rice grown in the lowland swamp is expected to be able to be developed into the bio controlling agent of the rice bugs specific of South Sumatera and can also add to the treasure of swamp biodiversity inventories existing in Indonesia.

Materials and Methods

Place of Research. The surveys on parasitoid of the eggs of the rice bugs were conducted 4 times for each location. The time of survey was from May 2008 up to October 2008. The locations of surveys were some areas of lowland-swamp rice centers, namely Karang Anyar, Jalan PAM and Musi 2 Gandus, Barangan and Jalan Sukarno Hatta Ilir Barat I, Sungai Ijuk Keramasan, Karya Jaya Kertapati, Jaka Baring Seberang Ulu I Palembang, Ibul Besar and Pelabuhan Dalam Pemulutan, Indralaya Ogan Ilir, along Tanjung Siapi-API Road from Kebun Bunga up to Jalur 17 Banyuasin. The identification of the parasitoids was carried out in the laboratory of the Department of Biology Education of Faculty of Teacher Training and Education of Sriwijaya University, Indaralaya Ogan Ilir.

Parasitoid Collection. The eggs of the rice bugs are collected by means of strip census method, namely by walking along the transect line around rice farming centers during reproduction phase. The length of the transect line is 100 meters at the sections of rice field which quickly or slowly harvest, because the population of the rice bugs is higher in those sections (modification by Soegianto, 1994). The eggs of the rice bugs, red to brown in color and flat in form, are usually laid lengthwise in rows on the leaves of the rice (Hill, 1983). The observation is focussed on the leaves of the rice, the wild vegetation, and the weeds which independently erect. The eggs of the rice bugs which are found are then put into a test tube for incubation until the imagoes of the parasitoid emerge. The imagoes of the parasitoid are then collected in 70 % alcohol, then the bottle is labelled with a note about the time of collection and the location of the research.

Identification of parasitoid. Identification is carried out by means of preparing the preserved specimen of the rice bug's egg parasitoid imagoes in the form of wet preservation. The specimen is observed under a microscope and its morphological characteristics,

especially wings and antenna, are recorded and photographed. Then the the specimen is identified by using a reference which contains the kinds of parasitoid which belong to the same family or the same genus as the parasitoid being discovered, namely Zang *et al.* (2005), Noyes and Hayat (1984), Huang and Noyes (1994), Kalshoven (1981), and Goulet and Huber (1993).

Data analysis. The result of the exploration of the parasitoid is presented in a tabular form. The kinds of the rice bug's egg parasitoid are revealed by observing the morphological characteristics of their wings and antenna.

The Result and Description

The exploration of *Ooencyrtus* spp. in some areas of lowland-swamp rice centers of South Sumatera.

The result of exploration the rice bug's egg parasitoid in some areas of lowland-swamp rice centers of South Sumatera is only one species, namely *Ooencyrtus* spp. The parasitoid found in the lowland-swamp can give a significant contribution in enriching the treasure of swamp biodiversity inventories existing in Indonesia. The information about the species of the rice bug's egg parasitoid is presented in Table 1 below.

Table 1. The number of samples and the percentage of the occurrence of the parasitoid in the lowland-swamp rice centers of South Sumatera

Regency/ Municipality	Location	Σ rice bug's eggs	Σ <i>Ooencyrtus</i> spp. (%)	Place of the colony of the rice bug's eggs			Use of Insecticide
				Rice	Wild Vegetation	Weeds	
Palembang	Karang Anyar	0	0	-	-	-	Without application
	Jalan PAM	0	0	-	-	-	Without application
	Musi 2	28	27 (96,42)	-	-	√	Without application
	Barangan	0	0	-	-	-	Without application
	Jln. Sukarno Hatta	0	0	-	-	-	Without application
	Sungai Ijuk	0	0	-	-	-	Without application
	Keramasan	0	0	-	-	-	Sometimes with application
	Karya jaya	0	0	-	-	-	Without application
	Jaka Baring	0	0	-	-	-	Without application
	Ibul besar	0	0	-	-	-	Without application
Ogan Ilir	Pelabuhan Dalam	1	0	*	-	-	Application
	Indralaya	10	0	*	-	-	Very intensive application
Banyuasin	Jalur 17	0	0	-	-	-	Very intensive application
	Jln. Tj. Siapi-Api	0	0	-	-	-	Without application
	Borang	7	0	*	-	-	Sometimes with application
Total		46	58,69				

Notes : At the time of observation (-) = the rice bug's eggs are not found
 (√) = the rice bug's eggs are found and the parasitoid emerges.
 (*) = the rice bug's eggs are found and nimfa emerges.

Ooencyrtus spp. which are obtained from some areas of lowland-swamp rice centers of South Sumatera are presented in Table 1. *Ooencyrtus* spp. are only found on the weeds of Musi 2 Gandus Palembang, while in other locations this species cannot be found. The rice bug's eggs are only found in the lowland-swamp rice centers of Musi 2 Gandus Palembang (28 pieces on the weeds), Pelabuhan dalam Pemulutan Ogan Ilir (1 piece on the rice leaf), Indralaya Ogan Ilir (10 pieces on the rice leaf) and Borang Banyuasin (7 pieces on the rice leaf). The total number of *Ooencyrtus* spp. which emerge from the eggs of the rice bugs is 27 (58,69%). All of the *Ooencyrtus* spp. are only found from the collection of the rice bug's eggs of Musi 2 Gandus Palembang (96,42%). While the observation of the lowland-swamp rice centers in Borang Banyuasin, Pemulutan Ogan Ilir and Indralaya Ogan Ilir does not result in the emergence of parasitoid.

Almost all of the field observations of all locations result in the finding of the population of the rice bugs, but only in some locations the eggs of the rice bugs can be found. It is assumed that the finding of the rice bug's eggs is minimal due to the limited place of observation which is only focussed on the erect rice leaves, wild vegetation, and weeds. The exploration of the rice bug's eggs should also have been conducted on the rice straw, slanting rice leaves, drooping leaves, rice flowers, weed's flowers, and the leaves of wild vegetation. This information is very important that the exploration of the rice bug's egg parasitoid should not only be focussed on the erect leaves but also on the rice straw, slanting rice leaves, drooping leaves, rice flowers, weed's flowers, and the leaves of wild vegetation. In addition, the natural enemies such as predator is supposed to be able to feed on the eggs of the rice bugs which exist in the habitat of the lowland-swamp rice centers. Therefore, the presence of the natural enemies can influence the number of rice bug's eggs which can be discovered.

The population of the rice bug discovered on the rice crop in the lowland-swamp rice field can also be found from the vegetation around the rice field. At the time the rice grains reach the mid-milky stage of the rice bugs migrate. It means that the rice bugs may lay their eggs on the plants or vegetations far away from the rice field of the lowland-swamp. Hill (1983) and Kalshoven (1981) state that the population of the rice bugs does not widely spread and does not appear every year. The rice bugs only appear at certain places and certain time of the year. Usually the great number of population is the result of migration from the rice fields in other locations.

It is assumed that the density of population of *Ooencyrtus* spp. can be influenced by an intensive use of insecticides in the agroecosystem of the lowland-swamp rice field. Table 1 shows three locations in which the rice bug's eggs are found but the egg parasitoid does not appear, namely Pelabuhan Dalam Ogan Ilir, Indralaya Ogan Ilir, and Borang Banyuasin. According to Abudulai (2001) that the application of endosulfan insecticide to eradicate *Leptoglossus phyllopus* (L.) can decrease the population of natural enemies such as *Gryon carinatifrons* (Ashmead), *Gryon pennsylvanicum* (Ashmead) and *Ooencyrtus leptoglossi* Yoshimoto at the cowpea crop (Abudulai, 2001).

The presence of *Ooencyrtus* spp. in the lowland-swamp rice field of Musi 2 Gandus Palembang is made possible by the fact that in this area the agricultural system used is still conventional without utilizing chemical substances and the rice crop is surrounded by many vegetations. The conventional system of farming is usually very friendly with the local ecosystem, for example, the farming system which uses low input from outside and without chemical substances. This system of farming can preserve pollinating insects and natural enemies (Pranadji and Saptana, 2005). This means that the diversity of the agroecosystem can function as a protector for conservation of predator, parasitoid, microflora antagonist, soil microflora and microfauna (Altieri, 1999). According to Hochberg and Ives (2000) the life of parasitoid at food crops is very short, because farm is cleared during harvest season and

recolonization is impossible until the next planting season. Changes of agricultural activities into organic farming can help improve the condition for the conservation of the population of parasitoid.

The *Ooencyrtus* spp. is a potential parasitoid for biological control. Most of the imagoes of the order of Hymenoptera are beneficial as pollinators and biological control agents (Elzinga, 1987). According to Borror (2005) the genus *Ooencyrtus* is generally known as the egg parasitoid of Hemiptera, Neuroptera and Lepidoptera. *Ooencyrtus kuvanae* (Howard) is an effective egg parasitoid to lessen the population of moth pest Gypsy which attacks tree leaves in the USA. The result of a reported study shows that 20-30 % of the population of Gypsy moth eggs can be destroyed by *O. kuvanae* in New Jersey, Virginia, Pennsylvania, and Michigan (Christenson, 1995).

The identification of the kinds of the rice bug's egg parasitoid from the lowland-swamp rice field of South Sumatera

The result of the identification shows that the imagoes of parasitoid which emerge from the eggs of the rice bugs originating from the rice centers of the lowland-swamp rice field of Musi 2 Gandus of Palembang are *Ooencyrtus* spp. The ♂ and ♀ Parasitoid *Ooencyrtus* spp. have general characteristics of having all bodily organs of the imagoes including eyes, antenna, mouth, legs, sternum and tergum of the head, thorax and abdomen which are black. The color of fore wings and hind wings is blackish brown. The length of the imago from head to the end of the abdomen is between 1 - 2 mm. The antenna of the ♂ and ♀ is in the form of filiform with elbows (Figure 1). The veins of the fore wings and the hind wings have been mostly reduced (Figure 2 dan Figure 3).

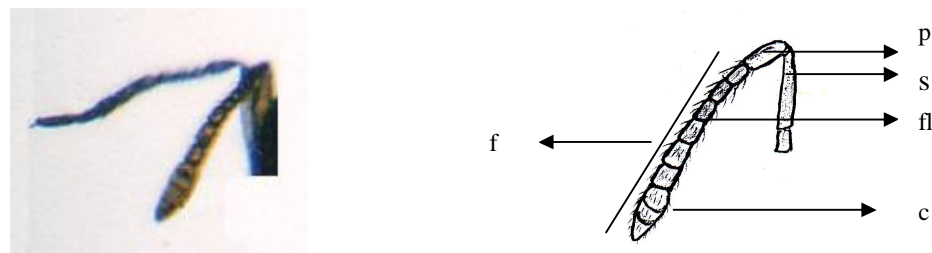


Figure 1. Morphological characteristic of the antenna of the *Ooencyrtus* spp. ♀. The result of the identification shows that the antenna of the *Ooencyrtus* spp. has elbow beginning from the shaft of pedicel (p) up to clava (c). The antenna consists of the base of scape (s), shaft of pedicel (p), funicle (fl), clava (c) and flagellum (f). The pictures are taken with an Olympus Camera with 400x magnification.

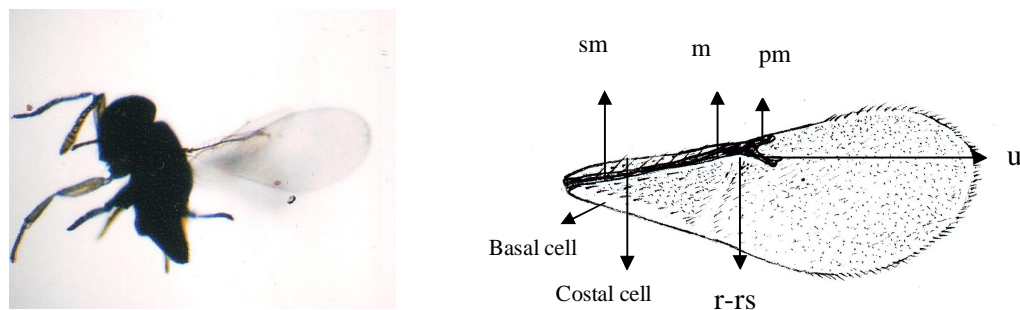


Figure 2. Morphological characteristic of the fore wings of the *Ooencyrtus* spp. ♀. The identification of the vein of the fore wings shows that the vein consists of submarginal vein (sm), marginal vein (m), postmarginal vein (pm), stigmal (r-rs), and uncus (u). The pictures are taken with an Olympus Camera with 100x magnification.



Figure 3. Morphological characteristic of the hind wings of the *Ooencyrtus* spp. ♀. The identification of the vein of the hind wings shows that only marginal vein (m) which develops well. The picture is taken with an Olympus Camera with 100x magnification.

The antenna of the *Ooencyrtus* spp. ♀ consists of basic segments namely basic shaft of scape (s), shaft of pedicel (p) and flagellum (f) which consists of six segments of funicles and three clavas. It has elbow beginning from the shaft of pedicel up to clava. In accordance with the description of Zang *et al.* (2005), Noyes and Hayat (1984), Huang and Noyes (1994), and Goulet and Huber (1993) that the species of *Ooencyrtus* spp. has the characteristics of the antenna in the form of filiform with elbow. The antenna consists of basic shaft of scape, shaft of pedicel and flagellum which consists of six segments of funicles and three clavas.

The wings have the characteristics of reduced veins of the fore wings and the hind wings, and the surface of the wings has fine and short hair. The parts of the fore wings which develop well are only submarginal vein (sm), marginal vein (m) and postmarginal vein (pm). In addition to that, there is stigmal (r-rs), and uncus (u). The part of the hind wing which develops well is only marginal vein (m). Zang *et al.* (2005), Noyes and Hayat (1984), Huang and Noyes (1994), and Goulet and Huber (1993) state that the veins of the fore wings and the hind wings of the family of encyrtidae have been greatly reduced. The parts of the veins which develop well are submarginal vein (sm), marginal vein (m) and postmarginal vein (pm). At the hind wings there is only marginal vein left. The surface of the edge of the wings has fine and short hairs.

Conclusions and Suggestions

Conclusions

Based on the result of the study, the following conclusions are drawn:

1. The exploration results in the finding of 27 individual *Ooencyrtus* spp. out of 46 rice bug eggs (*Leptocorisa* spp.) which are obtained from some rice farming centers of the lowland-swamp of South Sumatera. The 27 *Ooencyrtus* spp. are obtained from the rice field of the lowland-swamp of Musi 2 Gandus Palembang, whereas 18 eggs of the rice bugs originating from Pemulutan Ogan Ilir, Indralaya Ogan Ilir and Borang Banyuasin do not result in parasitoid.
2. The kind of parasitoid of the rice bug eggs originating from the rice centers of the lowland swamp of South Sumatera is the *Ooencyrtus* spp. The *Ooencyrtus* spp. which are found have morphological characteristics of having entire bodily organs of the imagoes which are black, except for the fore and the hind wings which are blackish brown. The length of the imago is between 1 - 2 mm. The antenna is in the form of filiform with elbow. The veins of the fore wings and the hind wings have been mostly reduced.

Suggestions

It is suggested that a further study to reveal the potential the *Ooencyrtus* spp. as a biocontrol agent of the rice bug pest (*Leptocorisa* spp.) (Hemiptera:Alydidae) in the rice (*Oryza sativa* L.) field of the lowland swamp of South Sumatera be conducted.

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