

Control of Rice Stem Borer *Scirpophaga* sp. Using *Trichogramma* sp.

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Abstract This community services activity was conducted together with a partner that is Benong II Farmers Group, in the Kalibuaya Village, Telaga Sari, Karawang. The problem that faced by partners is a lack of understanding of plant pest organisms (OPT), especially plant pests and diseases, as well as a lack of knowledge about the natural enemies. Knowledge and skills of the Benong II Farmers Group in the Kalibuaya Village, Telaga Sari, Karawang regarding the management and control of rice stem borer that environmentally friendly, especially biological control using parasitoid *Trichogramma* sp. needs to be improved. The evaluation results show that counselling and training on the breeding of natural enemies *Trichogramma* sp. resulting in the development and progress of the behavior, attitudes, and skills of farmers. There are four main results of the research. The results are (1) farmer more understand of the use of biological agents for IPM-based rice pest and disease control; (2) want to implement the control of rice stem borer *Scirpophaga* sp. by using *Trichogramma* sp.; (3) more skilled in monitoring the presence or absence of pests in rice plantations in the field; and (4) more active in finding out to community service teams, farmer group leaders, and POPT / field extension officers about how to mass culture the *Trichogramma* sp. and it's release techniques in the field.

1. INTRODUCTION

Karawang Regency is famous as a rice barn area. The suitable climate, extensive rice plantations, and good potential natural resources strongly support the development of the agricultural sector. The total area of rice fields in Karawang is 98,430 ha (Dinas Pertanian, 2013). Other regions in West Java, such as Indramayu, Subang, Bekasi, Cianjur, Sukabumi, Garut, Tasikmalaya, Ciamis, Cirebon, and Majalengka also become rice producing areas. Therefore, it is not surprising that agricultural products in West Java contribute to 15% of Indonesia's total agricultural value.

Meanwhile, this poses a challenge for actors in the agricultural sector to meet national rice needs. However, there are still many obstacles faced by agricultural sector actors like the problem of pests and diseases, especially rice stem borer. According to the Center for Plant Pest Organism Forecasting (BBPOPT) in Jatisari Karawang, in the 2017 planting season, it is predicted that there will be an explosion of stem borer. This stem borer is a serious threat to rice production, particularly in Karawang. Therefore, the appropriate, effective, inexpensive and environmentally friendly control measures are needed for the continuity of high rice production. Biological control techniques using natural enemies can be done as an effective and environmentally friendly alternative control.

The use of natural enemies using egg parasitoid, specifically *Trichogramma* sp. is a biological control that can be done to suppress the attack of rice stem borer. Parasitoid from a mass culture has been widely used to control stem borer in several crops, such as sugar cane and corn (Herlinda *et al.*, 2004). *Trichogramma* sp. is an entomophagous insect species that is classified as an egg parasitoid because it can parasitize the host insect which is generally a pest insect on the plant. Therefore, biological control uses parasitoid *Trichogramma* sp. is an effective control and is mostly done in controlling stem borer (Ariedhinata, 2006). Therefore, biological control of rice stem borer pests using egg parasitoid type *Trichogramma* sp. needs to be socialized. The socialization carried out included procedures for mass production and its release techniques in the field. After participating in counselling activities, the insights, and skills of farmers to control rice stem borer in Karawang are expected to increase.

2. PROBLEMS

The understanding of farmers about the concept of integrated pest control is still very lacking. Pest and disease control carried out by farmers, especially in Karawang tend to depend on the use of pesticides. The use of pesticides is a control effort that is relatively expensive and not environmentally friendly. Related to this, the principles of biological control techniques, mass propagation methods, its application in the field, and natural enemies habitat management needs to be conveyed to the farmers. Especially for rice stem borer, farmers need to be given knowledge and skills about the use of parasitoid *Trichogramma* sp. as pest control.

3. METHOD

The activity started with a preliminary survey in Kalibuaya Village, Telaga Sari Subdistrict, Karawang Regency to obtain data as a material for making proposals and then determined the Benong II Farmer Group as a partner in natural enemies conservation of the egg parasitoid *Trichogramma* sp. After that, it was consolidated and coordinated with partners and related institution that is the Karawang District Agricultural Service and to the Center for Plant Pest Organism Forecasting (BBPOPT) in Jatisari Karawang, which was then used as administration and licensing. Counselling to farmer groups about natural enemy conservation and its habitat management was done by lecturing, discussion, and demonstration methods. The training for farmer groups was carried out by providing basic training on the mass culture of egg parasitoid *Trichogramma* sp. at the Center for Plant Pest Organism Forecasting (BBPOPT) in Jatisari Karawang. Also, the equipment is provided for alternative host culture media, the supply of poultry, and mass production technical requirements.

The next step is direct practice by farmers about the technical mass production of egg parasitoid *Trichogramma* sp. and the technical release of natural enemies *Trichogramma* sp. in the field and followed by coaching assistance of Community Services team and students from the Faculty of Agriculture, Universitas Singaperbangsa Karawang. Furthermore, three months of assistance was carried out through regular meetings every two weeks, starting from May to July 2016. The purpose of this assistance was to improve the ability of farmers to breed mass the natural enemies *Trichogramma* sp. and to reduce the farmer's habit of not depending on synthetic pesticides. Activities during this study were collected through surveys by interviewing trainees, gathering data of services and observations result, which will then be used as the material for preparing reports.

4. DISCUSSION

The preliminary survey was conducted in Kalibuaya Village, Telaga Sari District, Karawang Regency. This survey aims to obtain data as material for community services. The Benong II Farmers Group was then chosen as a partner in natural enemies conservation of the egg parasitoid *Trichogramma* sp. It was started with the consolidation and coordination with relevant partners and institution that is the Department of Agriculture of Karawang Regency and the Center for Plant Pest Organism Forecasting (BBPOPT) Jatisari, Karawang. Implementation of counselling to farmer groups about natural enemy conservation and its habitat management was carried out by lecturing, discussion and demonstration methods. The material about breeding natural enemies was carried out three times. It includes: (1) the use of biological agents for rice pests and diseases with Integrated Pest Management (IPM);

(2) deficiency of plant nutrients and their management; and (3) natural enemies in rice plantations.

Wang *et al.* (2014) state that the genus *Trichogramma* is the most famous group and has been widely used as a biological control agent (natural enemy). In the present, *Trichogramma* has been utilized by more than 23 countries. Eighteen different *Trichogramma* species are used as biological control agents in maize, sugarcane, rice, beans, cotton, vegetables, and pine (Ko *et al.*, 2014). The effectiveness of *Trichogramma* in suppressing pest populations can be identified by monitoring and evaluation. Monitoring and evaluation are done by collecting borer eggs from several sample plants and then calculating the percentage of parasitism.

The results showed that the release of 150,000 eggs *Trichogramma* sp. per hectare could reduce the population of sugarcane shoot borer while 250,000 eggs are required per hectare to control sugarcane stem borer (Cascone *et al.*, 2014). In some countries, such as China, the Philippines, India, and Taiwan, *T. chilonis* is used as a biological control agent in sugarcane plantations (Grieshop *et al.*, 2014). In Indonesia, *T. chilonis* was first developed to address the problem of stem borer in several sugar cane plantations in Java which was later introduced to Lampung after similar problems arose. Besides being able to parasitize *Chilo* spp., *T. chilonis* is also capable of parasitizing *Agrotis* spp., *Argyroplote schistaceana*, *Cnaphalocrosis medinalis*, *Diatraea* spp., *Heliothis armigera*, *Leguminivora glycinivorella*, and *Spodoptera exigua* (Li-Ying, 1994).

In some countries, mass production of *Trichogramma* / *Trichogrammatoidea* in the laboratory was done by utilizing alternative hosts or substitute hosts as it could reduce the cost of mechanization (Untung, 1993). The alternative hosts that are often used in developing *T. japonicum* on a laboratory scale are *Corcyra cephalonica*,

Sitotroga cerealella, and *Ephestia kuehniella* (Subandi *et al.*, 2017). The basic training on mass production of egg parasitoid *Trichogramma* sp. to farmer groups carried out in Kalibuaya, Telagasari, Karawang. The used props include alternative hosts as a host insect maintenance media, pyramid paper, and other mass production technical requirements. The farmers were welcome to practice the breeding techniques of the egg parasitoid *Trichogramma* sp directly. They were also able to release natural enemies *Trichogramma* sp. in the field.

There are four (4) activities conducted in terms of mass production of eggs parasitoid *Trichogramma* sp. First, the preparation of alternative host *Corcyra cephalonica* for mass propagation of *Trichogramma* sp. The used tools on this training were a stove, frying pan, in case for inoculation, candles, spatula, and mating sites while the ingredients include bran, corn, *Corcyra cephalonica*, *Trichogramma* sp. (Figure 1). Second, the treatment of *Corcyra cephalonica* as alternative hosts. Some training was attended by female farmers in Kalibuaya.



Source: Primary data (2016)

Figure 1. Alternative Host Media Culture Insects *Corcyra cephalonica* for Mass Propagation *Trichogramma* sp.

Third, making a tray for parasitoid, mating the insect *Trichogramma* sp., and training on the release technique of egg parasitoid *Trichogramma* sp. in the field. The tray is about 4 x 2 cm from manila paper (Figure 2). While the release of the parasitoid was using bamboo and modified black bottles. The last activities are the release of the parasitoid in the field, a mini-expo of Benong II Farmer Group, and coaching. Coaching was carried out by final year students of Unsika.



Source: Primary data (2016)

Figure 2. Making a tray for parasitoid, mating the insect *Trichogramma* sp., and training on the release technique of egg parasitoid *Trichogramma* sp. in the field

The assistance of the community service team was carried out by third and fifth-semester students of the Faculty of Agriculture Unsika. The assistance was carried out for six months through regular biweekly meetings, started from March to September 2016. The assistance was expected to increase farmers' ability to breed the natural enemies of *Trichogramma* sp. In addition, with the assistance, farmers' dependence on synthetic pesticides was expected to decrease. The farmers are aware of how to use the natural enemy as management, and they know how to manage their rice crop habitat. Similar community services were also conducted by Purnama *et al.* (2015). He concluded that the application of biological agents for pest control has advantages because it is by the principle of ecosystem balance, that is by utilizing natural enemies from pests and plant pest diseases. Many experiences show that in controlling wilt in

plants, such as chilli, tomatoes, and potatoes are no longer able to be controlled with chemical pesticides, but it is possible to be controlled by using biological agents.

5. CONCLUSION

Counselling and training on breeding natural enemies *Trichogramma* sp. produced several developments and advances in the behavior, attitudes, and skills of the Kalibuaya community, Telagasari. Farmers understand the use of biological agents for IPM-based control of rice pests and diseases. Farmers want to implement the control of rice stem borer *Scirpophaga* sp. using *Trichogramma* sp. Farmers also became more skilled in monitoring the pests in rice plantations. After knowing and realizing the importance of habitat management in rice plantations, farmers entered the implementation stage. Farmers became more active in seeking information from the community services team, from the head of the farmer group, and the POPT/field instructors about the mass production of *Trichogramma* sp. and its release techniques in the field.

The recommendation for further community services activities is a counselling to other farmer groups in Karawang Regency so that the use of natural enemies can be simultaneously applied by the community. In addition, further guidance to farmers about the technical breeding of natural enemies *Trichogramma* sp. and how to organize the farmer groups in monitoring pests also need to be encouraged.

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