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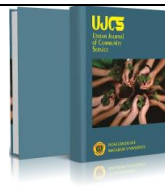

Supervising in the Implementation of Integrated Pest Management (IPM) in good Horticultural Practices in the Sembalun agrotourism area

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Abstract: The use of natural enemies as pest control has long been known, but has been largely replaced by the rapid development of chemical pesticide industry technology, especially since the green revolution. One alternative pest control technology that is quite promising to be developed is the use of biological agents (predators or parasotoids) that have more natural characteristics than chemical characteristics. With the presence of natural enemies which are then used to suppress pest populations, it will be safe for human health and the environment. It can be hoped that the agricultural products produced will be acceptable and highly competitive on the global market. Considering the Sembalun area as a tourism destination, it will be very relevant if the local community understands good horticultural practices. The intervention of using technology for farmers as an alternative in good Horticultural Cultivation is highly expected by farmers in the Sembalun area. Therefore, assistance is needed to implement integrated Pest Management in good Horticultural practices. The method used in this activity is the Action Research Method by applying a Participatory Action Program approach from participants through discussion and group work in all activities. The result is that farmers are very interested in implementing good horticultural cultivation, especially with habitat management approaches such as using refugia plants to control pests. Participating farmers increase their knowledge and skills to recognize differences in pests and natural enemies (predators and parasitoids) found on potato plants that are integrated with refugia plants. The target group has increased knowledge and understanding of the importance of implementing Integrated Pest Management (IPM) practices in horticultural cultivation. It is hoped that training and assistance activities for healthy horticultural cultivation efforts will continue both by the university team and related agencies. This kind of activity needs to be continued by the participating group and spread to other groups nearby. There is a need for assistance in applying for Prima 3 and Prima 2 food safety certification to farmer groups in the Sembalun Agrotourism Area, so that the number of products from certified horticultural business actors will increase. Activities to implement Integrated Pest Management in horticultural farming business groups in the Sembalun Tourism Area need to continue.

Keywords: Horticulture; IPM; Sembalun agrotourism.

Introduction

Sembalun is an area in the valley of Mount Rinjani which has great potential for highland horticultural cultivation (Sarjan, Fauzi, Sudantha, et al., 2020). For a long time, this area has been known for various vegetable commodities such as garlic, potatoes, tomatoes, mustard greens, broccoli, pitsay, cabbage, peppers, as well as fruit plants such as strawberries and melons (Sarjan, Na'im, et al., 2020). In the 1980s, Sembalun was a national garlic production center which was visited by President Suharto (Sarjan, Fauzi, Thei, et al., 2020). Since then there have been drastic changes in crop cultivation, especially using very intensive production inputs such as chemical fertilizers and pesticides. This habit continues to this day and it is

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feared that it will seriously disrupt product quality and the environment in the area. This is very worrying when this area has been used as an agrotourism center on Lombok Island which requires product quality requirements for consumers. Therefore, efforts must be made to gradually change behavior that depends on chemical pesticides by using alternative technologies that are more environmentally friendly, such as using plant-based pesticides. It is hoped that this can reduce the negative impacts that have occurred in the area, so that the target of Sembalun as an environmentally friendly agrotourism area will be realized.

Plant Pest Organisms (OPT) are one of the limiting factors in vegetable cultivation (Setyaningrum & Prasetyo, 2018). Excessive concern about pests usually encourages the use of pesticides with high efficacy, without considering their negative impact on the environment (Sarjan et al., 2022). However, with increasing social welfare, awareness of personal health and environmental sustainability, society's demands for the quality of food and the environment are increasing. This can be seen from various agricultural activities such as the emergence of organic farming activities and the application of Integrated Pest Management (IPM) technology.

Market demands and technological advances as well as public awareness of health and the environment can encourage farmers to recognize and develop integrated pest management (IPM) concepts and programs (Sarjan et al., 2022). This concept has developed in almost all countries, although there are still significant differences in its application between developing and developed countries. One of the potentials possessed by tropical countries like Indonesia is the biodiversity of flora and fauna which can be used as pest control agents, such as the presence of natural enemies, both predators and parasitoids. The use of natural enemies as pest control has long been known, but has been largely replaced by the rapid development of chemical pesticide industry technology, especially since the green revolution.

One alternative pest control technology that is quite promising to be developed is the use of biological agents (predators or parasotoids) which have more natural characteristics than chemical characteristics. With the presence of natural enemies which are then used to suppress pest populations, it will be safe for human health and the environment. It can be hoped that the agricultural products produced will be acceptable and highly competitive on the global market.

By utilizing these natural control principles, it is hoped that the role of natural enemies in suppressing pests will increase, so that the use of chemical pesticides can be reduced. To realize the production of healthy products in a healthy agroecosystem, it is necessary to carry out good horticultural cultivation based on Minister of Agriculture Regulation no. 22/2021. Considering the Sembalun area as a tourism destination, it will be very relevant if the local community understands good horticultural practices. The intervention of using technology for farmers as an alternative in good Horticultural Cultivation is highly expected by farmers in the Sembalun area. Therefore, assistance is needed to implement integrated Pest Management in good Horticultural practices. Based on the description above, it is hoped that universities can play an active role in helping disseminate this technology to farmers so that it can be applied sustainably in the form of Community Service activities. The aim is to assist farmers in introducing natural enemy types to the potato agroecosystem as an alternative technique for environmentally friendly pest control. Motivating to increase the ability and formation of attitudes of farmers to develop alternative techniques to chemical pesticides in controlling pests as part of good horticultural practices. The benefit is that the results of this activity are expected to provide understanding and skills for hortucultural farmers at the activity location in looking for alternative ways other than dependence on the use of chemical inputs in cultivating hortucultural plants. Furthermore, it will increase motivation for farmers to produce healthy vegetable products with an environmentally friendly production process, so that there will be an increase in the added value of vegetable products which will then increase the income of potato farmers.

Method

Determining Activity Locations and Target Participants

This activity was carried out in the Sembalun Agrotourism Area, East Lombok Regency, and the location chosen was a village which is a horticultural center. Participants consist of farmers whose crops are or have produced sustainable horticultural products.

Approach Method

The method used in this activity is the Action Research Method by applying a Participatory Action Program approach from participants through discussion and group work in all activities. The stages in this activity include preparation stages, including problem identification, then a basic survey using exploratory descriptive methods. The implementation stages begin with training using lecture techniques. The training material presented includes good horticultural plant cultivation techniques; Introduction to Potato Plant Pest Organisms, as well as Techniques for Biological Control of Plant Pest Organisms by utilizing natural enemies of pests. Fertilization with balanced

principles, introduction of synthetic non-chemical fertilizers.

Assessment/evaluation

The assessment of community service activities is carried out based on:

a. Suitability between the action research topic being carried out and the conditions of the activity location.
b. The presence and participation of the participants (targets) in each activity from preparation to the end of the activity reflects the participants' desire to know and adopt the technology introduced by the implementing team.

The attitudes and responses of the participants towards the activities carried out.

Results and Discussion

Socialization and Counseling

The socialization activity was carried out using a discussion method between the Team and Farmer Groups representing horticultural farmers in the Sembalun Area. At this event, material related to the theme was delivered successively by a team consisting of the Unram Team and the NTB Food Security Service, represented by the Head of the Food Security and Quality Assurance UPT. In general, the team presented material on good cultivation techniques, especially related to the issue of excessive use of chemical pesticides in the Sembalun area. Likewise, the team from Unram conveyed many alternatives to reduce farmers' dependence on the use of chemical pesticides, especially through the Integrated Pest Management (IPM) Approach.

Figure 1. The team from UNRAM and the NTB Food Security Service delivered material

Speaker Prof. Ir. M. Sarjan, M.Agr.CP., Ph.D and Ir. Haryanto, M.Si from the Unram Faculty of Agriculture delivered information regarding good agricultural cultivation to ensure the safety of food products, especially by considering reducing the use of fertilizer and pesticide production inputs. In fact, in the team's presentation it was explained that one of the efforts for healthy cultivation is through the development of organic agriculture. This is very relevant to efforts to increase food security in the Sembalun Tourism Area.

Figure 2. Socialization and Counseling on Efforts to Improve Food Security Through Good Horticulture Cultivation to Support Tourism in Sembalun Lawang Village

At the extension event there were community leaders and representatives of farmer groups as well as Unram KKN students who were expected to become agents for disseminating information related to the theme of the extension. Ir. Hj. Nur Ilmiati, M.Si, Head of UPT Quality Assurance and Food Safety, NTB Food Security Service delivered material on understanding food safety as well as efforts to increase awareness of business actors and farmers to independently register their products for Prima3 or Prima 2 certification. On this occasion it was delivered also the stages and process of proposing Prima3 food safety certification for several Fresh Food Plant Origin (PSAT) commodities.

During the discussion several response questions emerged from the participants which showed that the Cucup extension participants were interested in the theme presented. Some of the things that emerged were questions asked by Mr. Amirul SAR (School of Nature Rinjani): Related to practice in the field regarding excessive use of pesticides. In this case, how can we be confident in being farmers who can benefit the people around us and what is the solution to this problem? Answer: Regarding this matter, the thing that needs to be underlined is the word pesticide, where pesticide means poison that kills pests.

People's minds regarding pesticides must be changed, where most farmers think that the more

pesticides they use, the better. However, the impact of this poison is enormous both on the environment and on living creatures. Next question by Mr. Marsoni, the Village Staff asked whether they had seen the risks caused by the cultivation methods of the Sembalun community which still depended heavily on pesticides and chemical fertilizers. Then they responded with the answer that in this case, in 2021, a rapid residue content test had been carried out at the center on red onion and tomato plants which at that time were the samples. And the results, Alhamdulillah, are safe. What was questioned by other participants regarding the government's involvement in food safety, was then explained that for food security itself, basically it is not only the government that plays a role but the community must also take part in food safety. The government itself may be able to urge the public to register for a Prima-3 certificate to get products that are safe for consumption.

Another question is how to control these pests wisely, which is briefly explained that this can start from the basics. By increasing knowledge regarding mixing techniques. Where each pesticide has a different level of residue. So that later it will be in accordance with the principles of effectiveness and efficiency. There was another question about food safety raised by Sabur Tanjung and SAR (Rinjani Nature School), which the team answered that food is safe for consumption. This must start from the business actor himself by registering for a Prima-3 certificate at the Department of Agriculture to get safe products. to consume. Apart from business actors, the role of village government institutions is also very much needed to encourage business actors to register for Prima-3 certificates.

Figure 3. Demonstration plot for pest management by utilizing refugia plants and using biological and vegetable pesticides

Pests found in demonstration plot activities

1. Leafminer Pest (Liriomyza sp)

Based on the results of observations and identification, there are two types of leafminer pest insects on potato plants which have been carried out in the potato production center area in Sembalun Village, Sembalun District, East Lombok Regency, which was carried out during 9 observations. The two types of leafminer insects found in the field come from the orders Diptera and Lepidoptera.

Figure 4. Morphology of the leafminer pest Liriomyza sp. (a) Leafminer larva Liriomyza sp. (b) Imago of the leafminer pest Liriomyza sp (Results of Identification in the Laboratory) Under a Binocular Microscope Magnification 10 X 20

The image above shows that the larvae and imago of leafminer pests belonging to the order Diptera, Liriomyza sp species on potato plants. The morphological results of leafminer pests are that the larvae are yellowish white in color, the body length is about 1 mm, the movement is slow, the number of abdomens is around 11 and the mouth is black, consisting of three instars, instars 2 and 3 are the most destructive instars because the amount of food increases and the wider the scars it causes. While the imago is about 2 mm in size, the scutellum is bright yellow, the short antennae are above the mouth, the abdomen has six segments, the mouth type is biting and chewing, the legs are 6 black and yellowish in color, the tarsus is black to yellowish in color, the femur is black in color and is yellowish in color. smaller than the tibia, the yellowish black tibia is longer than the tarsus and femur. According to Baliadi and Tengkono's opinion, leafminer flies are about 2 mm long, the dorsal part is dark but the scutellum is bright yellow. This leafminer fly is yellow on the head, black near the oceli and behind the eyes, the antennae are brownish yellow with three short and rounded segments (Shahabuddin et al., 2012).

(a) (b)

Figure 5. Morphology of moth leafminer pests. (a) Leafminer moth larva. (b) Imago of leafminer moth pests (Results of Identification in the Laboratory) Under Binocular Microscope Magnification 10 X 20

The image above shows that leafminer pests belong to the Order Lepidoptera. The identification results show that the morphological characteristics of leafminer pests (Moths) are that the larvae are about 1 cm in size, blackish white in color, the chewing mouth type is white on the abdomen, the head is black, the eyes are a pair of brown, the true stalks are 6 in number and the path fast. Meanwhile, the imago of the moth is brown, the body size is longer than the antennae, the antenna segments are around 29 brown segments, the abdominal segments are around 7 whitish brown segments, consisting of four wings - 2 pairs of front wings and two pairs of hind wings, the legs are 2 pairs. ± 3 pairs (6) and run fast, the tarsus consists of 5 brown segments, the brown femur is shorter and wider than the tibia, the brown tibia is longer than the femur and tarsus. Leafminer pests do not only consist of the Diptera order, Liriomyza sp species, but there are also those from the Lepidoptera order called moths. However, until now the name of the species has not been found. This pest is included as a new record on potato plants. This is contrary to the opinion of Spencer Steyskal (1984) who stated that only one species is associated with potato plants, namely Liriomyza huidobrenensis. others originating from Suryaningsih, (2006) which stated that one type of leafminer fly was found on potato plants, namely the Liriomyza huidobrensis species, which could be controlled using Biorational pesticides rotated with synthetic pesticides.

The picture above is a symptom caused by leafminer pests (Liriomyza sp). The symptoms produced are the formation of beautiful white winding burrows in the mesophyll of the leaves which over time will turn brown. This is in accordance with the opinion of Baliadi (2010) who states that symptoms of snoring fly attacks can be recognized by symptoms in the form of clear white grooved burrows on the mesophyll of the leaves, this symptom is often found on plant leaves. The number of grooves varies, depending on the number of larvae dripping. In further attacks, the burrow changes color to brown and inside it the larvae develop. These symptoms are characteristic of attacks by leafminer flies (Liriomyza huidobrenensis). If the burrow is opened, the larvae can be seen actively moving.

Figure 6. Symptoms of the Diptera Order Leafminer Pest (Liriomyza sp) on Potato Plants

The larvae live and feed in the burrows of the korokan. On one leaf, more than one burrow can be found depending on the number of larvae that hatch. In the imago phase, leafminer flies stab their opipositors on young leaves, although symptoms also appear on the leaves that appear next. The number and age of leaves affect the density of larvae on plants. However, the symptoms caused by the imago are difficult to find because the symptoms are in the form of black dots which are marks from ovipositor punctures.

Figure 7. Symptoms of Leafminer Pests of the Order Lepidoptera (moths) on Potato Plants

The image above shows the symptoms of leafminer pests caused by moths from the order Lepidoptera. Symptoms form large straight scars on the leaf mesophyll. When opened there are larvae insidethe carcass. The bigger the larvae, the wider the pest's infestation. Moth larvae are larger than Liriomyza sp larvae. The initial symptoms are forming white balls,

over time they will enlarge to match the shape of the larva.

2. Javelin Beetle Epilachna sp

Based on the results of observations made, the morphology of the javelin beetle pest (Epilachna sp.) was obtained, namely stages (eggs, larvae and imago). Egg stage of the beetle pest Epilachna sp. found during observation, coloredpale yellow with an oval shape and placed under the leaf surface in groups of 20-30 in a standing position as in Figure 8.

Figure 8. Egg stage of the javelin beetle (Epilachna sp.)

Meanwhile, the larval stage resembles a hedgehog with branching spines. At this stage of growth, the larvae experience growth in body volume and changes in color from dark green, pale yellow and gray yellow. This is in accordance with Kapur's statement (1950) which said that the larvae of Epilachna sp. has the general appearance of a hedgehog. According to Pracaya (1991), the larvae of the beetle Epilachna sp. dark yellow, slightly gray in color and covered by many structures as protrusions of the epidermis throughout the body. The larval stages of the javelin beetle (Epilachna sp.) are presented in the Figure 9.

Figure 9. Larval stage of the javelin beetle (Epilachna sp.)

The imago stage of this pest has an oval shape and is dull yellow in color with black spots. Elitra pest beetle Epilachna sp. dull in color because it is filled with many short hairs that resemble very fine powder. Imago of the beetle pest Epilachna sp. has a length of about 6 to 7 mm. According toKahono et al., (2002)Morphological characters of Epilachna sp. The head and pronotum have no spots. Scutellum bright. Elytra with 6 spots. Between the paired spots on the suture; spot sometimes reaches the edge. The spot pattern in each area is different. The size of males is 5.5 -6.3 mm and females 6.1 - 6.6 mm. The tips of the elytra are rounded. The imago of the beetle pest Epilachna sp. can be seen in Figure 10.

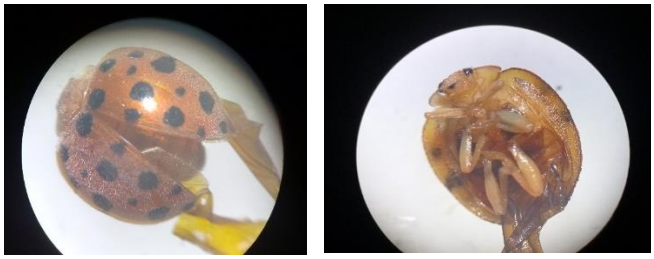

Figure 10. Larval stage of the javelin beetle (Epilachna sp.)

Symptoms of Javelin Beetle Pest Damage (Epilachna sp.)

The results of observing the symptoms of damage caused by the javelin beetle (Epilachna sp.) can be seen in the Figure 11.

Figure 11. Symptoms of the Javelin Beetle (Epilachna spi) Pest Infestation.

In the picture above, it can be seen that the leaves of the potato plant were attacked by the Epilachna sp. beetle. shows symptoms of leaves forming small holes. The symptoms are quite typical where only the epidermis of the leaves remains on the affected part. Symptoms of damage from the smallest to the largest scale toocanseen in the image above. At a high level of attack, leaves that were initially intact will only have the leaf veins remaining. Rahayu et al., (2021)stated that the larvae and imago of the beetle Epilachna sp. has a chewing mouth type. Therefore, this pest will scratch the chlorophyll from the epidermis layer of the leaves. As a result of the pest attack, holes will form in the windows. Leaves with holes will dry out and fall. If the attack is heavy, the holes in the leaves will fuse together and leave leaf veins.

Conclision

Based on the results of the activity, it was concluded that: (1) The target community group was aware of the negative impacts of using fertilizer and chemical pesticide production inputs in horticultural cultivation; (2) The target group often receives counseling and outreach about the importance of producing fresh food products from healthy plants; (3) Several groups have applied for and received prima3 certificates regarding food security, but these certificates have not been extended; (4) Farmers are very interested in implementing good horticultural cultivation, especially with habitat management approaches such as using refugia plants to control pests; (5) Participating farmers increase their knowledge and skills to recognize differences in pests and natural enemies (predators and parasitoids) found on potato plants integrated with refugia plants; (6) The target group has increased knowledge and understanding of the importance of implementing Integrated Pest Management (IPM) practices in horticultural cultivation.

References

Kahono, S., Pujiastuti, L. E., Fujiyama, N., & Nakano, S. (2002). Uji Preferensi Tumbuhan Inang Beberapa Populasi Kumbang Lembing Epilaehna^. Aff. Emarginata (Coleoptera; Coccinellidae; Epilachninae). *Berita Biologi*, *6*(3), 481–485.

Rahayu, E., Rizal, S., & Marmaini, M. (2021). Karakteristik Morfologi Serangga Yang Berpotensi Sebagai Hama Pada Perkebunan Kelapa (Cocos nucifera L.) di Desa Tirta Kencana Kecamatan Makarti Jaya Kabupaten Banyuasin. *Indobiosains*, *3*(2), 39. https://doi.org/10.31851/indobiosains.v3i2.6208

Sarjan, M., Fauzi, M. T., Sudantha, I. M., & Suwardji. (2020). Pengenalan Sistem Refugia Dalam Pengendalian Hama pada Tanaman Kentang di Desa Sembalun, Kabupaten Lombok Timur. *Jurnal PEPADU*, *1*(3), 269–279.

Sarjan, M., Fauzi, M., Thei, S., & Wirdianingsih, M. (2020). Pengenalan Pestisida Nabati Dari Limbah Batang Tembakau Virginia Untuk Mengendalikan Hama Kutu Kebul (Bemisia Tabaci) Pada Tanaman Kentang. *Jurnal Pengabdian Magister Pendidikan IPA*, *3*(2). https://doi.org/10.29303/jpmpi.v3i2.508

Sarjan, M., Na'im, B. J., & Wati, R. (2020). Kopi sajang menuju dunia melalui promosi dan pembaharuan kemasan produk. *Jurnal Warta Desa (JWD)*, *2*(1 SE-Articles), 135–140. https://doi.org/10.29303/jwd.v2i1.106

Sarjan, M., Thei, R. S. P., Haryanto, H., & Windarningsih, M. (2022). Pendampingan Pengenalan Musuh Alami Hama Potensial Pada Tanaman Kentang Di Sembalun. *Unram Journal of Community Service*, *3*(2), 42–46. https://doi.org/10.29303/ujcs.v3i2.191

Setyaningrum, C. A., & Prasetyo, S. Y. J. (2018). Sistem Peramalan Serangan Organisme Pengganggu Tanaman Menggunakan Metode Double Exponential Smoothing Berbasis Google Map. *Indonesian Journal of Computing and Modeling*, *1*(1), 1–9. https://doi.org/10.24246/j.icm.2018.v1.i1.p1-9

Shahabuddin, Anshary, A., & Gellang, A. (2012). Pada Tiga Varietas Lokal Bawang Merah di Lembah Palu Sulawesi Tengah. *Jurnal. HPT Tropika*, *12*(2), 153–161.

Suryaningsih, E. (2006). Pengendalian Lalat Pengorok Daun pada Tanaman Kentang Menggunakan Pestisida Biorasional Dirotasi dengan Pestisida Sintetik secara Bergiliran. *Jurnal Hortikultura*, *16*(3). https://doi.org/10.21082/jhort.v16n3.2006.p%p