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The Evaluation of Implementation of Integrated Pest and Disease Control by Farmers of Food and Holticultural Corps in Banyuasin and Ogan Komering Ulu Timur

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ABSTRACT

Reducing crop cultivation is providing ecological biota for plants through Integrated Pest Management (IPM). Farmers' problems regarding pests and diseases in Banyuasin and OKU Timur, especially for food crops and horticulture farmers. The purpose of this research is to evaluate the compliance of food crops and horticulture farmers in implementing safe and environmentally friendly IPM. Study on various fields of food and horticulture farmers in Banyuasin and Ogan Komering Ulu. The research method used is purposive sampling. Observation of Plant Pests and Diseases was completed directly in the field. Then determine the disease score in each sample plant. The parameters observed in this study are the behavior of farmers towards the decision-making process of using pesticides. Pest and disease intensity, and disease attack percentage were analyzed descriptively in the form of tables and graphs, as well as correlation analysis. The highest value of diversity of pests and diseases of food and horticultural crops based on the entire area of the observed land was found in a land area of 0.25 ha, which is the area that is often found in land for crop cultivation. The average age percentage of farmers in Banyuasin and OKU East is 40 to 50 years old. The average education of farmers in Banyuasin and OKU Timur is 24 farmers. The percentage and intensity of both horticultural and food crops in Banyuasin are good because only a few farmers get a score of 2 or 1. Cultivation techniques are land preparation, land sanitation, selection of resistant varieties, spacing, irrigation, crop rotation, intercropping, mulching, natural enemies of insects, and weeding.

Keywords: Evaluation, Integrated Pest Management, food crop, horticultural crop.

INTRODUCTION

Integrated Pest Management (IPM) is controlled with cultivation. IPM is applied to reduce the use of synthetic pesticides in the field and this control is combined with biological control (Fahimatul and Faizah, 2014). The use of synthetic pesticides is the last alternative if other controls are unable to suppress pest growth (Adiartayasa et al., 2017; Hersanti et al., 2013; Khuluq et al., 2019). Control of pests and diseases by understanding pests and diseases (Sholeh, 2019). Food and horticultural crops are plants that are of high interest and are grown by people because these two plants are staples in everyday life (Kurniati, 2014). Pest and disease control cannot be separated from the use of pesticides (Zuhroh, and Agustin, 2017). Plant-disturbing organisms (PDO) that attack plants are a problem in increasing rice yields in East OKU (Asngari, 2013; Fermadi et al., 2015; Putri, 2018). PDO in the field and attacking plants can reduce agricultural yields (Arfan, 2020; Cahyono et al., 2018; Sekarsari et al.,

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2013; Sari and Yustisia, 2020). The development of basic technology is carried out by reducing the use of new high-yielding rice varieties (VUB). Restrictions on the use of VUB by the government by providing the Integrated Plant Management Field School Program (SL-PTT) were carried out by the government through Agricultural Protection (Senewe et al., 2020). Banyuasin is a district that grows a lot of tidal rice plants (Syahputra and Inan, 2019. Rice has the ability to resist pests and plant diseases (Suparwoto et al., 2017; Dewi et al., 2013). Cultivation capital and skills must be increased to increase yields (Asngari, 2013; Nuriati et al., 2021). Pests attack various types of plants and have the ability to damage and reduce production yields on these plants (Novitarini , 2020; Akhmad and Antara, 2019). However, controls to suppress PDO still use synthetic pesticides (Syahri et al., 2019). This can lead to resistance and resuscitation of pests on agricultural land. Many PDO's are already resistant to pesticides, so it is necessary to conduct research on food crops and horticultural farmers in pest control. This research for evaluates the accuracy/compliance of food crop and horticulture farmers in Banyuasin and OKU Timur, Sumatra province South in implementing IPM which is environmentally friendly and safe for the farmers themselves and consumers.

MATERIAL AND METHOD

Research on various fields of food and horticulture farmers in Banyuasin and Ogan Komering Ulu Regencies from May to December 2022. The tools used in this study were 1) Office Stationery, 2) 12 MP dual camera system: Wide and Ultra Wide cameras. The method used in this study is a survey method in the form of interviews with farmers with reference to the questionnaire and then observing the farmers' land. The sampling method uses purposive sampling. Observation of pests and diseases on plants directly then determined the disease score on each sample plant.

The criteria for farmers as respondents in this study were food crop and horticulture farmers in Banyuasin and OKU Timur districts who had cultivated land of at least 0.25 hectares, were willing to be interviewed and were allowed land observations. The observation parameters in this study were farmer behavior towards the decision-making process in the use of PDO in Banyuasin and Ogan Komering Ulu Timur Regencies.

Observations were made after determining the respondents and taking samples on the cultivated land. Observation of pests and diseases found in plants on farmer's land as many as 30 plants per farmer. The intensity of pest and disease attacks using scoring (Table 1).

Tabel 1. Pest and disease attack intensity scores

Skor	Keterangan
0	Plants are asymptomatic and uninfected (0%)
1	Percentage of symptomatic and infected plants ($\leq$ 25%)
2	Percentage of symptomatic and infected plants (25-50%)
3	Percentage of symptomatic and infected plants (50-75%)
4	Percentage of symptomatic and infected plants ($\geq$75%)

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Intensity of Pests and Diseases

The percentage of disease severity is calculated based on symptoms using the Towsend and Heuberge (1943) formula as follows :

$$KP = \frac{\Sigma\, n\, x\, v}{z\, x\, N} X\ 100\%$$

Keterangan:
KP = Disease Severity (%)
n = Number of plants or plant parts on a scale
v = Plant damage scale value
N = The number of sample plants or plant parts observed
Z = The highest damage scale value

Disease Attack Percentage

Calculate of the percentage of pests and diseases by calculating the intensity of the disease in these plants. The percentage of diseases and pests is calculated based on the Towsend and Heuberger formula (1943):

$$I = \frac{n}{N} x\ 100\%$$

Keterangan:

I = Attack percentage (%)

n = The number of plants/parts of plants that are diseased

N = Number of plants/plant parts observed

Data analysis

Data were analyzed descriptively and in the form of tables and graphs, and correlation analysis.

RESULT AND DISCUSSION

The age of farmers is a factor that supports agricultural activities. Currently, farmers are of mature age and have sufficient experience in agriculture and very good cultivation, so the plants being cultivated are of good quality. Based on data, the average age of horticulture and food farmers in the districts of Banyuasin and OKU Timur is 41-50 years with 21 farmers in Banyuasin and 17 farmers in OKU East, ages 31-40 years in Banyuasin 10 farmers and in OKU East 3 farmers, there are 3 farmers aged 20-30 years in Banyuasin while in OKU Timur there are no farmers aged 20-30. There are 3 farmers aged >60 or <20 years in Banyuasin and OKU Timur. Based on the results of interviews with 60 respondents in Banyuasin and OKU East agriculture, the average farmer has implemented PHT (Integrated Pest Management). The implementation of integrated pest control for horticulture and food farmers in the Banyuasin and OKU Timur Regencies has been good, but the implementation of IPM has not been fully implemented. East OKU Regency is also the district that has the third largest land area after Banyuasin and also the soil conditions in Banyuasin and East OKU make land suitable for agriculture (Novitarini, 2020).

Farmers' education is needed in agriculture because managing cultivated plants requires knowledge of the cultivation process or controlling pests and plant diseases to produce high-quality crops. Based on the data, education possessed by farmers in Banyuasin and East OKU: 1 graduate in Banyuasin and 2 people in East OKU. Farmers with senior high school education in Banyuasin are 6 people, better than OKU Timur which has 4 people. There are 17 farmers with junior high school education in Banyuasin, while in OKU East there are 7 people. Elementary school level education based on data in Banyuasin has 17 people, while in OKU East there are 10 people. Horticultural and food crops are very popular commodities because they are

easy to cultivate and can help the economy of farmers. Cultivation by farmers, from young to old, therefore it is not surprising that many farmers are young and old. Based on data obtained from Banyuasin and OKU Timur, there were 38 farmers aged 41-50 years, 13 farmers aged 41-50. 3 farmers in Banyuasin are 20 years old, while 6 people are over 60 years old. The age of the farmer is also one of the important things in agriculture because the older the farmer, the more experience he has. On the other hand, farmers at a young age still need a lot of experience to be able to develop modern farmer cultivation to advance the economy through agriculture in Indonesia (Moroki *et al*., 2018).

Land area affects the success of cultivation. The larger the land area, the more farmers will spend on pesticides and nutrients to produce quality crops. Conversely, farmers with narrow land will incur less costs both in cultivation and pest control. Based on the data, 24 farmers have a land area of 0.25 ha in Banyuasin and 8 people in OKU East. The land area is 0.25 - 0.5 ha, there are 6 people in Banyuasin and 7 people in East OKU. The land area is 0.5 – 1 ha, in Banyuasin there are 4 people and in OKU Timur there are 5 people. Land area > 1 ha in Banyuasin and East OKU both have 3 people. Based on interview data from 60 respondents, an average of 24 people had junior high school education and the second highest average was elementary school education with 23 farmers, 10 high school education, 3 undergraduates. Education of farmers is needed in plant cultivation so that they can have extensive knowledge in how to cultivate plants, in order to produce quality crops. Education is also one of the factors that will influence the choice of agricultural business because it can be the main source of income (Gustami, 2013).

Based on the data, the largest average land area in Banyuasin and OKU Timur is with a land area of 0.25 ha with a total of 32 farmers and 0.25 - 0.5 ha with 13 farmers. In land area of 0.5 - 1 ha, there are 9 farmers, land area > 1 ha totaling 6 farmers. Food and horticultural crops are widely planted because they do not have to have large areas of land, especially horticultural crops that can be planted in the yard of the house. Meanwhile, for food crops in Banyuasin and OKU Timur, there are only corn and rice plants (Moniaga, 2011).

There are 12 families and 16 species of pests that attack Horticulture that are found on land in the Banyuasin and East OKU areas. Percentage and intensity of insect pest attacks on *Liriomyza* sp. namely, 17.28% and 4.32%, while the lowest was in *H. armigera* species, namely, 1.54% and 0.39%. The level of pest attack in the field can be influenced by the way farmers control pests that attack horticultural crops. In addition, the host of the insect can affect the level of attack. Because insects that have a broad host can increase the percentage and intensity of attacks. Farmers can also influence the level of pest attacks, because in crop cultivation, selecting superior seeds is one way to suppress pest attacks. The percentage and intensity of pest attacks on horticulture in Banyuasin and East OKU districts is still relatively low (Table 2).

Table 2. Percentage and intensity of attack by horticultural pests in Banyuasin and East OKU

Family	Pests	Attack Percentage (%)	Attack intensity (%)
Aphididae	*M. persicae*	15,74	3,94
	Aphid sp.	9,10	2,16
Acrididae	*Valanga* sp.	12,5	3,13
Agromyzidae	*A. phaseoli*	7,41	1,85
	Liriomyza sp.	17,28	4,32
Aleyrodidae	*Bemisia tabaci*	1,90	0,95
Belostomatidae	*Coptosoma* sp.	4,29	0,79
Coccinellidae	*Epilachna* sp.	11,21	2,8
Chrysomelidae	*Aulacophora* sp.	9,49	2,03
Hesperiidae	*Pelopidas* sp.	1,98	0,5
Noctuidae	*Spodotera litura*	14,19	3,47
Pentatomidae	*N. viridula*	4,63	1,16
Pyralidae	*H. armigera*	1,54	0,39
Tephritidae	*B. dorsalis*	12,69	3,12
	D. cucurbitae	13,89	3,47
Thripidae	*Thrips* sp.	4,40	1,04

Percentage and intensity of pest attacks, in Banyuasin and OKU Timur there were 5 families and 5 species. *S. frugiperda,* Noctuidae, the highest attack percentage and intensity were 97.22% and 54.23%. D.carolina with the lowest attack percentage was 6.84%. However, the lowest intensity of attacks were 2 species namely, *L. acuta* and *Succinea* sp. is 2.00 %. The most dominant level of attack by insect pests on food crops is S. frugiperda. This is because the observed plant samples are hosts of *S. frugiperda*, a pest that is a problem for corn in the vegetative phase. S. frugiperda attacks corn from the age of 1 week until the generative phase. Farmers control *S. frugiperda* using synthetic pesticides which can kill the insect's natural enemies. Control of *S. frugiperda* on corn is included in integrated pest management. Farmers have made a selection of superior seeds, good land management, and monitoring of corn. However, the use of synthetic pesticides is most prioritized when plants are attacked by pests in the field. So that pests become resistant and can cause resuscitation. In addition, farmers carry out a continuous cropping pattern with one type of plant. This can cause the level of pest attack in the field to have differences for each insect pest depending on the age of the plants (Table 3).

Table 3. Percentage and intensity of attacks on food crops in Banyuasin and East OKU

Family	Spesies	Attack Percentage (%)	Attack intensity (%)
Alydidae	*L. acuta*	8,66	2,00
Acrididae	*D. carolina*	6,84	3,00
Crambidae	*Scirpophaga sp.*	12,18	5,00
Noctuidae	*S. frugiperda*	97,22	54,23
Succineidae	*Succinea* sp.	8,93	2,00

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Percentage and Intensity of disease attacks on horticulture in the Banyuasin and OKU East areas 10 types of diseases can cause decreased production and death in horticulture. The level of disease attack in horticulture can be affected by cropping patterns that do not match the type of plant. Cultivation of plants can affect the development of diseases such as spacing, fertilization, land management, and land sanitation. Farmers monitoring horticultural crops is good.. Monitoring is carried out by farmers by visiting the plants every morning and evening. Based on the research results, this monitoring aims to determine the development of OPT. However, if farmers find pests in horticulture, farmers only take these pests and then throw them around the plants. This causes OPT in the field to continue to attack cultivated plants so that OPT development continues to increase along with plant growth (Table 4).

Table 4. Percentage and intensity of horticultural diseases in Banyuasin and East OKU.

Disease type	Attack Percentage (%)	Attack intensity (%)
Colletrotrichum sp.	10,91	4,00
Cercospora Capsici	8,24	3,00
Downy mildew	3,80	7,00
Exobasidium sp.	46,83	18,00
Gemini virus	2,08	1,00
Layu fusarium	6,83	2,00
Oidium sp.	4,63	1,00
Phytophthora sp.	3,09	1,00
Spaceloma sp.	6,48	2,00
Yellow Mosaic virus	12,37	4,00

There are 4 types of diseases in the percentage and intensity of food crop diseases in Banyuasin and OKU Timur. Diseases that attack food crops are the most influential in reducing farmers' income. The cultivation of food crops in the two districts has done a good IPM. This can be proven based on research results through interviews with farmers. Farmers have implemented good cultivation techniques, such as choosing seeds that have advantages in both production and OPT attacks. The land before planting has been processed first. The level of disease attacks on food crops is still relatively low, only one disease has a high percentage rate (Table 5). Diseases that attack plants can be affected by plant age and cultivation.

Table 5. Percentage and intensity of food crop diseases in Banyuasin and East OKU

Disease type	Attack Percentage (%)	Attack intensity (%)
Hemilia sp.	38,03	9,51
Helminthosporium sp.	5,13	1,28
Kresek	5,34	1,34
RTBV	2,14	0,53

The correlation value (r) between the IPM score and the pest attack is 0.54 which means the correlation between the two variables is weak and the coefficient of determination (r^2) is 0.29 where the effect of the IPM score and the pest population is 29.16%. (Table 6).

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Table 6. Correlation test of IPM scores with horticultural and food pest attacks

PHT Score Correlation and Pest Attack		Addition
Test	Value	
Correlation (r)	54,00	Negative Correlation
Coefficient of determination (r^2)	0,29	IPM affect

The correlation value (r) between the IPM score and the disease attack is 0.96 which means the correlation between the two variables is very strong and the coefficient of determination (r^2) is 0.9216 where the effect of the IPM score and the disease population is 92.16%, and the rest is influenced by other variables (Table 7).

Table 7. Correlation test of IPM scores with disease attacks in horticulture and food fields

PHT Score Correlation and Disease Attack		Addition
Test	Value	
Correlation (r)	0,96	Strong positive correlation
Coefficient of determination (r^2)	0,92	IPM affect

Based on observations, 23 species of pests attack horticultural and food crops in Banyuasin and OKU Timur. These pests can harm cultivation. To suppress the growth and development of pests, control must be carried out. IPM is very necessary in cultivation to reduce pest attacks which are a serious problem in agriculture. The pest with the highest percentage of damage to horticultural crops was Liriomyza sp., while the food crop pest was S. frugiperda which attacked corn (Marsadi *et al.*, 2021). Based on horticultural and food plant diseases in the Banyuasin and East OKU areas there are 14 disease species. OPT attacks on horticulture and food crops can cause a decrease in farmer yields and agricultural products have a low selling value (Marianah, 2020). Based on the results of the correlation test, PHT scores with pests and diseases, there is a difference between the correlation between IPM scores and pests and IPM scores with disease. The results of the PHT score correlation test with pests showed that the correlation was small, namely 29.16%, which means that the PHT score did not determine the number of pest attacks on the land, while the PHT score correlation test for disease was 92.16%, which means there is a correlation between the IPM score and the number of diseases present on agricultural land.

CONCLUSION

The highest value of diversity of pests and diseases of horticultural and food crops based on all observed land area was 0.25 ha of land, which is the size that is often found in farmers' fields. Farmers in Banyuasin and OKU East have an average age of 40-50 years. The education of farmers in Banyuasin and OKU East has an average education at the junior high school level with a total of 24 people and for the percentage and intensity of both horticultural and food crop pests the same has the highest and lowest percentages and intensity and for the application of IPM farmers in Banyuasin are classified as good because few farmers get a score of 2 or 1, starting from land management, land sanitation, selection of resistant varieties, spacing,

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irrigation, crop rotation, intercropping, use of mulch, use of natural enemies and weeding.

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