Study of pest attacks on maize plantation in the oil palm replanting land of Jambi Province

A Meilin*, R Rubiana, Jumakir, K Suheiti, WS Murni, Rustam, J Bobihoe
Assessment Institute for Agricultural Technology (AIAT) Jambi, Kotabaru 36128, Jambi - Indonesia.

*E-mail: araz_meilin@yahoo.com

Abstract. Activities of oil palm rejuvenation started in 2017 in Jambi Province. On replanting land, oil palms were intercropped with food crops (maize) while waiting for oil palm yield. Some constraints of food crop cultivation, including corn, is a pest attack. This study aims to determine the pest attack on maize plantations in oil palm replanting land. The research was conducted at maize plantation in oil palm replanting land in Talang Bukit and Marga Mulya Village, Sungai Bahar District, Muaro Jambi Regency from April to July 2019. This research used survey methods with 1 to 2 ha areas in each location during the maize's vegetative and generative phases. Morphology or symptoms of the attack, pest morphology, and the percentage of pest attacks observed in this study. The research result showed that the primary pest attacks in the maize's vegetative phase were Spodoptera frugiperda Fall Armyworm, which attacks the percentage reaching 93.45%, and then Spodoptera litura Armyworm, and Mythimna separata. Pest attacks at the generative phase of corn plants were S. frugiperda, S. litura, Rhopalosiphum maidis aphids, Ostrinia furnacalis stem borer, Helicoverpa armigera, respectively is 23.92%; 10.14%; 0.27%; 21.22%; 34.23%. Meanwhile, the damage caused by wild boars reached 27.56%, and 5.68% showed by the monkey.

1. Introduction
The area of oil palm in Jambi Province reaches 497,994 ha with a production of 1,123,329 tons. Muaro Jambi Regency is one of the locations for oil palm replanting activities. Sungai Bahar sub-district is one of the sub-districts in Muaro Jambi regency that has carried out oil palm replanting in three villages, namely Suka Makmur, Mekarsari Makmur Village, and Marga Mulya Village. The farmers' decision to rejuvenate oil palm is due to many old plants that cause a decrease in production and crop productivity so that there is a decrease in farmers' income. The old palm oil plantations of Ex-PIR Plasma in Sungai Bahar Subdistrict are 7,260 Ha or 75.9% of the total area of oil palm in the Sungai Bahar District [1]. This condition is a potential or alternative planting of seasonal crops (food or horticulture) on young oil palm plants' land after the replanting program.

Oil palm replanting has been going on since 2017 in Jambi Province. Cultivation by intercropping maize in young oil palm cultivation areas has been around since 2018. The harvest of corn in palm oil replanting land is use to meet daily life needs [2].

Some obstacles in the cultivation of maize are attacks on plant invaders, commonly known as crop pests. The pests of corn stings ranged from 33.33 to 90.47% [3]. Attacks with the highest percentage cause the stems to break down and fall, thereby reducing production. The primary pest of corn was seed flies and stem borer. Pest attacks can reduce production or even fail harvest if left unchecked [4-5].
type of pest attack information can use to develop pest control strategies. This study aims to determine pest attacks on maize plantations in replanting oil palm land in Jambi Province.

2. Materials and Methods
The study was conducted purposively in Talang Bukit Village, Bahar Utara Sub-District, and Marga Mulya Village, Sungai Bahar Sub-District, Muaro Jambi District, Jambi Province from April to July 2019.

This research used survey methods with approximately 2 ha and 1 ha areas in each location and during vegetative and generative phases of maize. The pest survey was done during the vegetative phase at 2-4 weeks after planting and in the generative phase at 7-9 weeks after planting maize. The observations used on the attack symptoms, pest species, and attacks percentage on maize. The observation was carried out pests and attack symptoms observations on 200 sample plants taken diagonally.

Identification of insect morphology using some literature, namely: [6-10]. The attack percentage calculated based on the number of plants attacked divided by the number of plants observed, then multiplied by 100%. Calculated the rate of damage caused by pigs and monkeys’ attacks were from the percentage of the number of plants attack divided by the whole plant, multiplied by 100%.

3. Results and Discussion
The results showed that the primary pest attacks in the vegetative phase of the corn plantation were Fall Armyworm *Spodoptera frugiperda* (Fig. 1, Fig. 2), which the percentage of attacks reaching 93.45% di Talang Bukit Village dan 47.50% di Marga Mulya Village. The attacks percentage of *Spodoptera litura* and *Mythimna separata* were low, only 0.52% dan 0.27%, respectively, and only in Talang Bukit Village (Table 1).

![Figure 1. Larva of Spodoptera frugiperda](image1)

*Figure 1. Larva of Spodoptera frugiperda*

![Figure 2. Symptoms of attacks in the vegetative (a) and generative (b) phases](image2)

*Figure 2. Symptoms of attacks in the vegetative (a) and generative (b) phases*

*S.frugiperda* is an invasive pest, and no information attack maize in Jambi, Indonesia, before 2019. The *S. frugiperda* reported having many host plants, 353 plants from 76 families as the host plant for *S. frugiperda* [11]. Morphological characteristics of *S.frugiperda* larvae were found to be very consistent with the features proposed by [6-9, 12] that was based on the morphological characteristics, the "Y" inverted shape on the head capsule and the patterns of black spots on the abdominal segments (square and trapezoidal forms), the species was confirmed as *S. frugiperda*. The larvae heavily damaged the early corn stage (approximately 2-week old), with 10% of plants infested. Each plant was occupied by a medium or large larva, while older corn received fewer damage larvae fed on the leaves, causing defoliation before providing on the growing point.

*Spodoptera litura* and *M. separata* are common pests that attack corn plants and widely reported. *S. litura* found in maize plantations in the South and Central Sulawesi, and *M. separata* found in West and
South Kalimantan, North Sumatra, Lampung, South Sulawesi, and Central Sulawesi [13]. Pest attacks in the generative phase of maize were *S. frugiperda* (Fig. 1 and Fig. 2), *S. litura, Rhopalosiphum maidis* aphids (Fig. 3), *Ostrinia furnacalis* stem borer, *Helicoverpa armigera*, with 23.92%; 10.14%; 0.27%; 21.22%; 34.23% in sequence. Meanwhile, the damage caused by wild boars (Fig. 4 and Fig. 5) reached 27.56% in Talang Bukit village and 10,45% in Marga Mulya village, and 5.68% by monkey only in Talang Bukit village (Table 2).

### Table 1. Pests of the vegetative phase of the corn plantations in oil palm replanting land of Jambi Province

| No. | Location                                           | Pest Name               | Class       | Percentage of attacks (%) |
|-----|---------------------------------------------------|-------------------------|-------------|---------------------------|
| 1   | Talang Bukit Village, Bahar Utara Sub-District, Muaro Jambi District | *Spodoptera frugiperda* | Insecta     | 93.45                     |
| 2   | Marga Mulya Village, Sungai Bahar Sub-District, Muaro Jambi District | *Spodoptera litura* | **Mythimna separata** | 0.52                     |
|     |                                                   | *Rhopalosiphum maidis* | Insecta     | 0.27                      |
|     |                                                   | *Ostrinia furnacalis*  | Insecta     | 21.22                     |
|     |                                                   | *Helicoverpa armigera* | Insecta     | 34.23                     |
|     |                                                   | Wild boars              | Mammalia    | 27.56                     |
|     |                                                   | Monkeys                 | Mammalia    | 5.68                      |

**Figure 3. Rhopalosiphum maidis**

*Rhopalosiphum maidis* found to attack the maize in the generative phase, with a low percentage of attack by 0.27% in Talang Bukit Village and 0.32% in Marga Mulya Village. *R. maidis* pests on maize area are primary pest at maize [13]. *R. maidis* is also considered a very economically harmful insect.

### Table 2. Pests of the generative phase of the corn crop in oil palm replanting land

| No. | Location                                           | Pest Name               | Class       | Percentage of attacks (%) |
|-----|---------------------------------------------------|-------------------------|-------------|---------------------------|
| 1   | Talang Bukit Village, Bahar Utara Sub-District, Muaro Jambi District | *Spodoptera frugiperda* | Insecta     | 23.92                     |
|     |                                                   | *Spodoptera litura*     | Insecta     | 10.14                     |
|     |                                                   | *Rhopalosiphum maidis*  | Insecta     | 0.27                      |
|     |                                                   | *Ostrinia furnacalis*   | Insecta     | 21.22                     |
|     |                                                   | *Helicoverpa armigera*  | Insecta     | 34.23                     |
|     |                                                   | Wild boars              | Mammalia    | 27.56                     |
|     |                                                   | Monkeys                 | Mammalia    | 5.68                      |
| 2   | Marga Mulya Village, Sungai Bahar Sub-District, Muaro Jambi District | *S. frugiperda*         | Insecta     | 10.43                     |
|     |                                                   | *R. maidis*             | Insecta     | 0.32                      |
|     |                                                   | Wild boars              | Mammalia    | 10.45                     |
The percentage of corn damage due to wild boar attacks reached 27.56% in Talang Bukit Village. This attack is higher than boar attack that occurred in Marga Mulya village. Wild boar destroys corn plants by laying down corn plants and eating mainly corncobs at night. Corn cobs are the part that is highly favored by wild boars. The remaining corncobs left by wild boars in corn plantations are a sign of wild boar attacks, in addition to their footprints. Farmers in Talang Bukit Village control feral boar pests by guarding and monitoring the garden at night and using firecrackers. This method is only useful in preventing wild boars from coming to the park in a few days. Corn farmers in Marga Mulya Village control wild boars by making waring fences and guarding gardens every night. Still, waring walls can damage by wild boars and eventually can enter the corn plantation. Rat and wild boar are a problem for almost 80% of the farmers, and they can cause severe yield losses [13]. Providing the right knowledge can diminish yield losses [14].

4. Conclusions
The primary pest attack was Fall Armyworm *S. frugiperda*. The attack percentage of *S. frugiperda* reached 93.45% at the vegetative phase of maize, and other pests were *S. litura* and armyworm *M. separata*. Pest attacks in the generative phase of maize were *S. frugiperda*, *S. litura*, *Rh. maidis* aphids, *O. fumacalis* stem borer, *H. armigera*, with respectively were 23.92%; 10.14%; 0.27%; 21.22%; and 34.23%. Meanwhile, the damage caused by wild boars reached 27.56% and 5.68% by monkeys.

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