Problems of Pests and Diseases on “Liberika Tungkal Komposit” Coffee in Peatlands, Jambi Province

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Abstract. Coffee of Liberika Tungkal Komposit (Libtukom) is a superior commodity that adapts well to the peatlands in West Tanjung Jabung Regency, Jambi Province. Libtukom coffee, which has a distinctive flavor, is the main source of income for the community in Tanjung Jabung Barat Regency. The problems in the cultivation of Libtukom coffee include pests and diseases. This study aimed to provide information on the type of pests and diseases that attack Libtukom coffee. The study was conducted in March-September 2017. Data were obtained from direct observation (primary data) and other sources (secondary data). Data were analyzed descriptively. The results showed that some of the pests that attack Libtukom Coffee were coffee fruit borer, white lice, and stem borer, with intensity of mild-moderate attacks. Diseases that can infect leaves Libtukom Coffee were mainly (rust and red rust) and roots (root fungi). White root fungus attack is the main problem of Libtukom coffee in peatland, Jambi Province. Farmers generally recognize the root fungus infection, which was already found in more than 30% of the plant population.

1. Introduction
The peatland area in Jambi Province is 0.717 million ha or 9.95% of the total peatland area on Sumatra Island [1]. The peatlands in Jambi are on the eastern side of Jambi Province, located in Muaro Jambi, Tanjung Jabung Barat (Tanjabbar), and Tanjung Jabung Timur (Tanjabtim) [2].

Libtukom coffee is a commodity of specific location in Tanjung Jabung Barat district besides areca nut and coconut. Libtukom coffee is a coffee plant that has been established as a variety of development through the Decree of the Minister of Agriculture of the Republic of Indonesia No. 4968/Kpts/SR.120/12/2013 dated December 6, 2013. Libtukom coffee has distinctive flavors, its fruits and leaves are different from Robusta or Arabica coffee and is able to adapt well in peatlands, and is also a major source of livelihood for local people. Demand from Malaysia reaches up to Rp 33,000/kg at the farm level, exceeding the price of robusta coffee which is Rp. 16,000,-/kg. Libtukom coffee production is potential if the average is 909 grams of coffee beans/tree or equivalent to 950 kg of seeds for planting with a population of 900-1000 trees/ha [3]. In the certificate of geographical indication (IG) issued by the Ministry of Law and Human Rights on July 23, 2015, informed that the value of taste test results from Indonesian Coffee and Cocoa Research Center (Puslitkoka) that Tungkal Jambi Liberica coffee processed as wet coffee (ripened) has flavors of herbal, rubbery, rutter sourish and high acidity.

Libtukom coffee plant area in Tanjung Jabung Barat regency decreased over the last three years, especially in Bram Iam (from 570 Ha in 2014 to 411 Ha in 2016) and Betara Subdistricts (from 1,540 Ha in 2014 to 1,492 Ha in 2016). The decrease of planted area contributes to the decrease of Libtukom Coffee planting area in Tanjung Jabung Barat Regency that were from 3.028 Ha in 2014 to 2.873 Ha in 2016 [4,5,6].

The decrease of Libtukom coffee plant area affected by several factors, such as pests and diseases that can cause plant death. Surveys on some farmers revealed that their coffee plants in recent years have experienced of deaths (personal communication). Several pest and disease attacks are commonly
reported to result in low productivity of coffee and may even result in death in coffee plants. Some pests in coffee plants are coffee fruit borer (*Hypotribas hampei*), parasitic nematodes (*Pratylenchus* sp., *Meloidogyne* sp., *Radopholus* sp.), the twig borer (*Xylosandrus* sp.), stem borer (*Zeuzera* sp.), white lice (*Plamococcus* sp.), leaf rust disease (*Hemileia vastatrix*), and root disease (*Rigidophorus lignosus*) [7,8,9,10,11] as well as pests from the primate groups of monkeys and monkeys during long dry seasons [12].

It is important to preserve Libtukom coffee as a source of germplasm in an effort to improve the function of peatlands and the income of Libtukom coffee farmers. Therefore, this study aimed to provide information about pest and disease problems affecting the Libtukom coffee in peatlands of Tanjung Jabung Barat Regency, Jambi Province.

2. Materials and Methods

2.1. Activity Location
The study was conducted during March-September 2017. The location of the research was the land of coffee cultivation in Betara Sub-district, Tanjung Jabung Barat Regency. This location was selected since it was a coffee plantation development and has the largest planting area (>50%) compared to other districts. Determination of Mandala Jaya Village, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong) as the location of the samples as reported as the location of which many of the coffee crops suffered deaths.

2.2. Sampling Method
The method of determining the location of the plantation was done using Accidental sampling was one of the methods in sampling from a population. Where Accidental sampling was included in the technique of non-probability sampling (samples with unequal probability). For sampling method like this was taken by choosing the land where the farmer happened/found in the research area and the land showed symptoms of pest and disease attack. The number of samples may be representative because it depends only on the sample members at that time. Samples to be taken were coffee plants that show symptoms of pest and disease attacks.

2.3. Observation of pest and diseases
Observations were made on the symptoms of coffee fruit borer attack (PBKo), twig borer and other pests found during observation. The observed plants were 15% of the population. Observation of the intensity of PBKo pest attack was conducted by calculating the percentage of fruits attacked on all fruit of each branch productive branch. Sample plant were consisted of four branches observations. Observations were made of the major diseases that attacked the coffee plant. Observations were made on leaves, fruit, stems, twigs and roots. Symptoms were recorded, documented and signs of an attack taken to the Laboratory for identification.

2.4. Data Analysis
Percentage of disease or attack incidence was calculated by dividing the numbers of diseased or attacked fruit per branch by the total number of fruits per branch observed, multiplied by 100%. The intensity data of pests and diseases were analyzed descriptively.

3. Results And Discussion

3.1. Pest Problems on Liberika Tungkal Komposit
Coffee fruit borer attack caused by *Hypotribas hampei* were found in all observation locations. Meanwhile, the attack of white lice caused by *Planococcus* sp. was found only in the village of Mandala Jaya, and the stem/twig borer caused by *Xylosandrus* sp. was found only in Mekar Jaya (Table 1). The attack intensity of each pest were presented in the Table 2.
Table 1. Identified problems of pests on LiberikaTungKal Komposit Coffee

| No. | Name of Pest / Location found | Symptoms / Signs of Attack |
|-----|------------------------------|---------------------------|
| 1.  | Coffee fruit borer (PBKo /Hypothenemushampei)/Mandala Jaya Village, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong) | ![Image](image1.jpg) |
| 2.  | White lice (Planococcus sp.)/Mandala Jaya | ![Image](image2.jpg) |
| 3.  | Twig borer (Xylosandrus sp.) /Mekar Jaya (Parit Tomo) | ![Image](image3.jpg) |

Table 2. The Attack Intensity of pests on LiberikaTungkal Komposit Coffee

| No. | Name of Pest                     | Attack Intensity (%) |
|-----|----------------------------------|----------------------|
| 1.  | Coffee fruit borer               | 4.17-11.17 (Average 9.03) |
| 2.  | White lice (Planococcus sp.)     | 0 – 3.40 (Average 0.01) |
| 3.  | Twig borer (Xylosandrus sp.)     | 0-0.30 (Average 0.07) |

The attack intensity of Libtukom coffee borer was obtained from five locations (Table 3). Overall, the average intensity of Libtukom coffee borer attack was below the control threshold (9.03%). The attack intensity above the control threshold was found in Parit Toto (Sri Utomo II and III) and Parit Lapis were 10.74%, 10.24%, and 11.17%, respectively, while in Parit Panglong and Serdang Jaya, the attack intensity of fruit borer attack Libtukom coffee were 8.86 and 4.17%, respectively.

Table 3. Average of Attack Intensity of Libtukom Coffee Fruit Bokers (PBKo) on Several Locations in Mekar Jaya and Serdang Jaya Village, Betara Subdistrict

| No. | Location of Garden (Village) | Average of Attack Intensity of Coffee Fruit Borer (%) |
|-----|------------------------------|------------------------------------------------------|
| 1   | Parit Tomo/Sri Utomo II (Mekar Jaya) | 10.74 |
| 2   | Parit Tomo/Sri Utomo III (Mekar Jaya) | 10.24 |
| 3   | Parit Lapis (Mekar Jaya) | 11.17 |
| 4   | Parit Panglong (Mekar Jaya) | 08.86 |
| 5   | Serdang Jaya | 04.17 |
|     | Average | 09.03 |

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The result of research at Parit Panglong showed that percentage intensity of PBKo attack is lower than research conducted by [13], the percentage of PBKo pest attack on Libtukom Coffee in ParitPanglong Village, Betara can reach 17.76%. White lice and twig borer are found with very low average attack intensity. Coffee fruit borer, white fleas and twigs are the most commonly reported pests attack on arabica or robusta coffee plants that live not in peatland [14,15,9,10].

White lice found in the village of Mandala Jaya on coffee fruit that was ripe and clustered on the fruit stalk, removed the honeydew and the soot fungus [16,17,18]. White lice in coffee attack the fruits and flowers when high pest populations can attack the shoots of plants, leaves, and young branches. Attacked flower buds, flowers and young fruit will dry and fall. Fruits that have grown and mature did not fall but experience abnormal growths resulting in wrinkled fruits and mature before the time. These reduce the quality of coffee beans. Loss of production due to severe attack until 90% [16]. In each coffee fruit found 3 - 19 Planococcuscitri that attacks the branches of flowers and young coffee fruit. Coffee flowers were attacked will look brown and fall. Attached young coffee fruit will be blackish green, while the coffee fruit that has been ripe in group which attacked will look red and black and then fall. Planococcus citri sucks water and breeds in the underarms of fruits, until adulthood and searches for other branches on the same tree that have not been attacked [17]. Planococcus citri produced honey dew which was very preferred by ants. Xylosandrus sp. (borer pest) found in Mekar Jaya characterized by one hole and the twig until broken. The Xylosandruscompactus characterized by the hole of about 1-2 mm indiameter on the surface of the coffee plant branch [15]. This hole leads until the inside of the twig to reach a length of 20-50 mm.

3.2. Plant Diseases Problems on Liberika Tungkal Komposit Coffee

Symptoms of fungus diseases of root and leaf rust was found in all observation sites of Mandala Jaya, Serdang Jaya, and Mekar Jaya Village (ParitTomo, Parit Lapis, ParitPanglong), whereas the Cephaleuros red rust was mainly found in Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong) (Table 4). The Average Intensity of disease incidence of root fungus diseases on Liberika Tungkal Komposit Coffee was highly (Table 5).

The dominant disease that occurs was root fungal fungus disease with initial symptoms were the wilting of coffee plants, and wilt symptoms can result in the death of the Libtukom coffee plant. Based on information obtained from farmer groups, farmers, and related agencies, it was stated that the symptoms of the disease that resulted in the death of coffee had started 1-2 years ago. The incidence of the diseases originated from certain spots, then clumped, and further developed into a population with widespread symptoms. At the planting site were also found some partially coffee, withered entirely, withered and partially dead, and died entirely. Observations on the neck roots of coffee plants that showed wilting symptoms found the presence of white mycelium. The fungus is thought to be a white root fungus that attacks Libtukom coffee plants. Morphology of white root fungus resembles a white root fungus that attacks rubber and other plantation crops [7]. The average intensity of disease incidence in Mandala Jaya Village was the highest (35.66%) and the lowest was in Mekar Jaya/ParitTomo/Sri Utomo III (Table 4).

Leaf rust disease symptoms which were encountered on the LiberikaTungkalKomposit coffee in TanjungJabung Barat Regency resembles the symptoms of leaf rust disease proposed by [17] that was characterized by yellow-orange spots such as powder (powder) and can be seen or found on the top and bottom surfaces of the leaves. On the underside of the leaves appears spots that initially light yellow, then turn into dark yellow. The orange or orange flour was a fungus H. vastatrix uredospores. In advanced symptoms, the leaves had brown spots joined together, become larger, then dry and fall off so the plants become bald [19,20,21]. Leaf rust disease in Libtukom coffee is the pathogenic fungus that attacks Libtukom coffee plant in Mekar Jaya Village, Betara Sub-district is Hemicelia sp. [22].
Table 4. Plant diseases problems on liberika tungkal komposit coffee

| No. | Name of Disease / Location                                                                                                           | Symptoms                                                                                                                                                                                                                                                                                                                                 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Root fungal diseases/ Mandala Jaya, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)                           | ![Image of root fungal disease symptoms](image1.png)                                                                                                                                                                                                                                                                                      |
| 2.  | Leaf rust/ *Hemileia vastatrix)* / Mandala Jaya, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)             | ![Image of leaf rust symptoms](image2.png)                                                                                                                                                                                                                                                                                               |
| 3.  | Alga red rust/ *Cephalaleuros* sp./Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)                                           | ![Image of alga red rust symptoms](image3.png)                                                                                                                                                                                                                                                                                           |

Table 5. The Average Intensity of Disease Incidence on Liberika Tungkal Komposit Coffee

| No. | Name of Disease / Location                                                                                                           | Average Intensity of Disease Incidence (%)                                                                                                                                                                                                                                                                                      |
|-----|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Root fungus diseases/ Mandala Jaya, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)                           | 23.41-35.66 (Average: 30.04)                                                                                                                                                                                                                                                                                                        |
| 2.  | Leaf rust/ *Hemileia vastatrix)* / Mandala Jaya, Serdang Jaya, and Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)             | 0-12.67 (Average: 0.24)                                                                                                                                                                                                                                                                                                          |
| 3.  | Alga red rust/ *Cephalaleuros* sp./Mekar Jaya (Parit Tomo, Parit Lapis, Parit Panglong)                                           | 0-14.26 (Average: 0.67)                                                                                                                                                                                                                                                                                                          |

Table 6. Intensity Diseases Incidence on Liberika Tungkal Komposit Coffee Root in Betara Subdistrict

| No. | Location Observation | Average Intensity of Libtukom Coffee Root Diseases Incidence (%) |
|-----|----------------------|---------------------------------------------------------------|
| 1.  | Mekar Jaya/Parit Tomo/ Sri Utomo II | 31.54                                                         |
| 2.  | Mekar Jaya/Parit Tomo/Sri UtomoII   | 23.41                                                         |
| 3.  | Mekar Jaya /Parit Panglong          | 26.52                                                         |
| 4.  | Mekar Jaya /Parit Lapis             | 30.47                                                         |
| 5.  | Serdang Jaya                     | 32.64                                                         |
| 6.  | Mandala Jaya                     | 35.66                                                         |
| 7.  | Average                           | 30.04                                                         |
The symptoms of red rust disease on coffee leaves both on the old leaves and young leaves were the appearance of spots-shaped round, thick, arise, and hairy consisting of colonies of green algae, the colours was grayish green and then turned into the brown orange, finally leaves dry and fall. The result of disease identification was *Cephaleuros* sp. [19, 23].

4. Conclusion

Pests and diseases problems identified on Liberika Tungkal Komposit coffee that grow at peatlands were coffee fruit borer (*Hythenemus hampei*), white lice (*Planococcus* sp.), twig/stem borer (*Xylosandrus* sp.), root fungus diseases, leaf rust (*Hemileia vastatrix*) and Algae red rust (*Cephaleuros* sp.). The attack intensity of fruit borer and the deseases incident of root fungus diseases on Libtukom coffee was higher than the other pests or diseases.

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