DOI: https://doi.org/10.33487/edumaspul.v9i1

EDUMASPUL
JURNAL PENDIDIKAN

Vol 10 No. 01 (2026) page 1-6

p-ISSN 2548-8201 | e-ISSN 236-0469
https://ummaspul.e-journal.id/maspuljr/

Inventory of Pests and Diseases of Figure-Eight Kaffir Lime (*Citrus hystrix* D.C.) Plants on Sandy Land

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Abstrak

Penelitian ini bertujuan untuk mengidentifikasi keanekaragaman hama dan penyakit yang berasosiasi dengan tanaman jeruk purut (*Citrus hystrix* D.C.) di PT Al Fatih Porang, Kabupaten Sidenreng Rappang, pada lahan berpasir kering. Penelitian dilakukan melalui metode survei pada fase pertumbuhan generatif sebelum tanaman memasuki fase senesen. Sebanyak 200 tanaman sampel dipilih dari total populasi 1.020 tanaman menggunakan metode pengambilan sampel garis diagonal. Hama serangga didokumentasikan melalui fotografi lapangan dan diidentifikasi berdasarkan karakter morfologinya, sedangkan penyakit diidentifikasi berdasarkan gejala visual yang muncul pada tanaman. Hasil penelitian menunjukkan adanya empat jenis hama serangga dominan dan empat jenis penyakit dominan yang berasosiasi dengan tanaman jeruk purut di lokasi penelitian. Keberadaan hama dan penyakit tersebut menunjukkan bahwa kompleks organisme pengganggu pada jeruk purut relatif beragam dan memiliki karakteristik yang serupa dengan yang umum ditemukan pada tanaman jeruk lainnya. Hasil penelitian ini dapat menjadi dasar dalam penyusunan strategi pengelolaan hama dan penyakit yang efektif pada budidaya jeruk purut di lahan berpasir kering.

Kata kunci: *Citrus hystrix* D.C, keanekaragaman, hama, gejala, penyakit.

Abstract

This study aimed to identify the diversity of pests and diseases associated with kaffir lime (Citrus hystrix D.C.) cultivated at PT Al Fatih Porang, Sidenreng Rappang Regency, on dry sandy land. The research was conducted using a survey method during the generative growth stage before the plants entered the senescence phase. A total of 200 sample plants were selected from a population of 1,020 plants using a diagonal sampling method. Insect pests were documented through field photography and identified based on their morphological characteristics, while diseases were identified based on the visual symptoms observed on the plants. The results revealed the presence of four dominant insect pest species and four dominant diseases associated with kaffir lime plants in the study area. The occurrence of these pests and diseases indicates that the pest complex associated with kaffir lime is relatively diverse and shares characteristics commonly found in other citrus species. These findings provide a basis for developing effective pest and disease management strategies for kaffir lime cultivation on dry sandy soils

Keywords: *Citrus hystrix, diversity,pest, symptoms, deseases*

Introduction

Kaffir lime (*Citrus hystrix* D.C.) is one of the citrus species widely cultivated in tropical and subtropical regions. Although this plant is not primarily valued for its fruit due to its strong acidic taste, its leaves have high economic value because they are commonly used as an aromatic ingredient in food, herbal products, and traditional preparations. In particular, the figure-eight kaffir lime variety has distinctive leaves resembling the number eight (Al Zarliani et al., 2021), making it an important commodity in certain citrus production areas.

PT Al Fatih Porang Indonesia, located in Sidenreng Rappang Regency, is one of the agricultural companies that cultivates figure-eight kaffir lime as a commercial crop (Agussalim et al., 2024; Ramadhan

et al., 2024). The cultivation area is characterized by dry sandy soil, which presents specific challenges for plant growth and crop management. Sandy soil generally has low water-holding capacity, limited nutrient retention, and high drainage rates. These conditions may influence plant vigor and can also affect the development and distribution of pests and diseases in the field.

Pests and diseases are among the major limiting factors in citrus cultivation. In kaffir lime production, pest attacks and disease infections may reduce vegetative growth, damage young shoots and leaves, lower leaf quality, and affect fruit appearance. Since the main economic value of figure-eight kaffir lime lies in its vegetative parts, particularly the leaves, damage caused by insect pests and plant diseases can directly reduce crop productivity and market quality. Therefore, information on the types and diversity of pests and diseases associated with this plant is essential for effective crop protection.

Inventory studies are important as an initial step in identifying dominant pests and diseases in a plantation area. Through field observation, documentation, and identification, farmers and researchers can obtain basic information regarding pest occurrence, disease symptoms, and their potential impacts on crop performance. Such information is useful for developing appropriate pest and disease management strategies, especially in dry sandy land conditions where environmental factors may influence pest population dynamics and disease development.

However, studies concerning the diversity of pests and diseases associated with figure-eight kaffir lime cultivated on dry sandy land remain limited. Most citrus pest and disease studies focus on common citrus species, while specific information on *Citrus hystrix* D.C., particularly the figure-eight variety, is still lacking. Therefore, this study was conducted to inventory and identify the dominant insect pests and disease symptoms found on figure-eight kaffir lime plants cultivated on dry sandy land at PT Al Fatih Porang Indonesia, Sidenreng Rappang Regency.

The results of this study are expected to provide baseline information for further research and support the development of integrated pest and disease management strategies for figure-eight kaffir lime cultivation. In addition, the findings may contribute to more effective monitoring, early detection, and sustainable management of citrus pests and diseases under dry sandy land conditions.

Method

This research was conducted at the plantation area of PT Al Fatih Porang Indonesia, located in Sidenreng Rappang Regency, South Sulawesi, Indonesia. The study area is characterized by dry sandy land conditions, which are commonly associated with low water retention, limited nutrient availability, and specific microclimatic conditions. The research was carried out for two months, from January to February 2026, during the generative growth phase of figure-eight kaffir lime (*Citrus hystrix* D.C.) plants, but before the plants entered the senescence stage.

The materials used in this study consisted of figure-eight kaffir lime plants showing signs of pest infestation and disease symptoms. Observations focused on plant organs such as leaves, shoots, stems, flowers, and fruits. The equipment used included field observation sheets, stationery, a camera or smartphone for photographic documentation, identification guidebooks, insect identification keys, plant disease references, and Android-based supporting applications for preliminary pest and disease diagnosis (Sukri dan Rakhmad, 2016) .

This study employed a field survey method combined with direct visual observation and photographic documentation. The survey method was selected because it allows researchers to observe the actual condition of plants in the field and identify pests and disease symptoms directly on the affected plant parts. Photographic documentation was used to support the identification process and to provide visual evidence of pest presence and disease symptoms found during field observations (Gazali & Ilhamiyah, 2023).

The kaffir lime plantation consisted of approximately 1,020 plants, from which 100 plants were selected using a diagonal sampling method. These plants served as the primary sampling units for both pest and disease assessments. Disease observations incorporated four subsamples representing the cardinal directions around each selected plant. Overall, a total of 200 observation units were evaluated. The distance between sampled plants was approximately 6 m, ensuring representative coverage of the plantation area.

Pest identification was carried out through purposive random observation in three main stages. The first stage was direct observation of plant parts to detect the presence of insects or pest damage symptoms. The second stage was specimen collection, in which insects or visible signs of pest activity were documented or collected when necessary. The third stage was identification, where the observed insects were identified based on morphological characteristics using insect identification references and supporting guidebooks.

Disease identification was conducted based on visible symptoms found on kaffir lime plants (Fig.1).

Symptoms such as leaf spots, leaf decay, scab lesions, fruit rot, discoloration, necrosis, and abnormal plant tissue development were carefully observed and recorded. The observed disease symptoms were then compared with descriptions in plant disease guidebooks and relevant references. Each symptom was documented photographically to assist the analysis and strengthen the accuracy of disease identification.

Figure 1. Field Observation and Image Documentation

The data obtained from field observations were analyzed descriptively. Pest species and disease symptoms were classified based on their dominant occurrence in the plantation. The results were then presented in the form of descriptions, tables, and photographic documentation. This descriptive analysis was used to explain the diversity of pests and diseases associated with figure-eight kaffir lime plants cultivated on dry sandy land, as well as their potential effects on plant growth, leaf quality, and fruit condition.

Result

Field observations were conducted under hot weather conditions, with an average temperature ranging from 30 to 32 °C, relatively high light intensity, and an average humidity of approximately 70%. These environmental conditions provided a suitable context for observing the presence of pests and disease symptoms on figure-eight kaffir lime (*Citrus hystrix* D.C.) plants cultivated on dry sandy land. The survey results showed that several insect pests and disease symptoms were present in the plantation area.

The inventory of insect pests indicated that four dominant pest groups were found on figure-eight kaffir lime plants, namely citrus butterfly (*Papilio demoleus*), citrus leafminer (*Phyllocnistis citrella*), aphids, and green grasshopper (*Oxya chinensis*). These insects were observed on different plant parts, especially young leaves, shoots, flowers, and fruiting parts. The presence of these pests suggests that figure-eight kaffir lime plants are susceptible to various types of insect attacks during their growth phase.

The citrus butterfly (*Papilio demoleus*) (Fig. 2a) was one of the dominant insects observed in the plantation. This pest was identified based on its morphological characteristics, including black wings with pale-yellow spots, club-shaped antennae, and typical features of the *Papilionidae* family (Yasmin & Suwarno, 2006). In the larval stage, this insect has the potential to damage citrus leaves by feeding on young foliage, which may reduce the photosynthetic capacity of the plant.

The citrus leafminer (*Phyllocnistis citrella*) (Fig. 2b) was also found as an important pest associated with the observed plants (Fig.2a). The larvae were identified by their slender, flattened, and almost transparent bodies, as well as their characteristic winding tunnels or mines on the surface of young leaves. Leafminer damage was mainly visible on young leaves, where the feeding activity caused deformation, curling, and reduced leaf quality (Arshad et al., 2019).

Aphids (Fig.2c) were observed mainly on young shoots and flowers. The symptoms associated with aphid infestation included curled leaves, deformed young shoots, and damage that remained visible as the leaves matured. Aphids were identified as sap-sucking insects that may weaken the plant by extracting phloem sap and reducing the normal development of new flushes.

The green grasshopper (*Oxya chinensis*) (Fig. 2d) was identified based on feeding symptoms such as irregular holes, jagged leaf margins, and torn leaf blades. Damage caused by this insect was particularly visible on young leaves. Although this pest is generally considered a minor or opportunistic pest on citrus, its presence in the plantation indicates the need for regular monitoring, especially in areas with abundant weeds or poor field sanitation.

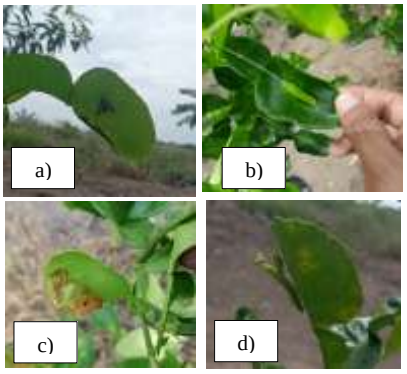

Figure 2. Insect pests from the field were photograph

In addition to insect pests, four dominant disease symptoms were identified on figure-eight kaffir lime plants. These included citrus leaf rot, citrus scab on leaves, citrus scab on fruits, and anthracnose fruit rot. The disease symptoms were mainly observed on leaves and fruits (Fig.3), with visible signs such as necrotic spots, corky lesions, leaf decay, fruit surface roughness, and dark sunken spots on fruit skin

kehitaman (Arief et al., 2024; Ivan et al., 2024; Zhang et al., 2024).

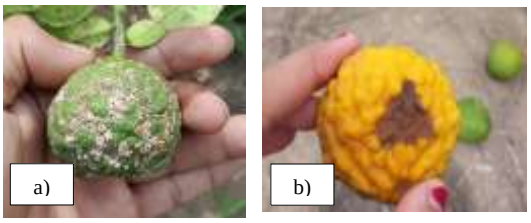

Figure 3. diseases symptoms were captured

Overall, the results showed that figure-eight kaffir lime plants cultivated on dry sandy land were associated with diverse pest and disease problems. The dominant pests mainly affected young leaves and shoots, while the disease symptoms were more visible on leaves and fruits. These findings indicate that pest and disease inventory is important as a basis for developing appropriate monitoring and integrated management strategies in figure-eight kaffir lime cultivation.

Discussion

The results of this study indicate that dry sandy land conditions may influence the occurrence and distribution of pests and diseases on figure-eight kaffir lime plants. Sandy soil generally has low water retention and limited nutrient availability, which can affect plant vigor and increase plant susceptibility to pest attacks and disease infection. In addition, high temperature and moderate humidity during observation may support the activity of certain insect pests and the development of disease symptoms.

The presence of *Papilio demoleus* in the plantation is important because this species is known as a citrus pest, particularly during its larval stage. The larvae feed on citrus leaves and may cause defoliation when population levels are high (Borror et al., 2005). Damage to young leaves is especially harmful because it can reduce the photosynthetic area and disturb vegetative growth, which is significant for figure-eight kaffir lime because its leaves are economically valuable.

The occurrence of *Phyllocnistis citrella* is also a major concern in figure-eight kaffir lime cultivation. This pest damages young leaves by mining inside the leaf tissue, creating winding galleries that reduce leaf quality. The damage caused by leafminer larvae may also create entry points for secondary pathogens, including bacteria or fungi, which can worsen leaf damage and increase the risk of disease development in the plantation.

Aphid infestation can cause both direct and indirect damage to citrus plants. Direct damage occurs through sap-sucking activity, which causes young shoots and leaves to curl, wilt, or become stunted. Indirectly, aphids may produce honeydew that supports the growth of sooty mold on leaf surfaces, reducing photosynthesis. In citrus cultivation, aphids are also important because some species can act as vectors of viral diseases, making their presence a serious management concern.

The green grasshopper (*Oxya chinensis*) found in the plantation appears to function as a minor or opportunistic pest. Its feeding activity caused irregular holes and jagged leaf margins, especially on young leaves. Although the level of damage may not be as severe as that caused by major citrus pests, high grasshopper populations can still reduce leaf area and affect plant growth, particularly in young plants or poorly maintained fields with high weed density.

The observed disease symptoms, especially citrus leaf rot and citrus scab, indicate that leaf and fruit tissues were affected by pathogenic organisms. Leaf rot symptoms, such as necrosis, blackish spots, curling, and leaf decay, may reduce photosynthetic efficiency and weaken the plant (Xin et al., 2014).. Citrus scab on leaves and fruits can reduce the visual and market quality of plant products, particularly when corky lesions develop on fruit surfaces (Dinata, 2019).

Anthracnose fruit rot is another important disease symptom observed in this study. The presence of dark brown to black necrotic spots, sunken lesions, and wrinkled fruit surfaces indicates infection commonly associated with *Colletotrichum* spp. Although figure-eight kaffir lime is mainly valued for its leaves, fruit infection remains important because it reflects the overall health condition of the plant and may serve as a source of inoculum for further disease spread.

Based on these findings, integrated pest and disease management is necessary in figure-eight kaffir lime plantations on dry sandy land. Regular field monitoring, early identification of pest populations and disease symptoms, sanitation of infected plant parts, weed control, canopy pruning, and the use of appropriate biological or chemical control methods should be considered. These strategies are essential to reduce pest and disease pressure, maintain leaf quality, and support sustainable production of figure-eight kaffir lime.

Conclusion

This study concluded that figure-eight kaffir lime (*Citrus hystrix* D.C.) cultivated on dry sandy land at

PT Al Fatih Porang Indonesia was associated with various insect pests and disease symptoms. The dominant insect pests identified in the plantation were citrus butterfly (*Papilio demoleus*), citrus leafminer (*Phyllocnistis citrella*), aphids, and green grasshopper (*Oxya chinensis*). These pests mainly attacked young leaves, shoots, and flowers, causing symptoms such as leaf curling, leaf mines, irregular holes, jagged leaf margins, and reduced vegetative growth.

The dominant disease symptoms observed were citrus leaf rot, citrus scab on leaves, citrus scab on fruits, and anthracnose fruit rot. These diseases were characterized by necrotic spots, corky lesions, leaf decay, fruit surface roughness, sunken dark spots, and fruit rot. The presence of these symptoms indicates that figure-eight kaffir lime plants are vulnerable to both pest infestation and pathogenic infection, especially under dry sandy land conditions.

Environmental conditions such as high temperature, strong light intensity, moderate humidity, and sandy soil characteristics may contribute to the development and distribution of pests and diseases in the plantation. Sandy soil with low water and nutrient retention can reduce plant vigor, making plants more susceptible to pest attacks and disease infection.

Therefore, regular monitoring and early identification of pests and diseases are essential for maintaining the productivity and quality of figure-eight kaffir lime plants. Integrated pest and disease management strategies, including field sanitation, weed control, canopy pruning, removal of infected plant parts, and appropriate control measures, should be implemented to minimize crop damage and support sustainable cultivation of figure-eight kaffir lime on dry sandy land.

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