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Diversity of Pathogenic Fungal Leaf Blight on Corn Plants In Tanjung Pering Village, North Indralaya District

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ABSTRACT

The decline in corn production due to leaf blight reached 15%, equivalent to US$1.0 billion. In South Sumatra, the incidence of leaf blight disease in corn plants reached 98%. However, there have been few reports on the various pathogens that can cause corn leaf blight in South Sumatra. The purpose of this study was to determine the incidence of disease, the intensity of disease attack, and the diversity of fungal pathogens causing leaf blight disease in Tanjung Pering Village, North Indralaya, South Sumatra. The methods used in this study were observation of disease incidence and disease attack intensity, and purposive random diagonal sampling of plants. Observations were conducted at weekly intervals for five times, and the plant samples were identified at the Plant Pathology Laboratory of the Department of Plant Pests and Diseases. The results show that the incidence of corn leaf blight reached 100% with an average disease intensity of 28.60%. Identification of the pathogens causing the disease revealed differences in fungal species and numbers between observations. The diversity index for each observation was <1, and the dominance index was small or close to 0. The pathogenic fungi causing corn leaf blight consisted of B. sacchari, B. maydis, B. panici-miliacei, B. oryzae, H. juglandinum, H. microsorum, H. quercicola, H. velutinum, C. pseudobrachyspora, and *C. dactyloctenicola*. Thus, based on the observation results, the intensity of leaf blight disease attack was classified as low, with a low species diversity index and a low dominance index.

Keywords: Diversity, fungal pathogen, leaf blight, *Zea mays*

INTRODUCTION

Indonesia is an agrarian country with the majority of its population working in agriculture. Corn (*Zea mays* L.) is one of the crops widely cultivated by farmers in Indonesia (Agung et al., 2020; Asriani et al., 2025; Bdr et al., 2020; Mu et al., 2026; Ridwan et al., 2025). Corn (*Zea mays* L.) is a food crop that plays an important role in strategies to boost Indonesia's economy (Ramayana et al., 2021). Corn is widely used as a major source of carbohydrates and protein after rice (Asriani et al., 2025; Indah et al., 2025; Saragih et al., 2024). In addition to being a source of carbohydrates, corn can also be used as animal feed, in industry, or for other purposes. According to data from the Kementerian Pertanian, (2018) Corn productivity in South Sumatra in 2018 increased by 6.35% compared to 2017. Good corn cultivation practices must accompany high corn productivity (Indah et al., 2025)

Corn (*Zea mays*) is one of the most widely cultivated horticultural crops in Indonesia. The high economic value of corn is evident from the community's high demand to meet various needs. This is evident in the use of corn as a staple food, animal feed, fuel, and for medical purposes, as well as in its richness in vitamins and minerals (Huma et al.,

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2019). In addition, corn is a food crop with important commercial value worldwide (Midega et al., 2018). According to Iderawumi (2018), corn is the third most important staple crop after rice. Corn contains 72% starch, 4% fat, 10% protein, and 365 kcal/100 g (Ranum et al., 2014). A decline in corn production can be caused by disease. Diseases commonly found to attack sweet corn (*Zea mays* L.) include blight, rust, and smut (Rondo et al., 2016). Corn leaf blight disease has early symptoms in the form of small spots. These spots will spread and merge with other spots, causing necrosis in corn leaves (Hamidson & Suwandi, 2019). Rust disease shows reddish pustules on the leaves, with symptoms that continue to spread in line with the plant's age (Rondo et al., 2016). Meanwhile, mildew is a disease that commonly attacks susceptible corn plants and can even cause crop failure if it attacks plants at 10-24 days after sowing (Talanca & Tenrirawe, 2015).

Leaf blight disease is one of the most significant diseases affecting maize crops (Arnold Bruns, 2017). Leaf blight disease reduces crop yields by up to 15%, or the equivalent of US$ 1.0 billion (Arnold Bruns, 2017). According to (Bhandari et al., 2017), leaf blight disease mainly affects hot and humid subtropical and tropical regions such as Indonesia. The incidence of leaf blight disease in South Sumatra reaches 98% (Hamidson & Suwandi, 2019). In corn crops with vulnerable conditions and a wet tropical climate, losses due to leaf blight disease reach 50% (Muis and Uriani 2015). This disease attacks all phases of corn plant growth, reducing production (Mueller et al., 2020; Sari et al., 2024). Leaf blight, a disease that attacks corn plants, can be caused by several pathogenic fungi. According to Hamidson & Suwandi, (2019). Corn leaf blight is caused by *Helminthosporium* sp, *Bipolaris* sp, and *Exserohilum* sp. Thus, this study was conducted to determine the intensity of the disease and disease outbreaks, as well as the diversity of fungal pathogens causing leaf blight in Tanjung Pering Village, North Indralaya, South Sumatra. The objectives of this study were to determine the incidence and intensity of corn leaf blight caused by pathogenic fungi in corn plants in Tanjung Pering Village, North Indralaya, South Sumatra.

MATERIAL AND METHOD

The research was conducted on corn fields in Tanjung Pering Village, North Indralaya District, Ogan Ilir Regency, South Sumatra Province. The tools and materials used in the research were stationery, cover glass, syringes, cameras, microscope slides, microscopes, alcohol, distilled water, and samples of diseased plants. Direct observation of the farmers' fields and plant sampling were conducted using a diagonal purposive random sampling pattern. Observations were made at weekly intervals. The data collected consisted of primary data obtained in the field to identify fungal pathogens causing blight, and secondary data from interviews with farmers. Observations were made to determine and observe the population and symptoms of leaf blight disease in corn plants. These observations will be used as a reference for further research. Observations were made by collecting disease samples from corn plants exhibiting blight symptoms. Interviews were conducted directly with corn farmers about the technical cultivation methods they use and the reasons for choosing to cultivate corn.

Documentation was conducted as part of the data collection process. In the implementation of the research, documentation became concrete evidence of what had been studied. Documentation was conducted to corroborate the data obtained using mobile phone cameras.

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The documentation results were photographs. The observation location was in Tanjung Pering Village, North Indralaya District, Ogan Ilir Regency, South Sumatra Province. The research area covered 1.5 hectares. Sampling was carried out by first determining the observation plots. The observation plots were arranged diagonally, with each side measuring 15 metres. Purposive random sampling was carried out. Ten plants were sampled from each observation plot. Sampling was conducted five times, with a one-week observation interval between samples. The parameters observed were disease incidence, disease intensity, and the diversity of pathogen types causing leaf blight. The diversity of fungal pathogens causing leaf blight was calculated using the method described by Ariyanto et al. (2013). This calculation was performed using the Shannon-Wiener diversity index (H') and the Simpson dominance index. The incidence of D infestation using the formula (Supriatna *et al.,* 2017), namely:

$$P = \frac{A}{B} \times 100\%$$

Notes :
P = Percentage incidence (occurrence) of pest or disease attacks (%)
A = Total number of plants affected,
B = Total number of plants observed
The intensity of disease attacks is measured using a disease attack intensity category/scale, where damage (0%) = score 0, minor (≤25%) = score 1, moderate (>25-50%) = score 2, severe (>50-75%) = score 3, and very severe (≥75%) = score 4 (Triwidodo & Tanjung, 2020). This calculation follows the research formula used by Zahrawati *et al.,* (2021) namely:

$$I = \frac{\Sigma\,(n \times v)}{Z \times N} \times 100\ \%$$

Notes :
I = Intensity of pest and disease attack (%)
N = Number of plants or plant parts attacked on a specific scale
v = Number of plants or plant parts observed
n = Number of plants or plant parts observed
Z = Highest scale value of the established attack symptom category (v=4)

Data Analysis

The calculation of pathogen infestation was performed using Microsoft Excel software, and then the data obtained was presented in graph form and analyzed descriptively**.**

RESULT AND DISCUSSION

The research was conducted on farmland in Tanjung Pering Village, Indralaya Utara Subdistrict, Ogan Ilir Regency, South Sumatra Province. The majority of the population of Tanjung Pering Village works as farmers. One of the crops widely cultivated by local farmers is corn. Based on interviews with farmers, the observed plot of land covered 1.5 hectares. Corn is planted in polyculture with pumpkin (*Cucurbita moschata*). Corn cultivation is carried out continuously without crop rotation. The corn variety used is Bonanza F1. Symptoms of leaf blight appear as small spots that enlarge (blight). Based on observations, leaf blight was found to be prevalent on the lower leaves (old leaves) (Figure 1). Leaf blight on old leaves showed Symptoms of dead and dried leaf tissue (necrosis) until the leaves turned brown. Meanwhile, on the upper leaves, the symptoms appeared as relatively large spots or elliptical lesions with grey-to-brownish colouration.

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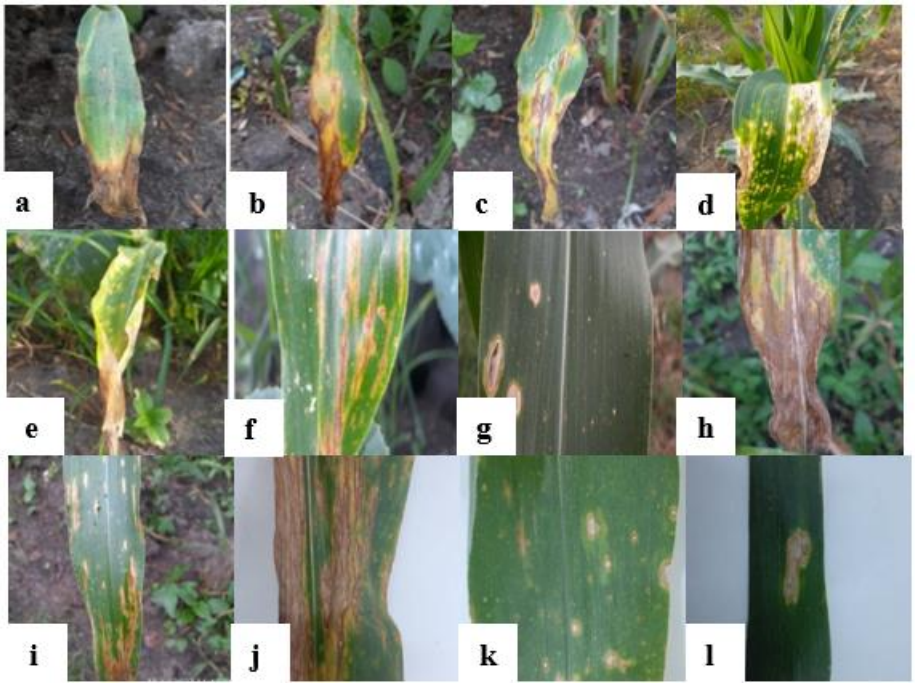

Figure 1. Symptoms of attack in the field: 24 HST (a, b, c), 32 HST (d, e), 39 HST (f, g), 46 HST (h, i), 53 HST (j, k, l)

Leaf blight disease in corn plants is common in both the vegetative and generative phases. The most common symptoms are found on older leaves (lower leaves). According to Girsang et al., (2020). Spots will first appear on the lower leaves, then develop and spread to infect the younger leaves (upper leaves). The symptoms observed in the field vary widely, ranging from small spots to leaf drying and necrosis. According to (Hamidson & Suwandi, 2019)Corn leaves infected with leaf blight disease show small, elongated, round spots that develop into large oval-shaped spots.

Plants showing symptoms of disease in the field were taken to the laboratory for microscopic observation. The results of identifying fungal pathogens in the field varied widely. The identification of fungal pathogens was carried out using reference sources for comparison and to reinforce the identification results (Figure 2).

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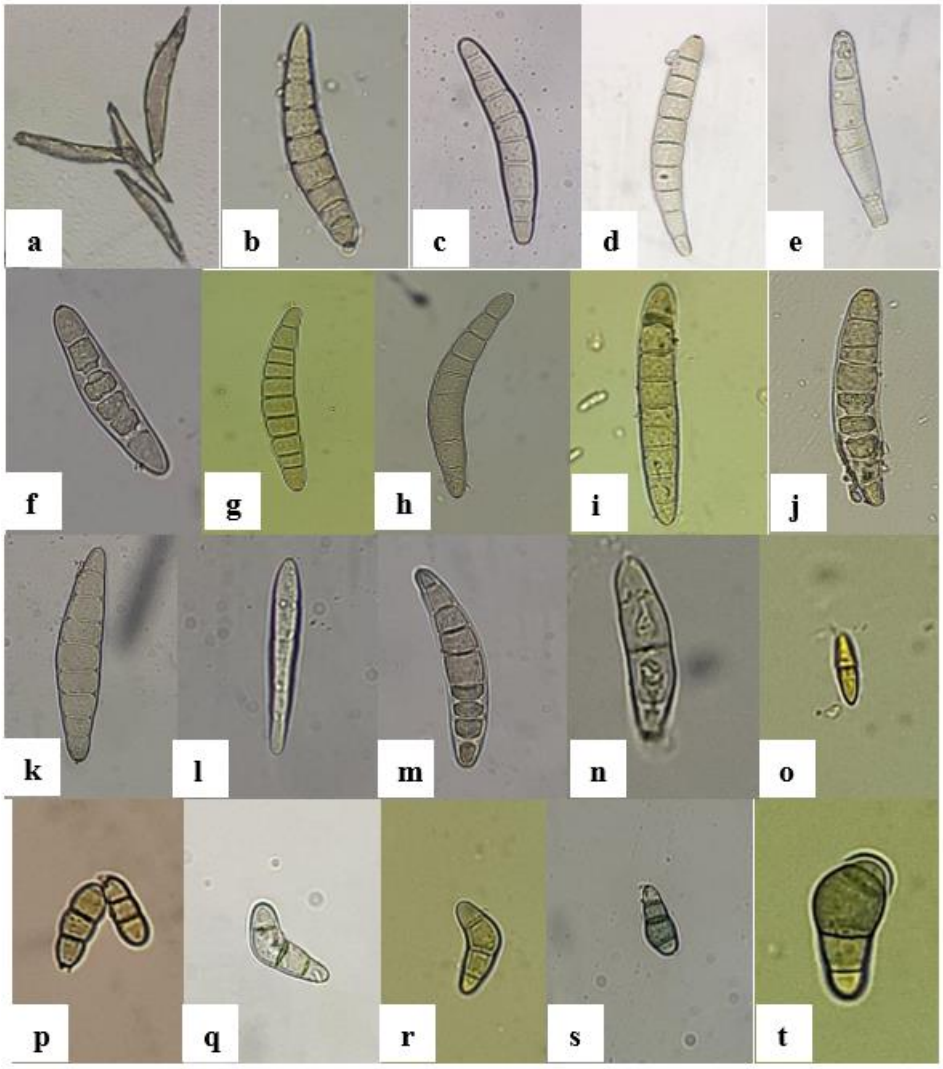

Figure 2. Pathogenic fungi causing corn leaf blight: *Bipolaris sacchari* (a), *Bipolaris maydis* (b,c,d,e,f,g,h,I,j), *Bipolaris panici-miliacei* (k,l,m), *Helminthosporium juglandinum* (n), *Bipolaris oryzae* (o), *Helminthosporium microsorum* (p), *Helminthosporium quercicola* (q), *Helminthosporium velutinum* (r), *Curvularia dactyloctenicola* (s,t), *Curvularia pseudobrachyspora* (u,v)

Identification of plant samples showing symptoms of leaf blight disease showed that there were differences in the types and numbers of fungi found on five different ages of corn plants. Observations were made by identifying samples using a microscope. In general, the fungi found were from the genera *Curvularia* sp. and *Bipolaris* sp. (synonym Helminthosporium sp.). The genus Bipolaris was previously known as the genus Helminthosporium. Based on taxonomic improvements, the genus Helminthosporium was divided into four genera consisting of *Drechslera, Bipolaris, Exserohilum,* and *Curvularia*, which share morphological similarities and are referred to as helminthosporoids (Manzar et al., 2022). Some of these genera can cause corn leaf spot disease through mixed infections (Hossain et al., 2024; Strunk & Byamukama, 2019). This results in the identification of corn plant samples affected by leaf blight, revealing two types of pathogens causing the infection.

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Observations of the incidence of disease or the percentage of leaf blight attacks on corn plants in Tanjung Pering Village, North Indralaya Subdistrict, showed a 100% incidence. This percentage indicates that all observed plants in the sample exhibited symptoms of leaf blight. The intensity of disease attack, or severity, of corn leaf blight observed in Tanjung Pering Village, North Indralaya Subdistrict, varied among plots (Figure 3).

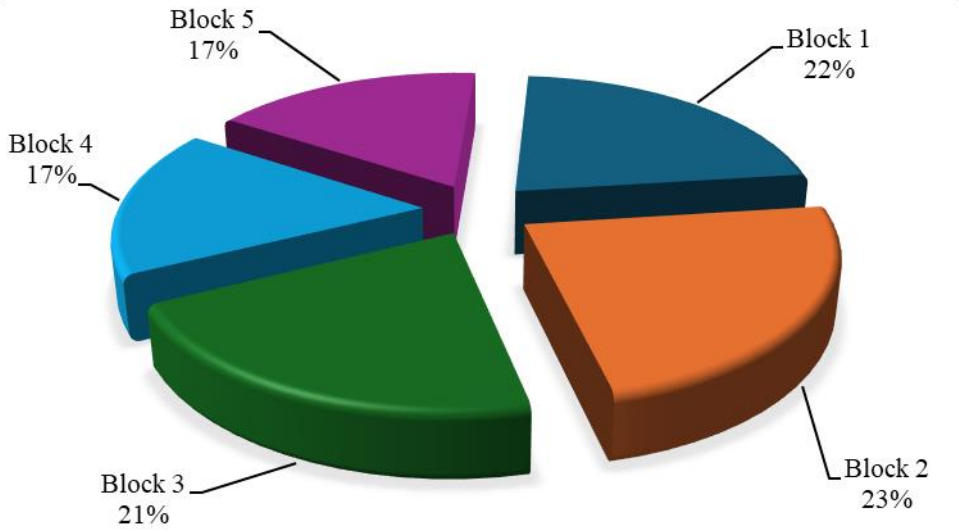

Figure 3. Intensity of leaf blight disease attacks on corn crops

Incidence Observations: The incidence and intensity of corn leaf blight in the field were classified as moderate, with corn plants showing moderate resistance to the disease. Cultivation methods, including weed sanitation and crop rotation, greatly influence the intensity of disease attacks in the field. An increase in the intensity of leaf blight attacks is associated with the presence of weeds, which cause higher micro-humidity conditions that support the development of the disease (Hamidson & Suwandi, 2019). In addition, cultivation methods without crop rotation greatly support the presence of disease inoculum. According to Strunk & Byamukama, (2019) A high-humidity environment supports the fungus that causes leaf blight in producing spores on previously infected plant residues. Thus, disease attacks will continue throughout the growing season.

Based on disease intensity observations in the observation plots, the highest incidence was observed in observation plot 2, at 33.27%. Meanwhile, the lowest disease intensity was found in observation plot 4, at 23.82%. The average disease intensity results indicate that the attack criteria fall into the moderate attack category. Meanwhile, the resistance of corn plants to leaf blight was classified as moderate.
The results of identifying plant samples collected during five observations and across two phases of corn plant life revealed the diversity of fungal pathogens causing leaf blight (Table 1). Identification was performed on the samples collected to determine the types of pathogens causing the disease (Figure 4). Based on the table, the types and numbers of fungi found were identified. The observation results showed that in the generative phase, the types of fungi found were more diverse than in the

vegetative phase. This was because, in one plant sample during the generative phase, several types of fungi were found.

Table 1. Number of plants affected by fungal pathogens causing corn leaf blight

Age of Plants	Pathogen	Number of plants attacked
24 HST	*Bipolaris maydis*	26
	Bipolaris panici-miliacei	9
	Bipolaris sacchari	15
32 HST	*Bipolaris maydis*	38
	Bipolaris panici-miliacei	12
39 HST	*Bipolaris maydis*	50
	Curvularia pseudobrachyspora	21
46 HST	*Bipolaris maydis*	28
	Bipolaris oryzae	22
	Bipolaris panici-miliacei	22
	Curvularia dactyloctenicola	21
	Helminthosporium juglandinum	22
53 HST	*Bipolaris maydis*	46
	Curvularia dactyloctenicola	20
	Curvularia pseudobrachyspora	24
	Helminthosporium quercicola	20
	Helminthosporium microsorum	24
	Helminthosporium velutinum	6

Notes: population of plant 50

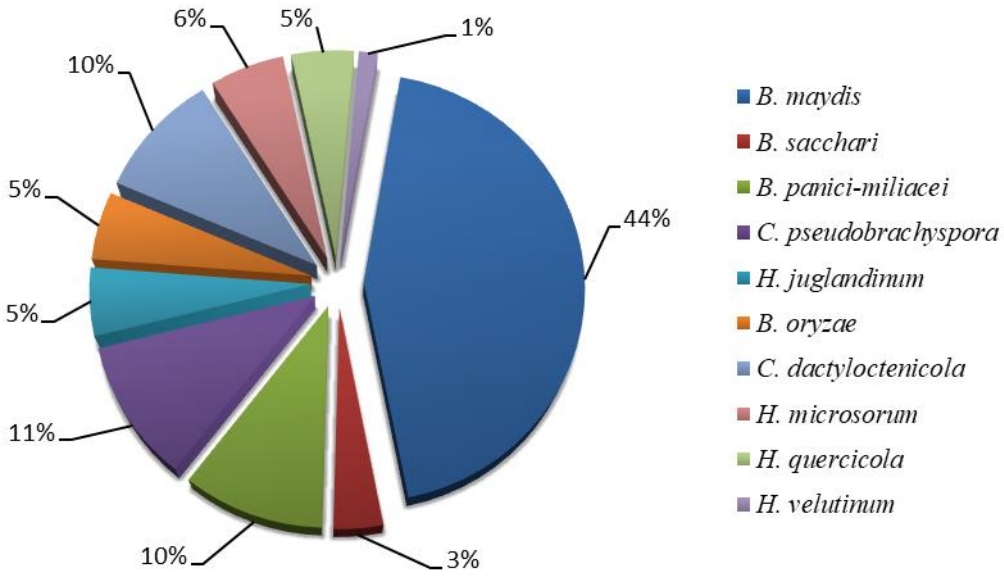

Figure 4. Diversity of fungi causing leaf blight disease in corn crops

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Observations on corn plants regarding the diversity index and dominance of fungal pathogens causing blight showed that the highest diversity index was for B. sacchari, and the highest dominance index for B. maydis (Figure 5).

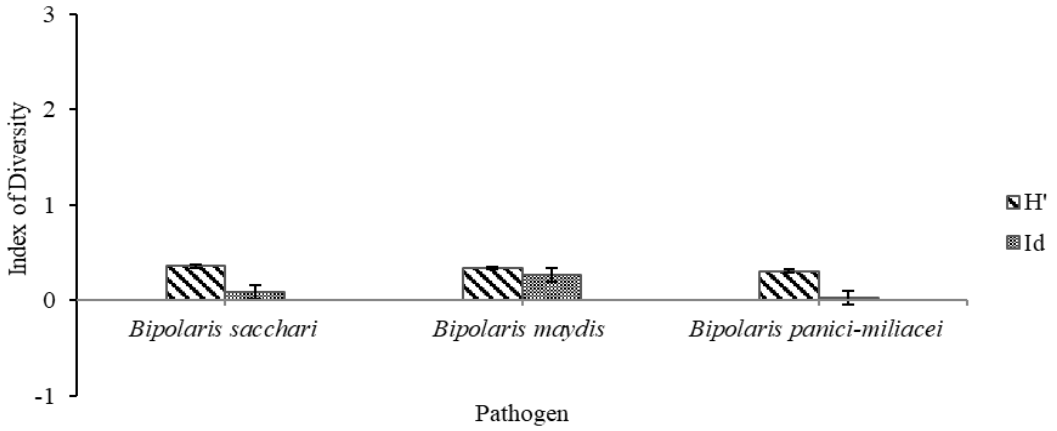

Figure 5. Diversity and dominance indices of pathogenic fungi causing leaf blight disease in corn plants aged 24 HST

Based on these results, the diversity index for the three types of fungi, namely B. sacchari 0.361, B. maydis 0.340, and B. panici-miliacei 0.309, was calculated. These values indicate that the diversity index is in the low category, as seen from the calculation results where H' shows a value <1. Meanwhile, based on the dominance index values for the three types of fungi, the dominance level is low, indicating that no type of fungus dominates the observation area. The results of observations on corn plants regarding the diversity and dominance indices of fungal pathogens causing blight in 32-day-old corn plants show that the highest diversity index was found in the fungus B. panici-miliacei at 0.342, and the highest dominance index was found in the fungus B. maydis at 0.577 (Figure 6).

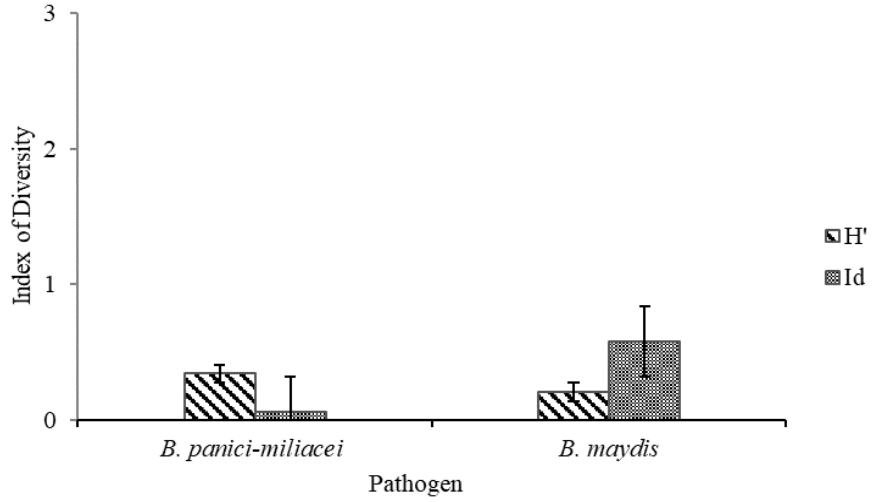

Figure 6. Diversity and dominance indices of pathogenic fungi causing leaf blight disease in 32 HST

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Based on the values obtained, the diversity index for both types of fungi falls in the low category. This can be seen from the H' value, which is <1. Meanwhile, the dominance index of B. maydis is 0.577, with a value approaching 1, indicating that B. maydis has a moderate level of dominance. Meanwhile, *B. panici-miliacei* showed a low dominance index of 0.057. Observations on corn plants regarding the diversity and dominance indices of fungal pathogens causing blight disease in 39-day-old corn plants showed that the highest diversity index was found in the fungus B. pseudobrachyspora at 0.360, and the highest dominance index was found in the fungus B. maydis at 0.495 (Figure 7).

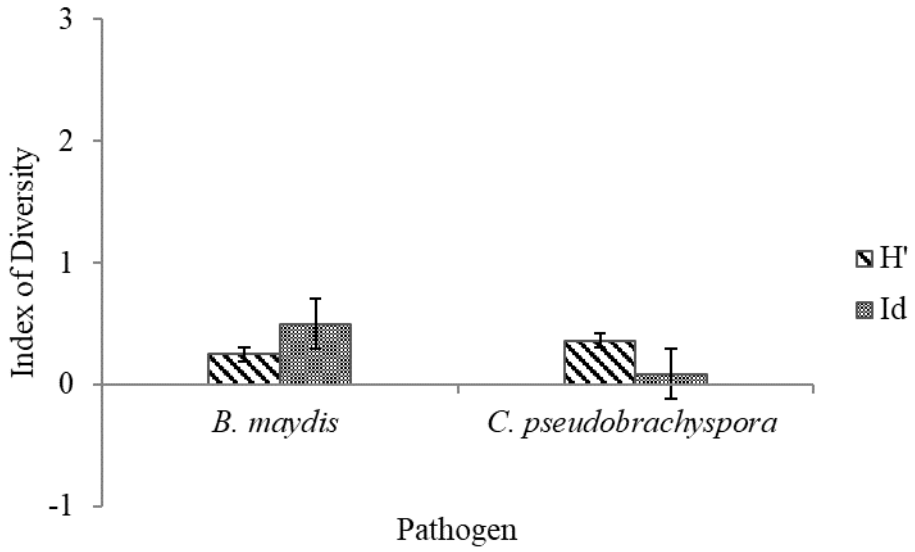

Figure 7. Diversity and dominance indices of pathogenic fungi causing leaf blight disease in 39 HST

The diversity index for both fungal species, based on these values, falls into the low category. This can be seen from the H' value, which is <1. Meanwhile, the dominance index of B. maydis is 0.495, indicating that B. maydis has a low to moderate level of dominance. B. pseudobrachyspora, on the other hand, has a low dominance index of 0.087.

Based on observations of 46-day-old corn plants infected with 5 fungal species, the highest diversity and dominance indices were observed for B. maydis, with values of 0.343 and 0.059, respectively (Figure 8).

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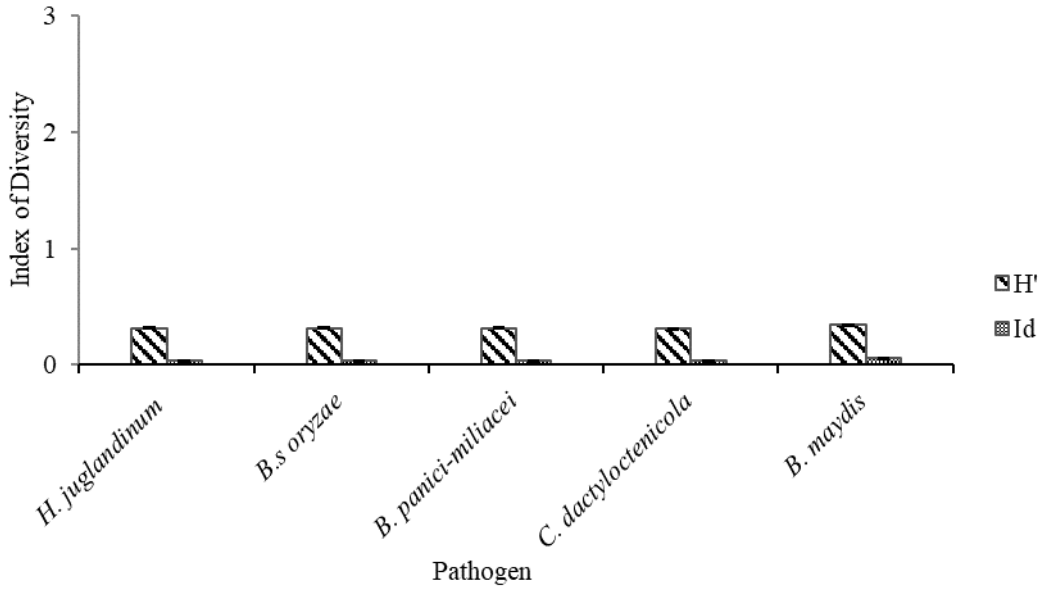

Figure 8. Diversity and dominance indices of pathogenic fungi causing leaf blight disease in 46 HST

Based on the above results, all types of fungi found on 46-day-old corn plants were classified as low. This was evident from the H' value, which was <1. Meanwhile, the dominance index of all types of fungi was classified as low, meaning that no type of fungus dominated the observation area.

Observations on 53-day-old corn plants showed that the fungus B. maydis had the highest diversity and dominance indices, with values of 0.365 and 0.108, respectively (Figure 9).

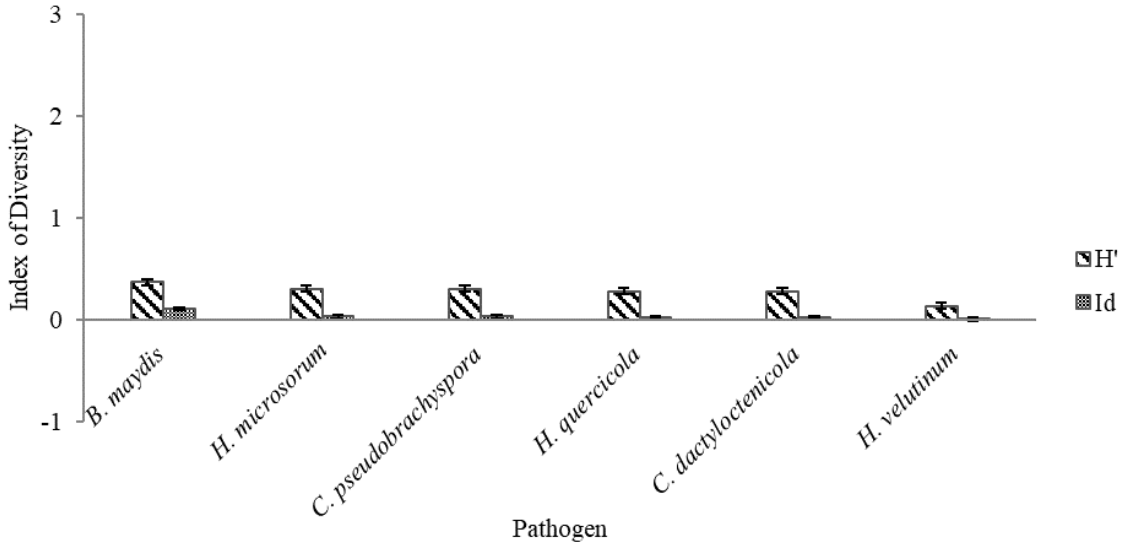

Figure 9. Diversity and dominance indices of fungal pathogens causing leaf blight disease in 53 HST

The diversity index for all fungal species, based on these values, falls into the low category. This can be seen from the H' value, which is <1. Meanwhile, the

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dominance index for all fungi is also low, indicating that no fungal species dominates the observation area, with a value close to 0.

The diversity of fungi found in this field practice includes 10 pathogenic species that cause leaf blight. The fungal species originating from *Bipolaris* (synonym *Helminthosporium*) consist of *B. sacchari, B. maydis, B. panici-miliacei, B. oryzae, H. juglandinum, H. microsorum, H. quercicola,* and *H. velutinum*. Meanwhile, fungi in the genus Curvularia include *C. pseudobrachyspora* and *C. dactyloctenicola*. Of the 10 types of fungi, the most commonly found was *B. maydis*. Optimal disease development by B. maydis occurs in slightly humid and warm conditions with temperatures of 20-32°C, causing significant potential damage and yield loss (Manzar et al., 2022). In several samples, *Bipolaris* sp. and *Curvularia* sp. fungi were found to attack in one plant symptom. The diversity index for all fungi found falls in the low category. This may be due to the land conditions, which use a polyculture planting technique with parang gourds with a planting distance of 100 x 60 cm, resulting in no canopy cover between plants. This planting distance affects the spread of plant diseases. Plants with close planting distances create a microclimate of low temperature and high humidity due to the canopy cover between plants. Low temperature and high humidity are very conducive to the development of leaf blight (Pakki & Burhanuddin, 2013; Talanca & Tenrirawe, 2015). Meanwhile, the dominance index of pathogenic fungi infecting maize plants falls into the small category. This indicates that the distribution of individuals across species is equal and that there is no tendency for any particular fungal species to dominate.

CONCLUSION

Corn leaf blight in Tanjung Pering Village showed a 100% incidence with low disease intensity and was associated with ten fungal pathogens: *B. sacchari, B. maydis, B. panici-miliacei, B. oryzae, H. juglandinum, H. microsorum, H. quercicola, H. velutinum, C. pseudobrachyspora,* and *C. dactyloctenicola*. The low diversity and dominance indices indicate a relatively simple pathogen community. These findings provide baseline information for corn leaf blight management in South Sumatra and highlight the importance of integrated disease management and further studies on pathogen virulence and environmental drivers

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