Jurnal Pertanian Tropik ISSN NO: 2356- 4725/p- ISSN : 2655-7576
Vol.9.No.1. 2022 (09) 075-090 DOI: 10.32734/jpt.v9i1, April.8891

Identification the Causes of Diseases Caused by Fungi and the Intensity of Their Attacks on Shallots (Allium ascalonicum L.) in Bungaraya Village, Bungaraya Sub-district, Siak district

Identifikasi Penyebab Penyakit yang Disebabkan oleh Jamur dan Intensitas Serangannya pada Tanaman Bawang Merah (*Allium ascalonicum* L.) di Desa Bungaraya, Kecamatan Bungaraya Kabupaten Siak

Irfandri, Muhammad Ali, Alviatul Khavifah*

Jurusan Agroteknologi, Fakultas Pertanian, Universitas Riau, Riau - 28293, Indonesia

*Corresponding author: alviatulkhavifah53@gmail.com

ABSTRACT

The demand of shallots that increase are not balanced with their productions especially in Riau. One of the main cause of low productivity is the attack of nuisance plant organism. The research aims to analyze the diseases that are caused by fungi and the intensity of their attacks on Shallots in Bungaraya Village, Bungaraya Sub District, Siak Regency. The research is done by using an exploration method; observing the diseases attacks intensity in field and observation; isolation and purification of shallots' fungi, identification of fungi' isolate on shallots. The intensity observation of diseases attack in field is done by diagonal method by determining the 5 points of samples randomly, then observing the kind of diseases that are found base on the symptoms and their intensity of attacks. The Identification of disease cause Fungi isolate observed the characteristic of macroscopic and microscopic mushroom. The result shows that the early diagnosis of diseases in the field on shallots in Bungaraya Village, Bungaraya Sub District, Siak Regency is withered fusarium diseases that is caused by A. porri fungi. The attack intensity of withered fusarium diseases is 80.51% and the attack intensity of purple spot diseases is 2.85%.

Keywords: *Alterania porri, Fusarium sp., mushroom identification, attack intensity, shallots.*

ABSTRAK

Kebutuhan bawang merah khususnya di Riau yang meningkat tidak diimbangi dengan produktivitasnya. Salah satu faktor penyebab rendahnya produktivitas di Riau yaitu adanya serangan dari organisme pengganggu tanaman. Penelitian ini bertujuan untuk mengetahui jenis jenis penyakit yang disebabkan oleh jamur dan intensitas serangannya pada pertanaman bawang merah di Desa Bungaraya, Kecamatan Bungaraya, Kabupaten Siak. Penelitian dilakukan dengan menggunakan metode eksplorasi; pengamatan intensitas serangan penyakit di lapangan, dan observasi; isolasi dan pemurnian jamur bawang merah, identifikasi isolat jamur pada bawang merah. Pengamatan intensitas serangan penyakit di lapangan dilakukan dengan metode diagonal dengan menentukan 5 titik sampel secara acak kemudian diamati jenis penyakit yang ditemukan berdasarkan gejala dan tingkat serangannya. Identifikasi isolat jamur penyebab penyakit diamati karakteristik makrokopis dan mikrokopis jamur. Hasil penelitian menunjukkan diagnosis awal penyakit dilapangan pada tanaman bawang merah di Desa Bungaraya Kecamatan Bungaraya Kabupaten Siak yaitu penyakit layu *fusarium* yang disebabkan oleh jamur *Fusarium* sp. dan penyakit bercak ungu yang disebabkan oleh jamur *A. porri*. Intensitas serangan penyakit layu *fusarium* yaitu sebesar 80,51% dan Intensitas serangan penyakit bercak ungu sebesar 2,85%.

Kata Kunci: *Alternaria porri*, bawang merah, *Fusarium* sp., identifikasi jamur; intensitas serangan

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INTRODUCTION

The increasing demand for shallots, especially in Riau Province, is not matched by its production. Shallot production in Riau only meets 4.2% of local needs and productivity is still very low compared to other areas. Based on data on shallot productivity in Riau Province in 2019 it was 5.51 ton.ha^{-1}, in 2020 it was 4.17 ton.ha^{-1}. Meanwhile, the productivity of shallots in West Sumatra Province in 2019 was 11.16 ton.ha^{-1}, in 2020 it was 11.34 ton.ha^{-1}. The productivity of shallots in Jambi Province in 2019 was 6.43 ton.ha^{-1}, in 2020 it was 6.84 ton.ha^{-1}. The productivity of shallots in North Sumatra Province in 2019 was 8.05 ton.ha^{-1}, in 2020 it was 9.55 ton.ha^{-1}. (Ministry of Agriculture of the Republic of Indonesia, 2021). Several factors causing the low productivity of shallots in Riau are the quality of shallot seeds that are not good, the application of shallot cultivation techniques that are not optimal, the level of soil fertility is low and the attack from plant pest organisms (OPT).

The most common pests that attack shallots are from the fungus group. The most common fungi found on shallots are *Fusarium oxysporum* which causes moles, *Colletotrichum gloeosporioides* which causes anthracnose, causes *Alternaria porii which* purple spot disease, *Peronospora destructor* causes downy mildew/false flour (*Downy mildew*) and *Pythopthora porii which* causes shoot death (Semangun, 2007). In general, the attack rate of onion plant diseases in Siak Regency is around 40-50% (Susila, 2020). According to Syaifullah (2019), the most common disease symptom is *fusarium* which attacks almost all shallot farmers' fields. The disease attack was found in the shallot cultivation trial area carried out by farmers in Bungaraya Village, Bungaraya District, Siak Regency.

This study aims to determine the types of diseases caused by fungi and the intensity of their attacks on shallot plantations in Bungaraya Village, Bungaraya District, Siak Regency.

MATERIALS AND METHODS

The materials used in this study were onion plant organs (leaves) with symptoms of disease, *potato dextrose agar* (PDA), $NaOCl_2$ 5.25%, sterile distilled water, tissue paper rolls., *aluminum foil* and filter paper.

The tools used in this study were a transparent plastic bag, *cutter*, scissors, binocular microscope, 9 cm diameter petri dish, 500 ml measuring cup, *beaker glass* , 250 ml erlemeyer, stirring rod, ose needle, tweezers, dropper pipette, *micro*-pipette, busen lamp, *laminar airflow cabinet* (LAFC), refrigerator, autoclave, object glass, cover glass, *incubator*, *handsprayer*, camera and identification book *Illustrated Genera of Imperfect Fungi* by Barnett and Hunter (2000) and disease manual Horticultural Plant Diseases in Indonesia by Semangun (2007).

Determination of Research Locations

Determination of the location of the land for sampling shallots was carried out by *purposive sampling*, namely the land where a lot of 1 month old shallots were planted in Bunga Raya Village, Bunga Raya District, Siak Regency with an area of 1 ha of shallot plantations. The land area for determining the sample point is 5% of the shallot plantation area. Sampling was carried out using the diagonal method by randomly determining 5 sample points. For each sample point, 10 plants were taken as samples so that 50 sample plants were obtained. The sampling scheme and technique can be seen in Appendix 2. Each sample plant was observed for the type of disease found based on the symptoms and the level of attack. Disease intensity was calculated based on the Natawigena method (1993). For the sample plants to be observed for their microscopic and macroscopic characteristics, 3 plants with the highest intensity of disease attack were taken, so that 15 sample plants were obtained.

Sample collection and storage of plant organs with symptoms of disease

Plant organs with symptoms of disease are taken using a cutting tool (sterile knife or sterile scissors). Shallots taken are in the middle (not at the base of the leaves and not

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at the ends). Each sample taken was put in a separate plastic bag and sprayed with sterile distilled water. The sample is taken to the laboratory for further identification.

Planting tissue on PDA medium

Samples of infected plant organs (leaves) were isolated by the method of planting tissue on PDA media. The samples taken were 15 samples, then repeated 2 times on petri dishes. Infected leaves were cut about 1 cm x 1 cm in 5 pieces, by taking the healthy half and the sick half using a sterile knife or scissors, then surface sterilization was carried out by soaking the infected plant parts in $NaOCl_2$ (0 ,5%) for 3 minutes and rinsed by immersing it in sterile distilled water 2 times. The plant parts were then arranged on sterile PDA media in petri dishes regularly, then incubated for 7 days in an incubator at room temperature. This activity is carried out in a *laminar air flow cabinet.*

Isolation of disease-causing fungi

Isolation of disease was carried out in a laminar air flow cabinet by taking fungal mycelia that had grown from tissue implants using sterile ose needles. The mycelia were placed in the middle of sterile PDA medium in a petri dish, closed and incubated at room temperature for 7 days in an incubator. Pure cultures of the fungus were identified.

Identification of disease-causing fungi

Disease fungi were identified macroscopically and microscopically based on the manual by Barnett and Hunter (2000), the Watanabe handbook (2002), and the Marthur, SB and Olda Kongsdal manual (2003). Macroscopic identification is done visually by using the eye directly. Microscopic identification was carried out by making wet preparations by taking mycelia from each fungal isolate with a sterile ose needle and placing it on a sterile object glass that had been dripped with distilled water. This preparation was then covered with a cover slip and observed with a binocular microscope at weak (10x10), medium (10x40) and high (10x100) magnifications.

Observation

Symptoms of disease in the planted area

Observations were made by looking at the symptoms present in the shallot plant organs, such as spots (color, necrosis, chlorosis), rot and wilting. Each symptom was recorded, documented and compared with the guidebook for Horticultural Plant Diseases in Indonesia (Semangun, 2007).

Disease intensity (%)

The intensity of each onion plant disease is calculated using the formula:

$$I = \frac{\sum_{i}^{n} n_i \times v_i}{Z \times N} \times 100\%$$

Description:
I = intensity of attack (%)
n_i = number of plant parts observed in each attack category. (*i*= 0-4)
v_i = damage scale value of each attack category (*i*= 0-4)
Z = highest damage scale value from each attack category
N = number of plant parts observed

Table 1. Assessment scale for disease attacks on shallot plant organs (Natawigena, 1990)

Scale	Description
0	No attacks on plant organs were observed
1	There was an attack with an area of 1 – 25% on plant organs observed
2	There was an attack with an area of > 25% – 50% on the observed plant organs
3	There is an attack with an area of >50% – 75% on the observed plant organ
4	There is an attack with an area of >75% on the observed plant organ

Identification of disease-causing fungi

Macroscopic characteristics

Observation of macroscopic characteristics was carried out visually on each pure isolate on PDA medium (7 days

after incubation) which included: mycelium color (hyaline, white, black and others), mycelium growth direction (upright or downwards). side), mycelium structure (smooth or coarse).

Microscopic characteristics

Observation of microscopic characteristics was carried out on pure isolates of fungi that had been incubated for 7 days on PDA medium by making wet preparations and using a binocular microscope. Hyphae from pure isolates of fungi were taken using a needle loop and then placed on an object glass and observed under a microscope. The parts observed were hyphae characteristics (hyphal branching and hyphal branching angle), color (colored or hyaline) and bulkhead (present or not). Conidiophores for example branched or not. Conidia for example colored or hyaline and shape (round, elliptical, mace, crescent moon and others).

Additional observations

Additional observations are data derived from questionnaires filled out by farmers through direct interviews using a list of questions (questionnaires) that have been prepared in advance.

RESULTS AND DISCUSSION

Disease Symptoms in the Field at Sample Points

Shallot is widely grown in the lowlands. One of the areas for planting shallots in Riau Province is Siak Regency. Based on the results of observations of disease symptoms in the field on the sample plants of shallots in Bungaraya village, Kacan Bungaraya, Siak Regency, it can be seen in Table 2.

Table 2. Early diagnosis of onion plant diseases in the field.

Beds	Sample point	Symptoms on plants	Initial Diagnosis
I	A1	In half of the leaves there are symptoms of yellowing leaves and the tips are starting to brown. The bulbs of the plant are small and begin to rot.	*Fusarium* wilt
	A2	On the leaves there are symptoms of yellowing and tend to be twisted (twisted). Plants are easily uprooted because the plant tubers begin to rot.	*Fusarium* wilt
	A3	On the leaves there are symptoms of yellowing from the tip to the base of some leaves. The tubers begin to rot and the plant is easily uprooted.	*Fusarium* wilt
II	A4	At the tips of the leaves of the onion plant there are symptoms of white leaves. The leaves begin to break on the white part. The other leaves turn yellow.	purple spots
	A5	On the leaves there are symptoms of yellowing and starting to fall. The plant bulbs begin to rot and the plant is easily uprooted.	*Fusarium* wilt
	A6	In plants there are symptoms of leaves starting to turn yellow and at the ends starting to brown. One of the leaves has a white spot. Plant tubers begin to shrink due to decay.	Purple spots
III	A7	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. Bulbs shrink due to decay.	*Fusarium* wilt
	A8	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. Bulbs shrink due to decay.	*Fusarium* wilt
	A9	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. The completely yellowed leaves begin to	*Fusarium* wilt

		fall. Bulbs shrink due to decay.	
IV	A10	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. Bulbs shrink due to decay.	*Fusarium* wilt
	A11	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. Bulbs shrink due to decay.	*Fusarium* wilt
	A12	On the leaves of the plant there are symptoms of yellowing of the leaves almost all over and browning at the tips of the leaves. Plant tubers begin to decay.	*Fusarium wilt*
V	A13	On the leaves of the plant there were symptoms of yellowing of the leaves almost all over the leaves and brownish color at the tips of the leaves. Plant tubers begin to rot.	*Fusarium* wilt
	A14	On the leaves of the plant there are symptoms of leaves starting to turn yellow and the leaves are falling/withering. Bulbs begin to rot.	*Fusarium* wilt
	A15	On the leaves of the plant there are symptoms of yellowing at the tips of the leaves. Bulbs shrink due to decay.	Purple Spots

Based on the symptoms that appear in the field, Fusarium wilt *is* thought to be caused by the fungus *Fusarium sp.*wilt *fusarium* can be seen in Figure 10.

Jurnal Pertanian Tropik ISSN NO: 2356- 4725/p- ISSN : 2655-7576
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Figure 10. Wilt *fusarium* in the field on sample plants A1, A2, A3, A5, A7, A8, A9, A10, A11, A12, A13, A14

According to Fadhilah *et al.* (2014), Symptoms of *fusarium* on shallot plants during their growth period, among others, occur in the early stages of leaf shoots that begin to appear coiled (a few or all of the existing leaves). Then there is yellowing or discoloration of circular leaves to yellow, starting from the top of the leaf towards the base of the leaf. In the next stage the leaves will dry up and die. These symptoms can appear in the early stages of germination or in the late stages of germination.

Another disease symptom found in the observation of shallot plant samples in the field was purple spot disease. The initial symptoms of the disease are in the form of spots which will then form white to gray patches. Later symptoms, the spots will turn purplish-brown in color, the edges of the spots are often reddish or purple and surrounded by a yellow circle. Symptoms seen in the field are early symptoms in the form of white to gray patches (Figure 11). Based on the symptoms in the field, this disease is thought to be caused by the fungus *A. porii*. Symptoms of purple berck disease on onion plants can be seen in Figure 11.

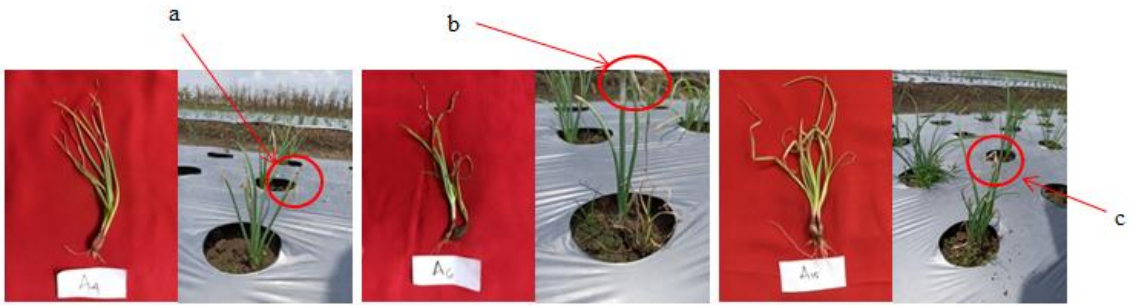

Figure 11. Symptoms of purple spot disease in the field on a. Sample plant A4 b. Sample plant A6 c. Sample plant A15

This is in accordance with what was stated by Agrios (2005), the first symptom of the disease appeared as a small number of light yellow spots or parallel streaks that spread about a week earlier. Then the spots become 1 to 4 cm long and turn purplish-brown.

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Disease Intensity

The results of observing the intensity of onion disease after being analyzed descriptively quantitatively can be seen in Table 3.

Table 3. Intensity of disease attack on shallot plants

Sample point	Average Attack Intensity (%)	
	Fusarium wilt	Purple spot
1	40,53	4,75
2	47,68	4,30
3	55,00	3,90
4	68,12	0,98
5	80,51	0,33
Average Total Attack Intensity	58,35	2,85

Factors that cause high wilt disease *fusarium* include the lack of care from shallot farmers such as; not providing fertilizer according to the recommended dose, less than optimal soil management and farmers not applying the rotational cropping system on their croplands. Shallot farmers in Bungaraya Village, Bungaraya District, Siak Regency in the previous planting period also planted shallots. At the previous planting time, farmers got quite high production yields. They continued to plant shallots this time based on the seeds provided by the previous government and wanted to try to plant F1 from the shallots harvest. This causes the onion plants planted to be attacked by diseases.

Based on the results of interviews with farmers obtained some information including;

Farmer Biodata

Name : M. Syaifullah
Age : 43 years
Address : Jayapura Village, Kec. Bunga Raya, Kab. Siak
Last education level : ☐ SD SMP ☐ SMA ■
☐ Diploma(....) ☐ Strata(....)
Attended training : Ever / ~~Never~~
■ Cultivation Training (3 times)
☐ Control Training (.... times)
☐ Others..... (.... times)

Land

Land area : 12,5 m x 10 m (1250 m^2)
Planting distance : ☐ 15 cm x 15 cm ☐ 20 cm x 20 cm
■ 15 cm x 20 cm ☐ Others.....
Plant population : 300 plant
Varieties planted : ■ Bima brebes ☐ Maja Cipanas
☐ Kuning ☐ Tuk tuk
Seedling origin : The assistance from agriculture department
Age of plant : 45 days
Preparation of land : plow
Watering : no watering because planting is done in the rainy season

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Air temperature when planting : 29 - 31 º C
Fertilizer given
a. inorganic Type : ZA, SP36, Phonska
Time : before planting
Dosage : 40 kg for one field with a ratio of 16 : 16 : 16
b. Organik Type : -
Time : x month
Dosis : -
How many times to plant : 2 times
Diseases that have attacked : Moler, Leaf Blight
Control that has been carried out:
a. Fungisida Type : Antracol, Fujiwan
Time : once a week
Dosage : according to the recommended dosage of
Previously planted plants : shallots

Based on the results of interviews with farmers, the land cultivation was not optimal so that it greatly affected the occurrence of disease attacks because the fungi found in this study were fungi soil borne. Microorganisms will live and reproduce in the soil if the land is not planted with plants. So that it is necessary to do maximum soil processing, namely by turning and loosening the soil. According to Sudirja (2007), shallot plants require soil with a crumb structure, medium to clay texture, good drainage or aeration, containing sufficient organic matter. The soil should not be flooded by water because it can cause rotting of the tubers and trigger the emergence of various diseases.

Identification of the Cause of Disease in the Laboratory

The results of macroscopic identification of the fungus that causes *fusarium* can be seen in Table 5.

Table 5. Macroscopic characteristics of *Fusarium sp.* 7 days after incubation (hsi) on PDA media.

Isolat Code	Characteristics of Fungal Colony		
	Structure	Color	Growth Direction
A1 U2J1	Smooth	Grayish white	Sideways and up
A2 U2J1	Smooth	Brownish white	Sideways and up
A3 U1J1	Smooth	Yellowish white	Sideways and up
A3 U2J1	Slightly rough	Grayish white	Sideways and up
A5 U1J2	Slightly rough	Yellowish white	Sideways and up
A5 U1J3	Slightly rough	Brownish white	Sideways and up
A5 U2J1	Smooth	Grayish white	Sideways and up
A6 U1J1	Smooth	Yellowish white	Sideways and up
A6 U2J1	Slightly rough	Brownish white	To side
A7 U1J2	Smooth	Yellowish white	Sideways and up
A7 U2J1	Smooth	Grayish white	Sideways and up
A8 U1J1	Slightly rough	Yellowish white	To side
A8 U2J1	Smooth	Yellowish white	Sideways and up
A9 U2J1	Smooth	Grayish white	Sideways and up

A10 U1J1	Slightly rough	Grayish white	Sideways and up
A10 U2J2	Smooth	Grayish white	Sideways and up
A11 U1J2	Smooth	Grayish white	Sideways and up
A11 U2J1	Slightly rough	Yellowish white	Sideways and up
A12 U1J1	Smooth	Yellowish white	Sideways and up
A12 U1J2	Slightly rough	Grayish white	To side
A12 U2J1	Smooth	Grayish white	To side
A13 U1J2	Smooth	Brownish white	Sideways and up
A13 U2J1	Smooth	Brownish white	To side
A13 U2J2	Smooth	Brownish white	To side
A14 U1J1	Smooth	Brownish white	Kesamping

The macroscopic structure of the fungus *Fusarium sp.* in Table 5 generally have a fine to slightly coarse structure and the color of the fungal mycelium is white to yellowish white. Some fungi that have a fine structure the direction of growth is only sideways and for a slightly coarse structure the growth direction is sideways and then upwards and forms a mycelium clump.

According to Wiyatiningsih (2009), the isolation of onion plant tissue with symptoms of moles on PDA medium resulted in two different fungal colonies. The first colony had a thin air mycelium, at the beginning of colony growth it was white, after 1 week it was yellow to orange, but after 3 weeks it turned yellowish white. The second colony had a dense aerial mycelium, at the beginning of growth the colony was white but after one month it turned brown. Macroscopic characteristics of the fungus *Fusarium sp.* which were found can be seen in Figure 12.

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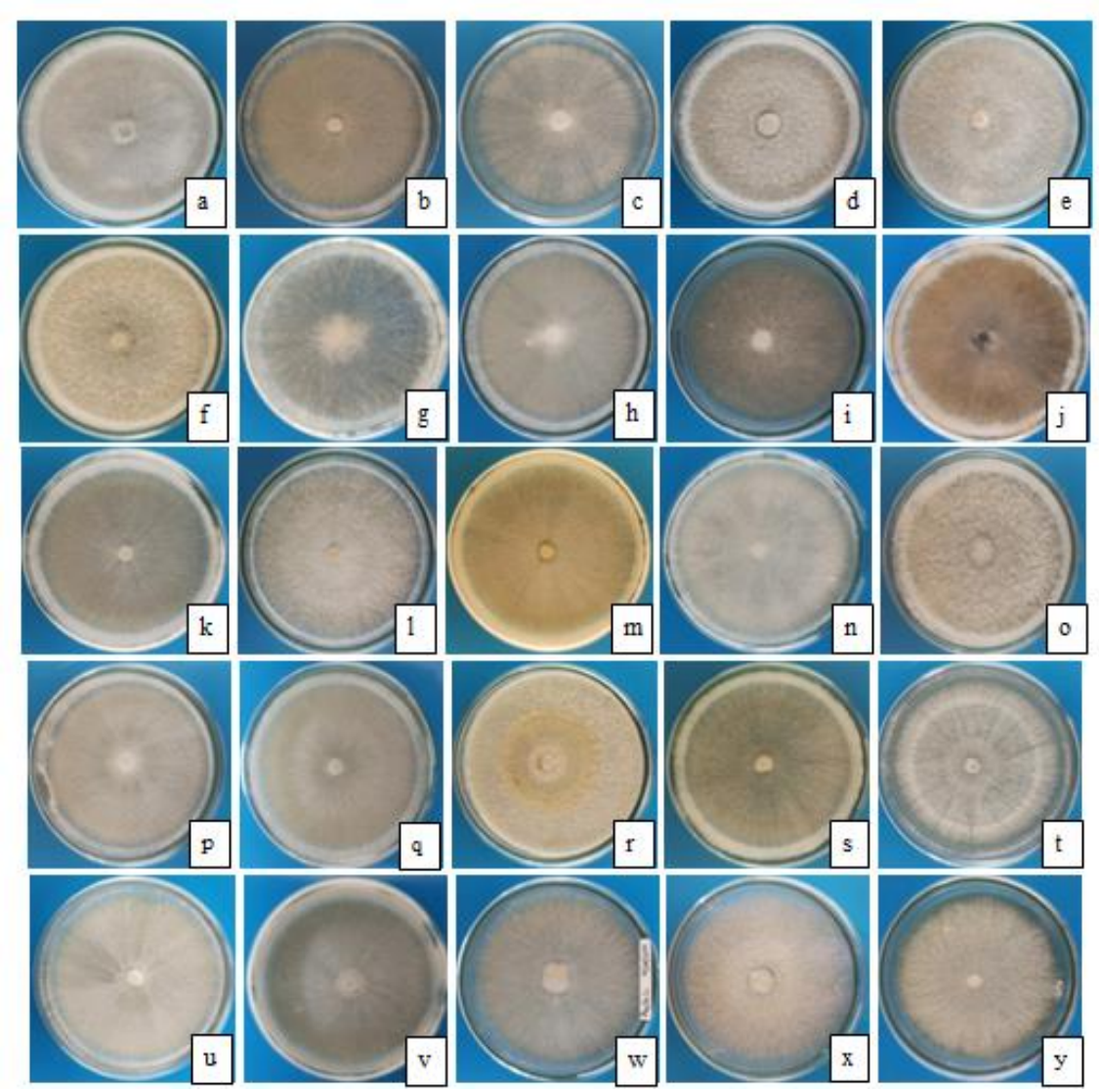

Figure 12. Macroscopic of the fungus Fusarium sp. a. Isolate A1U2J1 b. Isolate A2U2J1 c. Isolate A3U1J1 d. Isolate A3U2J1 e. Isolate A5U1J2 f. Isolate A5U1J3 g. Isolate A5U2J1 h. Isolate A6U1J1 i. Isolate A6U2J1 j. Isolate A7U1J2 k. Isolate A7U2J1 l. Isolate A8U1J1 m. Isolate A8U2J1 n. Isolate A9U2J1 o. Isolate A10U1J1 p. Isolate A10U2J2 q. Isolate A11U1J2 r. Isolate A11U2J1 s. Isolate A12U1J1 t. Isolate A12U1J2 u. Isolate A12U2J1 v. Isolate A13U1J2 w. Isolate A13U2J1 x. Isolate A13U2J2 y. Isolate A14U1J1

The results of microscopic identification of the fungus that causes *fusarium* can be seen in Table 6.

Table 6. Microscopic characteristics of the fungus *Fusarium sp.* 7 days after incubation (hsi) on isolate preparations.

Isolat Code	Hyphae		Konidiofor	Bentuk konidia
	Branched	Septum		
A1 U2J1	Branching	Septum	Branching	Elips
A2 U2J1	Branching	Not septum	Branching	Elips
A3 U1J1	Branching	Septum	Branching	Elips

A3	U2J1	Branching	Septum	Branching	Elips
A5	U1J2	Branching	Not septum	Branching	Elips
A5	U1J3	Branching	Not septum	Branching	Elips
A5	U2J1	Branching	Not septum	Branching	Elips
A6	U1J1	Branching	Septum	Branching	Elips
A6	U2J1	Branching	Not septum	Branching	Elips
A7	U1J2	Branching	Not septum	Branching	Sperical
A7	U2J1	Branching	Septum	Branching	Sperical
A8	U1J1	Branching	Septum	Branching	Crescent moon
A8	U2J1	Branching	Septum	Branching	Sperical
A9	U2J1	Branching	Not septum	Branching	Elips
A10	U1J1	Branching	Not septum	Branching	Elips
A10	U2J2	Branching	Septum	Branching	Sperical
A11	U1J2	Branching	Septum	Branching	Sperical
A11	U2J1	Branching	Septum	Branching	Sperical
A12	U1J1	Branching	Septum	Branching	Sperical
A12	U1J2	Branching	Not septum	Branching	Elips
A12	U2J1	Branching	Septum	Branching	Elips
A13	U1J2	Branching	Septum	Branching	Elips
A13	U2J1	Branching	Not septum	Branching	Elips
A13	U2J2	Branching	Septum	Branching	Elips
A14	U1J1	Branching	Septum	Branching	Elips

Microscopic characteristics of the fungus *Fusarium sp.* in Table 6 have branching hyphae, then some fungi have insulated hyphae but some others are not. Insulated hyphae were found in fungi with isolate code A1U2J1, A3U1J1, A3U2J1, A6U1J1, A7U2J1, A8U1J1, A8U2J1, A10,U2J2, A11U1J2, A11U2J1, A12U2J1, A13U1J2, A13U1J1, A14U1J1. Conidiophores of the fungus *Fusarium sp.* branched and the overall shape of the conidia of the fungus *Fusarium sp.* observed is an ellipse. According to Semangun (2007), the conidiophores of the fungus *Fusarium sp.* branched and have an average length of 70 m. Microscopic characteristics of the fungus *Fusarium sp.* found can be seen in Figure 13.

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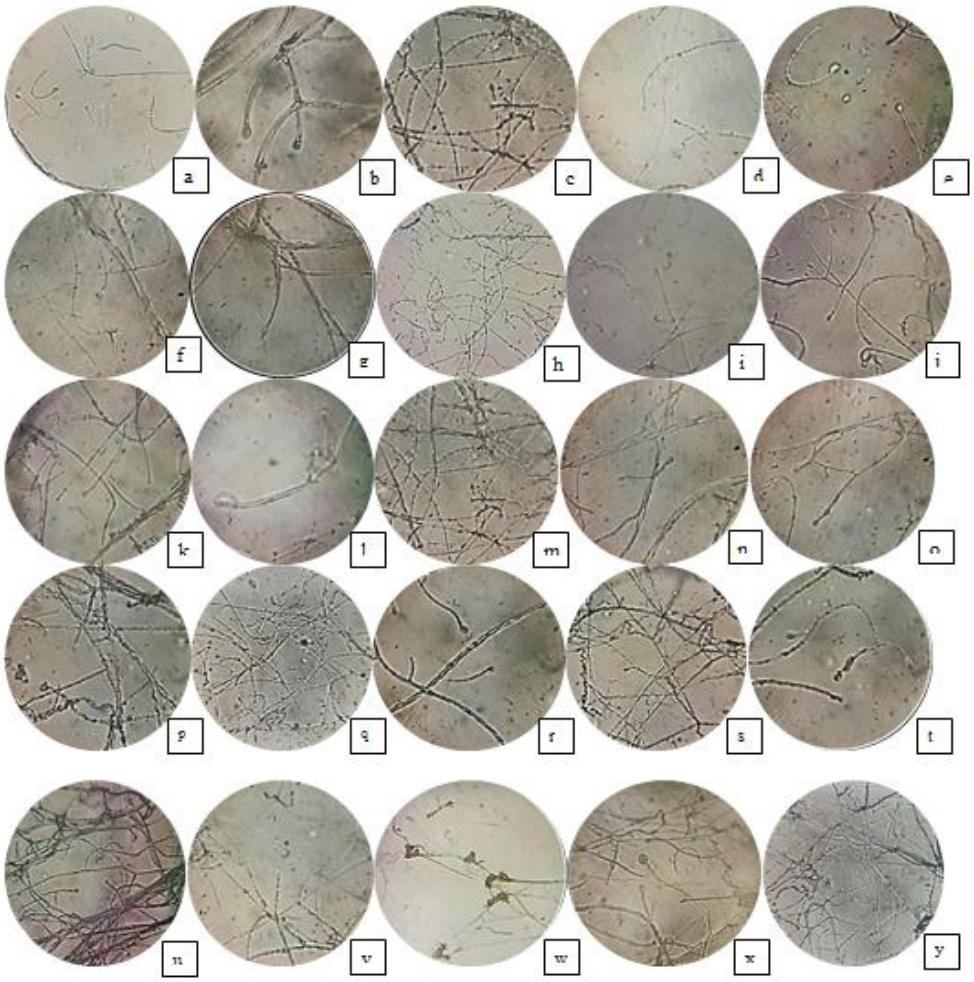

Figure 13. Characteristics of the microscopic appearance of the fungus *Fusarium sp.* under a microscope at a magnification of 40 x 10 a. Isolate A1U2J1 b. Isolate A2U2J1 c. Isolate A3U1J1 d. Isolate A3U2J1 e. Isolate A5U1J2 f. Isolate A5U1J3 g. Isolate A5U2J1 h. Isolate A6U1J1 i. Isolate A6U2J1 j. Isolate A7U1J2 k. Isolate A7U2J1 l. Isolate A8U1J1 m. Isolate A8U2J1 n. Isolate A9U2J1 o. Isolate A10U1J1 p. Isolate A10U2J2 q. Isolate A11U1J2 r. Isolate A11U2J1 s. Isolate A12U1J1 t. Isolate A12U1J2 u. Isolate A12U2J1 v. Isolate A13U1J2 w. Isolate A13U2J1 x. Isolate A13U2J2 y. Isolate A14U1J1

The other identified fungus causing shallot disease is A. porii. This fungus belongs to the Kingdom: Fungi, Divisio: Eumycota, Class: Hypomycetes, Order: Hypales, Family: Dematiaceae, Genus: Allternaria, Species: Alternaria porii (Barnet and Hunter, 1972 and Veloso, 2007). Identification of macroscopic and microscopic characteristics of the fungus that causes purple spot disease was found in 8 fungal isolates with isolate codes, namely A2U1J1, A3U1J2, A4U2J1, A7U2J2, A14U1J2, A15U1J1, A15U1J2 and A15U2J1. Observation of the macroscopic characteristics of the fungus A. porii was carried out by observing the structure of the appearance of the fungus, the color of the colonies and the direction of growth on PDA media. The results of the macroscopic identification of the fungus that causes purple spot disease can be seen in Table 7.

Jurnal Pertanian Tropik ISSN NO: 2356- 4725/p- ISSN : 2655-7576
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Table 7. Macroscopic characteristics of *A. porii* 7 days after incubation (hsi) on PDA media

Code Isolat	Characteristics of Fungal Colonies		
	Structure	Color	Growth Direction
A2 U1J1	Smooth	Black	To side
A3 U1J2	Smooth	Black	To side
A4 U2J1	Slightly rough	Black	Sideways and up
A7 U2J2	Slightly rough	Gray black	To side
A14 U1J2	Smooth	Dark brown	To side
A15 U1J1	Smooth	Black gray	To side
A15 U1J2	Slightly rough	Black	To side
A15 U2J1	Slightly rough	Black	To side

The macroscopic characteristics of the fungus *A. porii* were observed to have a fine to slightly coarse structure. The color of the fungus is mostly black, but the fungal isolate A7U2J2 is grayish black. The fungal isolate A14U1J2 had a blackish brown color and the A15U1J1 mushroom isolate was gray-black in color. The visible direction of fungal growth is sideways but in isolate A4U2J1 the growth direction is sideways and upwards. The macroscopic characteristics of the fungus *A. porii* found can be seen in Figure 14.

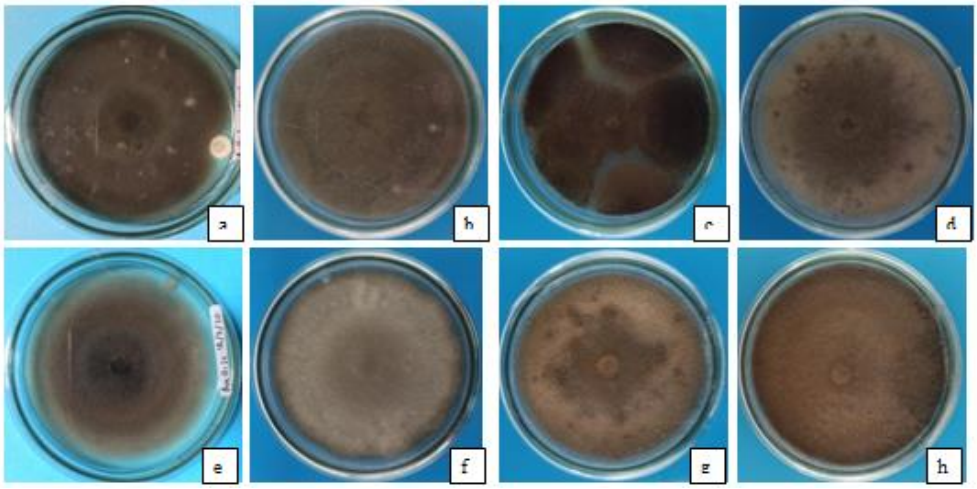

Figure 14. Macroscopic appearance of the fungus *A. porri* a. Isolate A2U1J1 b. Isolate A3U1J2 c. Isolate A4U2J1 d. Isolate A7U2J2 e. Isolate A14U1J2 f. Isolate A15U1J1 g. Isolate A15U1J2 h. Isolate A15U2J1

The fungus *A. porii* has a grayish black surface colony color and has a diameter of 6 cm (Rachmatunnisa *et al*., 2017). According to Susandi *et al*. (2018), colonies of A. *porii* that have been isolated have the characteristics of cottony colonies, gray in color with brownish yellow on the edges. Fungal colonies aged 7 days after isolation (hsi) were white and the mycelium surface was thin. mycelium begins to thicken like velvet, the old colonies are black to gray and spread in all directions until they fill the petri dish (Akhsan *et al*., 2021).

Observations of the fungus *A. porii* were observed by looking at branching hyphae, hyphal bulkheads, conidiophores and the shape of the conide on the fungal isolate preparations. Then the fungal isolate preparations were observed under a

Jurnal Pertanian Tropik ISSN NO: 2356- 4725/p- ISSN : 2655-7576
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microscope with a magnification of 100x. The results of the microscopic identification of the cause of purple spot disease can be seen in Table 8.

Table 8. Microscopic characteristics of the fungus *A. porii* 7 days after incubation (hsi) on isolate preparations.

Isolat Code	Hyphae		Conidiofor	Conidiaform
	Branched	Septum		
A2 U1J1	Branching	Septum	Branching	Elips
A3 U1J2	Not Branching	Septum	Not Branching	-
A4 U2J1	Not Branching	Septum	Not Branching	Sperical
A7 U2J2	Branching	Septum	Not Branching	Sperical
A14 U1J2	Not Branching	Septum	Not Branching	Elips
A15 U1J1	Not Branching	Septum	Not Branching	Elips
A15 U1J2	Branching	Septum	Branching	Gada
A15 U2J1	Branching	Septum	Branching	Sperical

Description : (-) = does not have conidia shape

Characteristics of the fungus *A. porii* have branched and unbranched hyphae. Branching hyphae were seen in fungal isolates A2U1J1, A7U2J2, A15U1J2 and A15U2J1. Unbranched hyphae were found in isolates A3U1J2, A4U2J1, A14U1J2 and A15U1J1. Fungal hyphae seen under a microscope are insulated. Fungal conidiophores are branched and unbranched. The conidal shape of the fungus *A. porii* found under the microscope is spherical, elliptical and club-shaped.characteristics of the fungus *A. porii* found can be seen in Figure 15.

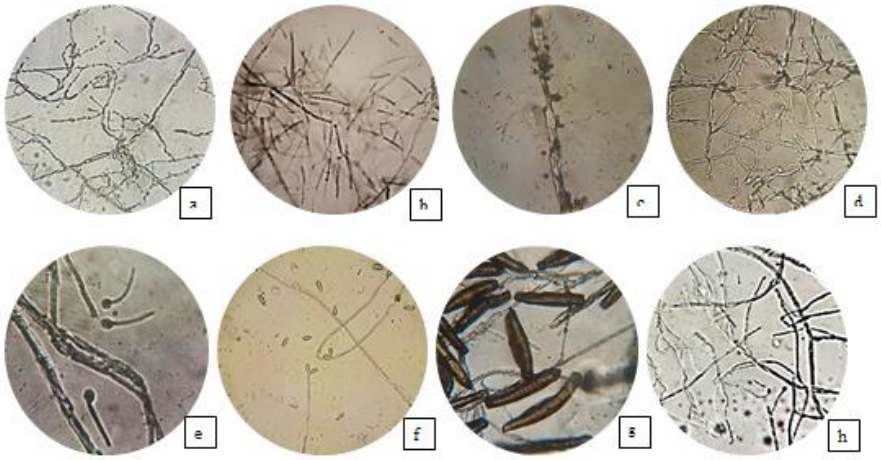

Figure 15. Microscopic appearance characteristics of the fungus *A. porri* under a microscope at a magnification of 40 x 10 a. Isolate A2U1J1 b. Isolate A3U1J2 c. Isolate A4U2J1 d. Isolate A7U2J2 e. Isolate A14U1J2 f. Isolate A15U1J1 g. Isolate A15U1J2 h. Isolate A15U2J1

Microscopic observations showed that the conidia were club-shaped, insulated, one end enlarged and blunt, conidiophores were insulated (Akhsan *et al.*, 2021). Based on Figure 15, it can be seen that the conidia of Isolate A15U1J1 were elliptical and Isolate A15U1J2 had conidia in the shape of a club. According to Susandi *et al.* (2018), the fungus *A. porii* has conidia shaped like a brown club and insulated. One end of the

conidia is blunt and the other is narrowed and elongated. The fungus *A. porii* cannot form conidia under unsuitable light and nutrient conditions.

CONCLUSIONS

Conclusions

The results of the initial diagnosis in the field showed that the diseases that attacked the shallot plants in Bungaraya Village, Bungaraya District, Siak Regency were fusarium disease and purple spot disease. Fusarium wilt disease is caused by the fungus Fusarium sp. and purple spot disease caused by the fungus A. porii. Fusarium sp. characterized by a fine to slightly rough structure and a white to yellowish white fungal mycelium color. Some fungi that have a fine structure the direction of growth is only sideways and for a slightly coarse structure the growth direction is sideways and then upwards and forms a mycelium clump. The fungus A. porii is characterized by a grayish black surface colony with a sideways and upward growth direction.wilt disease fusarium is 80.51% and the intensity of purple spot disease is 2.85%.

Suggestions

It is necessary to improve technical culture, such as the use of good (certified) seeds, treatment of seeds with biological agents before planting, arranging planting and harvesting schedules, crop rotation, and proper fertilization (time, dose and method).
2. Disease control should refer to the IPM concept which minimizes the use of pesticides and prioritizes biological control and cultivation that is appropriate and in accordance with economic aspects.

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