INVENTARISASI JAMUR
PADA BAWANG MERAH (*Allium ascalonicum*)

SKRIPSI

Oleh :

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ABSTRACT

Flora Erika Simbolon "Inventory of Fungus on shallots (Allium ascalonicum)" was guided by Prof.Dr.Ir.Ahmad Rafiqi Tantawi, MS as chairman and Ir. Zulhery Noor, MP as a member.

The purpose of this research was to determine the type of fungus on the surface and inside of shallots sold in the markets.

This research was carried out in three markets, namely Market One, namely the Central Market, Market Two, namely Pasar Sukaramai, Market Three, namely Pasar Jalan Bakti and in the Laboratory of Belawan Agricultural Quarantine from November 2008 to March 2009. Fungus found in Pasar One with treatments I, II and III were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Mucor sp, Penicillium oxalycum and Phytopthora porri.* The types of mushrooms found in market two with treatments I, II and III were: *Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Fusarium dimerum, Fusarium oxysforum, Penicillium oxalycum and Mucor sp. III are: Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium dimerum, Fusarium oxysforum, Mucor sp and Penicillium oxalycum.*

The types of fungus found on the surface of shallots with the first treatment from markets one, two and three were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Penicillium oxalycum and Mucor sp*. The types of fungus found in shallots with the second treatment from market one, two and three were: *Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Fusarium dimerum., Fusarium oxysforum, Penicillium oxalycum and Mucor sp.* The third from markets one, two and three are: *Aspergillus niger,*

I. INTRODUCTION

1.1 Background of Study

The public's need for luxury goods will continue to increase along with the increase in population and the people's purchasing power. In order to fulfill the needs, the amount of production must be adjusted. The current amount of production is still projected for domestic needs and not for export purposes.

Based on data, the number of domestic needs was greater than the total domestic shallots production. Therefore, importing shallots was necessary in order to meet the domestic needs. This is very unfortunate since Indonesian natural potential is quite extensive for shallot production development.

The success in shallot cultivation is largely determined by the cultivation techniques including the land condition which is free from pests and diseases. Therefore, it was necessary to further inventory the types of fungi that attack shallots both during planting phase and warehouse storage to counter it as early as possible.

Shallot Market Potential

The many uses of shallot caused an increase in its demand which made the market remains widely open, both foreign and export markets. According to the Directorate of Horticulture, Department of Agriculture (2005), shallots are one of the main priorities in the national horticultural production development, especially for export. According to the records of the Directorate of Horticulture, Department of Agriculture (2005), the national trade balance for shallot commodities were still in

negative values (durvins), meaning that the export value was smaller than the import values.

From 2001-2005, the largest deficit occurred in 2005, amounting to 95.98 thousand tons. This was much smaller compared to the domestic production in 2001 that reached 881.15 thousand tons. From this, it could be concluded that the domestic demand for shallot commodities far exceeded the production capacity. Thus, the country still needed imports to meet the domestic needs. This, of course, is very unfortunate considering the potential natural resources in Indonesia to develop shallot production to meet domestic needs.

The success in shallot cultivation is largely determined by the cultivation techniques including the land condition which is free from pests and diseases. Therefore, it was necessary to further inventory the types of fungi that attack shallots both at planting phase and warehouse storage to counter it as early as possible.

1.2 Objective of Study

To find out the type of fungus on the surface and inside parts of shallots sold in the market.

1.3 Research Hypothesis

It was presumed that the bulbs in shallots found at (three) 3 domestic markets were contaminated by various types of fungi.

1.4 Significance of Study

1. As a requirement in thesis undergraduate examination at the Faculty of Agriculture, University of Medan Area.
2. As a reference in relation to controlling plant diseases in onion planting and storage.

II. REVIEW OF LITERATURE

2.1 Shallot Botany

Shallots are annuals with shapes of grass that grow upright with a height that can reach 5-50 cm and form clumps. The roots are short and fibrous. Due to the root's nature, shallots can not stand dryness.

The shape of its leaves are small, round, and elongated like a pipe, but there are also those that form a semicircle in the cross section of the leaf. The tip of the leaf is tapered while the bottom part is wide and swollen with green color.

The base of the tuber forms a disc which is a pseudo (rudimentary) main stem. From the bottom of the disc, fibrous roots grow. At the top of the disc, between the layers of swollen leaves, there are buds that can grow into new plants. These shoots are called lateral shoots. In the middle of the disc grows the main bud which will grow into flowers. The shoot in this section is called the apical bud.

The flower stalk stems from the apical bud is the main shoot. These shoots emerge first from the tuber base through the tips the same as leaves. Onion flowers are perfect flowers consisting of 5-6 stamens and a pistil. The leaves are slightly green with whitish or white stripes. The roots form a triangle like a dome (Wibowo, 1994).

Shallots are classified as the following:

Division : Spermatophyla

Sub-Division : Angiospermase

Class : Monocoiyledoneae

Order : Liliales

Family : Liliales

Genus : Allium

Species : *Alliumm ascalonicum (Rahayu, 1997)*

2.2 Growing Condition

2.2.1 Climate

In growing, shallot plants prefer dry climates with slightly hot temperatures and sunny weather, especially exposed in more than an hour to sunlight. When shallots planted in a place with shades, the bulbs would be small and produce disappointing production.

Shallots can be planted in low or highlands (0-900 masl) with 300-2500 mm/year. However, the best altitude for growing shallots is up to 250 masl. Shallots are still capable to grow in 800-900 masl, but the bulb are smaller with less bright color. In addition, its lifespan is longer those planted in the lowlands due to the lower temperature. At 22°C, the plant is still easily growing bulbs, but the results are not as good as those planted in lowlands with high temperature. The suitable areas are those with 25-35°C temperature and 27-28°C annual temperature (Rismunandar, 1984).

2.2.2 Soil

Shallots prefer fertile and loose soil with lots of organic matter. Loose and fertile soil will boost the bulbs growth to produce good results. The best type of soil for shallots is the dusty sandy loam. This soil has good aeration and drainage since it has a balance ratio of clay, sand and dust fractions.

The most suitable soil acidity (pH) for shallots is slightly acidic to normal (6.0-6.8). Soil with a pH of 5.5-7.0 can still be used to grow shallots. Soil that is too acidic with a pH below 5.5 contains a lot of aluminum salts (AI). This substance is toxic and can cause plants to be stunted (Sumaryono, 1953).

2.3 Fungi

Fungi are a group of eukaryotic organisms that create the world of fungi. Fungi are generally multicellular (many celled). The characteristics of fungi are different from other organisms in how they eat, body structure, growth, and reproduction.

Fungi Structure

Fungi structure depends on its type. Single-celled yeast for example and there are also multicellular fungi that form large bodies sizing up to a meter like wood fungus. Fungi bodies are composed of basic components called hyphae. Hyphae form filaments called mycelium. Mycelium forms pseudo-weave into the body.

Hyphae are thread-like structures composed of tubular walls. This wall surrounds the plasma membrane and cytoplasm of hyphae. Its cytoplasm contains

eukaryotic organs. Most hyphae are limited by transverse walls or septa. The septa has pores large enough for ribosomes, mitochondria, and sometimes a set of nuclei that flow from cell to cell.

However, there are also non-septate and coenositic hyphae. The coenositic hyphae structure is produced by repeated nuclear division which is not followed by cytoplasmic division. Hyphae in parasitic fungi are usually modified into haustoria, an organ that absorbs food from the substral; haustoria is capable in penetrating the substrate tissue.

Fungi Ecology

All types of fungi are heterotrophs. However, unlike other organisms, fungi do not eat and digest food. To obtain food, fungi absorb organic substances from the environment through their hyphae and mycelium and store them in the form of glycogen. Since fungi are consumers, they depend on substrates that provide carbohydrates, proteins, vitamins, and other chemical compounds. All these substances are obtained from the environment. As heterotrophs, fungi are classified as obligate parasites, facultative parasites, or saprophytes.

a. Obligate parasite is a fungal trait that can only live on its host.
b. Facultative parasite is fungi that are parasitic when they find a suitable host and will turn saprophytic on unsuitable hosts.
c. Saprophytes are decaying fungi that change the composition of dead organic matter. Saprophytic fungi absorb their food from dead organisms such as fallen trees and fruits. Most saprophytic fungi secrete hydrolase enzymes on

food substrates to decompose complex molecules into simpler molecules to be easily absorbed by hyphae. Hyphae can also directly absorb simple organic coumpounds released by the host.

Another fungi trait is symbiotic mutualism. Fungi that live in symbiosis, apart from absorbing food from other organisms will also produce certain substances that benefit the symbionts. Fungi symbiotic mutualism can be seen in mycorrhizae, which are fungi living on the legumes roots or lichens.

Fungi live in a variety of environments and associate with many organisms. Although most live on land, some fungi exist live in water and associate with aquatic organisms. Fungi that live in water are commonly parasitic or saprophytic and are mostly from Oomycetes class.

Growth and Reproduction

Fungi reproduction can be sexual (generative) and asexual (vegetative). Asexually, fungi produce spores. Fungal spores vary in shape and size and are commonly unicellular, but some are multicellular. When the habitat condition is suitable, the fungus reproduces by producing large numbers of asexual spores. The spores are carried by water or wind. In a suitable place, the spores will germinate and grow into adult fungi.

Sexual reproduction in fungi is through gametangium contact and conjugation. The gametangium contact results in the occurrence of syngamy, which is the fusion of two individual cells. Syngamy occurs in two stages. The first stage is plasmogamy (fusion of the cytoplasm) and the second stage is karyogamy (fusion of

nuclei). After plasmogamy occurs, the nucleus of the cell from each parent unites but does not fuse and form dikaryon. Nuclear pairs in the dikaryon or mycelium set will divide within a few months to several years and finally, the nuclei fuse to form a diploid cell which immediately undergoes meiotic division.

Fungi Roles

There are many fungi roles in human life, both detrimental and beneficial. Beneficial fungi include the following types:

a. *Volvariella volvacea* (straw mushrooms) as high protein foods.
b. *Rhizopus* and *Mucor* are used in food industry, especially in tempe fermentaion.
c. *Khamir saccharomyces* is used to ferment cheese, bread, and beer.
d. *Penicillium Notatum* is used to produce antibiotic.
e. *Hygroporus* and *Lycoperdon perlatum* is used as decomposer.

In addition to the beneficial role, some fungi also have a detrimental role such as follows:

a. *Phytium* causes root rot to plant saplings.
b. *Phythophthora infestan* causes leaves disease to potato plants.
c. *Saprolegnia* is parasite on water organisms' bodies.
d. *Albugo* is a parasite to agricultural plants.
e. *Pneumonia carinii* causes pneumonia in human's lungs.
f. *Candida sp.* causes leucorrhea and sprue on humans.

Fungi are plants that do not possess chlorophyll which makes them heterotrophs with eukaryotic cells. Fungi are unicellular and multicellular. Fungi bodies are composed of basic components called hyphae. Hyphae form filaments called mycelium. Some fungi reproduce asexually and some reproduce sexually.

FUNGI ARE DIVIDED INTO 6 DIVISIONS:

1. MYXOMYCOTINA (Slimy Mold)

Myxomycotina is the simplest fungus. It has 2 phases of life: the asexual phase (the slimy phase) which capable of moving like an amoeba called the plasmodium body phase. Reproduction: asexually by spores, twin spores called myxoflagellates. An example of species: *Physarum polycephalum*.

2. OOMYCOTINA

The body consists of hyphae that are not insulated, branched and contain many nuclei. Asexual reproduction: in water by zoospores and on land by sporangium and conidia. Sexual reproduction: the fusion of male and female gametes forms oospores which then grow into new individuals. Examples of species: a) *Saprolegnia sp.:* lives saprophytely on fish carcasses, and land as well as water insects. b) *Phytaphtora infestan:* causes rotting on potato plants.

3. ZYGOMYCOTINA

The body is multicellular. The habitat is commonly found on land as a saprophyte. The hyphae are not insulated. Asexual reproduction by spores and sexual reproduction by conjugation of positive hyphae with negative hyphae produces

zygospores which will grow into new individuals. Examples of species: a) *Mucor mucedo*: commonly live in manure and bread. b) *Rhizopus oligosporus*: tempe fermentation.

4. ASCOMYCOTINA

Some are unicellular and some are multicellular. For the multicellular, the hyphae are insulated and have many nuclei. Some are parasitic, saprophytic, and some live in symbiosis with Lichens. Asexual reproduction: forming buds in unicellular fungi while in multicellular fungi, it forms spores from conidia. Sexual reproduction: forming ascus which produces ascospores. Examples of species: a) *Sacharomyces cereviseae:* most know as yeast. Used to make ferment beer, bread, and alcohol. It is capable to change glucose into alcohol and CO2 through fermentation process. b) *Neurospora sitophila*: Oncom fungus. c) *Penicillium nojajum* and *Penicillium chrysogenum*: produce penicillin antibiotic. d) *Aspergillus oryzae*: used to make sake and soysauce. e) *Aspergillus wenti*: used to make soysauce. f) *Aspergillus flavus*: produces aflatoxin and lives in grains. Aflatoxin is one of the causes for hepatic. g) *Cleviceps purpurea*: parasite in Gramineae ovaries.

5. BASIDIOMYCOTINA

The characteristics of these fungi is their sexual reproduction is a basidium as a spore producer. Most members of the species are macroscopic in size. They are: a) *Volvariella volvacea*: straw mushrooms which are edible and cultivated. b) *Auricularia polytricha*: wood ears which are edible and cultivated. c) *Exobasidium vexan*: parasite on tee tree and the cause for blister blight disease on the tree. d)

Ustilago maydis: ergot, parasite on corn. e) *Puccinia graminis*: stem rust, parasite on wheat plants.

6. DEUTEROMYCOTINA

Also known as fungi imperfecti (imperfect fungi) since this fungus sexual reproduction is still not known for certain. For example: oncom fungus which was known as *Monilia sitophila* before its sexual reproduction is known. After it was known, its name changed into *Neurospora sitophila* and classified as Ascomycotina.

III. MATERIALS AND METHODS

3.1 Time and Location

This research was conducted in the laboratory of Belawan Agricultural Quarantine Center. This research was conducted from November 2008 to March 2009.

3.2 Materials and Instruments

Materials

- Shallots
- PDA (Potato Dextrose Agar) Media
- Alcohol 70%
- Chlorox
- Lactic Acid
- Distilled Water
- Lacthopenol
- Nail Polish

Instruments

- Microscope
- Incubation Room
- Autoclave
- Oven
- Inoculation Needle

- Tweezer
- Laminar Air Flow
- Weight
- Beaker Glass
- Erlenmeyer Flask
- Object Glass
- Cover Glass
- Spatula

3.3 Research Method

3.3.1 Creating Fungi Growing Media (Potato Dextrose Agar)

39 grams Potato Dextrose Agar (PDA) was put into a beaker glass and distilled water was added until the volume reached 1 liter. The solution was stirred using a spatula then put moved into an Erlenmeyer tube and covered using aluminum foil. The media was sterelized with an autoclave.

3.3.2 Fungi Isolation

FIRST PROCEDURE

Shallots that still contain roots and leaves were watered/washed with sterile water. The washing water was collected, a few drops were taken and dropped into 5 petri dishes which already contained agar media. Then, 2 drops of lactic acid were added and incubated for 3-5 days. On the sixth day, the fungi were purified in the first or second or third petri dish, and so on. Then the fungi were taken using an inoculation needle and put into a petri dish that already contained agar media which

already contained the 2 drops of lactic acid and incubated one more time for 3-5 days. After the sixth day, the fungi were observed under a microscope.

SECOND PROCEDURE

Shallots that have been watered/washed with sterile water were then cut into 1/2 cm by l/2 cm size. The cut shallots were then put into 5 petri dishes which already contained agar media and then 2 drops of lactic acid were added and incubated for 3-5 days. On the sixth day, the fungi in the first or second or third or fourth or fifth petri dishes were purified. Then the fungi were taken using an inoculation needle and put into a petri dish that already contained agar media which already contained the 2 drops of lactic acid and incubated one more time for 3-5 days. After the sixth day, the fungi were observed under a microscope.

THIRD PROCEDURE

Shallots were soaked in chlorox for 1 minute and were then cut into 1/2 cm by l/2 cm size. The cut shallots were then put into 5 petri dishes which already contained agar media and then 2 drops of lactic acid were added and incubated for 3-5 days. On the sixth day, the fungi in the first or second or third or fourth or fifth petri dishes were purified. Then the fungi were taken using an inoculation needle and put into a petri dish that already contained agar media which already contained the 2 drops of lactic acid and incubated one more time for 3-5 days. After the sixth day, the fungi were observed under a microscope.

3.3.3 Identification

The isolated fungi were then purified and studied for their growth and specific characteristics through microscopic testing to ease the identification of each species. The identifications of the fungi were based on:

- Growth shapes, length and conidiophores structures.
- Shapess, colors, septations, and conidia chain structures.
- Shape of spore or mycelium mass. V
- Characteristics of fungal colonies such as the color of the colony, hyphae shapes (insulated or not insulated) and so on.

3.3.4 Identification Keys

The literatures commonly used in fungal identifications are:

Illustrated Genera of Imperfect Fungi; More Dematiaceous Hyphomycetes;

Illustrated Genera of Ascomycetes; Descriptions of Pathogenic Fungi and Bacteria;

and other literatures related to fungi genus or species identified.

V. CONCLUSION AND SUGGESTIONS

5.1 CONCLUSION

The types of fungi found in the first market through procedure I, II, and III were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Penicillium oxalycum, Phytaphtora porri,* and *Mucor sp.* The types of fungi found in the second market through procedure I, II, and III were: *Aspergillus niger, Aspergillus flavus, Aspergillus Fumigatus, Fusarium dimerum, Fusarium oxysforum, Penicillium oxalycum,* and *Mucor sp.,* while the fungi found in the third market through procedure I, II, and III were: *Aspergillus niger, Aspergillus flavus, Aspergillus Fumigatus, Fusarium dimerum, Fusarium oxysforum, Penicillium oxalycum,* and *Mucor sp.,*

The types of fungi found on shallots' surfaces taken from the first, second, and third markets thorugh procedure I were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Penicillium oxalycum,* and *Mucor sp.* The types of fungi found on shallots' surfaces taken from the first, second, and third markets thorugh procedure II were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Penicillium oxalycum,* and *Mucor sp.* Finally, the types of fungi found on shallots' surfaces taken from the first, second, and third markets thorugh procedure III were: *Aspergillus niger, Aspergillus fumigatus, Aspergillus flavus, Fusarium oxysforum, Fusarium dimerum, Penicillium oxalycum, Mucor sp, and Phytopthora porri.*

5.2 SUGGESTIONS

Continuous testing in carrying out this research is needed to obtain better results considered that the findings of this study were very needed in controlling diseases in shallots and in determining the types of Crop Damaging Organisms in shallots for the related parties.