Teaching Materials

# Disease Management of Crops and Hortikulture Plant

*Delivered by*

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## INTRODUCTION

Management of food crop and horticultural diseases is relatively complicated, given the many types of food and horticultural crops. Each type of plant is attacked by various types of pests and diseases, the number of pests and diseases is at least 10 types, so that overall there are quite a lot of them. The average of each type of disease does not only attack one type of plant.

Techniques for controlling plant diseases, to be successful, must start from knowing the ecobiology of each type of disease, however, information about ecobiology is not yet fully known. Another approach that can be taken to control it is to use biological pesticides and vegetable pesticides. The application of biological pesticides is more efficient and effective considering the frequency with which biological agents can survive on plants and the surrounding environment, while vegetable pesticides, although safe, must be repeated as needed.

The main food crop in the tropics is rice because of the relatively large number of consumers, easy cultivation and relatively stable selling prices. Meanwhile, vegetable and horticultural crops that are widely grown include chilies, shallots, potatoes and bananas. One of the toughest hands in cultivating these plants is the attack of various types of pathogens. The result of this disease attack is moderate to severe, and can even cause crop failure.

Rice plants are attacked by many types of diseases, especially blas disease and Tungro Virus. Blas disease attacks rice plants in the vegetative phase and the generative phase. Blas attack in the generative phase and tungro virus attack caused crop failure. In banana plants, crop failure is generally caused by stem rot disease by Fusarium fungi and Pseudomonas bacteria.

Vegetable plants, such as chilies, are often attacked by curly virus and yellow virus. Both types of these diseases do not kill the plant but are very detrimental, especially the yellow virus attack. For onion plants generally attacked by Fusarium wilt and root neck rot. All types of diseases can be controlled with vegetable pesticides with a success rate of 100%. Meanwhile, potato plants are often attacked by late blight which can also attack other parts of the plant, causing crop failure.

## I. DISEASES OF RICE

1. **Blas disease**, caused by the fungus *Pyricularia grisea*. blas disease can also develop in plants other than rice, such as wheat, sorghum and grass species. The development of the disease is determined by 4 factors, namely: availability of food; there is room to grow; appropriate temperature and humidity. If all four of these conditions are met, the fungus will continue to reproduce. In a conducive environment, blas fungus that attacks the leaves (leaf blas) can thrive and sometimes can cause the death of the plant. blas disease that infects the blood of the panicle neck (neck blas) can cause the neck of the panicle to rot or break so that the filling process of the panicle is disrupted and many empty rice grains form.


Figure 1. Symptoms of leaf blas and neck blas disease

Source: BBPadi, 2015

**Bioecology of Pyricularia grisea Mushroom**

*P. grisea* mushrooms have many breeds, which are easy to change and form new breeds quickly. Under favorable environmental conditions, one cycle of blas disease takes about 1 week, which starts when the fungal spores infect and produces a spot on the rice plant and ends when the fungus spores (produces new spores) that are ready to be spread into the air. Furthermore, from one spot can produce hundreds to thousands of spores

Blas disease prefers conditions of long dew periods, high humidity and night temperatures around 22–25 ° C. Other factors that support the development of blas disease are excessive use of nitrogen fertilizers, soil in aerobic conditions and drought stress. The effect of nitrogen on epidermal cells causes increased cell wall permeability and decreased levels of silica (Si), so that fungi are easier to penetrate**.** Giving the Si element can help the hardness and erectness of the leaves. Giving P elements can also increase the cohesiveness of the cell structure, so that it can suppress the attack of suckers-sucking pests, such as leafhoppers. The primary inoculum source of blas disease in the field is straw. In the tropics the source of the inoculum is always present throughout the year due to the presence of spores floating in the air and the large number of alternative host plants. Factors that influence the development of blas disease include soil, irrigation, humidity, temperature, fertilizer and variety resistance. These factors are manageable components of a disease epidemic for the purpose of controlling blas disease. Efforts to control blas disease through integrated management of epidemic components have a high chance of success.

**Control**

**1. Technically technical**

1.1. **Healthy Seed Planting**

*P. grisea* fungus can be transmitted through seeds, so that control can be more effective if done as early as possible. Plants infected with blas disease should not be used as seeds. It is necessary to treat / treat seeds with a systemic fungicide such as tricyclazole with a formulation dose of 3-5 g / kilogram of seed. Seed treatment can be done by soaking the seeds (soaking) or coating the seeds with recommended fungicides.

**1.2. Soaking the seeds**

Rice seeds are soaked in a fungicide solution for 24 hours, and during the soaking period, the solution is stirred evenly every 6 hours. The ratio of seed weight to volume of water is 1: 2 (1 kg of seeds soaked in 2 liters of fungicide solution water). Soak the seeds, then dry them at room temperature on newspaper and leave them until the grain is ready for sowing. Soaking rice seeds in a fungicide solution before ripening.

**1.3. How to coating (seed)**

Soak the seeds in water for several hours, then drain them until the water doesn't drip again. A certain dose of fungicide is mixed with 1 kg of wet seeds and shaken until evenly distributed, then the grain is dried in the same way as the soaking method, then the seeds are ready for sowing.

**1.4. How to plant**

Less dense spacing or legowo systems are strongly recommended to make environmental conditions unfavorable to pathogens. Then supported in a way intermittent watering. This method will reduce humidity around and in the plant canopy, reduce the occurrence of dew and gutting water and prevent friction between leaves.

**1.5. Fertilization**

Nitrogen (N) fertilizer has a positive correlation with the severity of blas disease. This means that plants fertilized with high doses of nitrogen will cause the plants to be more susceptible and the disease severity is higher. On the other hand, potassium fertilizer causes plants to be more resistant to blas disease. Therefore, it is advisable to use nitrogen and potassium fertilizers in a balanced way.

**1.6. Use of Resistant Varieties**

The most effective, cheap and environmentally friendly way to control blas disease is to use resistant varieties. The use of resistant varieties must be adapted to the distribution of races in an area. Several rice varieties that are resistant to several races of blas disease pathogens include: Inpari 21; Inpari 22; Inpari 26; Inpari 27; Inpago 4; Inpago 5; Inpago 6; Inpago 7; and Inpago 8. Another effort that needs to be considered in the use of resistant varieties is not to plant rice monogensically (1 or 2 varieties) widely and continuously. If the rice is planted continuously throughout the year, then it must be rotating the varieties. Several varieties with different levels of resistance are planted in one area, can reduce selection pressure against pathogens, so as to slow down the emergence of new pathogenic races and break the resistance of a variety.

**2. Synthetic Chemistry**

Treatment of seeds with fungicides for seed treatment only lasts 6 weeks, then it is necessary to spray the plants. The results of experiments on several fungicides showed that the fungicides Benomyl 50WP, Mancozeb 80%, Carbendazim 50%, isoprotiolan 40%, and trisikazole 20% were effective in suppressing the development of P. grisea fungi. Spraying with fungicides should be done 2 times during the maximum tillering stage and the beginning of the flowering phase.

**Prevention**

1. Environmental Sanitation, an effort that is highly recommended is the sanitation of the planting environment by maintaining the cleanliness of the rice field environment from weeds which become alternative hosts and cleaning the remains of infected plants.
2. Providing straw compost

The provision of organic material, especially the remaining straw for land health care, must be composted first. Composting straw can cause mycelia and mold spores to die, due to the increase in temperature during the decoposition process. Straw is also a source of the element K for plants. From 1 hectare of rice straw, you can get 93 kilograms of K.

**2. Tungro Virus Disease**

Diseases caused by viruses in rice such as tungro virus disease. This disease attacks rice cultivation in Indonesia. This viral disease can only be transmitted by green leafhoppers (*Nephotettix virescens* Distant). Tungro is caused by a virus that has two kinds of particle shapes, namely a round one (rice tungro spherical virus: RTSV) with a diameter of 30 nano meters (nm) and a rod (rice tungro bacilliform virus: RTBV) like a bacteria with a size (150 - 350) x 35 nm.

Yield loss due to tungro disease varies depending on the time the plant was infected, the location and point of infection, the growing season and the type of variety. The younger the plant is infected, the greater the percentage of yield loss incurred. Yield loss at infection stage from 2-12 weeks after implantation (MST) ranges from 90-20%.

Apart from Indonesia, tungro virus disease can also be found in several neighboring countries such as Malaysia, the Philippines, Thailand, India, and Bangladesh. In Japan there is a rice virus disease called "Waika" disease which was discovered in 1978 in the Kyushu area, southern Japan. The disease is also caused by an isometric virus with a diameter of between 30 nm and is transmitted non-persistently by the green leafhoppers *N. virescens* and *N. nigropictus*. Based on serological tests, "Waika" disease in Japan is related to the tungro virus in an isometric form.

The main symptom of tungro disease is a change in the color of young leaves to orange yellow, starting from the tip of the leaves, the number of tillers is reduced, erdil plants and stunted growth. Symptoms of the disease are scattered in groups, the rice fields look wavy because of the difference in plant height between healthy and infected plants.

Symptoms of severe tungro disease are caused by a complex of two types of viruses in the form of rods and spheres, while infection of either type causes mild or indistinct symptoms depending on the infecting particle. Viruses are not transmitted through insect eggs, nor can they be transmitted through seeds, soil, water and mechanically (eg, friction between diseased and healthy plant parts). Green planthopper nymphs can also transmit the virus, but become ininfective after molting. The tungro virus does not have a negative effect on vectors. If the viral inoculum is already in the field, the presence of tungro is influenced by vector fluctuations. Thus, it is important to understand the dynamics of the vector population to develop a tungro disease control strategy.

The intensity of disease attack depends on and the level of resistance of the rice variety and the age of the plant at the time of infection. Young plants are more sensitive to infection than old plants. The first symptoms generally appear as soon as one week after infection. If the plant is protected from infection until the age of two months, then tungro disease will not cause much damage and loss of yield.

Figure 2. Symptoms of the Tungro Virus attack
Source: Center for Food Crops Research (2007)

**Disease Transmitters (Vector)**

Both types of viruses are generally found in phloem tissue. The two particles were transmitted by leafhoppers, especially green leafhoppers, in a semi-persistent manner. Green planthopper species N. virescens is the most efficient vector of transmitting both types of viruses. Hibino et al (1978) reported that green leafhoppers could only transfer RTSV from rice plants infected with RTSV, but were unable to transfer RTBV. RTBV can be transferred by green leafhoppers that have been infected with RTSV.

Figure 3. Insects that transmit tungro disease
Source: Center for Food Crops Research (2007)

The two virus particles are non-circulative, meaning that in the body the virus vector cannot be transmitted from the image to the egg or between changes in the insect development stage. Insects that have acquired the virus can immediately transmit it until the acquired virus runs out, thus losing the ability to transmit the virus. The longest period a vector is able to transmit the virus is 6 days. The length of time it takes for insects to acquire the virus is between 5-30 minutes, while the time needed to transmit the virus is also short, between 7-30 minutes. The incubation period for viruses in plants is between 6-15 days.

**Host Plants**

The source of the inoculum of tungro virus disease is found in seedlings from infected grains (volunteers), plants, barbs and diseased host grass. Host plants other than rice, which are already known are: old grass (*Eleusine indic*a); duck grass or tuton (*Echinochloa colonum*); whiz (*Echinochloa crusgal*i); juhun randan (*Ischaemum rugosum*); starlings or katelan grass (*Dactyloctenium aegyptium*) ,; pickled grass (*Paspalum distichum*) and wild rice.

**Control**

1. Using biological agents (natural enemies)

1.1.Wolf spider (*Lycosa pseudoanulata*)

These spiders actively seek and hunt their prey. High prey ability, among other things, depends on the size of the prey and the activity of the prey. Larger prey will need a smaller number than smaller prey. The ability of this predator to catch and prey on less active pests such as *N. virescens* nymphs, is very small, around 0.293 - 3.75 individuals / day. Likewise for very active (agile) imago, this spider can only catch 0.13 head / day in a 35x35x35 cm room, but its prey ability is high, it can reach 20 birds/day if the spider is given prey of green leafhoppers tube 3 cm in diameter and 15 cm long.

The ability to prey on this predator against the brown planthopper can reach 10-20 imago/day or 15-20 nymphs / day. Several types of prey are brown planthoppers, green slugs, white backed leafhoppers, white pests, fake white pests and seed flies.

Their life habits are at the bottom of the stem or above the water surface during the day and at night it is usually on the upper leaves. Its life span is 100 days and the number of eggs produced is 380 / female. Female and male spiders can be distinguished by looking at the palpus which resembles a boxing glove on either side of the head which is found only in females.

Figure 4. *Lycosa pseudoanulata*
Source: Center for Food Crops Research (2007)

1.2 Bitch Eyed Spider (*Oxyopes javanus*)

This spider is an active spider that hunts its prey. Types of prey are brown leafhoppers, green leafhoppers, white-back leafhoppers (8 animals / day), zigzag leafhoppers, rice flies, white pests and fake white pests. This spider has the following characteristics: 7-10 mm in size, on its legs there are long spines with hexagon-shaped eyes. The life span is 150 days with 350 eggs / female.

Figure 5. *Oxyopes javanus*
Source: Center for Food Crops Research (2007)

1.3. Four Jawed Spider (*Tetragnatha* spp.)

This spider is not very active in attacking its prey. During the day, the spider is mostly silent and at night it is active in making nests and the prey that is caught in the nest is caught and eaten. The types of insects that are eaten are brown leafhoppers, green leafhoppers, white leafhoppers, green leafhoppers, white-backed leafhoppers, zigzag leafhoppers and rice flies. The characteristics of these predators are as follows: body length 10-25 mm, has a jaw, long limbs and in a resting state often protrudes in a line. Its life span is 150 days and the number of eggs is produced 120 eggs/female. Its life habit is on the leaves where the spider forms its web.

Figure 6. *Tetragnatha* spp.
Source: Center for Food Crops Research (2007)

1.4 Water Surface Clap (*Microvellia douglasi atrolineata*)

These ladybugs live in groups on the surface of the water and are very active in attacking pests / insects that fall on the surface of the water and are attracted by the light. These types of predatory prey are brown leafhoppers, green leafhoppers, white-backed leafhoppers, rice stem borer larvae and those that have just hatched. This ladybug is 1.5 mm long with the characteristics of the broad shoulders, the shiny color of the shoulders, the legs are located at the same distance along her body and the mouth is a sucking type. Its life span is 45 days and the number of eggs produced by a female is 100 eggs**.**

Figure 7. *Microvellia douglasi atrolineata*
Source: Center for Food Crops Research (2007)

1.5.Kepik Mirid (*Cyrtorhinus lividipennis*)

This ladybug is green and is usually found in high pests. These predators actively hunt prey and move like brown planthoppers and at night have silat attracted to light rays. Types of prey are brown, green leafhoppers, white-back leafhoppers, zigzag leafhoppers and rice flies. The predator has a body size of 2.5-3.25 mm with the characteristics of a bright green color and on the head and shoulders there is a black color. The mouth of this predator has 15 types of sucking. Its life span is 30 days and a female can produce 30 eggs. These predators live on rice plants, weeds and other plants.

Figure 8. *Cyrtorhinus lividipennis*
Source: Center for Food Crops Research (2007)

**1.6 Stacfilinea beetle (*Paederus fuscipes*)**

These predators are actively looking for prey at night and can swim in water or on plant parts. The types of prey are brown leafhoppers, green leafhoppers, white pests, zigzag leafhoppers, white-back leafhoppers and young caterpillar larvae. This predator has a size of 7 mm with the characteristics of its wings only half of the body, the tip of the abdomen is blue, the body is striped and the mouth apparatus is of the chewing type. The life span is 90-110 days and the number of eggs produced by a female is 24 eggs.

Figure 9. *Paederus fuscipes*
Source: Center for Food Crops Research (2007)

**1.7 Carabid beetles (*Ophionea nigrofasciata*)**

These predators are active in search of prey during the day and can swim. The types of prey are brown leafhoppers, green leafhoppers, white pests, zigzag leafhoppers, white-back leafhoppers, caterpillars, cyclone caterpillars and rice stem borer. Place his life at the base of the stem or in soil that is not watery. This Predator has a body length of 8 mm with the characteristics of a shiny body, smooth skin, bluish black head and midsection. Or the mouth is chewing type. Its life span is 15 days and the number of eggs produced by a female is 45 eggs.

Figure 10. *Ophionea nigrofasciat*a
Source: Center for Food Crops Research (2007

**1.8.Kinjeng Dom (*Agriocnemis* spp.)**

Kinjeng dom or often called small dragonflies are usually found under the canopy of plants and when perched on the stems of plants their bodies point straight down. This dragonfly is a predator of green leafhoppers, brown leafhoppers, white-backed leafhoppers and fake white pests. This predator has a body length of 30 mm with the characteristics of a slender body that is orange red or bluish-gray and its wings have a complex network shape. Its life span is 10-30 days and the number of eggs produced by a female is 30 eggs.

Figure 11. *Agriocnemis* spp.
Source: Center for Food Crops Research (2007)

**1.9 Long-horned Grasshopper (*Conocephalus longipennis*)**

This predator is very active in the morning, is a predator of stem borer eggs and a predator of brown leafhoppers, green leafhoppers, zigzag leafhoppers and white-back leafhoppers. This predator has a body length of 25-32 mm and has a characteristic antennae 2 to 3 times the length of its body and a green body.

The place of his life on the leaves or panicles of rice plants. The life span of this predator is 110 days and the number of eggs produced ranges from 15-30 eggs / female.

Figure 12. *Conocephalus longipennis*
Source: Center for Food Crops Research (2007)

**1.10.Coxinelid beetle (*Synharmonia octomaculata*)**

These beetles are predators of brown leafhoppers, white-back leafhoppers, green leafhoppers, zigzag leafhoppers, aphis, fake white pests and rice stem borer. These predatory larvae actively prey in groups. This predator has a body size of 6-7 mm. Adult beetle is yellow elongated round, the body of the larva is segmented by means of a chewing mouth. Place of life in all parts of the plant. The life span is 150 days with 45 eggs per female.

Figure 13. *Synharmonia octomaculata*
Source: Center for Food Crops Research (2007)

**1.1. Biological Agents (Entomopathogens)**

Naturally, it can be infected with entomopathogenic fungi such as *Beauveria bassiana* and *Metharizium anisopliae. B.bassiana* and *M.anisopliae* fungi caused significant mortality of green leafhoppers at 3-14 HSA. The fastest time for the death of green leafhoppers between 3-7 HSA. LT50 for treatment with the fungus B. bassiana achieved 7.57 days while for treatment with the fungus *M. anisopliae* achieved 8.39 days. The application of entomopathogenic fungi, M. anisopliae and B. bassiana, suppressed green leafhopper to only 32-58% of healthy females. Green planthopper life cycle who were not infected with entomopathogenic fungi in terms of their total reproduction rate (Ro), and higher population enhancement capacity (rc) and longer generation time (Tc). The application of *M.anisopliae* in the field reduced the population density of green leafhoppers but did not affect the population density of natural enemies (spiders). Entomopathogenic fungi suppress the green leafhoppers population in a double way, namely directly killing the green leafhoppers and indirectly suppressing the green leafhoppers..

**1.3. Technically Cultural**

**1.3.1 Plant simultaneously**

Simultaneous planting can shorten the presence of an inoculum source or the breeding time. Concomitant planting reduces the source of diseased plants and limits the breeding time for vectors that transmit pathogens. To reduce the attack of tungro disease, it is recommended that plants simultaneously cover a minimum area of 20 ha based on the disease gradient from one inoculum source.

**1.3.2. When planting is right**

Planting at the right time is intended to prevent the plant from being attacked when the plant is sensitive. The timing of planting was just right used to control 22 tungro diseases). Rice plants are known to be sensitive to tungro virus infection when the plants are less than one month after planting. By observing the pattern of fluctuation in the green planthopper population and the intensity of tungro attacks throughout the year, it will be known the times when tungro is the most serious threat.

The planting time is adjusted so that when the threat of tungro is serious, the plants are more than 1 month old after planting. Correct planting time is only effective in controlling tungro disease in areas with a simultaneous cropping pattern. When planting simultaneously succeeded in controlling the extent of tungro attacks in South Sulawesi, but it was difficult to apply in areas where rice planting was not synchronous, as in Bali. The right planting time can prevent the plant from being attacked by leafhoppers and tungro virus infection. In Maros, planting rice at the beginning of the rainy season (December-January) or the dry season (June-July) can prevent serious planthopper and tungro attacks.

**1.3.3. Resistant varieties**

Tungro disease-resistant varieties are classified as resistant to green leafhoppers as transmitters (vectors) of the pathogens mentioned above and resistant to viruses which are the pathogens that cause tungro disease.

Table 1. Rice varieties resistant to green leafhoppers

| Golongan | Varietas | Gen tahan |
|---|---|---|
| To | IR5, Pelita, Atomita, Cisadane, Cikapundung, dan Lusi | - |
| T1 | IR20, IR30, IR26, IR46, Citarum, dan Serayu | Glh1 |
| T2 | IR32, IR38, IR36, IR47, Semeru, Asahan, Ciliwung, Krueng Aceh dan Bengawan Solo | Glh 6 |
| T3 | IR50, IR48, IR54, IR52 dan IR64 | Glh 5 |
| T4 | IR66, IR70, IR72, IR68, Barumun, dan Klara. | Glh 4 |

Source: Center for Food Crops Research (2007)

**1.3.4. Variety rotation**

In order to extend the durability of varieties, it is recommended to rotate the varieties in order to reduce selection pressure. Resistant varieties of green leafhoppers are grouped based on the source of resistant parents. Variety rotation is carried out between growing seasons.

**1.3.5. Sanitation**

Weeds, singgang, scattered grain during harvest that grow (volunteer) can host insects and pathogens when the rice plant is not in the plant. Brown planthoppers can only develop well in rice, singgang and volunteer plants.

The green planthopper species *N. virescens* which is the most efficient as a tungro vector can only complete its life cycle well only in rice. Meanwhile, other green leafhoppers such as *N. nigropictus* and *N. malayanus* developed better on weeds.

The tungro virus besides being able to infect rice, can also be transmitted by green leafhoppers to weeds. The presence of the three green leafhoppers and weeds causes endemic tungro disease in that location. When there are no rice plants, singgang or volunteers, the tungro virus survives on weeds. Planthopper *N. nigropictus* and *N. malayanus* transmit the virus to weeds and when it starts, the rice plants transmit it to rice plants. The virus in rice is re-propagated by *N. virescens* so that tungro disease can persist. Removing weeds, singgang and volunteers will reduce the source of inoculum at the beginning of plant growth.

It is recommended that farmers make a nursery after clearing the land or planting rice by sowing the seeds directly (table). With tablea, the land is cleared and leveled before the seeds are sown, so that the tungro inoculum in particular has been reduced at the beginning of plant growth. Tabela is more effective in reducing tungro attacks if it is done simultaneously for at least 20 ha. Tables that are carried out simultaneously in one stretch will result in the planting of the rice plants the latest to get the accumulation of vectors and tungro inoculum.

**1.3.6. Sow the seeds directly**

In the method of planting rice with a table, the land is cleared and leveled first before sowing the seeds. Thus the tungro inoculum in particular has decreased at the start of plant growth. Tabela will be more effective in reducing tungro attacks if it is done simultaneously for at least 20 ha. Tables that are carried out simultaneously will result in the planting of the paddy plants getting the accumulation of vectors and tungro inoculum at the latest. In several areas in South Sulawesi, the practice of Tabela has been practiced, however, due to inconsistent sowing times, tungro attacks are still widespread.

**1.3.7. Plant legowo row**

Planting legowo rows causes the microclimate conditions under the plant canopy to be less supportive of pathogen development. In rice plants with legowo space distribution, green leafhoppers are less active in moving between clumps, so that the distribution of tungro is limited. Rats prefer to eat plants that are in the middle of the plots, on the rice planted rowdy legowo, rats are less comfortable eating plants. Likewise, the attack of bacterial leaf blight is reduced.

**1.3.8. Irrigation**

Drying the fields can increase the death of brown planthopper nymphs. However, if the rice plant is attacked by tungro disease, drying the fields will encourage green leafhoppers to move. Drying the fields affected by tungro will accelerate the spread of the disease.

## II. DISEASES OF SHALLOT

Shallots are one of the leading vegetable commodities that have long been cultivated by farmers intensively. This vegetable commodity is included in the non-substituted spice group which functions as a food seasoning and traditional medicinal ingredients. This commodity is also a source of income and job opportunities that contributes significantly to regional economic development (Rp. 2.7 trillion / year), with the potential for development of a large enough area reaching ± 90,000 ha (Ditjen Hortikultura, 2005).

Shallots are produced in 24 of 32 provinces in Indonesia. The main producers (harvested area> 1,000 hectares per year) of shallots are North Sumatra, West Sumatra, West Java, Central Java, DI Yogya, East Java, Bali, NTB, and South Sulawesi. The whole province contributed 95.8% (Java contributed 75%) of the total production of shallots in Indonesia in 2003. The average consumption of shallots in 2004 was 4.56 kg / capita / year or 0.38 kg / capita / month. Approaching religious holidays, consumption increases by 10 - 20% (Ditjen Hortikultura, 2005).

Some of the problems faced in shallot cultivation, among others, are: (1) the availability of quality seeds is not sufficiently sufficient (time, quantity, and quality); (2) the application of good and correct cultivation techniques has not been carried out optimally; (3) facilities and infrastructure are still limited; (4) business institutions at the farmer level have not been able to support cultivation efforts; (5) the business scale is still relatively small due to narrow land ownership and weak capital; (6) productivity tends to decline; (7) prices tend to fluctuate and are still controlled by middlemen; and (8) pest attacks are increasing.

Onion Pest Organisms (OPT) are in habitats with highly dynamic ecosystems. Therefore, ecologically, most of the pests and diseases in shallots are included in organisms with r strategy (selection) or a transition between r and K, with biological characteristics: (1) high meridian, (2) low natural mortality. , (3) short life cycle, (4) tend to migrate, (5) adaptability to new habitats is strong, (6) competitiveness between species is low, and (7) body size is (relatively) small. Therefore, pest explosion often occurs in supportive ecosystem conditions. The presence of latent shallot pests and it is often the case that before or when the commodity is planted, the population has reached a level close to its control threshold. Potency yield losses by the main pest of shallots can reach 138.4 billion (Anonymous 2004).

### 2.1. Twisting Disease (*Fusarium oxysporum* (Hanz.)

2.1.1. Symptoms of attack, the target of the attack is the base of the tuber. As a result, the growth of roots and tubers is disrupted. The visual symptom is yellowing of the leaves and a tendency to twist (twist). Plants are very easily uprooted because root growth is disturbed and even rot. At the base of the tubers, a whitish fungus is visible, whereas if the tuber is cut longitudinally, rot is visible, which starts from the base of the tuber extending upward or sideways. Further attacks will result in plant death, which starts at the tip of the leaf and quickly spreads to the bottom (Figure 14).

2.1.2. Morphology and life cycle:

The fungus is able to survive for a long time in the soil even without a host plant, because it can form chlamydospores, namely asexual spores formed from the swollen tip of the hypha. Although basically this fungus is a soil-borne pathogen, this pathogen can still be spread through irrigation water from contaminated soil, from one place to another. The final tuber infection that occurs in the crop will be carried away until the tubers are stored in the warehouse. The fungus will develop from the base of the tuber, then enter the tuber. If the tubers are used as seeds, the disease will spread in the field. Poor drainage and high soil moisture are very helpful for the development of moler disease (Anonymous, 2005).

Figure 14. Symptoms of *F. oxysporum* attack on onion plants
(Photo: Soetiarso)

### 2.2. Automatic or anthracnose disease (Antracnose)

Pathogen: the fungus *Colletotrichum gloeosporioides* (Penz.)

2.2.1. Symptoms of attack, in the Brebes area and its surroundings, this disease is called automatic disease, because infected plants will die quickly, suddenly, and simultaneously. The initial attack is marked by the appearance of white spots on the leaves, then an inward indentation (invagination) is formed.holes and breaks from drooping right at the spot (Figure 15). If the infection continues, it forms conidia colonies that are pink in color, which then turn light brown, dark brown, and finally blackish. In conditions of high humidity, especially in the rainy season, conidia develop rapidly to form mycelia that grow creeping from the leaf blade, penetrate to the tuber, then spread on the soil surface, are white, and infect the surrounding host. The tubers then rot, the leaves dry up and the spread of sporadic attacks, on the plant expanse you will see signs of baldness in several places.

### 2.2.2. Morphology and life cycle

Like Alternaria, Colletotrichum fungi are included in the imperfect fungi (imperfect fungi). These fungal hyphae are insulated but do not produce sexual stages. Mycelia form the aservuli fruit bodies (stromal layer). From the surface of this layer, a dense, upright, transparent (hyaline) conidiopore is formed, measuring 45-55 microns. At the end of the conidiophores, conidia are formed oval, straight or slightly bent with a length of about 15 microns, width of about 5 microns. Conidia are spread thanks to the help of wind and / or heavy rain and if they fall on the target host plant, they will germinate by forming an apresorium (short tube-shaped hyphae which when in contact with the epidermis, the ends will widen to form a kind of angular cell, thick-walled, and brown) . The formation of apresoria (haustoria) is the initiation of infection and is highly stimulated by host susceptibility and microclimate conditions, such as humidity, air temperature, and a suitable substrate for the fungus. The intensity of attacks is reduced in relatively dry conditions (dry season), good land drainage systems, and controlled weeds (Anonymous 2005).

Figure 15. Symptoms of *Colletotrichum gloeosporioides* disease in shallot plants (Photo: Suhardi)

### 3. Control

Fusarium wilt disease can be controlled by using vegetable pesticides containing the active ingredient Eugenol. Plants that contain Eugenol include: *Eugenia aromatica; E.aqua; E. polianta, E. uniflora; Ocimum basilicum; O. sanctum, O. basilicum, Zingiber officinale*, and others. Eugenol is found in the leaves, flowers and fruit. The amount of content and the processing method are not the same. The main principle is that all the ingredients are mashed first, then immersed in clear water with a ratio of 1: 4 (material: water). Soaking is carried out for 12-24 hours. Then filtered with a thin cloth. The result is ready to be applied by watering around the root area, the concentration is 5-7 ml / liter of water. Each plant is given between 50 - 100 ml of solution. Repeat after four days.

## III. DISEASES OF CHILI

There are several main diseases of chili plants, but on this occasion we will convey two types of diseases caused by viruses, namely curly virus and yellow virus. The two types of viruses are transmitted by different vectors. The curly virus is transmitted by the Myzus persicae tick and the yellow / Gemini virus is transmitted by the Bemisia tabaci tick.

### 3.1. Curly Virus

Symptoms of an attack:

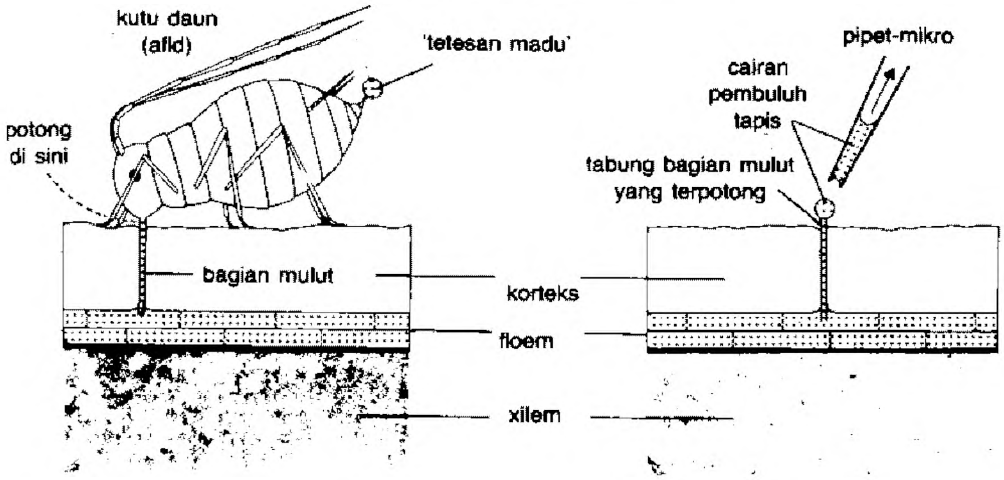
1. The leaves are thickened and then rolled down
2. Mosaic plants are mottled between dark green and light green.
3. Sometimes accompanied by a change in leaf shape (concave, curly or elongated).
4. The affected leaves become wrinkled, twisted, yellow, wither and eventually die.

Vector, this virus is transmitted by the aphids *Myzus persicae*

Pathogen: CMV, or CVMV singly or in combination.

Is a vector of> 150 virus strains

Figur 16. *Myzus persicae*




Figur 17. How to penetrate the mouth lice tool

### 3.2. Yellow Virus

Gemini yellow virus belongs to the Geminiviridae family. The virus particles are small (20 nm), are isometric in shape and the genetic material is single-stranded DNA. This article appears in pairs or twins as a result of the partial fusion of two sometrik particles.

#### 3.2.1. Attack Symptoms

Symptoms caused by gemini virus isolates vary, depending on the genus and species of plants infected. Symptoms in *C. annuum* first appear on young leaves / shoots in the form of yellow spots around the leaf bones, then develop into yellow veins (vein clearing), sunken and wrinkled with a light mosaic or yellow color. Symptoms continue until almost all young leaves or shoots are bright yellow, and some are yellow mixed with green, sunken and wrinkled leaves are smaller and thicker.

Figur 18. The development of symptoms of yellow virus disease in chili plants

#### 3.2.2. Ecology of Disease

The virus is found in the lowlands from 100 m asl to the highlands above 1000 m asl (in coastal chilli plantations, virus infection has not been found). Viruses can attack various ages of plants. The virus attacks various varieties of chili. Loss of yield 20 - 100%.

#### 3.2.3. Host Range

Various hosts of yellow virus, including Begomovirus, include *Datura stramonium, Lycopersicon esculentum, L. hirsutum, L. peruvianum, L. pimpinellifolium, Malva parviflora, M. sicaensis, Phaseolus vulgaris, Solanum nigrum, Arachis hypogaea, Sesamum indicum, Nicotiana tabacum* , *N. benthamiana, N. sylvestris* and *N. glutinosa*. Various hosts for yellow virus disease (geminivirus originating from Indonesia) include others are *Ageratum conyzoides*, *Gomphrena globosa*, *Phaseolus vulgaris*, *Glycine max*, *Capsicum annuum*, *C. frutescens*, *Lycopersicon esculentum*, *L. pimpinellifolium*, *Nicotiana benthamiana*, and *N. glutinosa*.

### 3.2.4. Control

1. Use of yellow traps

Yellow traps are used to trap the curse population, and as many as 40 traps / ha are installed in the middle of the chili cultivation. Traps are installed with a height of ± 30 cm.

Figur 19. Yellow trap: a. Yellow trap with plywood smeared with oil, b. Yellow trap with rolled paper (Photo: W. Setiawati)

### 3.2.5. Predatory use of *M. sexmaculatus*

Predator *M. sexmaculatus* is used to reduce the curse population. Release of predators of M. sexmaculatus as much as 1 head / 10 m2 or 1 bird / plant every two weeks.

Figur 20. Release of predators *M. sexmaculatus*: a. in chili plants, b. on cucumber plants (Photo: W. Setiawati), c. M. sexmaculatus (Photo: R. Murtiningsih)

### 3.2.5. Use of vegetable pesticides

The use of vegetable insecticides is carried out to reduce pesticide residues in vegetable products and the environment. Some plants that can be used as botanical insecticides are tobacco, soursop (5%), which has an efficacy value of 83-100%. Other vegetable pesticides that can be used are a mixture of neem, galangal and lemongrass / red lemongrass.

The way of making is as follows:

Ingredients: neem leaves (8 kg), galangal (6 kg), lemongrass (6 kg), aloe vera leaves (0.5kg) and water (80 liters).

Manufacturing steps:

• Finely ground neem, galangal, lemongrass and aloe vera leaves, then add 20 liters of water, stirring until evenly distributed. Add aloe vera leaves the size of two fingers. Then soaked for 24 hours.

After that it is filtered with a soft cloth.

• The final solution is diluted with 60 liters of water. The solution is sprayed on the plants for an area of 1 hectare.


Figure 21. Vegetable pesticide plants: a. Neem, b. Galangal, c. Fragrant lemongrass (Photo: R. Murtiningsih)

### 3.2.6. Use of entomopathogenic fungi

Entomopathogenic fungi can be used to reduce the curse population. Some of the known entomopathogenic fungi that can be used to control this pest include *Verticillium lecanii*, *Paecilomyces fumosoroseus*, *Peacilomyces farinosus*, *Aschersonia aleyrodis,* and *Beauveria bassiana*.

Figure 22. *Myzus persicae* ticks are attacked by entomopathogens

# V. DAFTAR PUSTAKA

Adiyoga, W., T.K.Moekasan, T.S. Uhan, E. Suenaryo dan Hendarsih. 2000. Present status of pest and disease management on food and vegetable crops and its future development. Lap. PEI dan PT. PCI.

Anonim. 2004. Kinerja Pembangunan Sistem dan Usaha Agribisnis Hortikultura 2000 –2003. Departemen Pertanian. Direktorat Jenderal Bina Produksi Hortikultura Jakarta 133 hal.

Anonim. 2005. Penerapan Pengendalian Hama terpadu Bawang Merah di Propinsi Jawa Timur. Dinas pertanian Propinsi Jawa Timur. Balai Proteksi Tanaman pangan dan Hortikultura. Jawa Timur.

Anonim. 2005. Pengendalian Organisme Pengganggu Tanaman Bawang Merah dengan Menggunakan Jaring Kelambu. Dinas Pertanian tanaman pangan, Kehutanan dan Perkebunan. Kabupaten Probolinggo. Jawa Timur.

Anonim. 2005. OPT Bawang Merah. Bercak Ungu atau Trotol (Purple Blotch): *Alternaria porri*. Direktorat Perlindungan Hortikultura. http://www.deptan.go.id/ditlinhorti/opt/bw_merah/trotol.htm

Anonim. 2005. OPT Bawang Merah. Antraknosa: *Colletotrichum gloeosporioides*. Direktorat Perlindungan Hortikultura. http://www.deptan.go.id/ditlinhorti/opt/bw_merah/antraknosa.htm

Anonim. 2005. OPT Bawang Merah. Penyakit Moler:*Fusarium oxysporum*. Direktorat Perlindungan Hortikultura. http://www.deptan.go.id/ditlinhorti/opt/bw_merah/fusarium.htm

Basuki, R.S. 2004. Teknologi peningkatan produktivitas dan daya saing bawang merah. Lap. Penelitian 2004.

Baswarsiati dan S. Nurbanah. 2001. Siasati Permintaan Bawang Merah dengan menanam di Luar Musim. Abdi Tani. 2 (5) : 15 – 17.

Chaput, J. And K. Schooley. 1989. *Thrips on Onion and Cabbage*. http://www.gov.on.ca/OMAFRA/english/crops/facts/99-027.htm

Courier. 1980. Control of cotton pests in Mexico with Bolstar 720 CE. Bayer 1(8) : 4 – 5

Dibiyantoro.A.L. 2003. Pengendalian Organisme Pengganggu Tanaman dengan Formula Biopestisida pada Komunitas Bawang dan Cabai. Lap.Perc. Balitsa. 2003.

Direktorat Bina Perlindunga Tanaman. 1993. Pedoman rekomendasi pengendalian hama dan penyakit tanaman pangan. Direktorat Jenderal Pertanian Tanaman Pangan. Jakarta: 186 halaman.

Direktorat Perlindungan Hortikultura. 2005. Kebijakan Teknis Pengendalian OPT. Makalah disampaikan dalam Apresiasi Penerapan Penanggulangan OPT Bawang Merah, Surabaya, 5 – 7 Juli 2005.

Direktorat Jendral Bina Produksi Hortikultura. 2005. Kebijakan Pengembangan Produksi Bawang Merah di Indonesia. Makalah disampaikan dalam Apresiasi Penerapan Penanggulangan OPT Bawang Merah, Surabaya, 5 – 7 Juli 2005.

Fye, R.E. and W.C. McAda. 1972. Laboratory studies on the development, longevity and fecundity of six lepidopterous pests of cotton in Arizona. USDA Technical Bulletin 1454. 73 pp.

Haryono Semangun. 1989. Penyakit-penyakit tanaman hortikultura di Indonesia. Fakultas Pertanian Universitas Gadjah Mada. Gadjah Mada University Press 1989: 850 halaman.

Hikmat, A. 2002. Bawang Merah di Bantul Aman dari Serangan Alternaria. Hortikultura 1(11) : 28 - 29

Kalshoven, L.G.E. 1981. *Pests of crops in Indonesia. Revised and translated* by P.A. van der Laan. PT. Ichtiar Baru-van Hoeve, Jakarta: 701 halaman.

Kawana, T. 1993. Biology and Control of Beet Army Worm *Spodoptera exigua* (Hubner). Agrochemicals Japan (62) : 5 – 7.

MacNab, A.A., A.F. Sherf and J.K. Springer. 1983. *Identifying Diseases of Vegetable*s. The Pennsylvania State University. College of Agriculture, University park, Pennsylvania. 62 pp.

Marwoto, B. 1996. Pengendalian nematode spiral (*Helycotylenchus retusus*) pada tanaman bawang merah secara hayati : Pengaruh berbagai cendawan tular tanah terhadap perkembangan *H. retusus* pada tanaman bawang merah. Bul. Penel. Hort. Vol. XXV (1) : 9 – 15.

Moekasan, T.K.., I. Sulastrini, T. Rubiati dan V.S. Utami. 1999.Pengujian efikasi ekstrak kasar SeNPV terhadap larva Spodoptera exigua pada tanaman bawang merah. J. Hort. 9 (1) : 121 - 128.

Moekasan, T.K. 2002. Efikasi formulasi SeNPV terhadap larva *Spodoptera exigua* Hbn. Pada Tanaman Bawang Merah di Rumah Kasa. J. Hort. 12 (2) : 94 – 101.

Moekasan, T.K. 2004. Pencampuran *Spodoptera exigua Nuclear Polyhedrosis Virus* dengan Insektisida kimia untuk mortalitas larva *Spodoptera exigua* Hbn. Di laboratorium. J. Hort. 14 (3) :178 - 187.

Moekasan, T.K. E. Suryaningsih, I. Sulastrini, N. Gunadi, W. Adiyoga, A.Hendra, M.A. Martono dan Karsum. 2004. Kelayakan Teknis dan Ekonomis Penerapan Teknologi Pengendalian Hama Terpadu pada Sistem Tanam Tumpanggilir Bawang Merah dan Cabai. J. Hort. 14 (3) : 188 – 203.

Prayogo Y dan W. Tengkano. 2002. Pengaruh tempat dan lama penyimpanan suspensi spora *Metarhizium anispliae* terhadap tingkat kematian larva *Spodoptera litura*. Makalah disampaikan pada Seminar Nasional dan Pameran Pertanian Organik. Jakarta, 2 Juli 2002.

Ridland, P. and A. Rauf. 2003. *Liriomyza huidobrensis* leaf miner: developing effective pest management strategies for Indonesia and Australia. Review Report of the leafminer project.

Ronald, F.L. and J.L.M. Kessing. 1991. *Thrips tabaci* (Linderman). Crop Knowledge Master http://www.extento.hawai. edu/Kbase/crop/Type/t-tabaci.htm

Setiawati.W. 1996. Kerusakan dan Kehilangan Hasil Bawang Merah akibat Serangan Ulat Perusak daun (*Spodoptera exigua* Hbn.). Hal : 418 – 425. *Dalam :* Duriat. A., R.S. Basuki, R.M. Sinaga, Y. Hilman dan Z. Abidin (eds.). Prosiding Ilmiah Nasional Komoditas Sayuran. Lembang 24 Oktober 1995. Balitsa Kerjasama dengan PFI Komda Bandung dan Ciba Plant Protection.733 hal.

Setiawati.W. 1997. Penerapan Pengendalian Hama Terpadu pada Sistem Tanam Tumpanggilir Bawang dan Cabai. Lap. Penel..

Setiawati.W. 1999. Penerapan Pengendalian Hama Terpadu pada Sistem Tanam Tumpanggilir Bawang dan Cabai. Lap. Penel.

Neni Gunaeni, Wiwin Setiawati, Rini Murtiningsih, dan Tati Rubiati, 1998. Penyakit Virus Kuning Dan Vektornya Serta Cara Pengendaliannya Pada Tanaman Sayuran. Balai Penelitian Tanaman Sayuran, Bandung.

Said M.Yasin, I Nyoman Widiarta, M. Muhsin, 2007. Juknis Pengendalian Terpadu Penyakit Tungro. Puslitban Tanaman Pangan. Badan Penelitian dan Pengembangan Pertanian. Jakarta.

Setiawati.W. 2000. Analisis dampak penerapan PHT pada sistem tanam tumpanggilir bawang merah dan cabai. Lap. APBN 2000.

Setiawati, W. 2000. Invasi *Liriomyza* sp. Pada komunitas bawang merah. Laporan Bahan Rapim. Balitsa, Agustus 2000.

Shepard, M., E.F. Shepard, G.R. Carner, M.D. Hamming, A. Rauf, S.G. Turnipseed and Samsudin. 1997. Prospect of IPM in Secondary food crops. Prosiding Kongres PEI V dan Simposium Entomologi.

Soeriaatmadja, R.E. dan T.R. Omoy. 1992. Penggunaan insektisida untuk mengendalikan hama bawang Spodoptera exigua Hbn. Berdasarkan populasi-populasi ngengat yang tertangkap feromonoid seks ddi musim hujan. Bul. Penel. Hort. Vol. XXII. (3) : 10 – 13.

Suhardi. 1989. Taksiran kehilangan hasil bawang merah (*Allium ascalonicum* L. ) oleh antraknosa. Sub Balai Penelitian Hortikultura Segunung. 7 p.

Suhardi. 1996. Pengaruh fungisida terhadap pemencaran dan perkembangan antraknosa pada bawang merah. J. Hort. 6 (1) : 40 – 48.

Suhardi, 1996. Pengaruh waktu tanam dan perlakuan fungisida terhadap intensitas serangan antraknosa pada bawang merah. J. Hort. 6 (2) : 172 – 180.