



OFFICE OF THE EXECUTIVE DIRECTOR

Dear Reader:

This Regional Farm Primer presents location-specific and need-based information, technologies, and farm practices from among the regional consortia. It aims to provide the farmers and other clientele the appropriate information and technology that target the regional priorities or focus commodities in their respective regions.

As part of enhancing the Techno Gabay Program, the primers aim to hasten the delivery of information, education and communication (IEC) materials that are specifically intended for the target audience and beneficiaries in the regions. Each primer is created by a regional team based on the identified focus commodities/regional priorities identified by the consortium.

Through these primers, farmers and other clientele of the PCARRD-Consortia partnership will have better access to appropriate information and viable technologies. Also, the primers will enhance the inventory of location-specific IECs and strengthen the continuum between research and extension.

Sincerely yours,

PATRICIO S. FAYLON
Executive Director

CLARRDEC Farm Primer No. 02/2007

Major Diseases of Onion: A Field Guide

**Philippine Council for Agriculture, Forestry and Natural
Resources Research and Development (PCARRD)**
Department of Science and Technology (DOST)

**Central Luzon Agriculture and Resources Research
and Development Consortium (CLARRDEC)**
Central Luzon State University (CLSU)

Los Baños, Laguna
2007

First Edition 2007

ISSN 1908-885X

Bibliographic Citation:

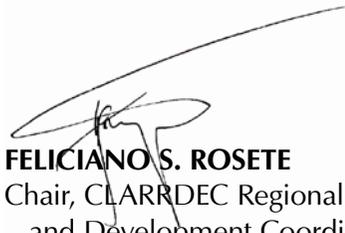
Central Luzon Agriculture and Resources Research and Development Consortium (CLARRDEC). Major diseases of onion: A field guide. Los Baños, Laguna: PCARRD-DOST, CLARRDEC-CLSU, 2007. 18p. - (CLARRDEC Farm Primer No. 02/2007)

Foreword

Accurate disease identification is the first step in planning an effective and efficient disease-control program. Hundreds of specific vegetable diseases exist. Although a vegetable grower will encounter only a few during any season, he must be able to distinguish significant and potentially serious diseases from those of lesser importance.

This field guide was designed to assist extension workers, farmers and students in the diagnosis of onion diseases. It lists, illustrates, and describes symptoms and causal organisms of major onion diseases in the field as well as recommends Integrated Disease Management Measures (IDM).

With this guide, it is hoped that the farmer may be able to reduce the occurrence of diseases and thus raise production levels, maximize profits and reduce the occurrence of diseases in onion production. This initial edition is an important contribution to the overall effort of increasing awareness of farmers on diseases of onion and propagating the use of integrated approach of managing diseases of onion in the field to reduce the pathogen population to a non-destructive level in the absence of excessive use of pesticides.



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Acknowledgment

This publication was made possible through the support of various individuals to whom we express our thanks:

- Dr. Feliciano S. Rosete and Dr. Teotimo M. Aganon, Consortium Director and RRDCC Chair, respectively, of CLARRDEC for their leadership and guidance in the preparation of this publication;
- Dr. Ronaldo T. Alberto for his technical expertise and validating the information herein;
- The Integrated Pest Management Collaborative Research Program of the Philippine Rice Research Institute for funding the projects on onion diseases;
- Maria Salome Duca and Salvacion Santiago for their assistance in the conduct of the research from which this book is based;
- Dr. Pastora Coloma, Techno Gabay Coordinator-CLARRDEC and Extension Director of the Central Luzon State University (CLSU) for overall direction;
- The representatives from the consortium member-agencies who make up the Regional Applied Communication Office (RACO) and the Regional Management Information Systems (RMIS) groups for their support and camaraderie;
- Magsasaka Siyentista and other farmers and partners from the FITS Centers - the Information Service Specialists for their valuable input; and
- Dr. Ruben Sevilleja, president of CLSU for allowing us to participate in the Adobe InDesign training that resulted in this publication.

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Fungal Diseases

Anthracnose

Local name: Antrak/Twister

Causal organism: *Colletotrichum gloeosporioides* (Penzig) Penzig & Sacc
(*Glomerella cingulata* (Stoneman) Spauld. & Schrenk)

Symptoms and signs

- On leaves: white, oval, sunken spots. As the disease progresses, clusters of orange spores form in target-like rings on the spots. As they mature, the spores harden and turn black (Anthracnose symptoms). Severely infected leaves dieback, twist, curl, and turn yellow in the classic “twister” symptom which gives this disease its local name.
- On neck: elongated neck
- On bulb: Infected leaves are slender with clusters of orange spores appearing just like on the leaves. The bulb often rots before harvest.



Left to Right: Typical anthracnose symptom in onion leaf sheath; twisting and curling of infected leaves and elongated neck and infected bulb.

Host Range: Tomato and pepper, fruit trees such as mango, avocado, and papaya.

Conditions for disease development. Heavy rainfall, high humidity and temperature of 20–30°C; too much nitrogen fertilizer and close plant spacing. Disease development is greatest during prolonged periods of leaf wetness.

Management options:

- Plant tolerant varieties, e.g., Rio Colorado, Takii's Red and Shallot (Tanduyong).
- Apply low amount of nitrogen (60 kg/ha).
- Use wider plant spacing and orient rows in the direction of the wind to hasten drying of plant surfaces.
- Destroy crop debris after harvest to reduce sources of inoculum.
- Apply protectant fungicides {Captan, Mancozeb (Dithane) or Benomyl (Benlate)} one week after transplanting or one week after emergence for direct seeded onion. Repeat application at 7–14 days interval depending on the severity of the disease. Or use systemic foliar fungicides {e.g., Armure (Mancozeb, Difenoconazole/Propiconazole), Score (Difeconazole)} two weeks after transplanting. Repeat application at 7–14 days interval depending on the severity of the disease.
- Use sticker and spreader when spraying fungicides.

Purple Blotch

Local name: Paltak

Causal organism: *Alternaria porri* (Ellis) Cif.

Symptoms and signs

- On leaves: Small water-soaked lesions with white center; the spots join resulting to brown lesion with purple margin. In moist weather, dark dusty appearing spores develop over the lesions in the morning. Affected leaves and stalks shrivel and die or break where large lesions are present.



Left to Right: Typical symptoms on onion leaves; expanding brownish-purple lesions.

- On neck: Similar lesions form on the neck region.
- On bulb: Semi-watery decay with conspicuously yellow to red lesion. Affected scales dry to a papery texture.

Conditions for disease development. Spores are formed during humid nights when leaves remain wet for longer than 12 hours. As the morning dew dries, spores become air-borne and are deposited onto susceptible onion tissue. One to four

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days are needed for symptom development after infection. Disease is most severe during prolonged periods of leaf wetness.

Management options:

- Practice good soil drainage and reduce plant density to reduce hours of leaf wetness. This reduction could break the cycle of infection.
- Destroy crop debris after harvest to reduce source of inoculum.
- Use long crop rotations with unrelated crops.
- Apply protectant fungicides (Mancozeb, Captan, Chlorothalonil, Propineb, Copper Hydroxide) one week after transplanting or one week after emergence for direct seeded onion. Repeat application at 7–14 days interval depending on the severity of the disease.
- Spray fungicides like Mancozeb (Dithane) for slight infection and Chlorothalonil (Daconil) when heavy rain is expected.
- Use sticker and spreader when spraying fungicides.

Pink Root

Local name: Pulang Ugat

Causal organism: *Phoma terrestris* M. Hans

Symptoms and signs

- On leaves: Leaves turn yellow and wilt. Severely affected plants appear to be suffering from nutrient deficiency or drought.
- On roots: Infected roots are colored pink and with time become deep pink to red. Root growth is greatly reduced, resulting to poor root anchorage and thus plants can be easily pulled up.



Left to Right: Pink root infected onion plant, severely stunted onion plants in the field.

Conditions for disease development. In the field, the optimum temperature for growth of the fungus and for disease development is 24–28°C.

Management options:

- Plant onion in a 3–6 year rotation with pepper, cucumber, mungbean, peanut and rice.
- Reduce irrigation interval from 16 or 12 days to 8 days.
- Tillage (plowing) + fallow (leave the area unplanted for at least 1 growing season) or tillage + soil solarization (for 1–2 months).
- In case of heavy infestation, sterilize the soil/field by burning 15 cm thick of rice hull over the field.
- Avoid using previously infected seedbed.

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- Dip seedlings in protectant fungicide before transplanting.
- Remove and destroy infected onion plants from the field.

Basal Plate Rot

Local name: Baldrap

Causal organism: *Fusarium oxysporum* f. sp. *cepae* (H.N. Hans.)
W.C. Snyder & H.N. Hans.

Symptoms and signs

- On leaves: Yellowing, curling and necrosis at the tip of the leaf blades. As the disease progresses, whole leaf blades show symptoms and eventually wither and rot.
- On roots and basal plate: Infected roots are dark brown and flattened. White cottony growth of the fungus attacks the basal plate and eventually the roots. Infected plants can be pulled easily because of poor root system.



Left to Right: White mycelial growth on the basal plate; foliar symptoms showing withering and necrosis of the leaves.

Conditions for Disease Development: Outbreaks are more serious in warm moist soil. The disease becomes more prevalent as temperature approaches 25–28°C. Infection is greater after periods of wet weather before harvest.

Management options:

- Avoid mechanical damage to bulbs during spray applications and harvest. Carefully sort the bulbs before storage to minimize losses. Keep onion storage dry and well ventilated.
- Rotate onion with nonhost crops for at least 3 years.
- Practice Tillage (plowing) + fallow (leave the area unplanted for at least 1 growing season) or tillage + soil solarization (for 1-2 months).
- In case of heavy infestation, sterilize the soil/field by burning 15 cm thick of rice hull over the field.
- Dip seedlings in fungicide before transplanting.

White Rot

Local Name: Baldrap

Causal Organism: *Sclerotium cepivorum* Berk.



Left to Right: Wilted necrotic onion plant; white fungal growth and numerous black sclerotial bodies on the bulb surface.

Symptoms and signs

- On leaves: Yellowing, wilting, death and dropping of older leaves.
- On roots and bulbs: Rotting of root system and basal plate associated with white fungal growth with numerous hard, black structures (sclerotia) developing within the white mold on the surface of the bulb. Infected plants can be easily pulled.

Conditions for Disease Development: The disease is more severe when soil moisture is favorable for root growth and at temperature of 20–24°C.

Management options:

- Plant clean and disease-free transplants.
- Remove and dispose infected plants to reduce the amount of fungus in the soil.
- Reduce sclerotial population in the soil by flooding, soil solarization and rice hull burning.
- Rotate onions or onion relatives for 3–4 years.

Seedling Damping-Off

Local Name: Damping

Causal Organism: *Fusarium* spp., *Phytophthora* spp., or *Rhizoctonia solani* Kuhn.

Symptoms and signs

- On seedlings: *Fusarium* species – The fungus may cause both pre and post emergence damping-off. Seedlings are unblemished and stunted, eventually turn yellow, wilt and die.

Rhizoctonia solani – Seeds rot before germination and seedlings decay before emergence.

Phytophthora species – Symptoms on young seedling are similar to those caused by *Rhizoctonia*. Leaves of infected older plants are stunted, yellowish and wilted.

- On roots: *Fusarium* species – Invaded roots eventually turn dark red or black as they decay.

Rhizoctonia solani - A brown rot develops on roots and lower stems at or below the soil line and infected seedlings quickly wilt and collapse.

Pythium species – A water-soaked lesion appears on lower stems and a watery rot occurs on the roots. Roots turn black as they decay.



Left to Right: Damping-off caused by *Fusarium* species; root rot caused by *Pythium* species

Conditions for Disease Development: The disease is more severe under conditions of poor sanitation, high soil moisture and compaction, cool temperatures, prolonged overcast weather and lack of air movement. Disease outbreaks occur where onions are grown in succession

Management options:

- Long crop rotation with cereal crops
- In case of heavy infestation, sterilize soil through solarization or rice hull burning.
- Improve soil drainage by using raised beds and regulate soil moisture by avoiding excessive irrigation.
- Tillage (plowing) + fallow (leave the area unplanted for at least 1 growing season) or tillage + soil solarization (for 1–2 months).
- Use only fungicide-treated seeds.

Neck Rot

Local Name: Baldrap

Causal Organism: *Botrytis allii* Munn.

Symptoms and signs

- On bulbs: Shriveled neck tissues of infected bulbs. Bulb scales soften and turn brown. A gray mold grows on the surface of the bulb and between bulb scales. Masses small black sclerotia grow on the outer scales around the neck. Affected internal parts of the bulb are brown, water-soaked and spongy.



Left to Right: External symptom with fungal growth and sclerotia on the neck and surface of the bulb; internal symptom characterized by tissue decay.

Conditions for Disease Development: Disease spread is most rapid during moderate temperatures with high humidity, rainfall or overhead irrigation. Infection can be more severe if necks are still succulent when stored. Storing uncured onions at temperatures and humidity which are too high can promote disease development and spread.

Management options:

- Avoid excessive and late season application of nitrogen which will delay onion senescence, promote larger necks and encourage diseases.
- Harvest only fully matured bulbs and do so during dry weather.
- Avoid injuring the onion neck and damaging the bulbs especially at harvest.
- Leave several inches of neck on the bulb and dry and cure well before storage to allow injuries to heal quickly.
- Sort the bulbs carefully before storage to minimize losses. Do not store bruised or damaged onions or those harvested from wet areas.
- Destroy onion cull and debris piles which may serve as sources of inoculum.
- Store onions at 0°C and do not allow moisture to form on the bulbs.

Black Mold

Local Name: Amag

Causal Organism: *Aspergillus niger* Tiegh

Symptoms and signs

- On bulbs: The region below the neck blackens and clusters of black fungal spores form along veins and on or between the outer papery scales of the bulbs. Infected tissues are water-soaked and dry and shrivel over time. In advanced stages of the disease, the entire surface of the bulb turns black and all the scales are infected. Discoloration extends from neck to the central fleshy scales and the disease is usually associated with soft rot bacteria.



Black fungal sporangia on the outer papery scales of the bulb.

Conditions for disease development. Spores of this fungus are very common in the air and soil. Black mold is most common when temperatures are higher than 30°C in the field or 24°C in the storage. Free moisture for 6 hours or longer on the onion surface is necessary for infection to occur.

Management options:

- Harvest the bulbs at maturity and cure them properly.
- Store under cool (1–10°C), dry, and well-ventilated conditions.
- Avoid bruising bulbs during harvest, storage, and transit.
- Do not store bulbs in boxes or bags.

Bacterial Diseases

Bacterial Soft Rots

Local Name: Baldrap

Causal Organisms: *Pseudomonas cepacia* (Burkholder)
Palleroni & Holmes
Erwinia carotovora subsp. *carotovora* (Jones)
Bergey et al.

Symptoms and signs

- On bulbs: Slimy, watery and smelly softening of the bulb tissue. The core of the infected bulbs can be squeezed out under pressure.

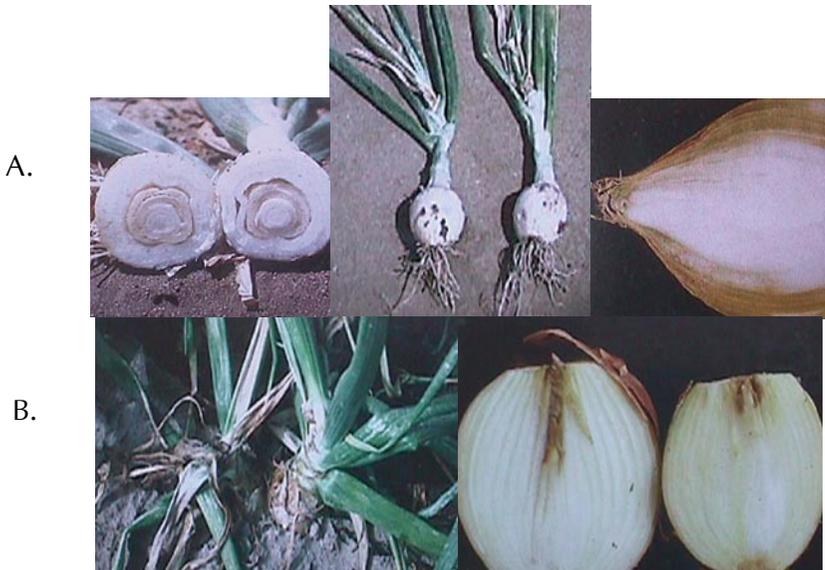
Pseudomonas bacteria – (Sour skin symptom). Slimy, pale yellow to light brown decay and breakdown of one or few inner bulb scales. Externally, bulbs appear firm but the neck region is soft. This rot has a sour smell and the tissue infected is generally yellow in color.

Erwinia bacteria – (Soft rot symptom). Water-soaked and pale-yellow decay of the affected internal scale tissues causes softening of the bulb. The bulb tissue gradually breaks down and become spongy, wet and smelly. A slimy, foul-smelling liquid can be squeezed from the neck of badly affected bulbs.

- On leaves: *Pseudomonas* bacteria – leaf die, starting from the tips.

Erwinia bacteria – Leaves wilt, become light colored and die.

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Clockwise: A. Sour skin - bulb cross-section showing separation of scales; light brown discoloration of infected inner leaves; bulb longitudinal section showing infected outer bulb scales: B. Soft rot – foliar collapse of infected plant; rotting of inner bulb scales.

Conditions for Disease Development: Bacterial soft rot caused by *Erwinia* bacteria is favored by warm, humid conditions. During storage or transit infection can develop in bruised onion bulbs when temperatures are above 3°C.

Bacteria soft rot caused by *Pseudomonas* bacteria is favored by rainstorms and warm weather and develops rapidly at temperatures above 30°C.

Management options:

- Use furrow irrigation.
- Minimize injuries to maturing and harvested bulbs.
- Harvest the crop at maturity (at closed neck stage) and cure the bulbs properly.
- Store onions at low temperature (0°C) at 65–70% relative humidity with adequate ventilation to prevent formation of water on the bulbs.

Nematode Disease

Root Knot

Local Name: Bukol sa Ugat

Causal Organisms: *Meloidogyne incognita*

M. hapla

M. arenaria

M. javanica

M. graminicola

Root knot nematodes are microscopic plant - parasitic round worms with a delicate stylet in both the second stage larva and adult female. They use this stylet to pierce plant cells and to feed. Males move around in the soil, and are long, robust with short-round tail while the females are sedentary, globose and stay in the roots.

Symptoms and signs

- On Roots: Affected plants are yellowed and stunted. During hot weather, affected plants wilt. Root galls or knots of varying sizes and shapes are present on the roots. Galls on small roots may be as small as 1–2 mm in diameter; on bigger roots, their diameter can be more than 2 mm.



Left to Right: Healthy onion plants with white longroot systems; root-knot infected onion with rootgalls or knots of varying sizes and shapes and poor root systems.

Conditions for Disease Development: Generally, root-knot is more severe in sandy-textured soils and in soils with high amount of humus than in clay soils. These soils have larger pore spaces and the nematodes can move freely in these spaces especially when water is present. Heavy infestation can be expected when soil moisture is inadequate.

Management Options. The root-knot nematodes deposit their eggs in unprotected egg mass, thus, nematode populations can be reduced with the use of nematicides. Root-knot nematodes have a very wide host range making crop rotation difficult.

- Remove and destroy root systems of affected plants that contain high populations of nematodes
- Deep plow during summer to expose nematodes to sunlight.
- Use furrow irrigation.
- In case of heavy infestation, sterilize the soil by burning 15 cm thick of rice hull over it.
- Reduce nematode population by deep plowing the field and leaving the the field unplanted for at least one cropping season if possible.

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Disclaimer

The use of trade names does not imply endorsement of or discrimination against any product. Such products were mentioned only to provide specific information for the convenience of the growers. The recommended methods, pesticides are based on the results of research and the best information available. In recommending certain treatments or activities, however, no liability shall be attached either in the event of injury to the commodity or to the operator.

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