

BULB ONION PRODUCTION GUIDE



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Farm Primer
Major Diseases of Onion - a Field Guide
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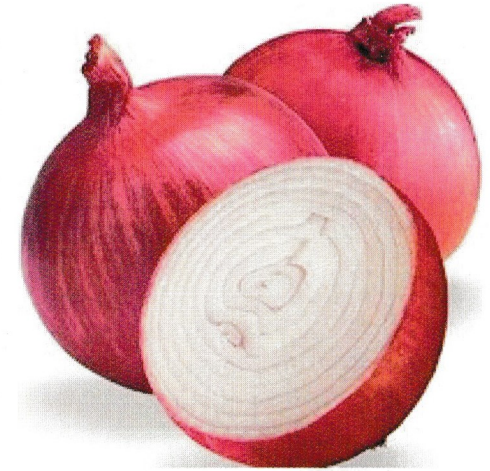


**REGIONAL AGRICULTURE AND FISHERIES
INFORMATION DIVISION (RAFID)**

Department of Agriculture
Regional Field Unit (RFU) 4-B



Bulb onion (*Allium cepa* L.), locally known as sibuyas, is probably the most indispensable culinary ingredient in the world. It is a favorite seasoning, and its pungent aroma and sharp taste makes it ideal for spicing up meat, salads and vegetable dishes. It is also used to cure a wide array of physiological disorders such as cough, obesity, insomnia, hemorrhoid and constipation.



There are two types of bulb onion growth in the Philippines; the yellow and the red onion. The yellow varieties grown for the traditional markets are either the granex (flat) or the grano (round) type, short day onions. Yellow granex hybrids and Superex are among the good varieties tested in the Philippines.

The red varieties, on the other hand, are produced because of their long storage life. Strains of Red Creole and Red Pinoy are among the popular varieties being grown.

Production and Trade

Bulb onions are grown in about 11,998 ha (1997) mainly in Central Luzon and the Ilocos Region. They are grown both for local and export markets.

In 1997, 7,296 t of fresh onions valued at P109 million were exported to Japan, Hongkong, Singapore, and Thailand.

Varieties

Yellow Onions	Red Onions
Yellow Granex Hybrids	Red Orient
Superex	Red Creole
Cal 120	Red Pinoy
Cal 202	BGS 95 (F,hybrid)
Cal 204	Capri
Liberty	

Climatic and Soil Requirements

Bulb onion grow well in friable and well-drained loam soil with good water holding capacity and pH between 6 and 7.

For best growth and bulb quality, onion requires cooler weather during the early stages of growth and a dry atmosphere with moderately high temperature for bulb development and maturation. Planting can be done as early as October (yellow onions) to as late as January (red onions).

Seedling Production

A 1-ha production area requires 5 kg seeds. A 300-500 m² seed-bed produces enough transplants for one hectare. Prepare beds 1 m wide and incorporate animal manure and rice hull. Line sow 3-5 kg seeds in rows set across the bed 7-10 cm apart. Distribute seeds thinly and evenly to control dumping off. Cover the seeds lightly with compost and mulch with rice straw or grass clippings. Maintain adequate soil moisture. Protect the seedbed against direct sunlight and rain with nylon net or removable plastic tunnels. Reduce watering and expose seedlings to full sunlight one week before transplanting.

Land Preparation

One month prior to land preparation, apply about 30 cm layer of rice hull over the entire field and burn for about two weeks.

Incorporate burnt rice hull during land preparation. Burnt rice hull reduces occurrence of weeds and diseases and improves soil texture.

Land preparation is done one month prior to transplanting. The use of tractor-driven implement requires 1-2 plowing and harrowing operations. Apply animal manure at 10-15 t/ha prior to bed preparation. Beds 1 m wide are recommended.

Transplanting

Transplant seedlings 4-6 weeks after sowing. Gently uproot the seedlings to prevent root damage. Plant at a distance of 15 cm between plants and 15 cm between hills. Plant spacing of 27 cm between rows and 3-5 cm between transplant can also be practiced. Use markers for proper spacing and to facilitate transplanting. After marking, use dibbles to make holes. Plant deep enough but not too deep. Care must be taken so as not to damage the basal portion of the plant. Place the white portion of the plant below the soil surface. Press the soil firmly around the basal portion. Irrigate the field before and after transplanting.

Fertilization

In the absence of soil analysis, a 1-ha production area requires 8.5-11.4 bags of ammonium sulfate (21-0-0), 6.6-26.7 bags superphosphate (0-18-0) and 2-4 bags muriate of potash (0-0-60).

Apply all of 0-18-0 and half of 21-0-0 and 0-0-60 as basal fertilizer. Side-dress remaining 21-0-0 and 0-0-60 at 30, 45, and 60 days after transplanting. High nitrogen rates tend to shorten storage life of onions. Combine herbicide application with hand weeding to produce a good quality crop.

Irrigation

Bulb onion requires adequate moisture for steady, continuous and desirable growth. Depending on soil type, irrigation varies between 4 and 7 days. Stop irrigation 2-3 weeks before harvest, or when 20-30% of the tops fold over. The last irrigation should be a light one.

Pest and Disease Management

Thrips (*Thrips tabaci*), **army worm** (*Spodoptera exigua*), **cutworm** (*Argotis spp.*), and **leafminer** (*Liriomyza spp.*). Use overhead irrigation and high pressure spray of water and insecticidal soap solution. Remove badly infested leaves. Spray hot pepper extract, or spread wood ash to control army worm and cutworm. To control leafminer, spray chlorox solution (1:10 commercial grade chlorox and water) and rinse one hour later with water. Manage weed properly to maintain sufficient population of natural enemies.

Fungal Diseases

ANTHRACNOSE

Local name: Antrak/Twister

Causal organism: *Collectrichum gloeosporioides* (Penzig) Penzig and Sacc (*Glomerella cingulata* (Stoneman) Spauld & Schrenk)

Signs & Symptoms:

White, oval, sunken spots appear on leaves. As the disease progresses, cluster 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. Neck becomes elongated and the bulb often rots before harvest.

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

Condition 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 Shalot (Tanduyong).
- Apply low amount of nitrogen fertilizer (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.
- Use sticker and spreader when spraying fungicides.



PURPLE BLOTCH



Local name: Paltak

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

Symptoms and signs:

Small water-soaked lesions with white center appears on leaves; 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. Similar lesions form

on the neck region. On bulb, semi-watery decay with conspicuously yellow to red lesion appears. Affected scales dry to a papery texture.

Condition 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 days are needed for symptom development after infection. Disease is more 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 Chlorothanil (Daconil) when heavy rain is expected.
- Use sticker and spreader when spraying fungicides.

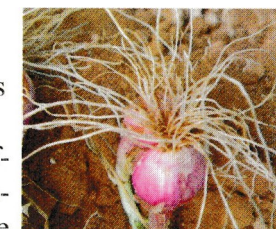
PINK ROOT

Local name: Pulang Ugat

Causal organism: *Phoma terrestris* M. Hans

Symptoms and signs:

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



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, mung-bean, 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.
- 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. *cepea* (H.N. Hans.)

W.C. Snyder & H.N. Hans.

Symptoms and signs

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.

Conditions of 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, sterilized 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.

Symptoms and signs

Yellowing, wilting, death and dropping of older leaves. Rotting of root system and basal plate associated with white fungal growth with numerous hard, black structure (sclerotia) developing within the white mold in the surface of the bulb. Infected plant 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., *Pythium* spp., or *Rhizoctonia solani* Kuhn.

Symptoms and signs

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.

Pythium species – symptoms on young seedlings are similar to those caused by *Rhizoctonia*. Leaves of infected older plants are stunted, yellowish and wilted; water-soaked lesion appears on lower stems and a watery rot occurs on the roots. Roots turn black as they decay.

Conditions for Disease Development: The disease is more severe under condition 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 successions.

Management options:

- Long crop rotation with cereal crops.
- In case of heavy infestation, sterilized the 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.

Symtoms and signs

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 grows on the outer scales around the neck. Affected internal parts of the bulb are brown, water-soaked and spongy.



Condition 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 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 bulb 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

The region below the neck blackens and clusters of black fungal spores from 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.

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 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 ROT

Local Name: Baldrap

Causal Organisms:

Pseudomonas cepacia

(Burkholder)

Palleroni & Holmes

Erwinia carotovora subsp. *carotovora* (Jones)

Bergey et al.



Symptoms and signs

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. Leaves die, starting from the tips.

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. Leaves wilt, become light colored and die.

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.

Bacterial 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). 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:

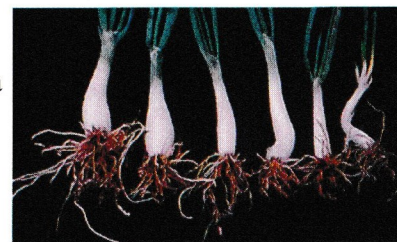
Meloidogyne incognita

M. hapla

M. arenaria

M. javanica

M. graminicola



Root knot nematodes are microscopic plant – parasitic round worms with 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

Affected plants are yellowed and stunted. During the 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.

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 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 field unplanted for at least one cropping season if possible.

Harvesting

With any bulb-forming onion, the general rule of thumb is to wait for half of the plants to fall over, and then harvest the entire planting. This is fine if you have dry weather, but under moist conditions it's better to feel the necks of your plants for a soft spot a few inches above the onion bulb. This soft spot is a sign that the bulb has finished growing, and you can feel it a day or two before the top of the plant falls over. When rain is predicted, it's best to pull every plant that has gone soft at the neck, because moisture spells trouble for mature onions.



Shallots are an exception to the fall-over rule, because they often splay out over the ground as they divide into separate bulbs, but the plants may still be growing. This rather unattractive posture should therefore be tolerated until shallots' green leaves have withered back about halfway. Then they are ready to harvest and cure.

Postharvest



Cure harvested bulbs for 10-14 days in a sunny, well-ventilated area. Align onions so that the leaves of one onion cover the bulb of another. Clip dried leaves 1.5 inches from the stem and remove all roots. Grade bulb according to size and quality. Pack in jute or net sacks for storage and/or immediate disposal.