

Post Harvest Diseases of Onion and their Management

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SUMMARY

Onion is one of the highly perishable vegetable in India. It is highly valued as flouring agents. The reason for the success of onion in agriculture is its ability to be stored for long period. There are diverse pathogen species like *Aspergillus* spp., *Penicillium* spp., *Fusarium* spp., *Colletotrichum* spp., *Pseudomonas* spp. and *Botrytis* spp. which attacks onion bulb during the post harvest storage period. The preventive approach of using conventional fungicides to reduce the post harvest losses is not sufficient to provide safe onion and onion products for human consumption and may be hazardous for the human health due to residual impact issues. Therefore, for effective management of post harvest diseases; intercultural operations, fertilizer and irrigation management, field curing, shade curing, post harvest handling and storage environment are important.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crops grown in India and being used as vegetables, spices or as medicines. It is grown in three seasons *i.e.* *kharif* (June-July), late *kharif* (August-September) and *rabi* (November-December) (Sing *et al.* 1994) and harvested during October-November, February-March and April-May respectively. There is no next harvest till November or there is a gap in production during June to October. Hence onion is stored to fulfill countrywide demand and export during this period and to add value on it. The onion post harvest losses is due to desiccation, rotting and sprouting. Currently, post harvest losses is due to various post harvest operations including handling and storage. Onions suffer from many post harvest diseases such as black mold, blue mold rot, neck rot, brown rot, basal rot, and smudge (Siddayya *et al.* 2020). About 35-40% onion is lost due to damage caused by storage diseases (Kumar *et al.* 2015). The disease not only reduce the crop yield but also poses harmful effects during harvesting, post harvesting, processing and marketing stages, which lower the quality and export potential of the crops that significantly causes the economic loss (Mishra *et al.* 2014). Inadequate and improper field curing after harvest, infection by different pathogen, sprouting and also poor storage methods being practiced by the farmers are the main reasons of prevailing losses.

Important Post Harvest Diseases

1. Black Mold: It is caused by the fungus *Aspergillus Niger*. Infection usually is through neck tissues as foliage dies down at maturity. Infected bulbs are discolored black around the neck, and affected scales shrivel. Masses of powdery black spores generally are arranged as streaks along veins on and between outer dry scales. Infection may advance from the neck into the central fleshy scales. In advanced disease stages, the entire bulb surface turns black, and secondary bacterial soft rot may make the bulb soft and mushy. It reduces the market value of the bulbs.



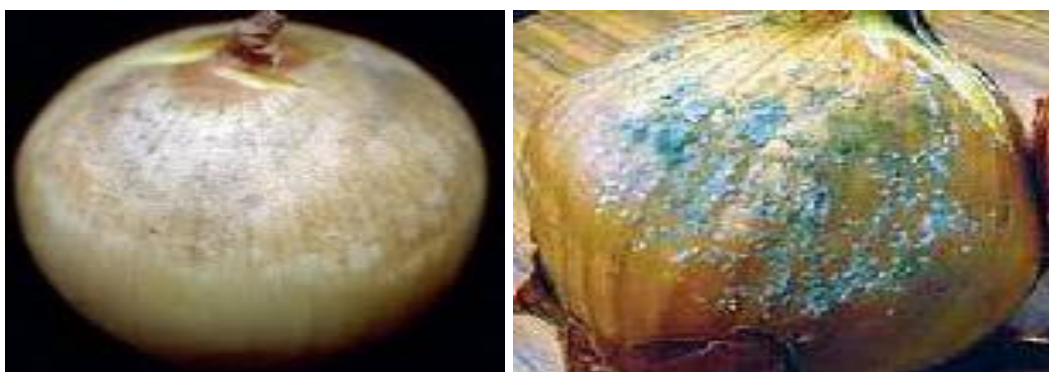
2. Neck Rot : It is caused by various species of *Botrytis* fungi. The infection usually takes place in the field and symptoms become evident in storage. The fungi that cause neck rot survive the winter on previously infected onion debris in the soil, in cull piles and refuse dumps, and in trash in storage sheds. Greatest epidemic development occurs when cool (50° to 75°F), moist weather prevails for some days before or during harvest. If the weather remains dry during harvest and curing, losses found in storage are usually small. Symptoms are first

seen as a softening of the tissues around the neck of the bulb, or more rarely, at a wound. A definite margin separates diseased and healthy tissues. Infected tissues become sunken, soft, and appear brownish to grayish in color, as if they had been cooked. These symptoms progress gradually to the base of the bulb. Then the entire bulb may become mummified. Hard, irregularly shaped kernel-like bodies, black sclerotia, may form between scales, especially at the neck region. Excessive nitrogen and untimely irrigation increases the incidence of this disease. The fungus causes softening of the scales which appear water soaked. Under moist conditions, a grayish fungal mat develops on the surface of the scales.



Management : For effective control of black mold and neck rot disease, Onion is left for drying in the field for 2-3 days (field curing). These bulbs should be further dried in shade for 10-15 days before storage. Care should be taken to avoid injury to the bulbs during post harvest handling. There must not any application to nitrogenous fertilizer after 60 days of transplanting. The irrigation should be stopped 2-3 weeks before harvest. Allow tops to mature well before harvest. Undercut and windrow onions until inside neck tissues are dry before topping and storing. Do not store improperly cured bulbs.

3. Blue mold rot : It is caused by various species of *Penicillium*. These fungi are common saprophytes on plant debris and senescent plant tissue. Invasion of onion bulbs is usually through wounds, bruises, or uncured neck tissue. Once inside the bulb, the mycelium grows through the fleshy scales, eventually sporulating profusely on the surface of lesions and wounds. Optimum conditions include moderate temperatures 21° to 25°C and high relative humidity. Initial symptoms include water soaked areas on the outer surface of scales. Later, a green to blue green, powdery mold may develop on the surface of the lesions. Infected areas of fleshy scales are gray when cut. In advanced stages, infected bulbs may disintegrate into a watery rot.



Management : The field should be well drained. Three foliar sprayings with Copper oxychloride 0.25 % or Chlorothalonil 0.2%. Follow crop rotation and harvested bulbs must be thoroughly cured to reduce potential storage losses. Soil drenching with Copper oxychloride 0.25%.

4. Basal rot : It is caused by fungus *Fusarium oxysporum f.sp. cepae*. The pathogen is soil borne and the optimum temperatures for development are 28-32°C. Infection occurs through the root either directly or through wounds. The leaves turn yellow and then dry up slowly. The affected plant shows drying of leaf tip downwards. The entire plant shows complete drying of the foliage. The bulb of the affected plant shows soft rotting and the roots get

rotted. There will be a whitish mouldy growth on the scale. This disease can begin in the field and continue on in storage. Disease also appears during storage when the temperature (35 to 40°C) and relative humidity (70%) are high in the month of July to August.

Management : Mixed cropping and crop rotation reduce the incidence of disease. Application of additional copper content fertilizer. Soil drenching with Copper oxychloride 0.25%. Soil solarization by spreading polythene sheet of 250 guage in summer season for 30 days reduces the infectious propagules. Application of *Trichoderma* spp. along with arbuscular mycorrhizal fungi (AMF) at the time of transplanting of the crop, seed treatment with *Pseudomonas cepacis*, and *Trichoderma viride* reduces the disease.



5. Onion smudge : It is also called as anthracnose disease caused by *Colletotrichum circinans* and occurs in the both field and storage. It occurs on white onion varieties and reduces the market value of the bulbs. The disease is characterized by small dark green to black spots, which appear on the outer scales.



Management : Field curing of the bulb after harvesting and storing the bulbs in well ventilated rooms can control the disease.

6. Bacterial Brown Rot : It is very serious disease of onions in storage caused by *Pseudomonas aeruginosa*. The infection occurs through the wounds. The rot begins at the neck of the bulbs which later gives foul smell through the neck when squeezed.

Management : Proper curing and rapid drying of the bulbs after harvesting is essential for controlling the disease. Affected bulbs should be discarded before storage. If rains occur during maturity, spraying of Streptocycline (0.02%).



Impact of Growing Conditions on Post Harvest Diseases Of Onion

- High crop density in the field.
- Prolonged periods of wet conditions during crop maturity.
- Damage due to pre-harvest diseases and pest.

- Insufficient curing (field or artificial) at 27°C with a relative humidity of 80%.
- Application of excess nitrogen fertilizer during crop maturity.
- Application of excess irrigation during crop maturity.
- Leaving mature crops in the field too long.
- Rough handling during harvesting and grading.
- High temperature and humidity during storage

Integrated Management Approach for Managing Onion Diseases

- Use crop rotation. The fungal and bacterial organisms that cause bulb diseases can build up in soils that are continually planted to onions.
- Remove volunteer onion plants and weeds in and around fields before planting new stands.
- Do not apply nitrogen within 4-5 weeks of harvest. Nitrogen stimulates growth of soil fungi and makes the onion tissue susceptible to infections.
- Stop irrigations 10-14 days before harvest. Wet soils at harvest time promote bulb infections. Withholding water before harvest encourages necks to dry and collapse.
- Do not clip tops too close to the bulb. Tops should be cut 2-3cm from the bulb to allow proper drying and sealing of the neck.
- Practice good sanitation in the field and packing shed.
- Remove diseased, bruised, or sunburned bulbs during harvest, grading, and packing to avoid contamination of entire lots. Cull onions can carry disease organisms to the next crop and should be burned or buried immediately.
- Wash and sanitize all equipment and tillage implements regularly. Pathogen inoculum can be easily transferred from a diseased field to another location on tractors and implements.
- Keep bulbs dry and practice thorough curing. This is essential after harvest; wet or improperly cured onions are highly susceptible to fungal and bacterial rots. Onions are considered cured when the neck is tight and dry.
- Minimize mechanical damage of any kind. Most injuries occur during harvest, hauling, grading, packing, and shipment, but the injuries can take several days or weeks to become noticeable. Replace any old padding on grading and packing equipment with thick foam around all sharp corners, edges, and drop points.
- Keep storage and transit temperatures cool. The best storage temperature is 0-2°C, the best relative humidity is 65-70%.

CONCLUSION

Black mold rot, soft rot, neck rot, smudge, basal stem rot are major storage diseases of onion causing serious storage losses at harvest and after harvesting resulting great economic losses in onion growing countries including India. The emphasis should be given on an integrated management approach including selection of healthy planting material, crop rotation, soil solarisation, deep ploughing, water and fertilizer management, chemical control, field cares, harvest cares and storage cares for effective management of postharvest diseases of onion.

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