

Article

Integrated disease managements in cucurbitaceous crops

■ SANTOSH KUMAR^{1*} AND O.P. SINGH²

¹Indian Council of Agriculture Research (ICAR), Kolasib Centre, MIZORAM, INDIA

²Krishi Vigyan Kendra, KOLASIB (MIZORAM) INDIA

ARTICLE INFO

Article Chronicle :

Received : 15.10.2011

Accepted : 18.03.2012

*Corresponding author:

How to view point the article : Kumar, Santosh and Singh, O.P. (2012). Integrated disease managements in cucurbitaceous crops. *Internat. J. Plant Protec.*, 5(1) : 191-194.

Key words : Integrated disease managements, Cucurbitaceous crops, Powdery mildew

Cucurbitaceous is a plant family commonly known as melons, gourds or cucurbits, among the vegetables the cucurbitaceous crop form one of the largest group in the vegetable kingdom they includes about 118 genera and 825 sp. In India a number of major and minor cucurbits are cultivated, which share about 5.6 per cent of the vegetable production. Successful vegetables cultivation is hampered due to several factors like insect pest, disease and nematode. Disease is one of the major factors in minimizing the productivity causing more than 40 per cent of yield loss. Sometimes, under severe infestation; there is total destruction of the crop. Several control method have been tried to over come these problem. Since the green revolution the soil fertility is showing the sign of fatigue and plant developing resistant to disease is breaking down and causing soil and water pollution due to continuous use of chemical fertilizer. Hence the farmer and consumer are looking safe to health as well as environment friendly solution. The best management strategy combines cultural, biological, host-plant resistance, to reduce disease infestation and timely used fungicides if needed such programmer is known as integrated disease management (IDM). With the principle of IDM encompassing avoidance of disease preventing inoculums by seed treatment, and plant quarantine, eradication by biological methods, crop rotation and rouging and protection by chemical spray on the diseased plants and insect vectors is one of the common tools at severe stage but multi-resistant cultivars/ line is one of the best answer to manage the disease problems.

Cucurbits are affected by a number of disease like downy mildew, powdery mildew, gummosis, *Phytophthora* blight, anthracnose, *Cercospora* leaf spot, *Phoma* blight, collar rot,

Fusarium wilt, white rot, root knot nematode, bacterial wilt, watermelon bud necrosis and leaf distortion virus. Among them, damping off, powdery mildew, downy mildew, anthracnose, *Alternaria* blight, bacterial wilt and virus are becoming the most destructive disease in cucurbits.

Damping off fungi infect and rot both seeds and young seedlings. Infected seeds may not emerge from the soil. Seedlings may emerge with soft brown water soaked areas on the cotyledons (seed leaves). Stems may be thin, wire-like and unable to support even the small seedling.

Management:

- Do not plant cucurbit seeds when soils have completely warmed to 20°C at a 2" depth.
- Keep bed moist but not to be water logged.
- Treated seed should be sown which is coated with a layer of fungicides that will help to prevent seed rot.

Powdery Mildew: (*Podosphaera xanthii*):

Powdery mildew, caused primarily by the fungus *Podosphaera xanthii*, infects all cucurbits, including muskmelons, squash, cucumbers, gourds, watermelons and pumpkins. In severe cases, powdery mildew can cause premature death of leaves and reduce yield and fruit quality.

Identification:

Powdery mildew is first evident as pale yellow leaf spots. White powdery spots can form on both upper and lower leaf surfaces and quickly expand into large blotches which ultimately can cover entire leaf, petiole and stem surfaces. When the majority of the foliage is infected, the plant is

weakened and the fruit ripens prematurely.

- Resistant varieties should be grown as Arka Manik and Arka Rajhans for watermelon and musk melon, respectively.
- Avoid excess nitrogen fertilizer.
- Provide good air movement around plants through proper spacing, staking of plants and weed control.
- Apply fungicides product by both upper and lower surface of the leaves when a single spot of powdery mildew is appear.
- Three spray of calixin (0.05%) or sulfex (0.25%) at an interval of 15 days effectively controlled powdery mildew.

Downy Mildew (*Pseudoperonospora cubensis*):

Downy Mildew, caused by *Pseudoperonospora cubensis*, is an oomycete that is not a true fungus and is often referred to as a water mold due to the fact that it thrives in wet or very humid conditions. Downy Mildew can infect all cucurbits including cucumber, melon, pumpkin and squash.

Identification:

- Pale green to yellow spots form on upper surface of leaves and later it turn brown.
- Leaf spots are angular bounded by leaf veins. This is most distinct in cucumber.
- In wet or very humid conditions, disease progresses rapidly. Leaf spots grow together and entire leaves turn brown. Often appearing as if they were killed by frost.
- On watermelons, an exaggerated upward leaf curling is common.

Management:

- Resistant varieties should be grown as Punjab Rasila and Arka Manik for musk melon and watermelon, respectively.
- Use drip irrigation and wide row spacing to promote leaf drying and encourage good air movement around the plants.
- Monitor plants for symptoms of disease at regular interval.
- If the disease is found in a home field, plants should be immediately removed and destroyed to prevent the spread to other plants.
- Spray Dithane M-45 (0.3%) at 15 days intervals.
- Fungicides are effective if applied before disease becomes severe. Both contact and systemic fungicides are use against downy mildew. Systemic are more effective if weather conditions are conducive to disease and the host is very susceptible. Avoided fungicide resistance, it is important to rotate systemic fungicides.

Anthracoze (*Colletotrichum orbiculare*):

Anthracoze is caused by the fungus, *Colletotrichum*

orbiculare. This pathogen can attack all cucurbits but the most severe disease is seen on cucumbers, muskmelons, and watermelons.

Identification:

All above ground plant parts can be infected. Symptoms vary depending on which cucurbit is infected. Irregular brown leaf spots form on squash, melon and cucumber. The center of the leaf spot may drop out resulting in shot hole or ragged appearance. This is most common on cucumbers. Cucumber leaf spots often have a yellow halo. Watermelon leaf spots are smaller and dark brown to black. Sunken elongate stem infections can occur on cucumber and melon, but are not common on other cucurbits. Infections on melon often exude a reddish gum. Fruit infections are sunken black spots, spots may have fluffy white cotton like mycelia and sticky salmon colored spores during wet weather.

Management:

- Purchase clean seed from a reputable source. Do not save seed from infected plants.
- Proper rotation of vegetables and clean cultivation minimize the initial inoculum.
- Use drip irrigation instead of overhead sprinklers if possible.
- Do not work in plants when wet.
- Remove and destroy infected vines at the end of the season in small fields.
- Several fungicides are registered for use against Anthracnose such as benomyl or bavistin (0.1%) or dithane M-45 (0.2%) for effective control.

Alternaria leaf blight (*Alternaria cucumerina*):

Alternaria leaf blight is caused by the fungus *Alternaria cucumerina*. This disease is most problematic on melon but can also occur on cucumber, pumpkin and squash and spread by wind. *Alternaria* leaf blight does not commonly infect fruit but can reduce yield and quality through reduced plant vigor and sunscald of exposed fruit. Severe attacks occur when plants have been weakened by poor soil fertility, poor growing conditions, occurrence of other diseases, or a heavy fruit setting.

Identification:

- Mature leaves near the crown of the plant are often infected first.
- Leaf spots start as small brown spots, often with a yellow halo, and grow into irregular brown spots.
- Leaf spots sometimes develop a target-like pattern of rings.
- Severely infected leaves turn brown, curl upward, wither and die.

– Fruit are not commonly infected but can suffer from sunscald due to leaf loss.

Management:

- Clean cultivation, disease free seeds and crop rotation are effective for control of disease.
- Use drip irrigation instead of overhead sprinklers if possible.
- Do not work in plants when wet.
- Remove and destroy infected plants at the end of the season in small fields.
- Several fungicides are registered for use against *Alternaria* leaf blight. Preventative sprays are effective but are only necessary in fields with a history of *Alternaria* leaf blight.
- Spray of Indofil M-45 (0.25%) at 10-15 days intervals is effective against *Alternaria* leaf blight.

Bacterial wilt (*Erwinia tracheiphila*):

Bacterial wilt is caused by the bacterium *Erwinia tracheiphila*. This pathogen can cause severe losses in cucumbers and muskmelons whereas; squash and pumpkins are less affected. The bacterial wilt organism is carried from plant to plant by the striped cucumber beetle (*Acalymma vitatum*).

Identification:

- Striped or spotted cucumber beetles will be present in the field.
- Leaves first appear dull green, wilt during the day and recover at night.
- Leaves eventually yellow and brown at the margins completely wither and later it dies.
- Wilt progression varies by crop. Cucumbers and melons wilt and die rapidly. Pumpkins take up two weeks to completely wilt. Summer squash may continue to produce for several weeks even when infected.
- Wilt progresses down the vine until entire vine is wilted or killed.
- If infected vines are cut close to the crown of the plant and the cross sections pressed together, thread like strands of bacterial ooze can be seen when the two halves are gently pulled apart again.

Management:

- Managing cucumber beetles provides the most effective control of bacterial wilt.
- If disease appears in a few plants, rogue and bury these plants to prevent further spread of the disease.

Viruses:

Infection with virus commonly occurs on all cucurbit

crops. These diseases are caused by several different viruses including Cucumber Mosaic Virus (CMV), Squash Mosaic Virus (SqMV), Watermelon Mosaic Virus 2 (WMV-2) and Watermelon Mosaic Virus 1 (WMV-1) also known as Papaya Ringspot Virus (PRSV).

Identification:

It is difficult to distinguish between the different viruses by symptoms alone. Symptoms vary depending on the crop, variety, age of the plant at the time of infection and in some cases weather. In addition it is common to find plants infected with more than one virus at the same time, often resulting in combined severe symptoms. Virus infected leaves often have a mottling or mosaic pattern in shades of green and yellow. Leaves are often distorted or deformed. They may be puckered, cupped under, have deep lobes, or appear thin and string-like. Young leaves often show the most severe symptoms and are frequently abnormally small. Growth on infected vines is typically stunted and in CMV infections, vines may wither completely.

The virus's affect on fruit varies depending on when the plant was infected. Early infections often result in no or very low fruit production. Later infection can result in fruit that is small, deformed and discolored. Fruit may have a mottled or mosaic pattern, ring spots or exhibit color break on all or part of the fruit. Melons infected with SqMV often lack netting at maturity.

Management:

- Plant resistant or tolerant varieties whenever available. Resistance is virus specific and it is necessary to first determine which mosaic virus is causing disease in order to select appropriate viruses
- Purchase clean seed from a reputable supplier. If saving seeds, do not collect seed from infected plants.
- Control weeds within and around the field. Especially focus control efforts on perennials weeds that may allow the virus to carry over from one season to the next.
- Manage aphids and cucumber beetles to keep populations low.
- If disease appears in a few plants, rogue and bury these plants to prevent further spread of the disease in the field.
- Clean tools and workers hands with soap and water after working with infected plants.
- There are no pesticides that can be applied to reverse or limit the symptoms of viral infection.

Mosaic:

Identification:

Mosaic is caused by cucumber mosaic virus and squash mosaic virus. A patchwork or mosaic pattern of light and dark

green forms on the leaves and fruits. Leaves are small and puckered, and plants become severely stunted. Fruits develop knobs or warts and often the fruits are misshapen. Cucumber mosaic is very common. In addition to the mosaic pattern the edges of the leaves turn down, and the knobs on the fruits are light yellow. The cucumber mosaic virus is transmitted from plant to plant by several different kinds of aphids. The virus infects cucumbers, melons, squash, pumpkin, pepper, spinach, tomato, and many other vegetables, flowers and weeds. Cucumber mosaic is readily transmitted mechanically on the hands of workers in the cucurbit patch and by aphids.

Squash mosaic, caused by the squash mosaic virus, is transmitted from plant to plant by cucumber beetles. The virus infects squash, cucumber, melon, and occasionally watermelon. The virus is sometimes seed-borne.

Management:

- Mosaic diseases are managed by using good quality seed and by controlling aphids and cucumber beetles throughout the season.
- Diazinon can be used for aphid and beetle control. Carbaryl (Sevin) and methoxychlor will also provide beetle control.
- Begin insect control as soon as plants emerge from the soil. Carefully applying insecticides to tender young

cucurbit plants, as they are easily injured.

- Do not plant cucurbits near woods, brushy areas, or other areas that are weedy. Control all weeds, especially perennial weeds.

- Plant several rows of maize around the cucurbit patch, or at least plant maize on the windward side. The maize helps to keep out aphids.

Remove and destroy diseased plants as soon as mosaic appears this helps to reduce virus spread and infected plants will not produce anyway. After handling diseased plants, wash hands with detergent and water. Detergent inactivates the virus and reduces the danger of transmitting the virus to other plants.

REFERENCES

- Gopalakrishnan, T.R. (2007).** *Vegetable crops*. New India publishing agency, New Delhi.
- Rangahan, Manna Kai (2001).** Powdery mildew in squash. *Crop food research*. Number 133.
- Rai, N. and Yadav, D.S. (2005).** *Advances in vegetable production*. Researchco book centre, New Delhi.
- Thamburaj, S. and Singh, Narendra (2003).** *Text book of Vegetables, Tubercrops and Spices*. Directorate of information and publication of agriculture, ICAR, New Delhi
