

Seed borne diseases of Wheat and Barley

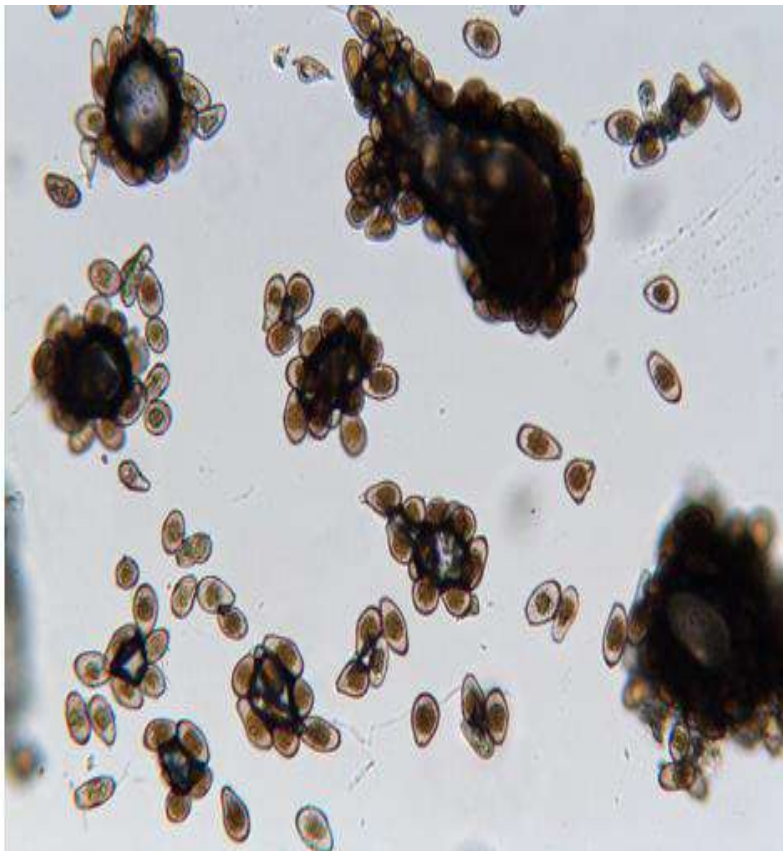
Loose smut	<i>Ustilago tritici</i>
Fusarium head blight	<i>fusarium graminearum.</i>
Seed gall nematode	<i>Anguina tritici</i>
Spot blotch	<i>Byopolaris sorokiniana</i>
Wheat streak mosaic virus	WSMV

1- Loose smut

symptoms: the disease first appear when plants produce ears. Infected ears emerge earlier than healthy plants.

All of the infected spiklets are being converted in to black powdery (telio spores) and replace the flowering parts. During the flowering period these spores are dispersed by wind in to healthy plants. It reduced the yield.

Teliospores of *Ustilago tritici*



Symptoms of the disease



Fungal biology

Seed-borne fungal mycelium establishes itself in the embryo of the seed at flowering.

As the seed matures, the mycelium becomes dormant. When infected seed germinates the following spring, the mycelium begins to grow and penetrates the growing point.

Wheat plants are infected only during flowering by wind, rain and insects blown spores from nearby smutted heads.

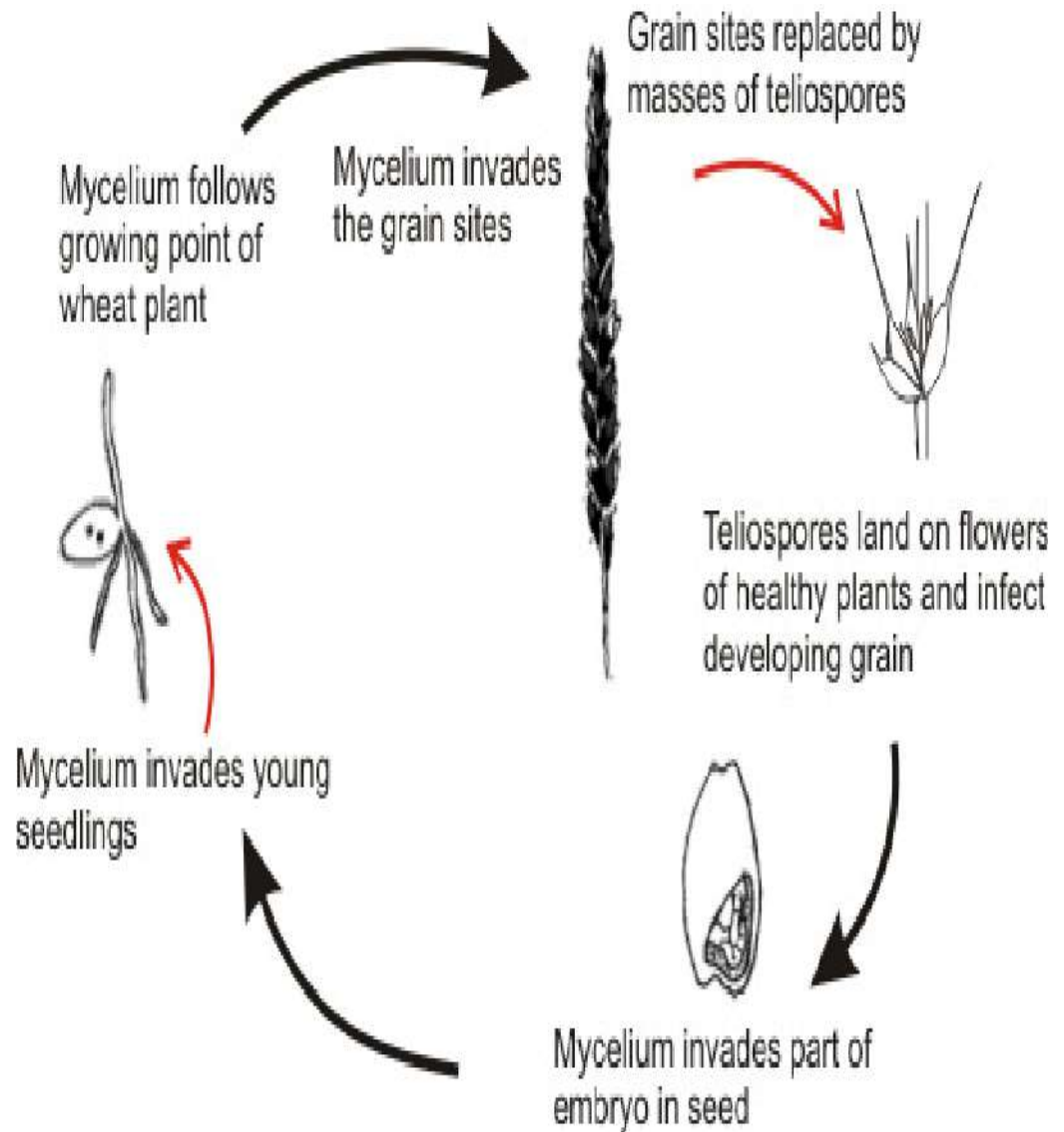


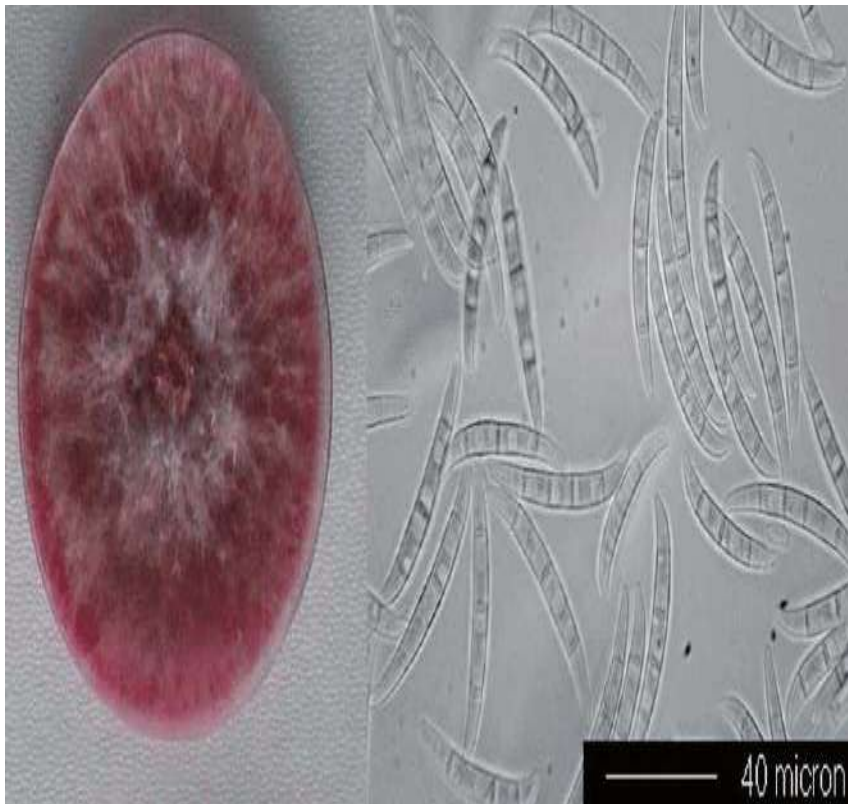
Figure 2. The life cycle of loose smut of wheat

Management

- 1- Use pathogen free seed
- 2- Seed treatment by applying systemic fungicide
Carboxin , Benomyl, Benlate.
- 3- Apply heat treatment, but viability and germination rate should be checked
- 4- Use resistant cultivars
- 5- Solar heat treatment

2- Fusarium head blight

Fusarium graminearum



FHB symptoms



FHB symptoms: the first noticeable symptom is bleaching of some or all of the spikelets which often started from the middle of the head while healthy heads are still green



FHB symptoms: Infected kernels are called (Tombstones) may appear shrivelled, shrunken, light weight and discolored with a light brown or pinkish-white appearance. It reduced the grain quality and marketing price.



Mycotoxin

Fusarium graminearum produces the mycotoxin, deoxynivalenol (DON), also known as vomitoxin.

This mycotoxin negatively affects the baking and milling quality of wheat, biofuel (ethanol) production, and the malting and brewing qualities of malt barley.

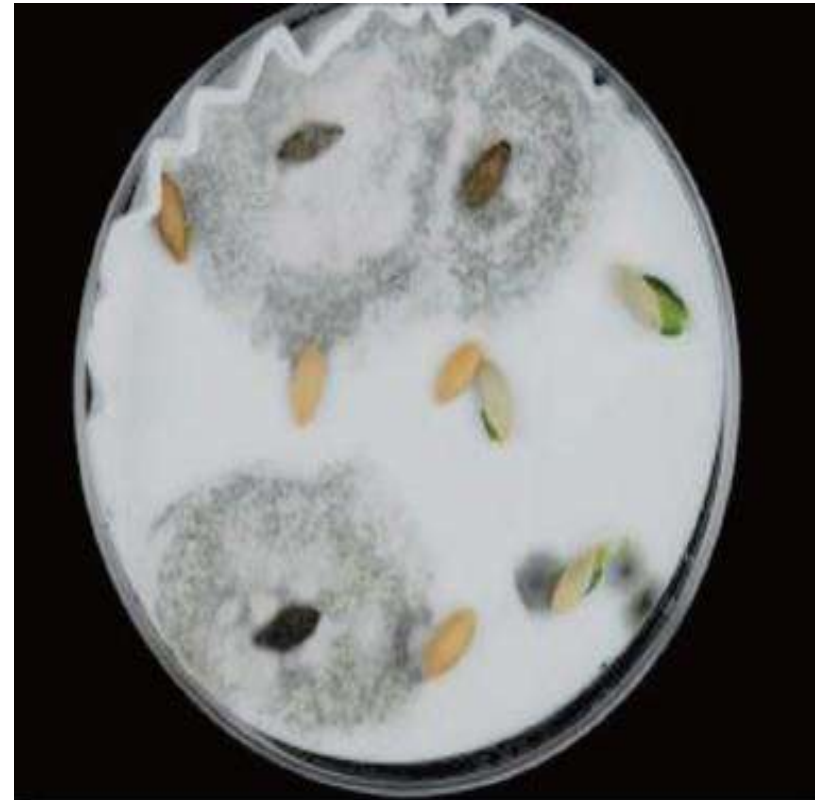
DON is one of the least toxic mycotoxins. The toxicity of DON is such that animals or humans do not die from ingesting it. However, livestock consuming high levels of DON may experience reduced feed intake, reduced immune response and reproductive dysfunction.

Detection of fusarium head blight

Agar plate method



Blotter methods



Management

- 1- Seed treatment: it helps prevent seedling blights caused by FHB and other seed and soil-borne pathogens.
- 2- Select Resistant Varieties.
- 3- Use clean seed: infected seed can cause seedling blight the fungus will move from the infected seed to the root, crown and stem base tissues due to this reason before planting the seeds must be tested by seed health testing methods and avoid planting susceptible seeds to FHB.

4- Irrigation management: If possible, limit irrigation just prior to and during the flowering period to reduce humid conditions in the crop canopy which would otherwise favour FHB.

5- Application of fungicides: spraying of propiconazole can help suppress the development of Fusarium head blight.

3- Seed gall nematodes



Seed gall nematode symptoms

Symptoms: Ectoparasitic feeding of *A. tritici* may cause leaf rolling, curling, and spiraling.

Severe infection of young plants can result in stunted plants with distorted, misshapen stems and leaves.

Plants mature more slowly, and produce smaller seed heads. Yield depressions of up to 50% are possible.



Grain replaced by hard brown black seed galls containing thousands of dry nematodes.



detection of Seed gall nematode

1- visual examination:

Infected seeds can be detected by visual inspection of black galls which are due to nematode *Anguina tritici*.

2- soaking seed:

The diagnosis is confirmed by soaking galls in water for 1 hr and cutting them into pieces in drops of water. Thousands of larvae are released into the water and can be seen under a binocular microscope.



damages

Flour produced from wheat infected with *A. tritici* has significantly lower levels of protein and gluten.

nematode also reduces the number of grains per spike, grain weight per spike, (cause yield loss).

This effect on quality has an adverse impact on the price of wheat.

Management:

Seed cleaning: seeds are poured into a salt solution and stirred vigorously. Debris and galls float to the surface.

The galls and debris are skimmed from the surface.

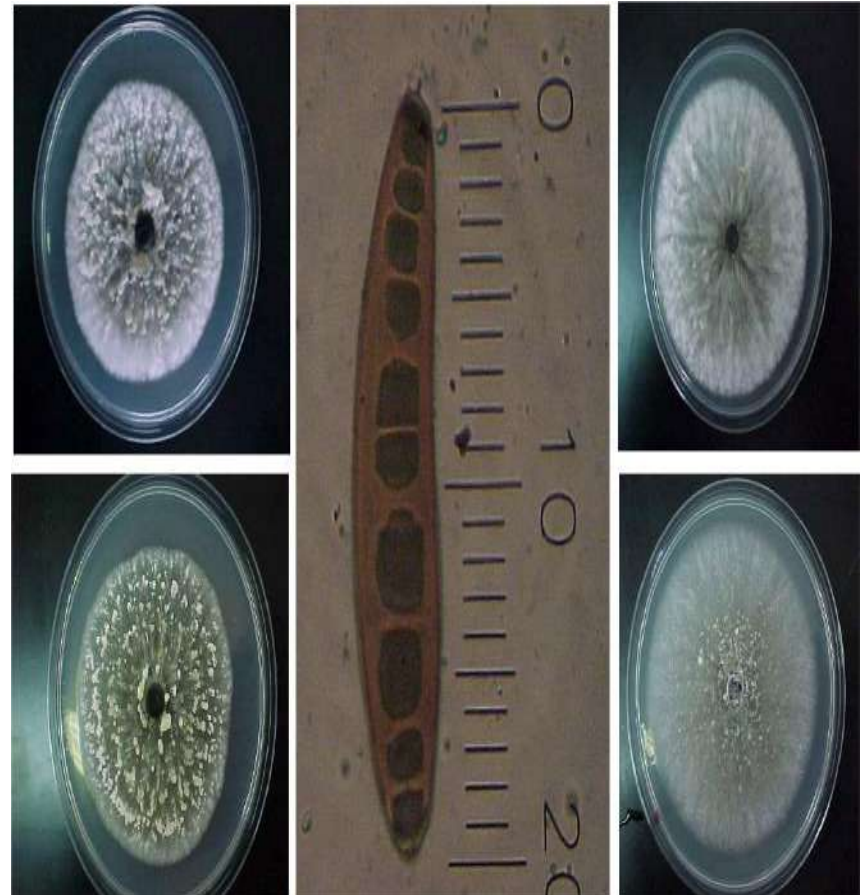
hot-water treatment involves pre-soaking the seed at 21-27°C for 2-4 hours, then placing them in water for 30 minutes at 50°C. The seeds are rinsed in tap water, then spread in thin layers on a clean surface till dry.

4- Spot blotch

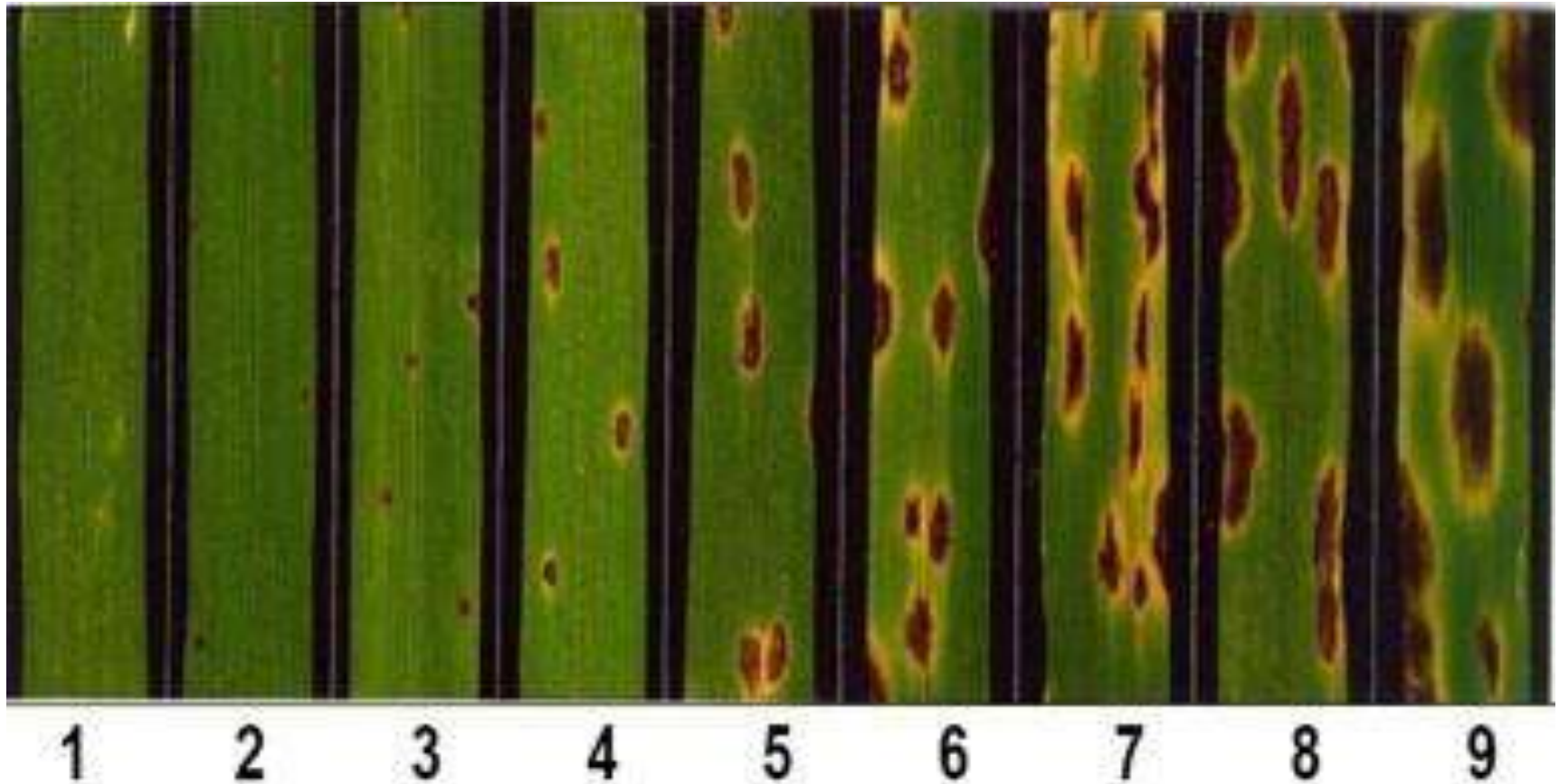
Bypolaris sorokiniana



Conidia and colony of *Bypolaris*



Symptoms : dark brown spots occur on the leaves, As the disease progresses the spots join together forming large blotches that cover the leaves. The affected leaves soon become chlorophyll deficient and eventually die.



Symptoms : Under the most severe conditions, the spikes are also affected and dark brown to black discolouration appears around the germinating point of the seed, called (black point).



management

- 1- Use resistance varieties.
- 2- seed treatment with vitavax (Carboxin + Thiram 1:1), raxil, Flint (Trifloxystrobin), thiram.
- 3- seed treatment with biological control agents such as trichoderma spp., pseudomonas florescence and Chaetomium globosum.
- 4- prevent excessive irrigation.
- 5- do not store seeds in moist places.
- 6- foliar spray of propiconazole

5- WHEAT STREAK MOAIC VIRUS

Symptoms:

The first signs of the disease are light green streaks in the leaves caused by the destruction of chlorophyll. As the disease progresses the light green streaks turn to yellow streaks and blotches giving the leaf a green and yellow pattern of colour called a “mosaic”, hence the disease is called “streak mosaic”.



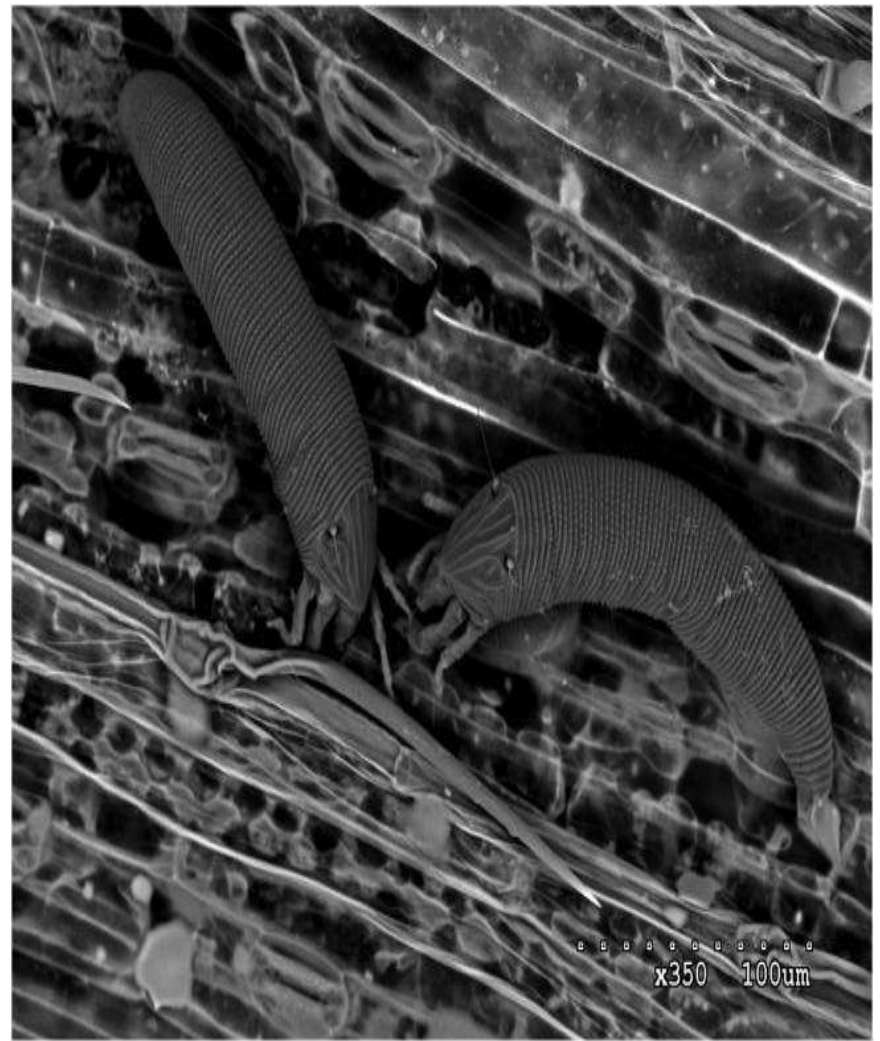
Infected plants are stunted



Infected plants are produce fewer seeds which are often shrivelled



The virus is transmitted by wheat curl mite (*Aceria tulipae*)



Detection of WSMV

- 1- visual observation of shriveled seed
- 2- grow out test (leaf chlorosis)
- 3- serological test.

Management

- 1- Sow clean seeds
- 2- cultural practices
- 3- Control grass weeds (tillage or herbicide)
- 4- Avoid early planting
- 5- control of vectors (mite).