



## ONION SMUT

Onion smut, caused by the soilborne fungi *Urocystis magica* (synonym: *U. cepulae*) and *U. colchici*, is the most destructive disease in onion-growing sections of the northern United States, where the crop has been grown intensively for a number of years. Once introduced into the soil, the smut fungus may remain dormant but alive for 15 years or possibly longer as multicelled teliospores.

*Urocystis magica* infects only common and Welsh or Spanish onions and certain closely related species, such as garlic, leek, wild leek, shallot, and several wild species of *Allium*. The Winterbeck onion, chives, Siberian chive, and certain ornamental species of *Allium* are resistant.

*Urocystis colchici* has a wider host range than *U. magica*. It infects common onion, shallot and *Allium nevadense*, as well as camosh or common camas and English camass, autumn crocus or meadow-saffron, *Polygonatum biflorum*, false spikenard and lily-of-the-valley.



Figure 1. Onion smut on young seedlings (courtesy R.C. lambe).



Figure 2. Two half-grown onion plants showing unbroken smut blisters or pustules (courtesy British Ministry of Agriculture)

### SYMPTOMS

Dark, lead-colored, slightly thickened spots and streaks develop in the cotyledonary leaf (the first leaf to emerge from the soil) of the seedling. Similar lead-colored to black spots and streaks occur in the scales or leaves as they develop. Affected leaves soon become abnormally swollen, bent or twisted downward and distorted (Figure 1). Elongated, raised black blisters can also be found in the outer scales of the developing bulb (Figure 2). Affected plants are usually severely stunted. Blisters in localized areas in leaves and bulbs often split irregularly to expose the dark brown to black, powdery masses of smut spores. Infected plants may survive in a weakened condition until mid-season or harvest but usually dry up, wither and die within a month after the seedling emerges. Smut in slightly affected bulbs appears as somewhat raised, dark brown to black pustules in the outer fleshy scales. Some pustules may occur as deeply as the third or fourth scale.

Smut-infected bulbs shrink more rapidly in storage and are more susceptible than healthy ones to attack by soft rot-producing organisms. Very rarely, smut-infested leaves may come from a bulb infected during the previous season.

## DISEASE CYCLE

The causal fungi are transmitted from one field to another on infested bulbs and sets, by surface drainage water, by wind-blown soil, on tools or farm equipment, on the feet of humans, domestic animals and birds, or by any other agency that transports soil. Although smut spores (multicelled teliospores) have occasionally been found on onion seed, spread of the causal fungi on the seed is not important. Diseased sets are probably the most common means of long-distance spread.

The black, powdery masses of smut spores serve to propagate the causal fungi. The microscopic spores are highly resistant to environmental changes and once incorporated in the soil may remain alive for many years even in the absence of a susceptible host crop. The smut

fungi can **only** penetrate and infect the onion plant in the young seedling stage. If the cotyledon (outer seedling leaf) escapes infection until it is mature, no further infection can occur even in heavily infested soil. Infection is possible only from the second or third day after the seed germinates until the seedling is in first leaf and about three inches above ground, a period of 10 to 21 days. Healthy onion sets or transplants may be planted in smut-infested soil without danger of becoming infected.

Smut teliospores germinate by sending out delicate hyphae (Figure 3) that penetrate the young cotyledon before it emerges. After emerging, the fungus obtains nourishment and grows through the cotyledon until it reaches the true leaves. Here the characteristic dark blisters appear just under the epidermis. Later, the blisters become filled with masses of black smut spores. When the pustules rupture, the spores drop, recontaminate the soil, and are ready to start the disease cycle once again when an onion seed germinates close by.

Smut spores may germinate and cause infection within the range of 50° and 78°F (10° to 25°C) with an optimum of 61° to 72°F (16° to 22°C). If the mean soil temperature is 84°F (28°C) or above when the young seedlings are susceptible, no infection occurs. At slightly lower soil temperatures, onion seedlings tend to outgrow the disease. These temperature relations explain why smut is absent in southern Illinois and in winter onion-growing areas where the seed is sown in late summer.

Soil moisture has no direct effect on spore germination or the disease, but an excess of water in the soil generally means low temperature there and slow growth, thus favoring the chances of attack. The smut fungi grow slowly in the soil, and contaminated areas do not rapidly enlarge when the soil is left undisturbed.

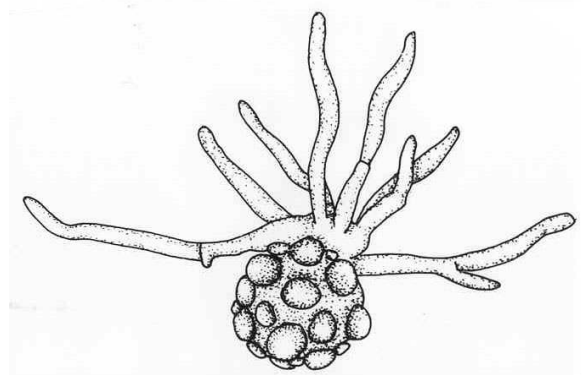


Figure 3. Germinating teliospore of *Urocystis magica*, with a number of delicate hyphae, as it would be seen under a high-power microscope (drawing by Lenore Gray).

## CONTROL

1. Where feasible, sow onion seed in noninfested soil or start onions from disease-free sets and transplants.
2. All diseased seedlings and plants should, whenever possible, be collected and burned on the spot. Everything should be done to avoid the distribution of smut-infested soil.
3. Treat the seed with a seed-protectant fungicide. For details see Report on Plant Diseases No. 915, "Vegetable Seed Treatment." Where onion maggot is destructive, a recommended insecticide should be added to the seed with the fungicide. Follow current recommendations of Illinois Extension Entomologists or your nearest Extension office where a current copy of Circular 1373, Illinois Homeowners' Guide to Pest Management is available. A properly applied seed-protectant fungicide also controls seed rot and damping-off.
  - a. **For onion sets** - Thoroughly mix the seed protectant with the dry seed before planting. Use 1 pound of 100 percent active seed protectant to 20 pounds of seed. (This equals 1 1/4 pounds of 75 percent active or 2 pounds of 50 percent active to 20 pounds of seed).
  - b. **For bulb onions** - Mix the seed-protectant fungicide with seed that has been moistened with a 4 percent methyl-cellulose sticker (Methocel). Prepare by dissolving two ounces of Methocel in 1 quart of warm water. Let this solution stand overnight. Add it to 8 pounds of onion seed and stir vigorously for 1 or 2 minutes. Then add 8 pounds of 75 percent seed protectant (or 12 pounds of 50 percent active fungicide). Tumble the seed for 4 or 5 minutes in a butter churn or barrel, an electric paint-can shaker, or a pelleting machine until it is uniformly coated with the dust. Then spread it out on fine screen wire to dry. Do not try to remove excess seed protectant. Several seed companies offer this service free or on a custom basis. The rate of seeding should be adjusted to allow for the greater size of the pelleted seed.
  - c. **For pickling and green bunching onions** - Same as for bulb onions, but use only half the dosage of fungicide and sticker.
4. Granular formulations are available to control smut and onion maggot. Be sure that the granules contain **both** an insecticide and a seed-protectant fungicide. Carefully follow the manufacturer's directions. Do not use pelleted seed in conjunction with granular applications.

Contact your nearest Extension office or ITCS, University of Illinois P345, 1917 S. Wright St., Champaign, IL 61802 to obtain publications mentioned above.