

Distinguishing Between the Loose Smuts of Barley

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ABSTRACT

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Ustilago nigra and *U. nuda* are difficult to differentiate in barley in the field because biotypes within each species produce different morphological types of infected spikes. The most reliable distinguishing feature is the sporidial germination type of *U. nigra* as opposed to the mycelial germination type of *U. nuda*.

In western Canada in 1972–1977, false loose smut or black loose smut (*Ustilago nigra* Tapke) was found in 16–56% of the barley fields examined, while loose smut (*U. nuda* (Jens.) Rostr.) was found in 3–25% (4,5). Therefore, both diseases were commonly encountered, even in the same field: 6% of the fields examined in 1977 contained both species. Distinguishing between the two species is important because they respond differently to seed treatments and they produce different reactions in cultivars.

U. nigra was first described by Tapke in 1932 (2). He stated that the smut was separable from *U. nuda* on the basis of spore color, size, and viability, as well as by mode of infection and reaction to fungicide. Germination of the teliospores was also different (3). Of these features, only spore color (dark chocolate brown for *U. nigra* and olive brown for *U. nuda*) is useful in the field. Recent descriptions appear to add a distinguishing characteristic by stating that the awns may remain on the spikes of plants infected by *U. nigra* while the entire spike, except the rachis, is replaced by spore masses in plants infected by *U. nuda* (1). This suggests that the species may be

distinguished in the field on the basis of morphology of affected spikes.

Figure 1 shows that distinguishing between the species in this way is not possible. The spike on the left of each pair infected by *U. nuda* was symptomatic of biotype 72-66, and the spike on the right was symptomatic of 72-146. Both biotypes occur naturally and are widely distributed in Canada (4, unpublished). The morphology of the infected spike was consistent from generation to generation for each biotype, in different varieties of the host (both two- and six-row cultivars), and under different environmental conditions. Biotype 72-146 left most of the awns on the spike and, according to some authorities, would have been classified as *U. nigra* at first examination.

Figure 1 also shows the different morphology of spikes infected with *U. nigra*. However, this difference was more inconsistent and was not specific to biotype or cultivar. Infected spikes had a range of morphological types, even when the inoculum was purified by selection of spores from single spikes. This range of types precluded the use of morphology of infected spikes to distinguish between *U. nuda* and *U. nigra* in the field.

The other infected spikes in Figure 1, which were on plants grown from seed inoculated with covered smut (*U. hordei* Pers. (Lagerh.)), are shown for comparison. This species is easily distinguished from the other two in the field because the sori become indurate and the spores do not readily disperse. The membrane covering the sori is also much more substantial.

The two species of loose smut can be distinguished in the field by spore color, but color difference is so slight that one

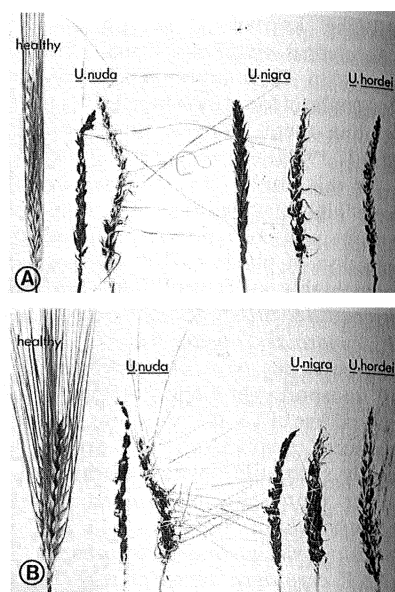


Fig. 1. Healthy and smutted spikes of barley showing differing morphologies within and between disease species. Spikes were harvested before all spores had blown away. Twisting of the rachis was caused by drying after harvest. (A) Two-row and (B) six-row barley.

needs extensive experience or a comparative sample to make the distinction. The most reliable and positive distinguishing feature is the sporidial germination type of *U. nigra*, as opposed to the mycelial germination type of *U. nuda*. Although this test is simple, it must be performed in the laboratory.

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