Breeding Oat for Resistance to Diseases

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Oat (Avena sativa L.) diseases are a potential constraint to oat production in nearly all areas of oat culture in North America and throughout the world. A significant portion of oat improvement research has been to increase resistance to pathogens and thus to stabilize production and crop quality. The severity of crop loss to diseases varies significantly among regions and years because development and spread of pathogens depends on various environmental conditions, the proportion of the oat hectarage planted to resistant cultivars, and the effectiveness of the resistance.

Many North American oat cultivars have one or more genes for resistance to the organisms that cause plant disease. New cultivars have been readily adopted by farmers because they are dramatically resistant to important diseases as well as being superior for agronomic and grain quality characteristics.

18-1 IMPORTANCE OF RESISTANCE

Host resistance is an important method of minimizing crop loss due to diseases, including crown rust (Puccinia coronata Cor. var. avenae R.P. Fraser & Ledingham) (Murphy et al., 1940), barley yellow dwarf (BYD) (Bruehl, 1961; Catherall et al., 1977), powdery mildew (Erysiphe graminis DC. f. sp. avenae Em. Marchal) (Aung et al., 1977), and soil-borne oat mosaic (Graham et al., 1969). Certain fungal pathogens, such as Ustilago avenae (Pers.) Rostr. that causes loose smut and U. segatum (Bull.: Pers.) Roussel (= U. kolleri Wille.) that causes covered smut, can be controlled economically and effectively by fungicide use. Crop losses caused by certain other pathogens such as barley yellow dwarf virus (BYDV), and soil-borne oat mosaic virus (OMV) can be reduced by cultural practices. Once a susceptible crop has become infected in the field, however, it can be difficult to control the disease by chemical or cultural means. Where applicable, an effective procedure is to use all three methods to control or minimize losses: host resistance, fungicides, and cultural practices.

There are many examples of losses caused by important diseases (see chapter 12 by Harder and Haber) and the implicit assumption that these losses...