Breeding for Pest Resistance

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Pests can often be a limiting factor in barley production, affecting both yield and quality of the harvested grain. Pest situations are dynamic and change with changing cropping systems and patterns of cultivar use. A number of control measures may be enlisted, but growing resistant cultivars is often the most satisfactory one. This chapter discusses breeding for resistance to the major disease and insect pests.

TYPES OF INHERENT PLANT PROTECTION

Inherent protection of plants from disease pathogens and insects may be considered under several categories. Specific resistance is a type of reaction that is expressed by a cultivar against some strains or races of a causal agent but may not be expressed against other strains or races. This phenomenon was little understood when breeders first used resistant parents in breeding programs. The attributes of this resistance were largely determined after use. Plants were originally selected because they gave a distinct phenotype, an immune or very resistant reaction, which could be readily identified in the breeding program. Later investigation showed that such resistance often was due to one or, at most, a few genes and that a hypersensitive necrotic reaction was usually expressed by the resistant cultivars. Unfortunately, after extensive use of cultivars with these resistance genes, the resistance often broke down within 3 to 5 years, with races of the pathogen to which these genes did not offer resistance becoming prevalent. However, there are notable exceptions in which monogenic resistance has been long-lasting, as reviewed by Walker (1966) and Caldwell (1968). The T gene for stem rust (Puccinia graminis Pers.) resistance is a good example of durable monogenic resistance in barley (Moseman, 1963, p.38). On the other hand, specific or nondurable resistance...