38. Viral Resistant Wheat

The states of Idaho, Washington and Oregon produced 242 million bushels of wheat valued at $648 million in 2000. The majority of wheat produced in the Pacific Northwest is soft winter wheat, a low protein wheat used in baked goods such as cookies and pastries. Two of the most serious viruses affecting wheat in the Pacific Northwest are barley yellow dwarf virus (BYDV), vectored by aphids, and wheat streak mosaic virus (WSMV), vectored by mites. Both viruses stunt plant growth and reduce yields. Yield losses to these diseases can vary greatly from year to year, reaching as high as 70% to 90% in an infected field, but average losses are estimated at 1% to 3% across the region.

Management of BYDV and WSMV in wheat depends on avoiding exposure to the aphids and mites that vector them. Delaying planting is a major technique for avoiding peak aphid and mite populations, but too great of a delay risks missing the period when soil and moisture conditions are best for wheat establishment. Yield losses to delayed planting may average as much as 10 bushels per acre, or 13%. For BYDV management, insecticides are applied to 2% of Northwest wheat acreage for aphid suppression.

Commercial soft winter wheat varieties have been transformed with three different genes for protection against viruses. Two genes are coat protein genes, one from BYDV and one from WSMV. Each gene is expected to provide resistance specific to the virus from which it was isolated. The third gene being tested is derived from yeast. Its products interfere with a key enzyme needed for viral replication, thus providing more general virus resistance than the pathogen-derived genes. Field tests are underway to evaluate these three potential sources of virus resistance in transgenic wheat.

Potential Impacts of Viral Resistant Transgenic Wheat

Changes in Production: prevent loss of 2.48 million bu/yr to viruses
Changes in Production: prevent loss of 12.75 million bu/yr to delayed planting
Change in Production Value: prevent loss of $39 million per year
Change in Pesticide Use: reduction of 82,800 pounds of insecticide use

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