18. Fungal Resistant Potatoes

Verticillium wilt is a major limiting factor in potato production throughout the U. S. The fungal pathogen enters root tissue and infects the water conducting system of the plant, causing symptoms of severe drought. Size and quality of potatoes are decreased and yields decline 20% to 40%.

Verticillium builds up in soil planted to susceptible plants year after year, and its spores can survive dormant in soil for several years. Crop rotations of less than five years are therefore not effective in controlling Verticillium, but high land values and lack of profitable alternative cash crops discourage implementation of such long rotation schedules. The fumigant metam sodium applied to soil through sprinkler irrigation prior to planting is the most common control of Verticillium due to its efficacy and ease of application. In continuous potato plantings, metam sodium increases yields by 23-33%. It must be reapplied each season, and it is expensive. The average application of 121 lbs a.i./acre costs approximately $157/acre.

An antifungal gene from alfalfa has been isolated and transferred to Russet Burbank potato plants. The protein encoded by the gene, alfAFP, can inhibit Verticillium growth completely. In laboratory studies, transgenic potato plants producing alfAFP exhibited enhanced resistance to Verticillium wilt as compared to non-transgenic plants. In the field, fungal levels in transgenic potato plants were six-fold lower than those in non-transgenic plants. If commercialized, transgenic potato plants with Verticillium wilt resistance could significantly reduce metam sodium use and lower growers production costs.

Potential Impacts of Fungal Wilt Resistant Transgenic Potato:
Changes in Pesticide Use: 28.4 million lbs a.i. yr reduction in fumigant use
Changes in Production Costs: $18 million/yr net savings

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