17. Insect/ Viral Resistant Potato

Two of the most damaging pests in Northwest potato production are the Colorado Potato Beetle (CPB) and the green peach aphid. Uncontrolled CPB populations can defoliate an entire field by mid-season, severely lowering plant yields and tuber quality. The green peach aphid can cause feeding damage on leaves if populations are high enough, but they are considered primary pests because of their ability to spread potato leaf roll virus. Potato leaf roll virus severely reduces marketable yields by reducing plant production and causing net necrosis in tubers, making them unsalable.

CPB and aphid management in potatoes has been based on significant insecticide use, progressing from lead arsenate use in the early part of the century to DDT and parathion use in the 1940s and 1950s, numerous organophosphates in the 1960s, and pyrethrroids and carbamates in the 1970s. Insecticides currently used on northwest potatoes to prevent economic losses to CPB and aphids include aldicarb, carbaryl, carbofuran, disulfoton, endosulfan, imidacloprid, permethrin, azinphos-methyl, diazinon, dimethoate, esfenvalerate, phorate, and methamidophos. However, because insecticide applications do not kill all aphids or prevent all aphid feeding, and because of aphids migrating into fields from other areas, virus infections and associated losses still occur.

Russet Burbank potatoes have been transformed to express the Cry3A Bt protein, which is toxic to CPB, and to express a potato leaf roll virus coat protein, which provides resistance to the virus. Field trials indicate protection against CPB provided by the Bt gene is equivalent to that provided by current insecticide usage, and the pathogen-derived protection against potato leaf roll virus is close to 100%.

Planting of CPB and virus resistant potatoes could therefore potentially replace current insecticide applications targeting CPB and aphids, as well as prevent current losses to potato leaf roll virus.

Potential Impacts of Insect/ Viral Resistant Transgenic Potato
Change in Production: prevent 1 billion lbs/ yr in losses to potato leaf roll virus
Change in Pesticide Use: 1.45 million lbs/ yr decrease in insecticide use
Change in Revenue: $58.7 million/ yr net increase

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