

ENGINEERING DISEASE RESISTANCE INTO POTATO CULTIVARS

by
Lee A. Hadwiger
Dept. of Plant Pathology
Washington State University
Pullman, Wa.

Existing potato cultivars generally serve the needs of Washington growers in quality, however as these potato lines are continually used year after year their susceptibility to various diseases increases. This problem is further aggregated by loss of chemical fungicides, bactericides and nematocides because of environmental concerns, etc.

New genetic engineering strategies have enabled my laboratory to develop new potato lines which are essentially identical to mainstay commercial varieties such as Shepody and Russet Burbank, except for the addition of a single disease resistant trait. The first resistant trait (gene) used was cloned from a pea plant. In nature peas have the desired quality of resisting nearly all pathogenic organisms which attack potatoes. Whereas in the past breeders have transferred resistance traits only between plants of the same species, genetic engineering technology enables us to acquire disease resistance traits from any plant species.

Preliminary pathogenicity tests and field tests of an engineered potato cultivar Shepody, that possessed a single pea gene, indicate this new line is superior to the commercial Shepody cultivar in resisting *Verticillium* wilt and powdery mildew. This resistance also increased tuber yield as indicated in table 1. The identification of successful disease resistance response genes was possible because of a long term study on disease resistance in peas. The transfer of this and other genes to potatoes is a labor-intensive process requiring multiple genetic arrangements and multiple transformation attempts. However, plant improvements once acquired are inherited and thus stable through subsequent propagule increases. Drs. Dave Culley and Ming Mei Chang in my laboratory have transformed several promising new genes into Russet Burbank potatoes and will be evaluating their effects in field tests. In the long-term these new cultivars should greatly reduce pesticide use and in many other ways benefit Washington growers. This research is financed to a large part by the Washington Potato Commission.

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Table 1. Comparison of average tuber yield (5 plants) of different transgenic potato lines with a pea gene and the non-transformed potato cv. Shepody grown in PED (potato early dying) infested soil.

Line	Tuber Yield (g)
Shepody Control	1,252 a
Shepody & pea gene	2,600 b
Shepody & pea gene	1,524 a
Shepody & pea gene	2,670 b