Research Progress Report for 1993

Submitted to:

SLV Research Center Committee
and the
Colorado Potato Administrative Committee (Area II)

Title: Field evaluation of transgenic potatoes for resistance to tuber black spot and bacterial pathogens.

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In cooperation with Dr. William Belknap, USDA/ARS, Albany, California, nine transgenic clones of the potato variety Lemhi Russet, each carrying a different insertion of the larval serum protein from the greater wax moth, and six transgenic clones of Russet Burbank with different inserts of the Cecropin B gene from the giant silk moth were grown at the SLV Research Center. Twenty-five seed pieces of each clone, along with nontransformed controls were replicated two times in a randomized block. The study was planted on May 20, 1993. Standard cultural practices were used, and irrigation was provided by solid set sprinkler. As the potato plants developed over the growing season, notes were taken on morphology and growth. According to USDA/APHIS permit requirements, all flowers were removed as they developed to prevent possible transfer of transgenes by pollen. The study was sprayed with Diquat on August 23 and harvested by hand on September 23, 1993.

Tubers from each plot were weighed and yields determined. Sample tubers from each Lemhi Russet clone were evaluated for black spot bruise by the controlled impact technique. No transgenic clone of either Lemhi Russet or Russet Burbank yielded more than the nontransformed controls (Tables 1 and 2). Among the transgenic clones of Lemhi, clone 63 showed the lowest susceptibility to black spot bruise in post-harvest tests run on tubers (Table 3). Clone 63 performed similarly in black spot tests run in North Dakota, Maine and Idaho. Soft rot tests were not run on any transgenic clones of Russet Burbank due to reports from other test locations that this construct was non-functional. Some tubers of Lemhi Russet clone 63 were retained for further studies in the greenhouse. All remaining tubers of the transgenic Russet Burbank and Lemhi Russet clones were destroyed by freezing.

Table 1. Yields for transgenic clones of Lemhi Russet

Clone	Yield[a]
LHGAL-18	36.6
LHGAL-27	46.0
LHGAL-43	45.5
LHGAL-52	35.5
LHGAL-63	21.1
LHGAL-M40	41.7
LHGAL-M46	42.7
LHGAL-M57	8.6
Lemhi wt ck	46.5
SLV RC Lemhi	51.2
LSD (P=0.05)	8.0

[a]Pounds per 20 feet of row

Table 2. Yields for transgenic clones of Russet Burbank

Clone	Yield[a]
RB Cec-1	42.7
RB Cec-3	43.8
RB Cec-4	35.2
RB Cec-5	29.1
RB Cec-6	39.9
RB Cec-7	31.1
Russet Burbank wt ck	42.5
SLV RC RB	47.3
	NS

[a]Pounds per 20 feet of row

Table 3. Black spot bruise reactions for transgenic clones of Lemhi Russet

Clone	Reaction[a]
LH GAL-18	2.3
LH GAL-27	2.1
LH GAL-43	1.1
LH GAL-52	2.4
LH GAL-53	1.8
LH GAL-63	2.9
LH GAL-M40	1.4
LH GAL-M46	1.1
LH GAL-M57	2.3
Lemhi wt ck	1.5
SLV RC Lemhi	2.2

[a]Black spot bruise reaction rated 1 to 5, 1 = heavy damage, 5 = no damage