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SUMMARY RESEARCH PROGRESS REPORT FOR 2001
AND RESEARCH PROPOSAL FOR 2002

Submitted to:

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

TITLE: Potato Breeding and Selection

PROJECT LEADER: David G. Holm and Patrick F. Naranjo

PROJECT JUSTIFICATION: Many challenges and opportunities are confronting the Colorado potato industry. These challenges/opportunities include food safety, water quality, current market constraints, new market development (processing, exporting, etc.), changing consumer expectations, and increasing costs with highly variable potato prices.

To help meet these challenges, continued emphasis needs to be placed on developing new potato cultivars. The primary objectives of the Colorado Potato Breeding and Selection Program are to develop new potato cultivars with increased yield, improved quality, resistance to diseases and pests, and tolerance to environmental stresses for Colorado. Other objectives are to provide a basic seed source to growers for seed increase and commercial testing; and to evaluate promising selections for potential seed export.

The Colorado Potato Breeding and Selection Program has always emphasized the development of "low input" cultivars, primarily for reduced nitrogen and fungicide input. Over the last few years, a major emphasis has been placed on developing Colorado cultivars that are resistant to late blight (foliar and tuber). Areas with recent increased emphasis or new emphasis are: 1) developing cultivars immune to PVY; 2) developing cultivars with tuber resistance to dry rot (Fusarium and early blight) and bacterial soft rot; 3) identifying and incorporating breeding material demonstrating resistance to powder scab; and 4) developing protocols to screen and evaluate advanced selections for reduced tuber greening potential and red skin color retention in storage.

Continued emphasis will be placed on breeding for improved postharvest and processing qualities such as lengthened dormancy and ability to process after cold storage. Cultivars with these characteristics will help assure that the potato industry in Colorado will remain productive and in a competitive position.

PROJECT STATUS: This is an ongoing project.

SIGNIFICANT ACCOMPLISHMENTS FOR 2001:

Six years ago, clones derived from somatic hybrids of the *Solanum tuberosum* (the commercially cultivated potato) and *Solanum bulbocastanum* were obtained from the USDA-ARS in Madison, WI. *Solanum bulbocastanum* is a species which exhibits high levels of resistance too late blight and early blight. In 1999, additional germplasm with resistance to late blight was identified and acquired from breeding programs around the United States.

Other germplasm has been acquired with multiple virus resistance to PVX, PVY, and leafroll from the USDA-ARS in Idaho. Several additional field selections exhibiting field immunity to PVY were obtained from Oregon State University in 2000. In 2001, additional sources of PVY immunity were obtained from the USDA-ARS in Idaho and Washington. All of these materials and other accessions with improved quality and disease characteristics are being incorporated into the breeding program.

Eighty-nine parental clones were intercrossed in 2001 in two separate crossing blocks. The emphasis of the first crossing block was disease resistance (late blight and PVY) and the second emphasized cultivar

development and virus resistance (PVX, PVY, and PLRV). Seed from 605 combinations was obtained. Approximately 45,000 seedling tubers representing 166 families were produced from 2000 crosses, for initial field selection in 2002. Second thru fourth size seedling tubers from these crosses will be distributed to Idaho, Minnesota, Oregon, Texas, and Alberta, Canada. Additional seedling tubers for planting in 2002 will be obtained from Dr. Richard G. Novy, USDA-ARS, Aberdeen, Idaho; Dr. Dermot Lynch, Agriculture Canada, Lethbridge, Alberta; and Dr. J. Creighton Miller, Texas A&M University, College Station, Texas.

A total of 77,993 first year seedlings were grown in 2001, with 930 being retained for subsequent planting, evaluation, and increase in 2002. Another 1,074 clones were in 12-hill, preliminary, and intermediate stages of selection. Of these, 293 were saved for further observation. Thirty-nine advanced selections were saved at harvest and will be increased in 2002 pending final evaluations. Another 188 selections were maintained for germplasm development, breeding, other experimental purposed, or seed increases for other programs.

Field trials conducted in 2001 included: Preliminary Trial, Intermediate Yield Trial, Advanced Yield Trial, Southwestern Regional Trial, Western Regional Main Trial, Western Regional Red Trial, Western Regional Specialty Trial, San Luis Valley Chipping Study, and Western Regional Chipping Trial.

Colorado advanced selections evaluated in the Southwest Regional Trials, Western Regional Trials, or by producers, included 11 russets (AC87079-3RU, AC87138-4RU, AC87084-3RU, AC89536-5RU, AC91014-2RU, AC92009-4RU, CO85026-4RU, CO92027-2RU, CO92077-2RU, NDC5372-1RU, and TC1675-1RU), 5 reds (CO86218-2R, CO89097-2R, CO93037-6R, DT6063-1R, and NDC5281-2R), and 3 chippers (AC87340-2W, AC89653-3W, and BC0894-2W).

Selections schedule for initial release for grower evaluations are AC92009-2RU, CO92077-2RU, NDC5372-1RU, TC1675-1RU, and NDC5281-2R.

Advanced selections that were discarded from further evaluation are AC87079-3RU, AC87138-4RU, AC91014-2RU, CO92027-2RU, and AC89653-3W. The status of AC87084-3RU and AC87340-2W are pending further evaluations over the next year.

Upcoming releases include *Cherry Red* (DT6063-1R), *Fremont Russet* (CO85026-4RU), and *Durango Red* (CO86218-2R) and *BC0894-2W*. Plant Variety Protection was granted for Russet Norkotah Selections 3 and 8. Plant Variety Protection for Keystone Russet and Silverton Russet was applied for.

A total of 203 samples were evaluated for two or more of the following postharvest characteristics: blackspot susceptibility, storage weight loss, dormancy, enzymatic browning, specific gravity, french fry color, french fry texture, and chip color.

OBJECTIVES FOR 2002:

1. The potato breeding and selection program will be continued. Advanced clones will be tested, as appropriate in yield trials, Southwestern Regional Trials, Western Regional Trials, out-of-state trials, and by growers.

2. Evaluate preliminary, intermediate, and advanced selections from the breeding project, Southwestern Regional Trials, and Western Regional Trials for: blackspot susceptibility, storage weight loss, dormancy, enzymatic browning, specific gravity, chip color, french fry color, and french fry texture. Advanced selections will be also be screened, as appropriate, for tuber greening potential and red skin color retention in storage.

3. Continued emphasis will be placed on identifying and incorporating parental material with resistance to late blight, immunity to PVY, tuber resistance to dry rot (*Fusarium* and early blight), bacterial soft rot. New emphasis will be placed on identifying and incorporating breeding material demonstrating resistance to powdery scab. Protocols will be refined for screening progenies for late blight resistance.

4. Clones in the 8th cycle of field selection will be entered in cultural management trials and postharvest disease evaluations. Evaluations will be conducted primarily on bacterial soft rot and dry rot (Fusarium and early blight). These studies will be conducted in cooperation with other CSU personnel.

5. A new grower suggested project will be initiated to evaluate the potential of using 2,4-D to intensify the red skin color of red cultivars.

Funding Summary:

2001 Request	$28,000	**2002 Request***	$30,000
2001 Allocation	25,000	Temporary Labor	19,500
		Supplies	8,500
		Travel	2,000

*Final fund usage categorization dependent on the day-to-day needs of the program.

2001 Expenditure Report to Date	
Labor	$12,683
Travel	2,233
Chemical	0
Ag Supplies	5,886
Equipment	1,000
Miscellaneous	2,154
Total (3/01/02)	23,956