

## **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:** Characterize antioxidants and possible other healthy chemicals in potatoes

**PROJECT LEADER (S):** Cecil Stushnoff, Ann McSay, David Holm

**PROJECT JUSTIFICATION:** This project is based on the need to investigate the role potatoes might have in improving human diets. We are characterizing existing cultivars and promising new selections for antioxidant content and free radical scavenging activity, specifically to assess their potential contribution to intervene in the onset of cancer and cardiac diseases.

**PROJECT STATUS:** This project was initiated in 2001 following promising initial tests of freeze dried CO cultivars in New Zealand, by C. Stushnoff while on sabbatical leave to learn analytical techniques to evaluate antioxidant properties of food. Four tests (total phenolics, ABTS radical scavenging activity, FOX inhibition of lipid peroxidation, and TRAP peroxy radical scavenging activity) were completed for eight cultivars and selections. A microplate reader was acquired and the first two assays have been successfully established in our Fort Collins laboratory. The remaining two assays are in the process of development, as well. A heat stability study was initiated in 2001/2002, as well as tests on 39 additional advanced selections from Dave Holm's breeding program.

### **SIGNIFICANT ACCOMPLISHMENTS FOR 2001:**

- (1) While white fleshed potato cultivars were found to be among the lowest of the vegetables in antioxidant potential, about equal to published reports for fresh tomato and carrot, red and purple fleshed potatoes were 3 to 8 times higher, ranking them equal to sweet potato, red onion and spinach. Of the white fleshed entries tested so far, R. Norkotah #3 was the highest.
- (2) Total phenolic content of tuber tissue with and without skins, was highly correlated with radical scavenging activity, but not with inhibition of lipid peroxidation. Russet Nugget was the most effective inhibitor of lipid peroxidation, but among the least effective in ABTS radical scavenging activity.
- (3) The red and purple pigmented cultivars likely derive their activity from phenolic based anthocyanins. While yellow fleshed Yukon Gold is known to contain carotenoid antioxidants, antioxidant potential is no different than the lower activity of white fleshed types.
- (4) We conclude that more than one assay is needed to evaluate antioxidant potential of potato germplasm.
- (5) Preliminary data collected to date for tubers cooked by baking at 350 °F for 1 hour, microwaving at the high setting for 5 minutes per tuber, boiling for 30 minutes and chip frying in soybean oil at 365 °F for 10 minutes generally reduced antioxidant potential. However, some heat treatments did compare favorably with uncooked freeze-dried samples. The red fleshed entry was heat stable for all treatments, except chipping. The purple tubers lost more activity when boiled,

oven baked, and chipped than when microwaved. However, even in the case of chip frying the red and purple pigmented tubers has higher total phenolic and ABTS radical scavenging activity than the white fleshed tubers.

(6) Preconditioning tubers for chip frying at 40 °F resulted in about twice the antioxidant content of those preconditioned at 50 °F. This suggests that metabolic events that reduce soluble sugars at 50 °F are more destructive of antioxidant potential than conditioning at 40 °F.

With the current high level of interest among consumers in healthy foods, knowledge about the potential of potato cultivars to contribute to human health should provide opportunities to add value in marketing antioxidant active potatoes. We were pleased to discover that a significant portion of the antioxidant activity is heat stable, and even though the levels are not high in chips from traditional cultivars, it seems possible to enhance levels through breeding and postharvest handling procedures.

**OBJECTIVES FOR 2002:** Thirty nine entries from the breeding program have been freeze dried and will be analyzed in 2002. We have completed only two of the assays with a few of the entries, and plan to analyze the remainder. We are also interested in examining additional postharvest and environmental effects. Discussions have been held with Dave Holm, to explore ways to attain sufficient funding for a graduate student, or equivalent postdoc to work on this project.

**FUNDING REQUEST:**

2001 Allocation	\$1000 for chemicals; \$7000 for student hourly and workstudy	\$8,000
2002 Request	\$1000 for consumables; \$2000 for work study; \$8000 for ½ domestic assistantship or part-time postdoc.	\$11,000

**2001 - Use of Funds Report for a) Storage study; b) Minituber dormancy; c) Antioxidant research. Total allocated = \$14,000. The deficit was made up by borrowing from other project reserve funds.**

1)	Project Labor:	8,221
2)	Project Domestic Travel	1,281
3)	Supplies	10,435
4)	Services	1,769
5)	Total	21,706
6)	Deficit	7,706