

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 the diet of individuals. We are characterizing existing cultivars and promising new selections for antioxidant content and free radical scavenging activity, to assess their potential contribution to intervene in the onset of “life style” diseases.

PROJECT STATUS: This project was initiated in 2001 following promising initial tests of freeze dried CO cultivars by C. Stushnoff in New Zealand, 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 28 additional advanced selections from the 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.
- (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) 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 1.5 hours, microwaving at the high setting for 5 minutes per tuber, boiling for 30 minutes and chip frying in soybean oil at 350 F for 10 minutes generally reduced antioxidant potential, but 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 destructive of antioxidant potential in all cultivars.