SUMMARY RESEARCH PROGRESS REPORT FOR 1992
AND RESEARCH PROPOSAL FOR 1993

Submitted to:

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

TITLE: 1992 Quality and Flavor Evaluations

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PROJECT JUSTIFICATION: Potato composition is important to the grower, processor and consumer. for example solids content, degree of browning, sugar content and composition influence potato product quality during processing, while both nutritional and antinutritional components are of concern to the consumer.

PROJECT STATUS: Ongoing

SIGNIFICANT ACCOMPLISHMENTS FOR 1992: A total of 27 lines were evaluated for percent solids, subjective baked flavor, subjective enzymatic browning, total glycoalkaloids, vitamin C, protein, total sugars, sucrose and glucose. Several promising lines were observed that had high solids and protein contents, while several other lines exhibited a low potential for darkening and had good baked flavor. No extremes were noted among the lines in total glycoalkaloids, vitamin C, total sugars, sucrose and glucose.

The pyrazines located in the volatiles obtained from four lines that were baked were quantitated and found to range from 40-60 ppm. These compounds are important contributions to baked potato flavor.

OBJECTIVES FOR 1993:

1) Continue to measure quality properties in both promising and traditional lines except that the sugar analyses will be performed by SLV.
2) Measure pyrazine levels in several lines as influenced by method of preparation (baking, boiling, frying, etc.)
3) Evaluate the fatty acid composition of several lines as influenced by storage and processing. (Fatty acids have been reported to make significant contributions to off-flavors in potatoes).

FUNDING REQUEST:

1992 Allocation: $5,100

1993 Request:

1)	Quality evaluation (less sugar analyses):	
	Materials/supplies	$2,800
2)	Flavor analysis:	
	Materials/supplies	400
3)	Fatty acid analysis	
	Materials/supplies	700
	Total requested:	$3,900

1992 Quality Evaluations

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TABLE 1
1992 Quality Evaluations
Percent Solids

Field	Clone	% Solids
1901	AC75430-1	24.2
1903	AC78069-17	18.7
0241	AC80545-1	20.3
1801	AC83064-1	22.7
1802	AC83064-6	19.6
1803	AC83068-1	18.4
1804	AC83172-1	24.4
1805	AC83306-1	21.7
1701	AC84028-4	22.3
1702	AC84487-1	23.6
1601	AC84610-5	21.0
0321	CO80011-5	20.3
0631	CO81082-1	17.7
1902	CO82142-4	19.9
1703	CO84074-2	20.7
1704	CO84205-5	16.1
1603	CO85026-4	19.1
1604	CO85168-4	21.8
1469	Atlantic	21.3
CR31	Centennial Russet	21.0
FR41	Frontier Russet	19.3
1470	Norchip	21.2
RR41	Ranger Russet	20.1
RB41	Russet Burbank	21.3
NK41	Russet Norkotah	20.8
NU31	Russet Nugget	23.9
S441	Sangre	17.4

TABLE 2
1992 Quality Evaluations
Subjective Baked Flavor

Field	Clone	Baked Flavor Rating
1901	AC75430-1	1
1903	AC78069-17	1
0241	AC80545-1	2
1801	AC83064-1	1
1802	AC83064-6	2
1803	AC83068-1	1
1804	AC83172-1	1
1805	AC83306-1	1
1701	AC84028-4	1
1702	AC84487-1	2
1601	AC84610-5	2
0321	CO80011-5	1
0631	CO81082-1	1
1902	CO82142-4	1
1703	CO84074-2	1
1704	CO84205-5	2
1603	CO85026-4	1
1604	CO85168-4	2
1469	Atlantic	3
CR31	Centennial Russet	1
FR41	Frontier Russet	1
1470	Norchip	4
RR41	Ranger Russet	1
RB41	Russet Burbank	1
NK41	Russet Norkotah	2
NU31	Russet Nugget	1
S441	Sangre	4

20-member trained panel using a 5-point scale with 1 being like a lot and 5 being dislike a lot.

TABLE 3
1992 Quality Evaluations
Subjective Enzymatic Browning

Field	Clone	30 min.	60 min.	90 min.	150 min.
1901	AC75430-1	1	1	1.5	2
1903	AC78069-17	1	1	1.5	1.5
0241	AC80545-1	1	1	1.5	2
1801	AC83064-1	0	0.5	0.5	1
1802	AC83064-6	1	1.5	1.5	1.5
1803	AC83068-1	1	2	2.5	3
1804	AC83172-1	1	2	2.5	3
1805	AC83306-1	0	0.5	0.5	1
1701	AC84028-4	1	2	2	3
1702	AC84487-1	1	2	2.5	3
1601	AC84610-5	0.5	0.75	1	2
0321	CO80011-5	0.5	1	1	1.5
0631	CO81082-1	1	1.5	1.5	1.5
1902	CO82142-4	1	1.5	1.5	2
1703	CO84074-2	0	0.5	0.5	0.5
1704	CO84205-5	0.5	1	1	1.5
1603	CO85026-4	1	1.5	2	2
1604	CO85168-4	1	1.5	2	2
1469	Atlantic	0	0.5	0.5	1.5
CR31	Centennial	0.5	1	1.5	2
FR41	Frontier Russet	0	0.5	0.5	1
1470	Norchip	1	2	2	3
RR41	Ranger Russet	1.5	2.5	3	3
RB41	Russet Burbank	0.5	2	2	2.5
NK41	Russet Norkotah	1.5	2	2	2.5
NU31	Russet Nugget	1	2	2	2
S441	Sangre	0.5	1	2	2

On a 0 to 3 scale with 0 being none and 3 very dark.

TABLE 4
1992 Quality Evaluations
Total Glycoalkaloids

Field	Clone	Mg/100g FWB
1901	AC75430-1	12.2
1902	AC78069-17	8.3
0241	AC80545-1	8.7
1801	AC83064-1	7.1
1802	AC83064-6	7.1
1803	AC83068-1	7.7
1804	AC83172-1	7.9
1805	AC83306-1	8.4
1701	AC84028-4	7.1
1702	AC84487-1	6.7
1601	AC84610-5	6.3
0321	CO80011-5	8.5
0631	CO81082-1	9.3
1902	CO82142-4	8.6
1703	CO84074-2	8.5
1704	CO84205-5	8.7
1603	CO85026-4	8.3
1604	CO85168-4	8.8
1469	Atlantic	9.6
CR31	Centennial Russet	9.4
FR41	Frontier Russet	6.6
1470	Norchip	7.3
RR41	Ranger Russet	10.1
RB41	Russet Burbank	10.7
NK41	Russet Norkotah	10.3
NU31	Russet Nugget	10.1
S441	Sangre	9.4

TABLE 5
1992 Quality Evaluations
Vitamin C

Field	Clone	Mg/100g FWB
1901	AC75430-1	46
1902	AC78069-17	40
0241	AC80545-1	37
1801	AC83064-1	40
1802	AC83064-6	51
1803	AC83068-1	55
1804	AC83172-1	39
1805	AC83306-1	42
1701	AC84028-4	43
1702	AC84487-1	45
1601	AC84610-5	54
0321	CO80011-5	45
0631	CO81082-1	49
1902	CO82142-4	46
1703	CO84074-2	48
1704	CO84205-5	47
1603	CO85026-4	52
1604	CO85168-4	54
1469	Atlantic	51
CR31	Centennial Russet	37
FR41	Frontier Russet	41
1470	Norchip	45
RR41	Ranger Russet	44
RB41	Russet Burbank	51
NK41	Russet Norkotah	44
NU31	Russet Nugget	39
S441	Sangre	43

TABLE 6
1992 Quality Evaluations
Protein

Field	Clone	% Protein DWB (Nx6.25)
1901	AC75430-1	10.5
1902	AC78069-17	10.0
0241	AC80545-1	8.7
1801	AC83064-1	7.7
1802	AC83064-6	10.4
1803	AC83068-1	10.9
1804	AC83172-1	9.3
1805	AC83306-1	10.4
1701	AC84028-4	9.3
1702	AC84487-1	7.7
1601	AC84610-5	9.7
0321	CO80011-5	11.1
0631	CO81082-1	8.4
1902	CO82142-4	10.5
1703	CO84074-2	10.0
1704	CO84205-5	11.4
1603	CO85026-4	10.7
1604	CO85168-4	10.4
1469	Atlantic	10.3
CR31	Centennial Russet	11.0
FR41	Frontier Russet	11.7
1470	Norchip	11.6
RR41	Ranger Russet	10.3
RB41	Russet Burbank	10.1
NK41	Russet Norkotah	11.1
NU31	Russet Nugget	12.9
S441	Sangre	11.5

TABLE 7
1992 Quality Evaluations
Total Sugars

Field	Clone	% Total Sugars (FWB)
1901	AC75430-1	1.5
1902	AC78069-17	1.3
0241	AC80545-1	1.7
1801	AC83064-1	1.5
1802	AC83064-6	2.0
1803	AC83068-1	2.3
1804	AC83172-1	1.9
1805	AC83306-1	1.5
1701	AC84028-4	1.4
1702	AC84487-1	2.2
1601	AC84610-5	2.0
0321	CO80011-5	2.1
0631	CO81082-1	1.7
1902	CO82142-4	2.3
1703	CO84074-2	2.0
1704	CO84205-5	1.7
1603	CO85026-4	1.9
1604	CO85168-4	2.1
1469	Atlantic	1.5
CR31	Centennial Russet	1.8
FR41	Frontier Russet	1.4
1470	Norchip	1.5
RR41	Ranger Russet	1.9
RB41	Russet Burbank	1.7
NK41	Russet Norkotah	1.9
NU31	Russet Nugget	1.7
S441	Sangre	1.8

TABLE 8
1992 Quality Evaluations
Sucrose

Field	Clone	Mg/g FWB
1901	AC75430-1	10.0
1902	AC78069-17	9.4
0241	AC80545-1	8.0
1801	AC83064-1	8.4
1802	AC83064-6	8.0
1803	AC83068-1	8.3
1804	AC83172-1	10.8
1805	AC83306-1	9.4
1701	AC84028-4	10.7
1702	AC84487-1	10.0
1601	AC84610-5	9.0
0321	CO80011-5	10.7
0631	CO81082-1	9.3
1902	CO82142-4	9.0
1703	CO84074-2	10.5
1704	CO84205-5	9.3
1603	CO85026-4	9.0
1604	CO85168-4	9.4
1469	Atlantic	10.1
CR31	Centennial Russet	9.1
FR41	Frontier Russet	9.3
1470	Norchip	9.0
RR41	Ranger Russet	8.7
RB41	Russet Burbank	8.9
NK41	Russet Norkotah	9.1
NU31	Russet Nugget	8.5
S441	Sangre	9.0

TABLE 9
1992 Quality Evaluations
Glucose

Field	Clone	Mg/g FWB
1901	AC75430-1	1.8
1902	AC78069-17	2.0
0241	AC80545-1	1.6
1801	AC83064-1	2.2
1802	AC83064-6	2.1
1803	AC83068-1	2.0
1804	AC83172-1	1.7
1805	AC83306-1	1.7
1701	AC84028-4	1.4
1702	AC84487-1	2.4
1601	AC84610-5	2.0
0321	CO80011-5	1.7
0631	CO81082-1	1.8
1902	CO82142-4	1.7
1703	CO84074-2	2.0
1704	CO84205-5	2.1
1603	CO85026-4	1.9
1604	CO85168-4	2.1
1469	Atlantic	2.2
CR31	Centennial Russet	2.1
FR41	Frontier Russet	2.0
1470	Norchip	1.7
RR41	Ranger Russet	1.7
RB41	Russet Burbank	1.9
NK41	Russet Norkotah	1.9
NU31	Russet Nugget	2.0
S441	Sangre	2.2

Report Summary

1) Percent solids: ranged from a low of 16.% (CO 84205-5) to a high of 24.4% (AC83172-1)

2) Subjective baked flavor: 17 of the 27 lines evaluated were judged to have very good baked potato sensory properties.

3) Subjective enzymatic browning: the rate of enzymatic darkening in cut raw product varied quite significantly. Lines that exhibited the least amount of darkening over a period of 150 minutes included CO84074-2, AC83064-1, AC83306-1 and Frontier Russet

4) Total glycoalkaloids: ranged from a low of 6.3 mg/100g FWB (AC84610-5) to a high of 12.2 mg/100g FWB (AC75430-1). All lines were well below the suggested maximum of 20 mg/100g.

5) Vitamin C: no extremes in vitamin C content were noted. It ranged from a low of 37 mg/100g FWB (Frontier Russet and AC83064-1) to a high of 55 mg/100g FWB (AC83172-1).

6) Protein: ranged from a low of 7.7% DWB (AC83064-1 and AC84487-1) to a high of 11.7% (Frontier Russet).

7) Total sugars: no extremes were noted with a range of 1.3% (AC78069-17) to 2.3% (AC83068-1 and CO82142-4).

8) Sucrose: ranged from a low of 8.0 mg/g (AC80545-1 and AC83064-6) to high of 10.8 mg/g (AC83172-1).

9) Glucose: ranged from a low of 1.6 mg/g (AC80545-1) to a high of 2.4 mg/g (AC84487-1).

1992 Potato Flavor Study

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Four potato lines consisting of two named (Centennial Russet and Russet Nugget) and two experimental (CO 80011-5 and CO 81082-1) were baked, using traditional baking at 400°F for 40, 50, or 60 minutes. Resulting volatiles were extracted and the pyrazines were selectively analyzed using gas chromatography.

Potatoes baked for 50 minutes were subjectively judged to be adequately baked while 40 minutes of baking resulted in an underdone product and baking for 60 minutes produced an overbaked product.

The major objective of this study was to evaluate the roles of potato clone and baking time on resulting total pyrazine amounts. Pyrazines in turn have directly been demonstrated to favorably influence baked potato flavor.

Pyrazine quantitation data are summarized below:

	Total Pyrazines (ppm) Baking Time (minutes)		
Potato Line	40	50	60
CO80011-5		56	
CO81082-1		40	
Centennial Russet		51	
Russet Nugget		60	

As can be seen, pyrazine content was dependent both on potato line and baking time. Independent of line, pyrazine content increased as baking time increased from 40 to 50 minutes. Pyrazines are thermally produced and thus one would expect pyrazine content to increase with time.

On the other hand, total pyrazine content decreased as baking time was increased to 60 minutes. Since pyrazines are quite volatile, it can be assumed that the longer baking time resulted in pyrazine losses due to compound volatility.

As can be seen from the above, at ideal baking time (50 minutes) total pyrazine concentration ranged from a low of 40ppm (CO81082-1) to a high of 60ppm (Russet Nugget).