



Lutein – What is it?

Why are we talking about it at a
potato meeting?

Michele Konschuh, Tricia McAllister,
Simone Dalpé, Tina Lewis and Darcy
Driedger

Potato Research Program, Crop Diversification Centre South



Background

- Lutein is a carotenoid compound associated with a reduced incidence of age-related macular degeneration (AMD) and cataract formation (leading causes of blindness as people age).
- Carotenoids are anti-oxidant compounds that may also protect against a variety of chronic diseases including cardiovascular disease and certain cancers.
- The color of yellow-fleshed potatoes is imparted by carotenoids.



A Little More Background

- Dietary lutein intakes of 3 to 6 mg (1 mg = 1000 mcg) have been correlated with reduced risk of AMD and cataract formation.
- Lutein supplements in multi-vitamin pills range from 250 to 600 mcg/pill.
- We want to provide good reasons for people to include **potatoes** as part of a healthy diet.



Preliminary Work (2004)

- Discussed concept with stakeholders.
- Proposals to AF and PGA for preliminary project.
- Requested variety recommendations and seed from stakeholders.
- Trial was conducted at CDCN (Edmonton) and CDCS (Brooks).
- FPDC Lab analyzed flesh color, and concentrations of lutein, zeaxanthin and total carotenoids.



Sound Concept

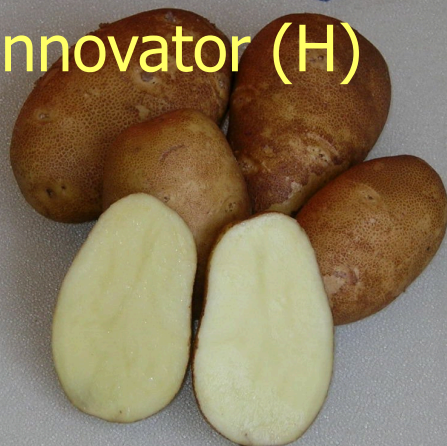
- Total carotenoid concentration in yellow-fleshed potatoes ranged from 35 to 240 mcg/100 g FW.
- In most varieties, lutein made up to 1/3 of the total carotenoid content.
- Zeaxanthin concentration was negligible in the varieties we studied.
- Selected 5 fresh market and 5 processing varieties from 20.
- Determined stability of carotenoid compounds in storage and after cooking and frying.

Lutein (mcg/100g FW)

Variety (2004):	CDCN	CDCS
Agata	29.0	23.5
Cecile	32.4	40.6
Innovator	23.5	22.7
Island Sunshine	34.3	45.0
Piccolo	21.5	23.6
Sante	36.2	27.2
Satina	54.0	50.8
Sinora	17.3	28.2
Victoria	21.9	22.5
Yukon Gold	10.6	12.6
Russet Burbank	9.3	13.5

Processing Varieties

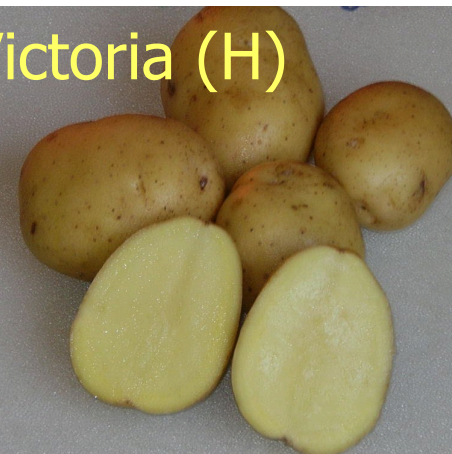
Innovator (H)



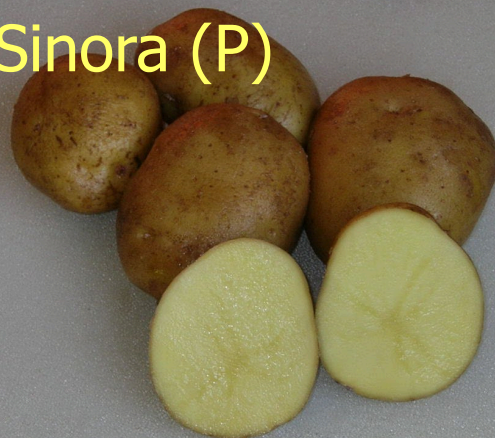
Satina (S)



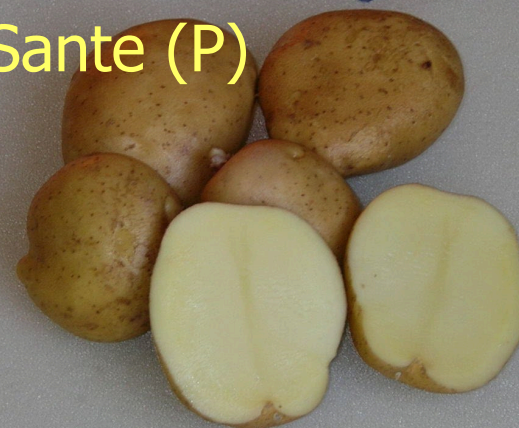
Victoria (H)



Sinora (P)

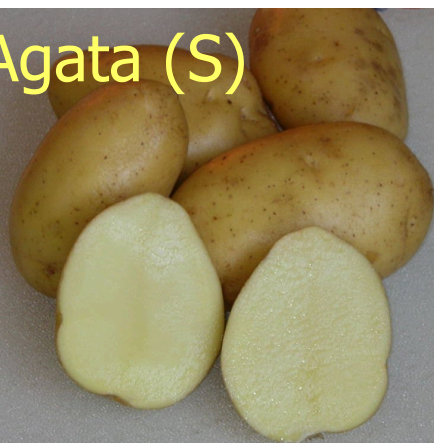


Sante (P)



Fresh Market Varieties

Agata (S)



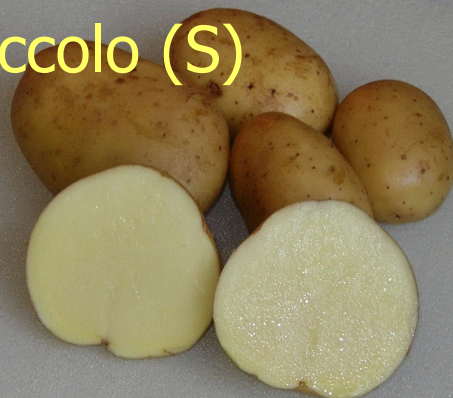
Island Sunshine (P)



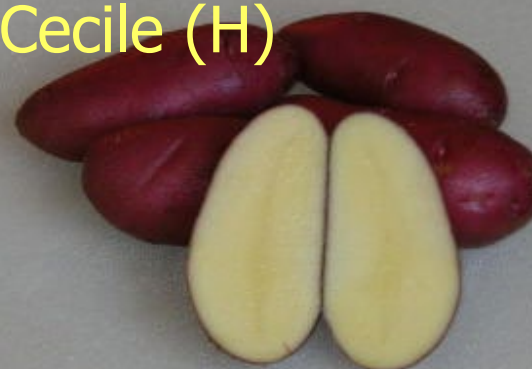
Satina (S)



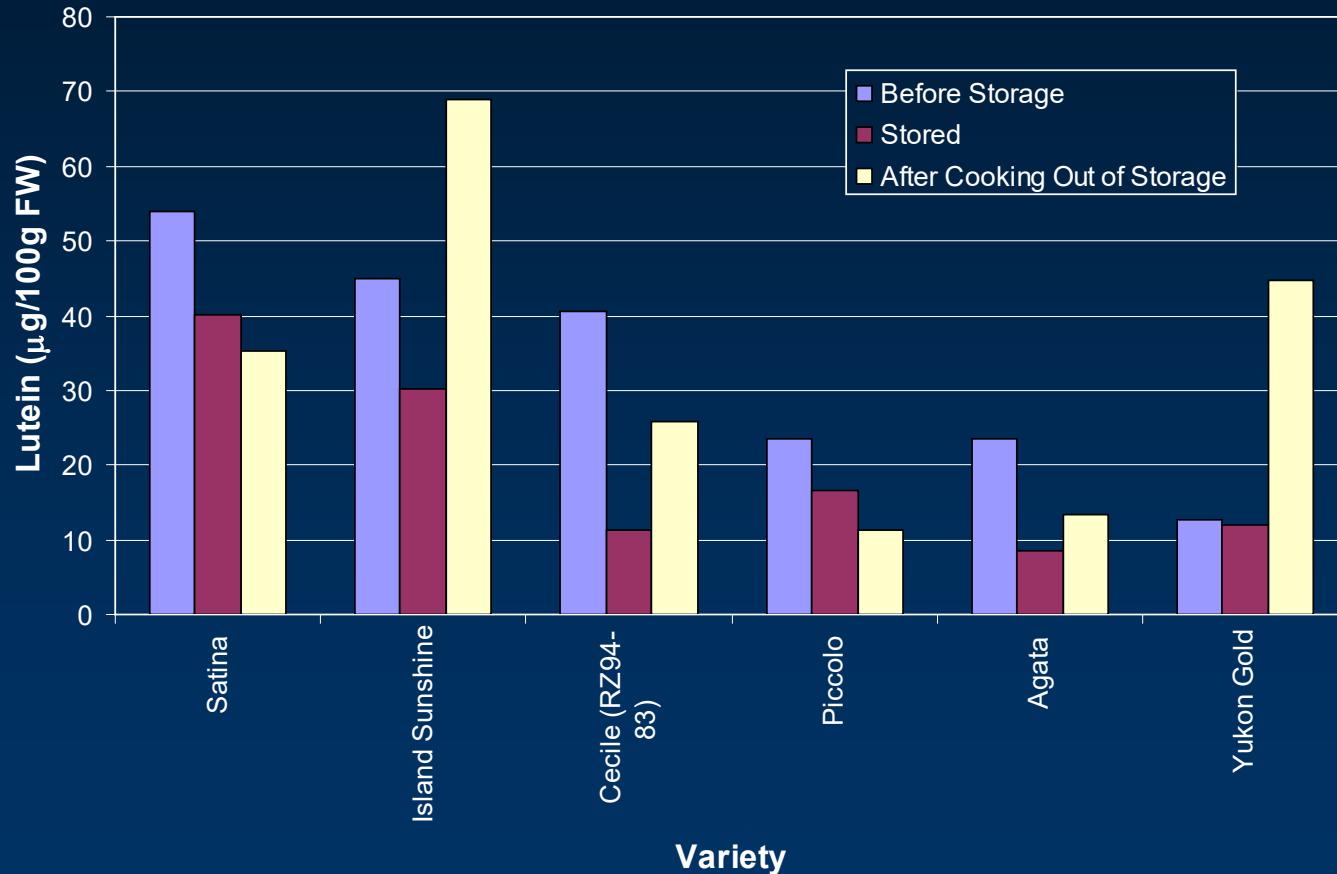
Piccolo (S)



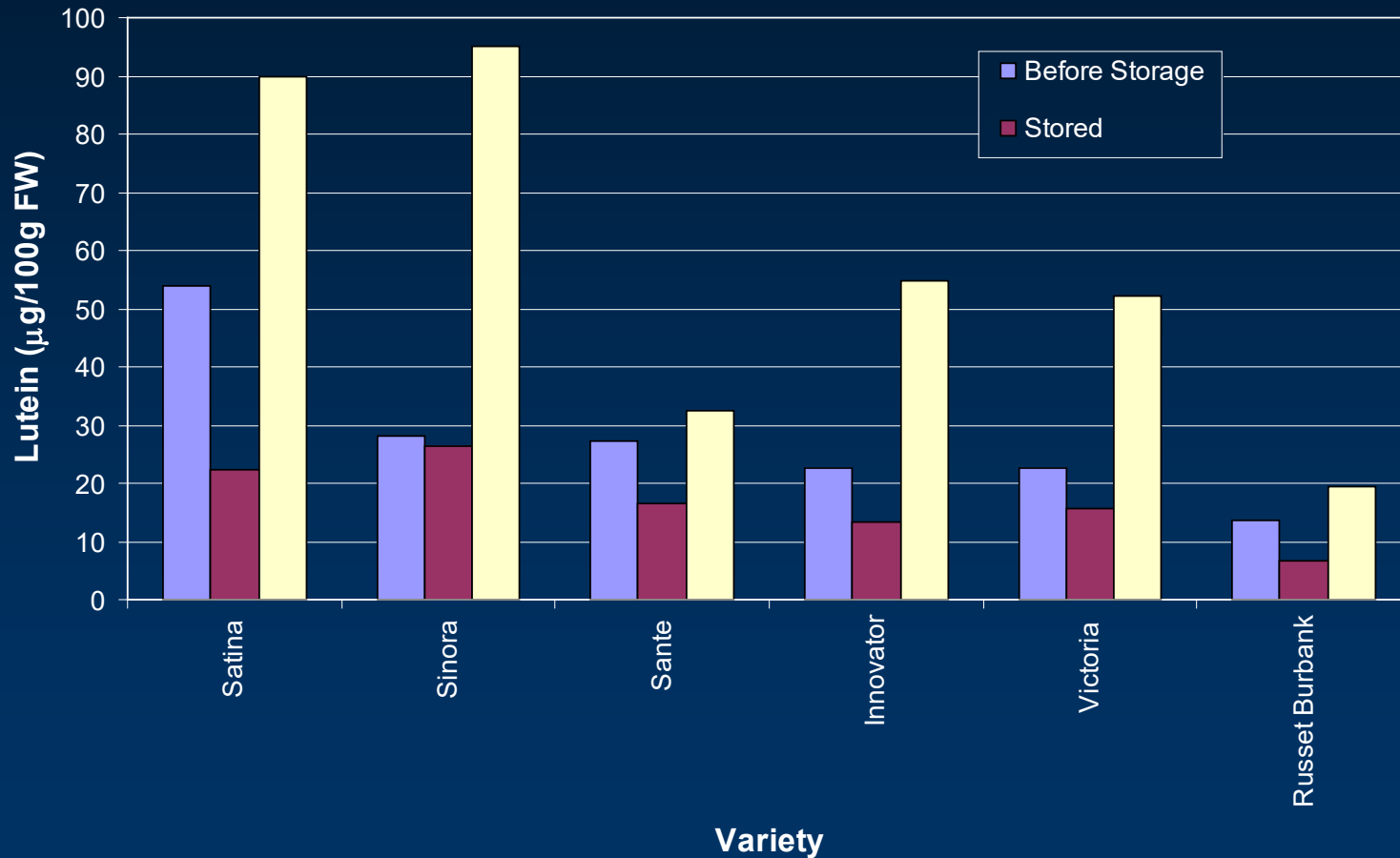
Cecile (H)



Lutein Cooking Stability



Lutein Frying Stability





Stability of Lutein

- Lutein concentration up to 60 mcg/100 g FW.
- Carotenoid stability in storage differed by variety, but in all cases, some lutein was lost during storage.
- More lutein was recovered from 3 of 5 varieties after cooking.
- The quantity of lutein extracted from fried samples was much greater than from stored potatoes.



So What?

- Results from the 2004 study provided information that would allow us to include “contains lutein” on packaging.
- We needed to establish the quantity of lutein in an average serving (consistency, reproducibility) for use in marketing strategies.
- Ag & Food Council and others provided financial assistance for field trials in 2005 - 2006.



2005 - 2006

- This project involved growing 10 potato varieties in three locations in Alberta;
- Harvested at three different times;
- Analyzed for flesh color and concentration of lutein and total carotenoids.

Lutein (mcg/100 g FW)

2005	CDCS (Brooks)			CDCN (Edmonton)			Lacombe		
	80 DAP	100 DAP	130 DAP	80 DAP	100 DAP	130 DAP	80 DAP	100 DAP	130 DAP
Agata	22.0	13.6	19.8	8.2	15.6	10.0	28.7	6.2	-
Cecile	13.0	15.5	17.3	21.7	36.1	27.9		27.5	-
Innovator	26.5	16.5	35.8	15.3	33.6	15.3	12.2	21.9	-
Island Sunshine	38.3	14.9	13.4	16.2	15.7	13.4	21.8	14.8	25.5
Piccolo	14.0	5.0	18.9	14.9	15.9	17.3	50.0	28.1	-
Sante	20.4	14.8	36.5	19.6	30.6	22.8	29.2	26.6	-
Satina	31.1	34.6	32.9	38.8	55.7	40.7	38.2	40.0	-
Sinora	13.0	3.2	11.3	14.8	15.0	9.7	7.9	4.8	-
Victoria	30.3	23.3	31.6	29.8	39.9	25.4	34.0	40.6	16.2
Yukon Gold	22.0	6.1	31.8	12.4	23.5	21.7	19.9	17.2	-

Lutein (mcg/100 g FW)

2006	CDCS (Brooks)			CDCN (Edmonton)			Lacombe		
	85 DAP	95 DAP	120 DAP	85 DAP	95 DAP	120 DAP	85 DAP	95 DAP	120 DAP
Agata	40.2	13.6	19.8	29.0	15.6	10.0	13.6	18.5	16.0
Agria	52.7	15.5	17.3	53.7	36.1	27.9	39.0	86.6	39.3
Cecile	42.3	16.5	35.8	20.4	33.6	15.3	4.8	50.5	34.8
Innovator	9.8	14.9	13.4	27.0	15.7	13.4	22.7	36.8	23.2
Island Sunshine	81.2	5.0	18.9	46.6	15.9	17.3	15.5	47.9	35.0
Piccolo	5.1	14.8	36.5	12.6	30.6	22.8	10.4	42.6	25.4
Satina	46.5	34.6	32.9	46.3	55.7	40.7	18.2	41.7	28.5
Sinora	49.2	3.2	11.3	26.1	15.0	9.7	8.3	57.3	27.8
Victoria	35.9	23.3	31.6	20.3	39.9	25.4	26.4	54.2	15.1
Yukon Gold	31.6	6.1	31.8	22.2	23.5	21.7	31.0	25.3	15.2



2005 - 2006 Results

- Lutein concentration is variety dependent, and is influenced by growing location, environmental conditions and time of harvest.
- Lutein concentrations varied from 3.2 mcg to over 80 mcg per 100g FW.
- Agria, Satina, Island Sunshine and Victoria consistently showed higher concentrations of lutein than other varieties.
- A 7 oz. potato may contribute between 20 and 50% of the lutein in a supplemented multivitamin.



What Next?

- Business Development people completed a Market Opportunity Assessment.
- Stakeholders have been invited to access AF funds to pursue a marketing opportunity.
- Need to screen additional varieties for greater lutein concentration.
- Develop variety specific agronomic information.
- Conduct storage studies to improve stability of lutein in stored potatoes.
- Additional research must be led by industry.



Acknowledgements

- Funding for the project was provided by Ag & Food Council, Potato Growers of Alberta, Con Agra, HZPC Americas, Parkland Seed Potatoes Ltd., Solanum International, Edmonton Potato Growers, Little Potato Company and AF.
- Special thanks to Cindy Dykstra and Marivic Hansen for carotenoid analyses.



Dr. Michele Konschuh

Alberta Agriculture and Food

Crop Diversification Centre South

301 Horticultural Station Road East

Brooks, Alberta T1R 1E6

403-362-1314 phone

403-362-1306 fax

michele.konschuh@gov.ab.ca

Potato Research Program, Crop Diversification Centre South