

Stushnoff

COMPREHENSIVE REPORT

1. **Dormancy in Potatoes**
2. **Characterization of Antioxidants and Possible Other Healthy Chemicals in Potatoes**

March 3, 2002

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

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Dormancy in Potatoes - Minituber Dormancy

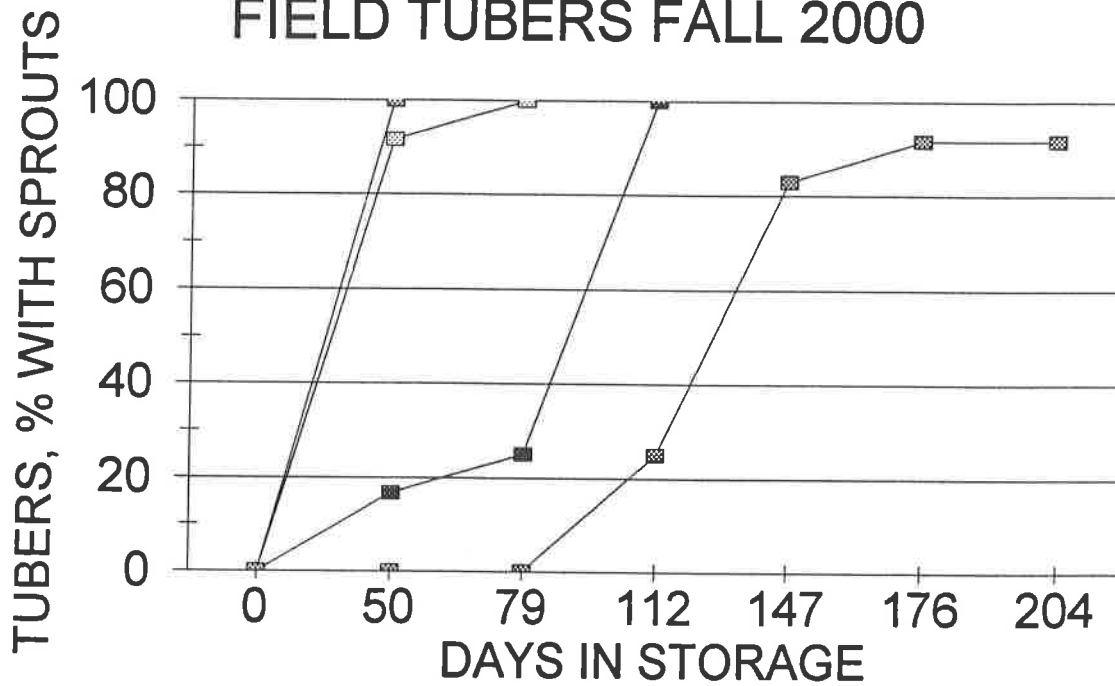
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Characterization of Antioxidants and Possible Other Healthy Chemicals in Potatoes

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CHERRY RED

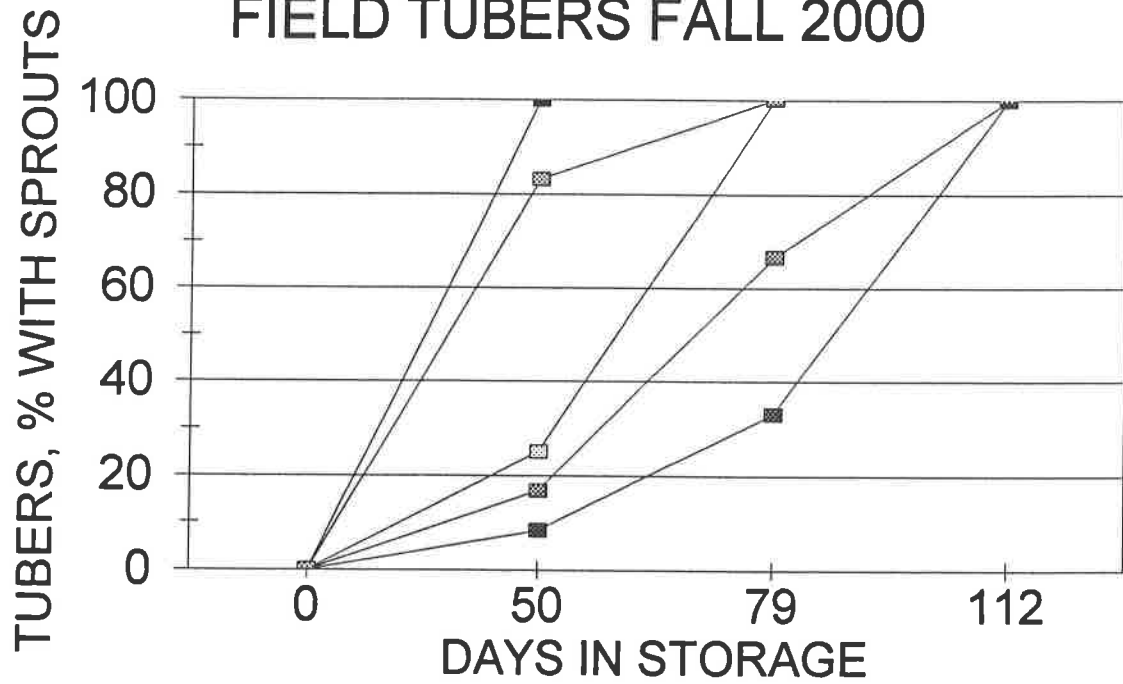
FIELD TUBERS FALL 2000



■ 34(1.1) ■ 36(2.2) ■ 38(3.3) ■ 40(4.4) ■ 44(6.6)

CHIPETA

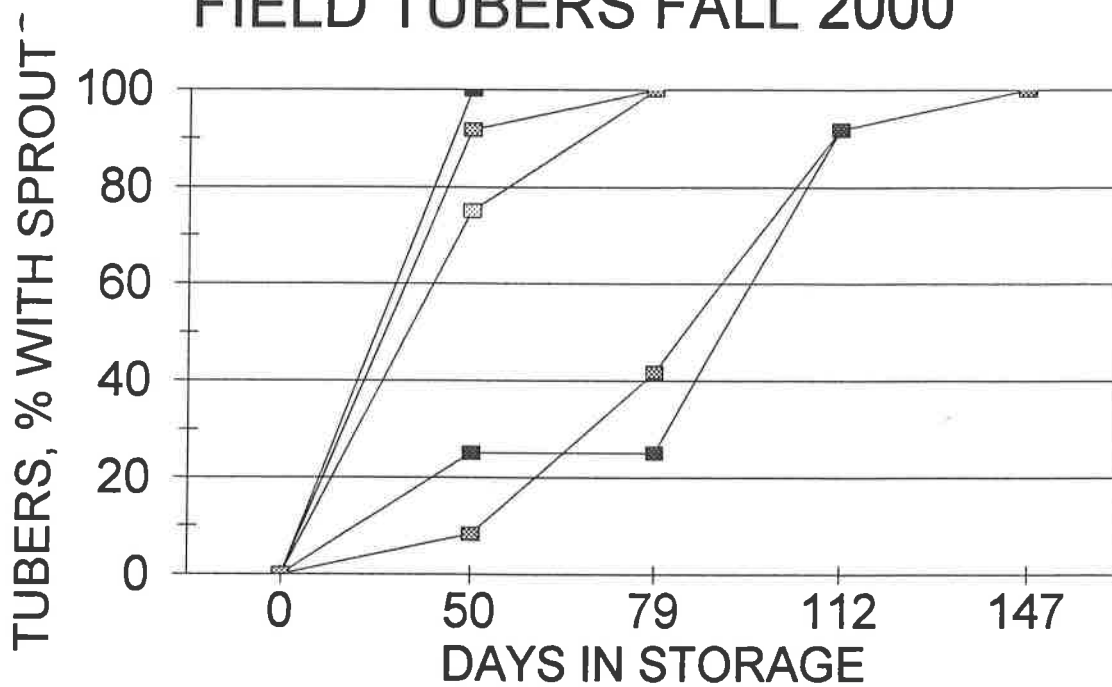
FIELD TUBERS FALL 2000



■ 34(1.1) ■ 36(2.2) ■ 38(3.3) ■ 40(4.4) ■ 44(6.6)

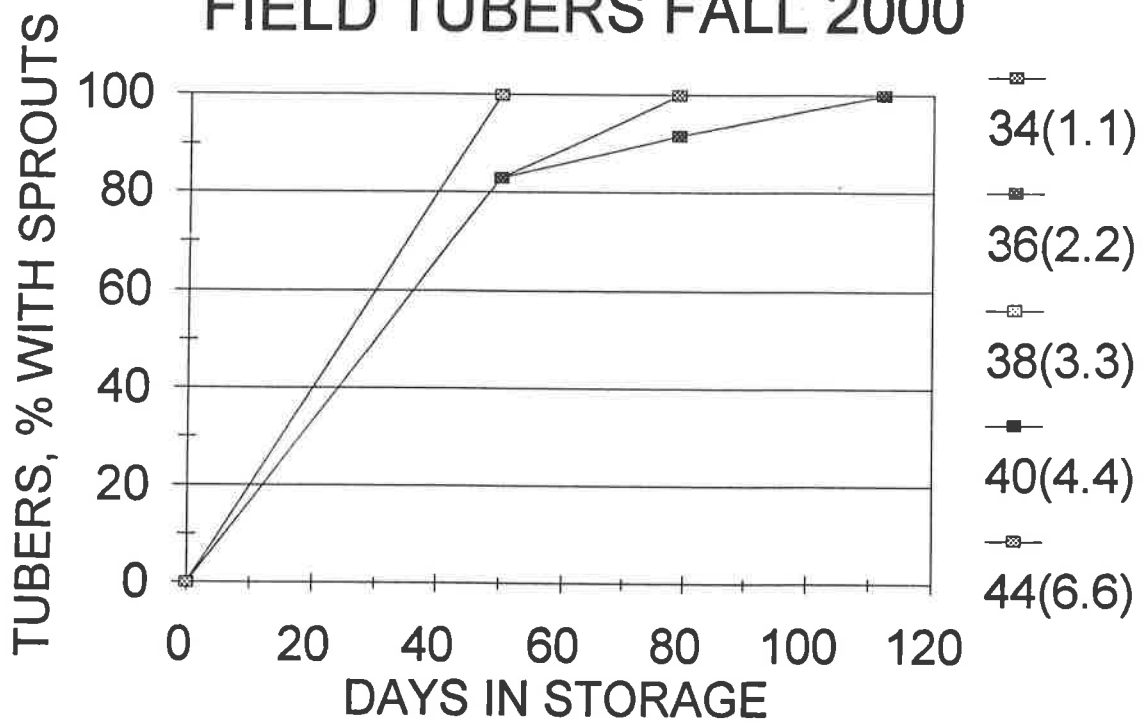
DURANGO RED(CO86218-2)

FIELD TUBERS FALL 2000



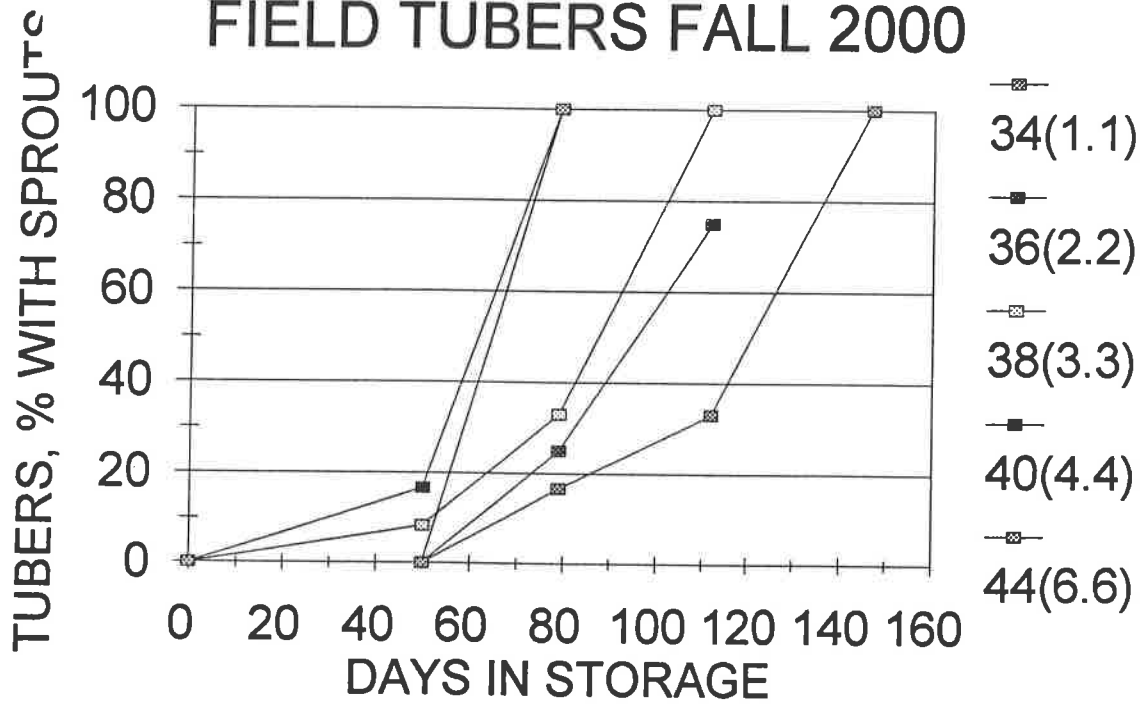
■ 34(1.1) ■ 36(2.2) ■ 38(3.3) ■ 40(4.4) ■ 44(6.6)

KEYSTONE RUSSET (AC83064-1) FIELD TUBERS FALL 2000



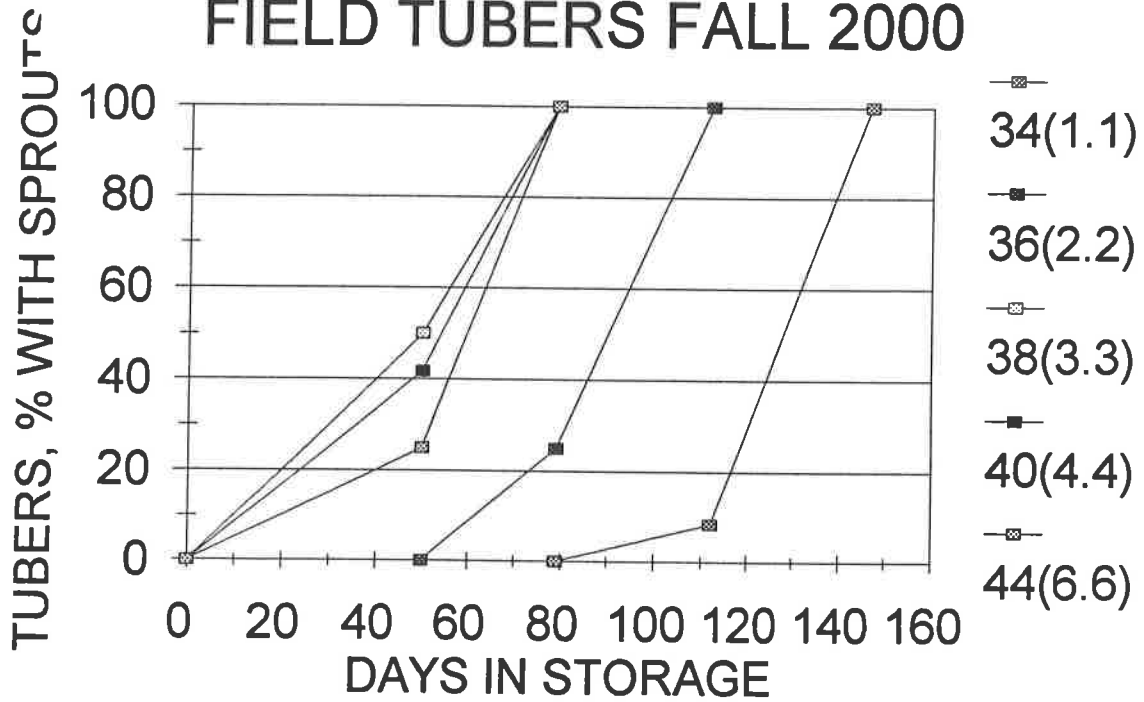
RUSSET NORKOTAH 3

FIELD TUBERS FALL 2000



RUSSET NORKOTAH 8

FIELD TUBERS FALL 2000



RUSSET NUGGET

FIELD TUBERS FALL 2000

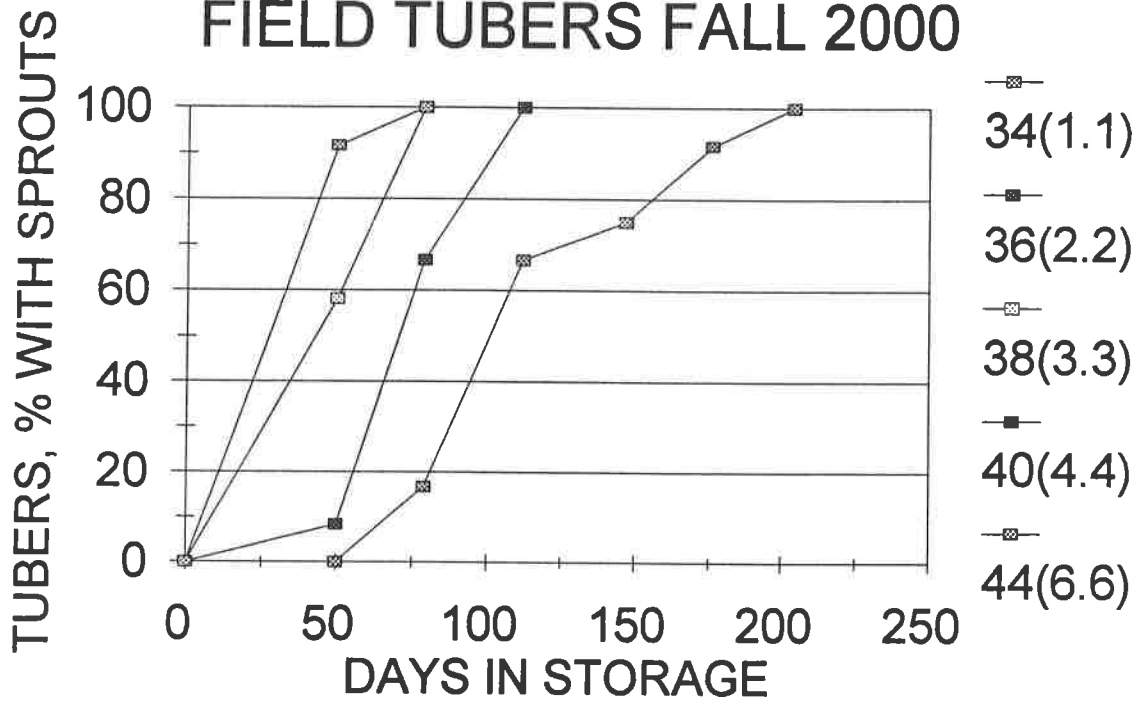


Table 1. Days in storage to attain 10% tuber bud break for 1999/00 and 2000/01 storage.						
Cultivar/storage year	Storage temperature (°F)					Rank
	44	40	38	36	34	
Cherry Red 1999/00 2000/01	<50 <50	<50 <50	<50 <50	<50 <50	>79 95	2
Chipeta 1999/00 2000/01	<50 <50	<50 <50	<50 <50	55 <50	90 <50	3
Durango Red 1999/00 2000/01	<50 <50	<50 <50	<50 <50	<50 <50	85 52	4
Keystone 1999/00 2000/01	<50 <50	<50 <50	<50 <50	<50 <50	<50 <50	7
R. Norkotah #3 1999/00 2000/01	52 <50	<50 50	<50 52	65 66	60 68	6
R. Norkotah #8 1999/00 2000/01	<50 <50	<50 <50	<50 <50	63 60	>79 110	1
R. Nugget 1999/00 2000/01	<50 <50	<50 <50	<50 <50	52 53	70 65	5

Table 2. Days in storage to attain 50% tuber bud break for 1999/00 and 2000/01 storage.							
		Storage temperature (°F)					
Cultivar		44	40	38	36	34	Rank
Cherry Red	1999/00	<50	<50	<50	>150	>150	5
	2000/01	<50	<50	<50	90	125	
Chipeta	1999/00	<50	<50	<50	100	>200	4
	2000/01	<50	<50	<50	70	85	
Durango Red	1999/00	<50	<50	<50	>150	>200	3
	2000/01	<50	<50	<50	90	85	
Keystone	1999/00	<50	<50	<50	<50	<50	7
	2000/01	<50	<50	<50	<50	<50	
R. Norkotah #3	1999/00	68	65	50	>100	>200	1
	2000/01	65	67	85	90	127	
R. Norkotah #8	1999/00	60	55	50	>100	>200	2
	2000/01	50	55	58	90	127	
R. Nugget	1999/00	<50	<50	<50	70	>100	6
	2000/01	<50	<50	<50	65	100	

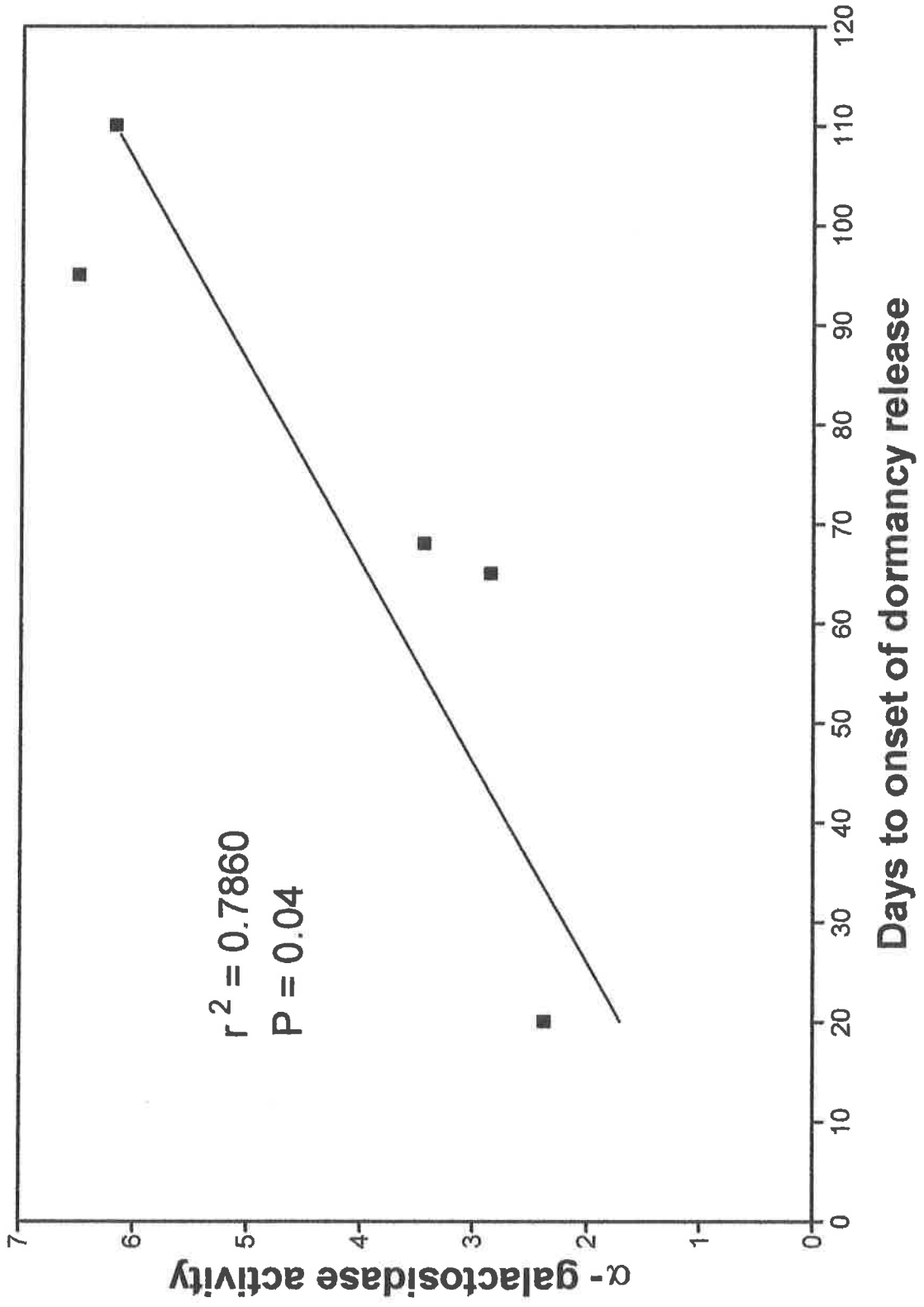
Table 3. Analysis of variance for dry matter content after 204 days of storage at four temperatures.

Source	Df	% of total variation	P value	Mean square	F value
Storage temp.	3	59	<0.0001	940	330
Cultivars	6	19	<0.0001	150	52
Interaction	18	3.08	0.0001	8.1	2.8
Residual	301			2.9	

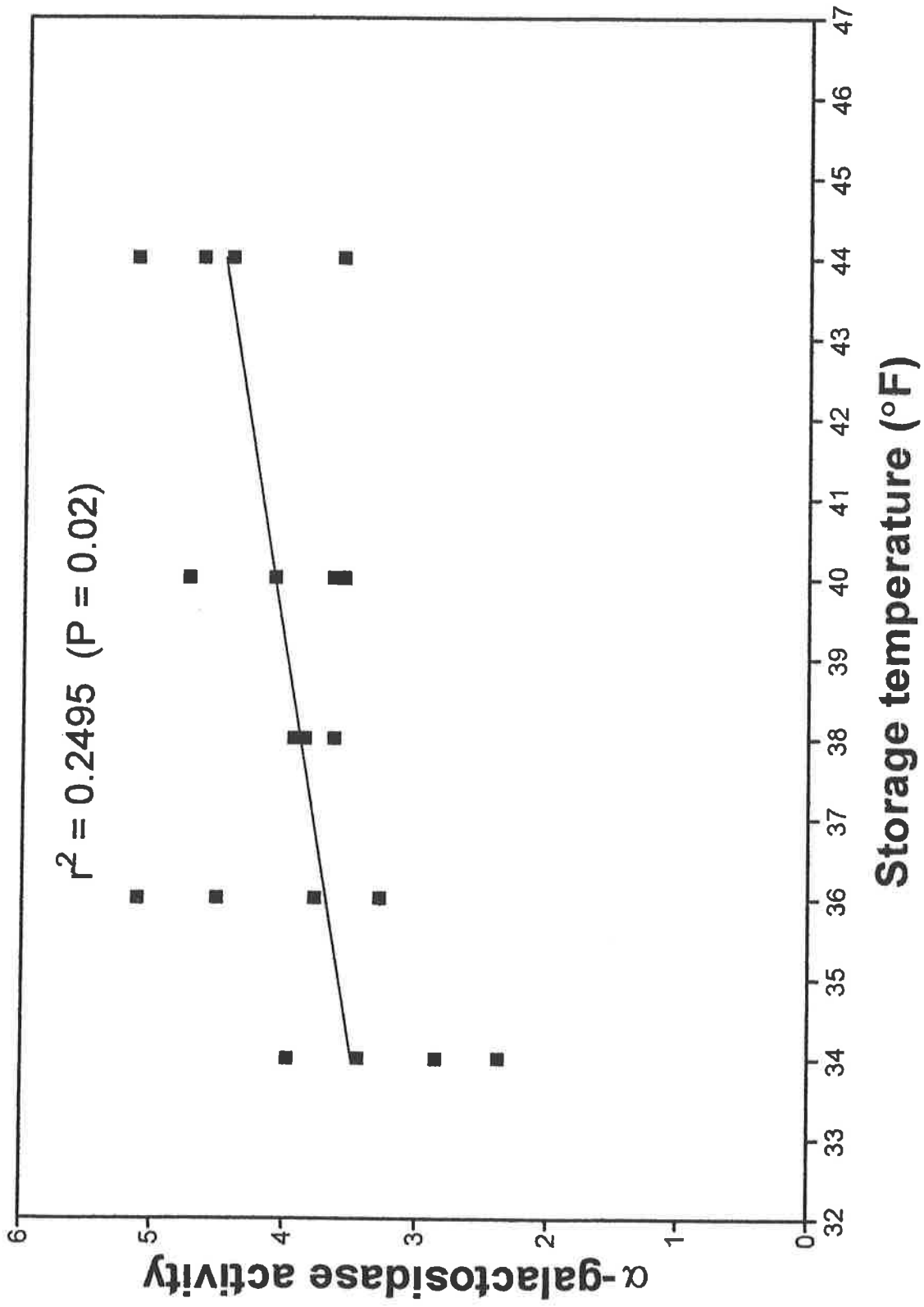
Table 4. Treatment and cultivar means for % dry matter after 204 days storage

Cultivar	Storage Temperature (°F)				Mean
	34	38	40	44	
Cherry Red	28.4	29.3	22.9	22.4	25.8
Chipeta	26.7	28.0	21.9	20.7	24.4
Durango Red	26.0	27.6	21.5	21.6	24.2
Keystone	22.9	23.0	17.8	18.1	20.5
R. Norkotah#3	24.0	26.6	20.3	21.4	23.1
R. Norkotah#8	26.9	28.2	21.7	21.5	24.6
R. Nugget	28.9	29.8	22.8	20.4	25.5

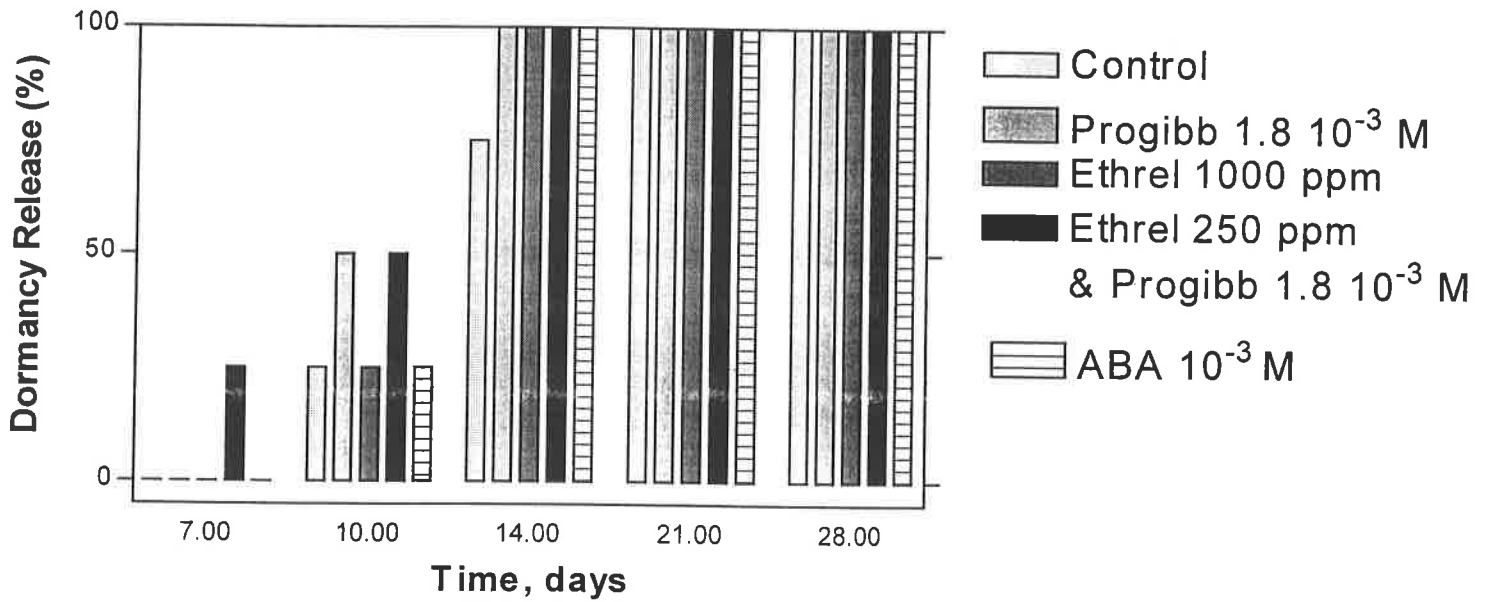
Relationship of α -galactosidase activity to dormancy at 34 °F



Regression of α -galactosidase activity on storage temperature for four cultivars



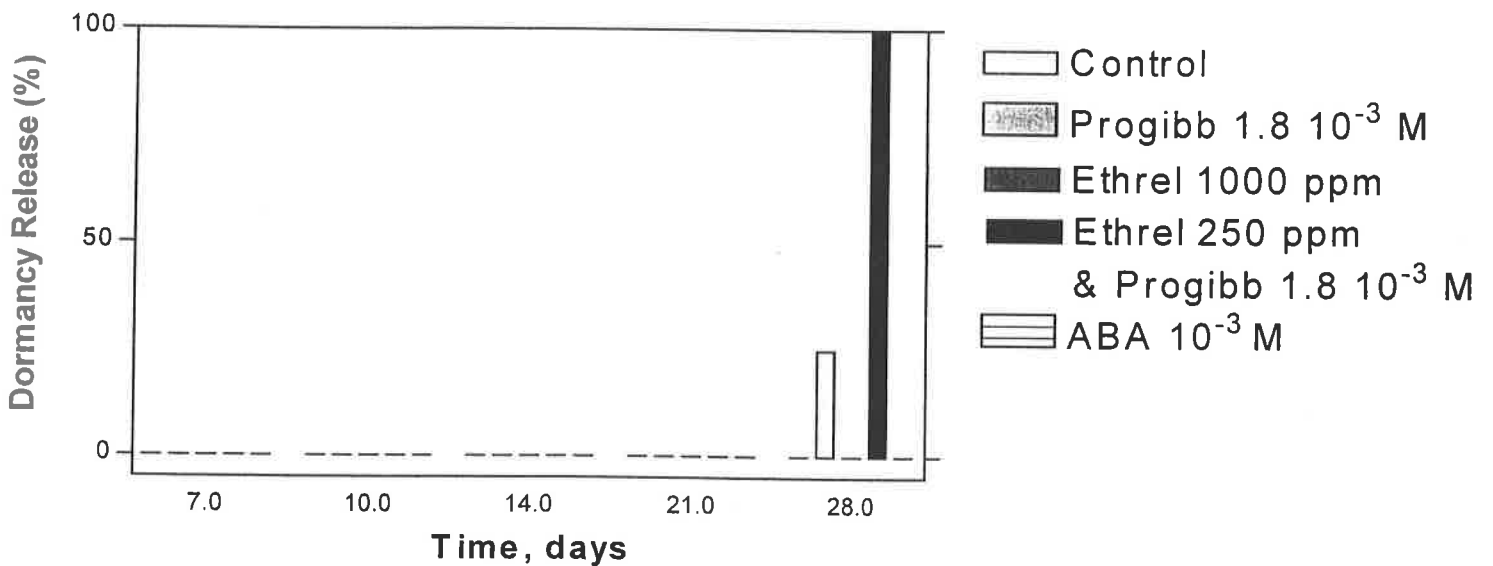
Silverton potato tuber dormancy release (%)



Result(s) for Silverton:

- 1) Progibb and progibb-ethrel treatments break the dormancy at 10 days.
- 2) In two weeks all treatments break the dormancy.

RNK-3 potato tuber dormancy release (%)



Result(s) for RNK-3:

- 1) Only progibb-ethrel treatment breaks the dormancy in 4 weeks.

Table 1. Mean and SEM of sprout number of 2 potato minituber cultivars (Atlantic & Sangree) treated by chemicals.

Time	ATLANTIC				SANGREE			
	Water Aeration	Calcium Chloride (100,000 ppm)	Calcium Nitrate (100,000 ppm)	Progibb 1.8 10 ⁻⁶ M & Ethrel 250 ppm	Water Aeration	Calcium Chloride (100,000 ppm)	Calcium Nitrate (100,000 ppm)	Progibb 1.8 10 ⁻⁶ M & Ethrel 250 ppm
1-Week	0 ^{CZ} (0)	0 ^{DZ} (0)	0 ^{DZ} (0)	0 ^{CZ} (0)	0 ^{DZ} (0)	0 ^{DZ} (0)	0 ^{DZ} (0)	0 ^{CZ} (0)
2-Week	1.75 ^{BX} (0.12)	1.92 ^{CYX} (0.11)	2.08 ^{CY} (0.15)	2.46 ^{BZ} (0.15)	1.29 ^{CW} (0.09)	1.48 ^{CW} (0.10)	1.35 ^{CW} (0.10)	2.71 ^{BZ} (0.20)
3-Week	4.79 ^{AZ} (0.12)	4.28 ^{BY} (0.22)	4.09 ^{BYX} (0.23)	5 ^{AZ} (0)	4.13 ^{BYX} (0.17)	4.00 ^{BX} (0.17)	4.17 ^{BYX} (0.17)	4.79 ^{AZ} (0.08)
4-Week	4.95 ^{AZ} (0.04)	4.84 ^{AZY} (0.09)	4.78 ^{AZY} (0.11)	5 ^{AZ} (0)	4.58 ^{AY} (0.15)	4.88 ^{AZ} (0.06)	4.83 ^{AZY} (0.08)	5 ^{AZ} (0)
5-Week	5 ^{AZ} (0)	4.92 ^{AZ} (0.06)	5 ^{AZ} (0)	5 ^{AZ} (0)	4.83 ^{AZ} (0.10)	5 ^{AZ} (0)	5 ^{AZ} (0)	5 ^{AZ} (0)

ABCD: Means within a column lacking a common superscript letter are different (p<0.05)

ZYXWV: Means within a row lacking a common superscript letter are different (p<0.05)

Table 2. Means and SEM of minituber sprout numbers of 8 treatments used for cultivar **Atlantic**.

Time	Control	Water Aeration	Progibb 1.8 10 ⁻⁶ M	Progibb 1.8 10 ⁻⁶ M & Ethrel 250 ppm	Calcium Chloride (100,000 ppm)	Calcium Nitrate (100,000 ppm)	Hydrogen Peroxide (0.75%)	Potassium Thiosulfate 10 ⁻³ M
1 -Week	0 ^{DZ} (0)	0 ^{CZ} (0)	0 ^{CZ} (0)	0 ^{CZ} (0)	0 ^{DZ} (0)	0 ^{DZ} (0)	0 ^{DZ} (0)	0 ^{CZ} (0)
2 -Week	2.13 ^{CXW} (0.13)	1.75 ^{BU} (0.12)	2.79 ^{BZ} (0.19)	2.46 ^{BY} (0.15)	1.92 ^{CWVU} (0.12)	2.08 ^{CXWV} (0.17)	1.88 ^{CVU} (0.15)	2.21 ^{BX} (0.12)
3 -Week	4.75 ^{BY} (0.11)	4.79 ^{AZY} (0.12)	5 ^{AZ} (0)	5 ^{AZ} (0)	4.28 ^{BX} (0.23)	4.09 ^{BX} (0.22)	4.75 ^{BY} (0.11)	5 ^{AZ} (0)
4 -Week	4.96 ^{ABZ} (0.04)	4.95 ^{AZ} (0.04)	5 ^{AZ} (0)	5 ^{AZ} (0)	4.84 ^{AZ} (0.10)	4.78 ^{AZ} (0.10)	4.96 ^{ABZ} (0.04)	5 ^{AZ} (0)
5 -Week	5 ^{AZ} (0)	5 ^{AZ} (0)	5 ^{AZ} (0)	5 ^{AZ} (0)	4.92 ^{AZ} (0.06)	5 ^{AZ} (0)	5 ^{AZ} (0)	5 ^{AZ} (0)

ABCD: Means within a column lacking a common superscript letter are different (p<0.05)

ZYXWV: Means within a row lacking a common superscript letter are different (p<0.05)

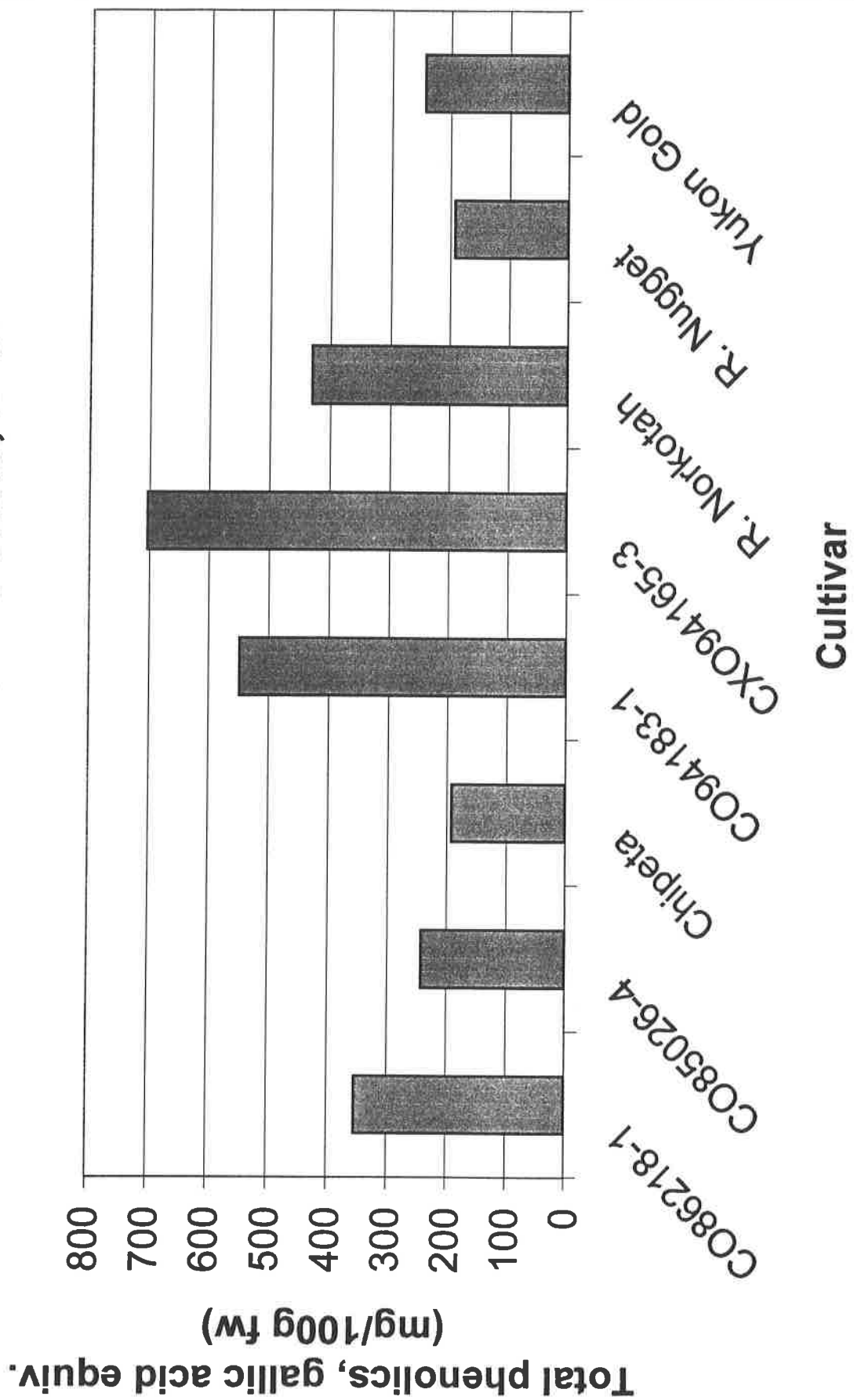
Table 1. Total phenolic content, ABTS hydroxyl radical scavenging activity, FOX inhibition of lipid peroxidation, and TRAP peroxyl radical scavenging potential for freeze dried samples. Data collected May7, 2001-05-07 at Crop and Food Research, CRI, Lincoln, New Zealand.

Cultivar	Phenolic content (mg gallic acid /100gfw) w/o skin	Phenolic content (mg gallic acid /100gfw) w skin	ABTS radical scavenging Trolox equivalents/g fw)	FOX IC ₅₀ (g fw/ml intralipid)	TRAP μ Moles/ g fw
Arkansas (CO86218-1)	354 (4)	318 (4)	93.28 (4)	258.5 (6)	297 (3)
Big T (CO85026-4)	243 (6)	259 (5)	62.53 (6)	498.0 (8)	215 (6)
Chipeta	193 (8)	221 (7)	57.81 (7)	152.5 (3)	231 (5)
Platte (CO94183-1)	548 (2)	577 (2)	257.46 (2)	181.5 (4)	633 (2)
Poudre (CO94165-3)	703 (1)	717 (1)	423.29 (1)	138.5 (2)	739 (1)
R. Norkotah	430 (3)	582 (3)	94.38 (3)	457.0 (7)	172 (7)
R. Nugget	193 (7)	226 (6)	55.45 (8)	115.0 (1)	268 (4)
Yukon Gold	244 (5)	204 (8)	78.30 (5)	258.0 (5)	165 (8)

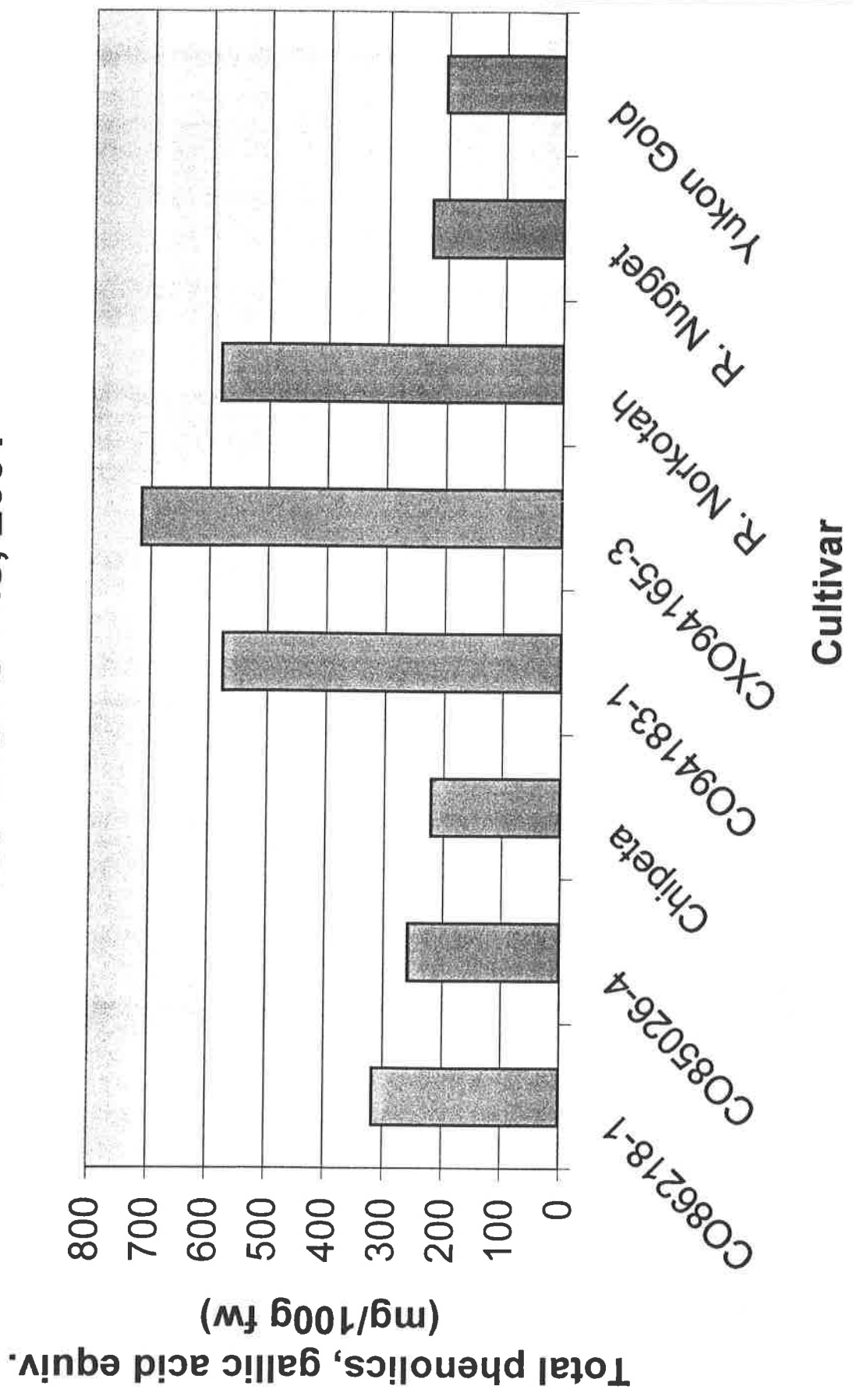
Freeze dried powder prepared by Ann McSay at Fort Collins, CO was shipped by air courier in sealed 15 ml Eppendorf tubes and stored over silica gel at -20 °C until use. 200 mg powder (closely equivalent to 1 gram fresh tissue) was dispersed in 10 ml 80% acetone with an Ultra Turox, then rotated slowly to extract antioxidants for 4 hours at 10 °C in the dark, and centrifuged @2800 rpm for 15 minutes. The supernatant was aliquoted in 1ml volumes into eppendorf tubes and speed vac concentrated for 2.5 hours to dryness, then stored at -20 °C until use.

Data are means of three repeat trials for each assay, and rank of content or effectiveness as an antioxidant ().

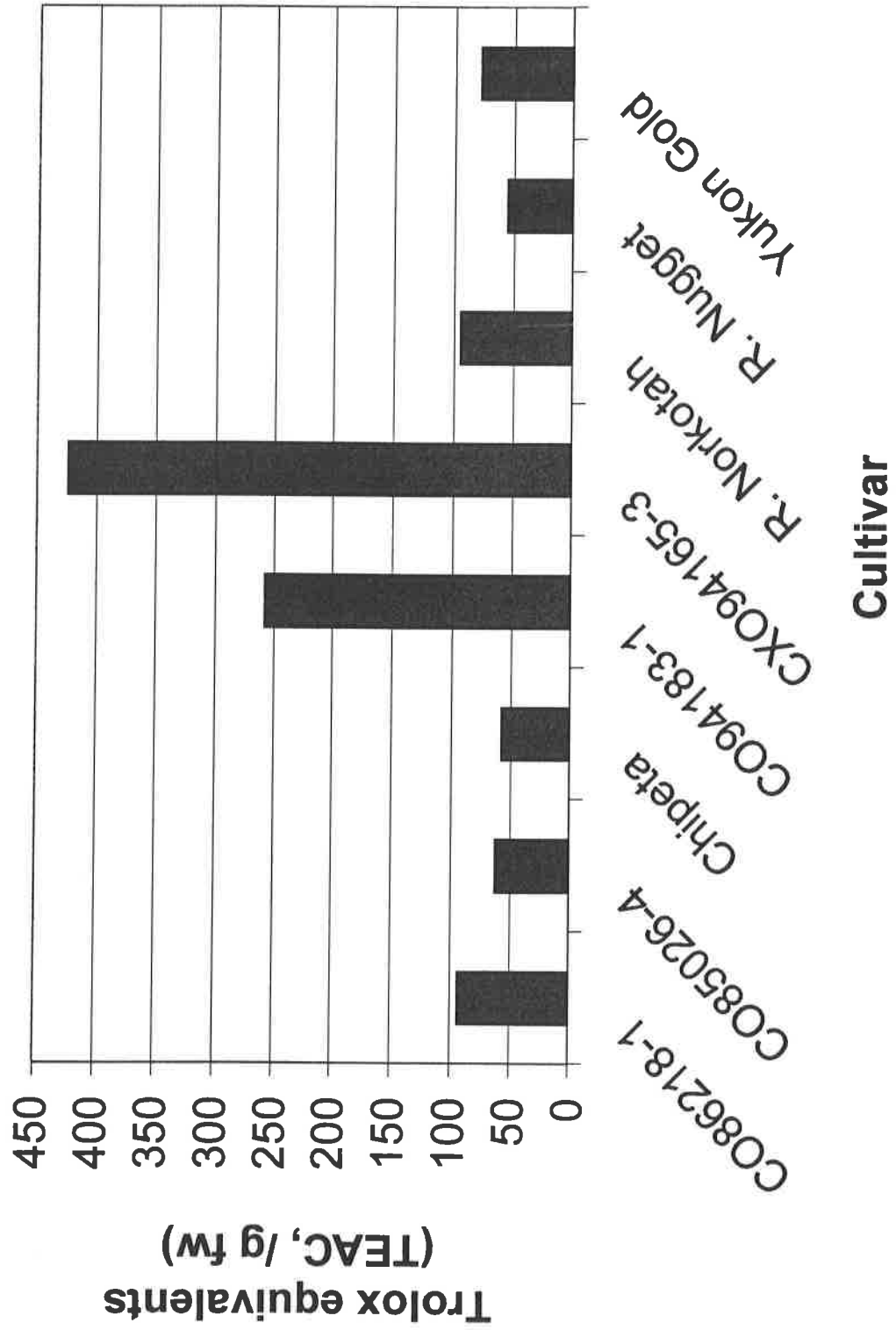
Freeze dried tissue w/o skins, 2001



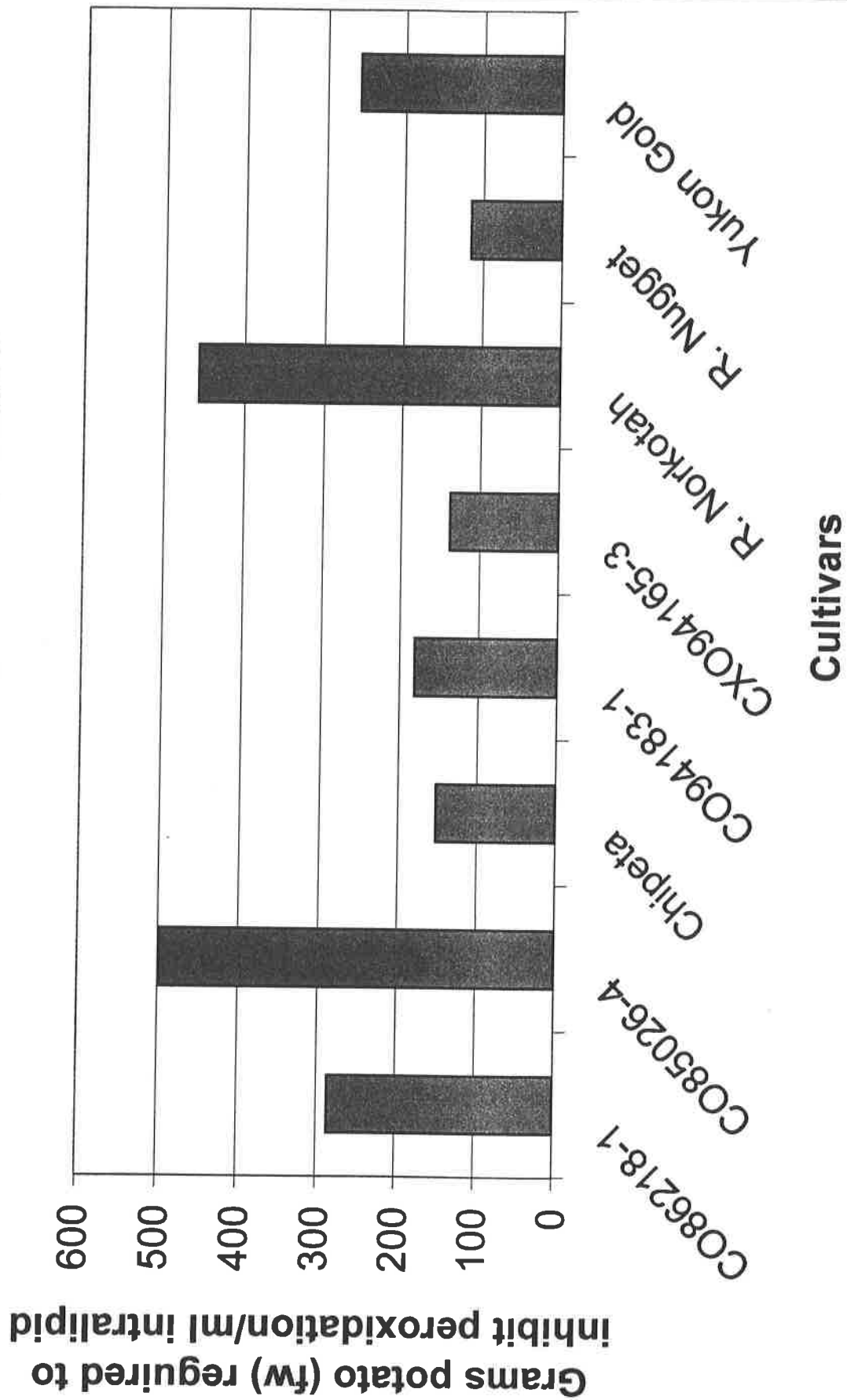
Freeze dried skins, 2001



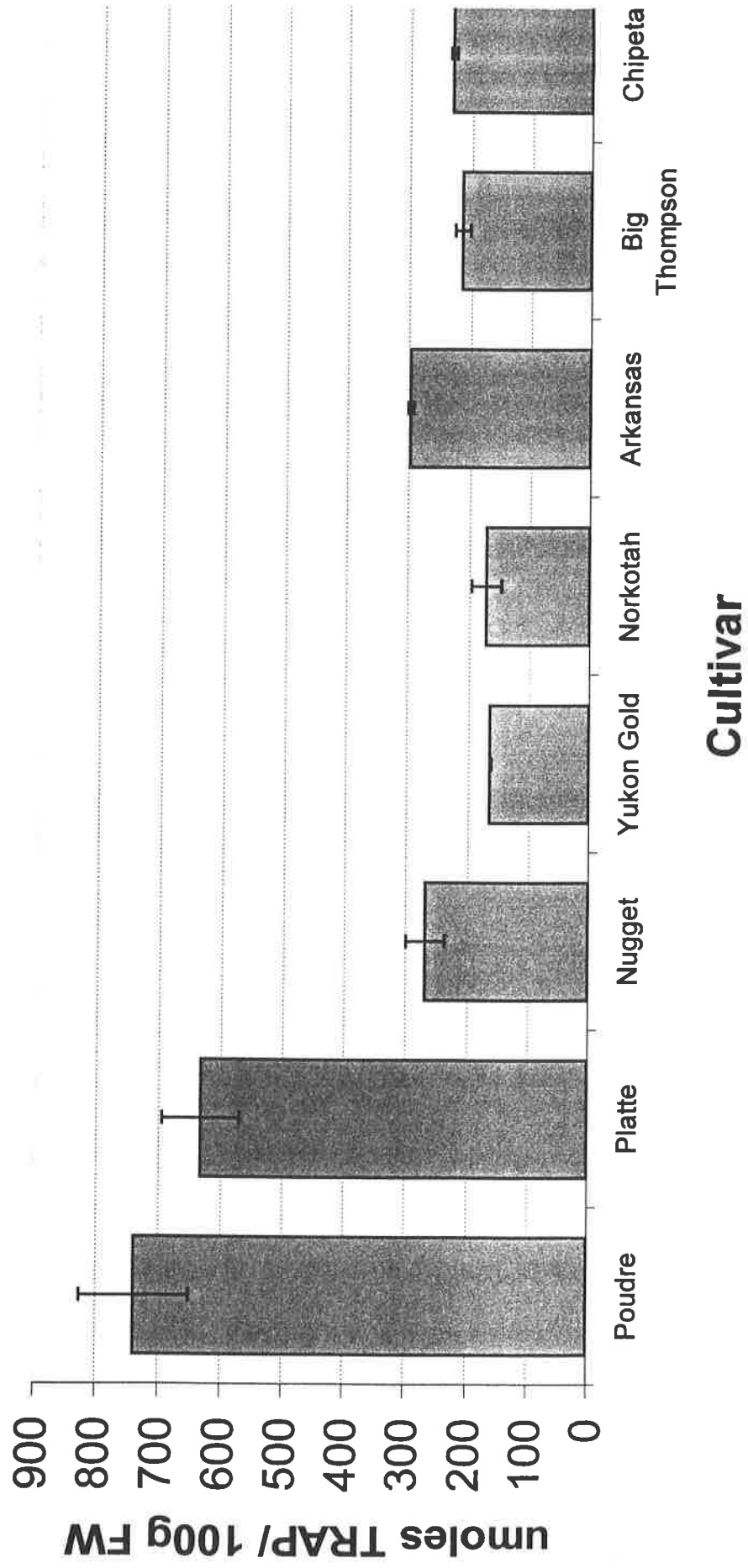
ABTS hydroxy radical scavenging capacity



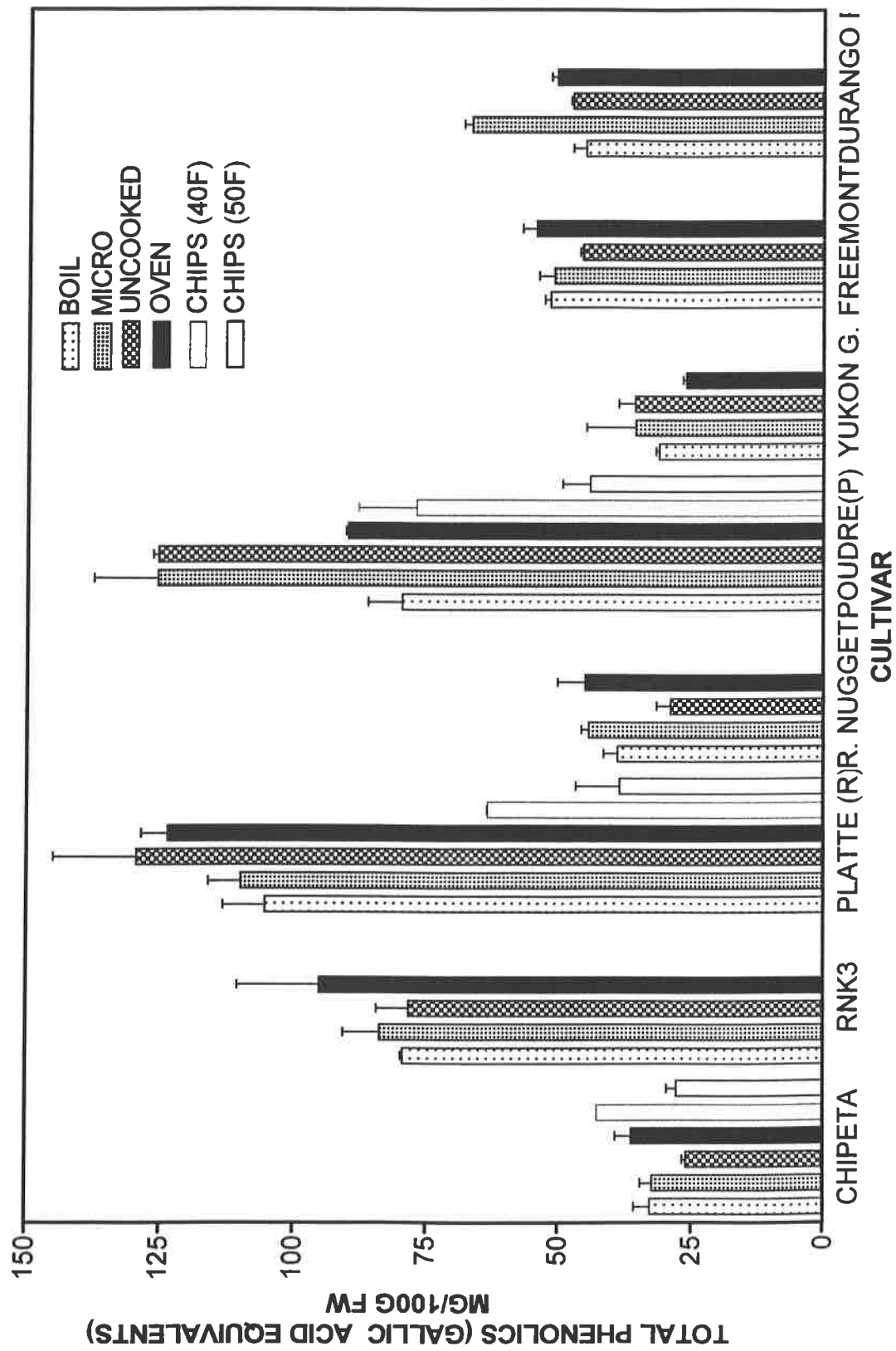
FOX Inhibition of Lipid Peroxidation



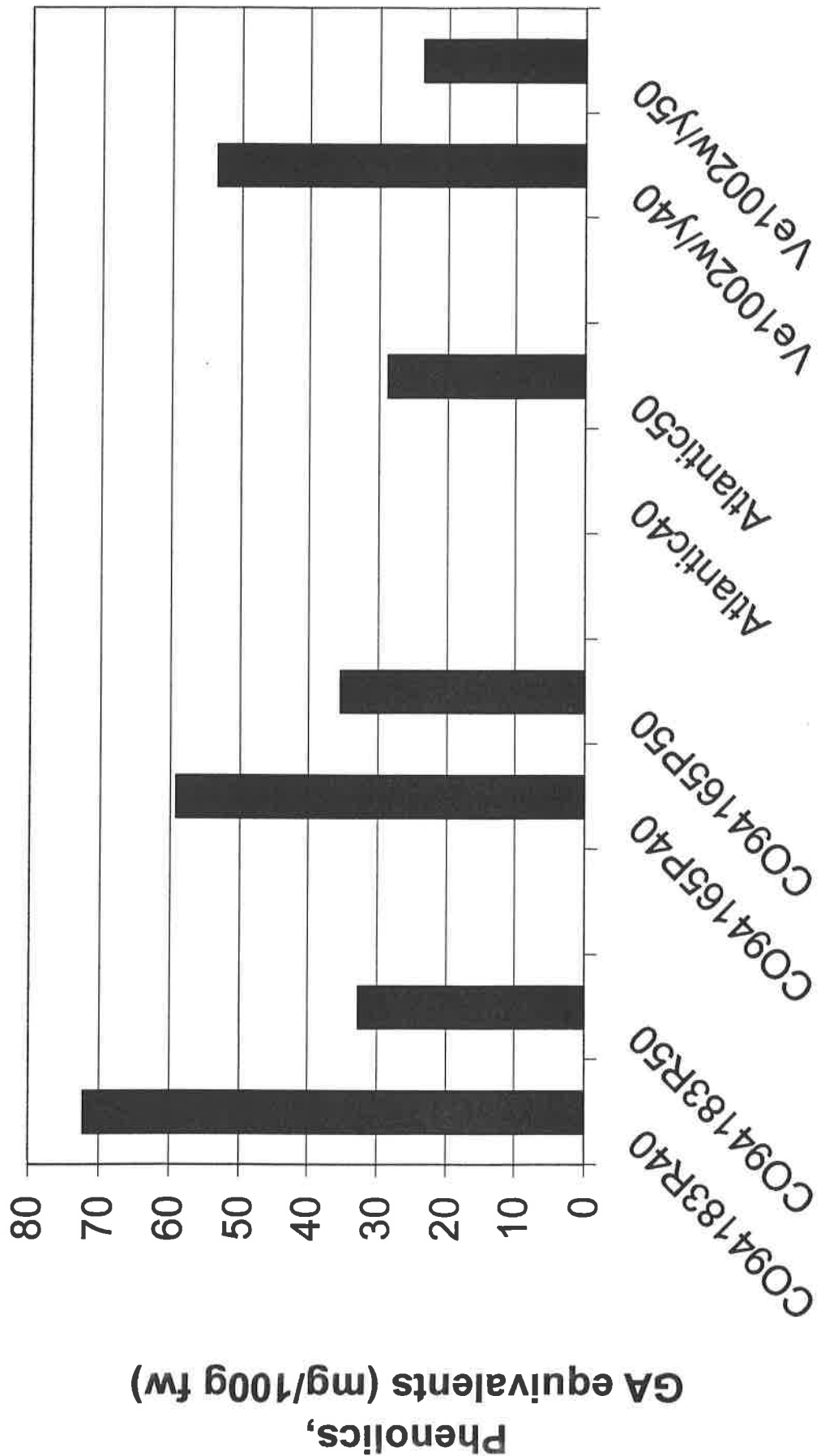
Antioxidant Activity (TRAP) Potato Cultivars



HEAT STABILITY



Effect of Conditioning Temp. on Phenolic Content



Effect of Conditioning Temp. on ABTS Radical Scavenging Activity

