1983 - 1984

Annual Report

to the

Area II Potato Administrative Committee

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Table of Contents

List of Tables

List of Figures

SUMMARY

Seven promising seedling clones were compared to Russet Burbank and Centennial (1982 crop) during the 1982-83 storage season. Measurements of dry matter content, ascorbic acid, redox potential, soft rot susceptibility and blackspot susceptibility were made shortly after harvest and repeated after storage at $4^{o}C$ ($39^{o}F$). Tuber mineral content was determined and weight loss and sprouting behavior of cut seed held at 18^{o}-$21^{o}C$ (65^{o}-$70^{o}F$) was determined in the spring.

Significant differences were found between clones in all measurements. TC2-1 was perhaps the most interesting and promising of the seedlings. It possessed high dry matter, high ascorbic acid, and low blackspot and shatter bruise susceptibility. Soft rot susceptibility was similar to Russet Burbank. Tuber condition was excellent out of $4^{o}C$ ($39^{o}F$) storage but 1/16" to 1/8" sprouts had developed. Russet Burbank did not show any sprout activity. Cut seed of TC2-1 lost weight significantly more rapidly than Russet Burbank but seed pieces remained in good condition and sprouted vigorously.

Of interest and perhaps concern was the apparent change in blackspot susceptibility and soft rot susceptibility of Centennial. A few years ago this cultivar, in our tests, was blackspot resistant and quite resistant to soft rot. The change in soft rot susceptibility may have resulted from a change in the strain of Erwinia atroseptica used for soft rot assay.

Six seedlings clones (1983 crop) were compared to Russet Burbank and Centennial in respect to all of the measurements mentioned above except redox potential. Three of the seedlings were common to both years. TC2-1 showed somewhat more blackspot susceptibility in the fall of 1983 than in the fall of 1982. However, the color was light and shatter bruise continued low.

A74212-1, AD74135-1, and A72685-1 were ranked 1, 2, and 3 in respect to yield and tuber type in 1982 and A72685-1 was number 2 in the 1983 Western Regional trials.

A74212-1 was at least equal and perhaps superior to Russet Burbank in most comparisons. Tuber weight loss at $10^{o}C$ ($50^{o}F$) was slightly faster than Russet Burbank. AD74135-1 showed more blackspot susceptibility and much more shatter bruise susceptibility. Tuber weight loss at $10^{o}C$ was slightly faster. A72685-2 showed more shatter than Russet Burbank but was similar in other respects. All three clones were significantly higher than Russet Burbank in ascorbic acid content.

A small experiment was conducted to determine how Russet Burbank blackspot is influenced by time of bruising and storage. Tubers bruised shortly after harvest and incubated immediately at $28^{o}C$ ($82^{o}F$) and tubers bruised and placed at $4^{o}C$ and examined in April 1983 immediately upon removal from storage developed the same amount of blackspot. If the potatoes were warmed 36 hours at $28^{o}C$ after removal from storage, to simulate holding on the shipping room floor, blackspot color darkened and the volume of the spot increased. If the potatoes were bruised only after storage at $4^{o}C$ blackspot color was darker and volume was greater than in the above 3 cases.

I. OBSERVATIONS OF CLONES HARVESTED IN 1982 DURING THE 1982-83 STORAGE SEASON.

A. Percentage Dry Matter, Ascorbic Acid Content and Mean Redox Potential (table 1).

Dry matter content differed significantly between the nine clones and ranged from 20.6% to 25.3% in the fall and from 23.2% to 27.4% in the spring following storage at 4°C. The increase in % dry matter during storage resulted from moisture loss.

Ascorbic acid likewise differed significantly, ranging from 12 mg/100 grams to 23.1 mg in the fall and from 8.0 mg to 10.7 mg after storage.

Clones also differed significantly in redox potential. On the average redox potential increased with storage at 4°C. In part this was most likely due to the decrease in ascorbic acid resulting in a more oxidized status.

The most interesting clone was TC2-1 which had the highest dry matter content, nearly 3% higher than Russet Burbank, and a very high ascorbic acid content, nearly double that of Russet Burbank when measured shortly after harvest.

B. Soft Rot Susceptibility Evaluations (table 2).

Tuber discs inoculated with Erwinia atroseptica (J-10 strain) and incubated in air and 8% CO_2 were used to assay for soft rot susceptibility. On a scale of 0-200, the mean soft rot index ranged from 122 to 183. Relative to Russet Burbank only Centennial and WC285-18 were significantly less susceptible. The remaining clones

Table 1 - Percentage dry matter, ascorbic acid content, and mean redox of 9 clones measured in the fall, 1982 and spring, 1983.

Cultivar	% D.M.		Asc. acid Mg/100 g		Mean redox				
	F '82	S '83	F '82	S '83	F '82	S '83	Stem	Mid	Bud
AC71861-4	19.8	20.8	19.6	6.1	100	93	106	86	98
AC77652-1	21.2	23.6	19.0	6.3	89	95	97	87	93
AC77149-2	20.6	23.2	16.2	6.8	108	94	110	98	94
AC77514-1	22.9	26.8	18.7	3.2	67	99	87	77	85
Centennial	21.4	23.4	18.4	7.4	85	107	97	88	104
R. Burbank	22.3	24.4	12.0	8.0	91	93	92	92	92
WC285-18	21.1	24.1	16.2	6.6	95	113	114	93	105
AC77513-1	22.1	23.8	21.0	5.5	86	157	122	108	135
TC2-1	25.3	27.4	23.1	10.7	68	141	113	99	101
Mean	21.8	27.2	20.5	7.6	88	110	104	92	101

Analyses of Variance

% Dry matter and ascorbic acid

Factor	F values		Required F	
	% D.M.	Asc. acid	0.05	0.01
Clone	39	11	2.01	2.65
Season	192	872	3.92	6.84
C x S	2	9	2.01	2.65

Redox

Factor	F value	Required F	
		0.05	0.01
Clone	16	1.96	2.55
Season	155	3.86	6.70
Location	16	3.02	4.66
C x S	34	1.96	2.55
C x L	2	1.67	2.04
S x L	12	3.02	4.66

Table 2 - Soft rot susceptibility indices[a] of 9 clones evaluated in air and 8% CO_2 in the fall, 1982 and spring, 1983.

	Fall		Spring		Means				
Cultivar	Air	8% CO_2	Air	8% CO_2	Fall	Spring	Air	8% CO_2	Mean
AC71861-4	174	186	152	196	180	174	163	191	177
AC77562-1	196	189	189	157	193	173	192	173	183
AC77149-2	186	166	164	167	176	166	175	166	171
AC77514-1	172	185	90	194	178	142	131	189	160
Centennial	161	147	94	136	154	115	128	142	135
R. Burbank	153	187	146	186	170	166	149	186	168
WC285-18	157	183	59	90	170	74	108	136	122
AC77513-1	190	200	37	165	195	101	114	183	148
TC2-1	154	173	113	178	164	145	133	176	155
Mean	172	179	116	163	176	140	144	171	158
								$LSD_{.05}$	24

Analyses of Variance

		Required F value	
Factor	F value	0.05	0.01
Clone	5.5	2.0	2.6
Season	39.6	3.9	6.8
Atmosphere	23.4	3.9	6.8
C x S	4.3	2.0	2.6
C x A	2.8	2.0	2.6
S x A	11.9	3.9	6.8

[a] scale of 0 to 200 where 0 = resistant 200 = maximum susceptibility

did not differ significantly in soft rot susceptibility from Russet Burbank.

All clones decreased in soft rot susceptibility to varying degrees during storage at $4^{o}C$ ($39^{o}F$). WC285-18 showed the greatest decrease in susceptibility.

When evaluated in the fall the mean soft rot susceptibility was the same whether evaluated in air or 8% CO_2. However, after storage, 8 of 9 cultivars showed increased susceptibility in 8% CO_2 relative to air.

Centennial, although significantly less susceptible than Russet Burbank, did show considerable soft rot susceptibility. In prior years Centennial has shown considerable resistance.

C. Blackspot Susceptibility Evaluations.

The clones from the 1982 harvest differed significantly in blackspot susceptibility when evaluated after storage at $4^{o}C$ (table 3). The susceptibility indices ranged from a low of 13 (WC285-18) to a high of 310 (AC77514-1) on a scale of 0-400. AC77514-1 is a cross between Lemhi and WC316-1 and Lemhi has very high blackspot susceptibility. TC2-1, the clone with the highest percent dry matter, was 2nd lowest in blackspot susceptibility and nearly free of shatter bruising. The clones did differ considerably in susceptibility to shatter bruising. WC285-18 and Centennial were relatively free of shatter while Russet Burbank and AC77513-1 shattered quite badly. The mean volume of the spot gives a fair indication of the degree of shatter - note the volumes range from 211 mm^3 for WC285-18 to 1387 mm^3 for AC77513-1.

Table 3 - Blackspot susceptibility of 9 clones (1982 crop) evaluated in the spring, 1983.

Cultivar	% Loci showing color			Mean volume of spot			Color			Means			
	Stem	Mid	Bud	Stem	Mid	Bud	Stem	Mid	Bud	% Loci	Volume	Color	Index[b]
AC71861-4	75	88	88	659	647	543	2.2	2.2	2.1	84	616	2.2	185
AC77652-1	100	100	100	634	1225	669	2.6	2.5	2.3	100	843	2.5	250
AC77149-2	88	75	75	498	716	548	1.4	1.8	1.7	79	587	1.6	126
AC77514-1	100	100	100	1128	1027	636	3.4	2.8	3.0	100	588	3.1	310
Centennial	100	50	25	302	482	275	2.1	2.3	2.0	58	353	2.1	122
R. Burbank	100	88	75	701	1586	1100	2.9	2.7	2.8	88	1129	2.8	246
WC285-18	13	13	13	231	352	49	1.0	1.0	1.0	13	211	1.0	13
AC77513-1	100	100	63	1484	1577	1101	2.6	3.0	2.2	88	1387	2.6	229
TC2-1	75	13[a]	38	188	1195[a]	272	1.2	1.0	1.0	42	552	1.1	46
Means	83	70	64	647	979	577	2.2	2.1	2.0				

Clone Comparison - Analyses of Variance

Measurement	F value	Required F .05	Required F .01
% Loci showing color	7.29	2.5	3.7
Mean volume of spot	4.71	2.5	3.7
Mean color	39.3	2.5	3.7

[a] Only one loci of 8 that discolored

[b] Index = mean % loci x index
0 = resistant
400 = maximum susceptibility

A comparison of the fall 1982 and spring 1983 blackspot response is given in table 4. The mean percentage of bruised loci that discolored, the mean volume of the discolored spot, the mean color, and the mean index did not change significantly with storage at $4^{o}C$. However, individual clones varied in response to storage. AC71861-4 and AC77652-1 increased in blackspot susceptibility during storage while AC77149-2, Russet Burbank and WC285-18 decreased in susceptibility. The remaining clones changed less in blackspot susceptibility. The order of blackspot susceptibility, however, did not change greatly with storage.

D. Mineral Content of Clones Evaluated During 1982-83 (table 5).

The tuber mineral content was determined with an ionized coupled plasma analyzer on a 2% acetic acid extract of dried and ground tuber tissue. The analyses were done in the CSU soil testing laboratory. Significant differences were found between clones in the concentration of each element. The range in concentrations varied with the element measured. Copper varied the most between clones and magnesium the least. Potassium, often implicated in blackspot susceptibility, varied from 1.80 to 2.16%. The relationship to blackspot susceptibility in these observations is not consistent. Russet Burbank, low in potassium, was blackspot susceptible and WC285-18, fairly high in potassium, was blackspot resistant; but, TC2-1, low in potassium, was also quite blackspot resistant.

Also, of interest in table 5 was that Russet Burbank was lowest not only in potassium but in calcium, magnesium, and zinc but highest in copper.

Table 4 - Comparison of blackspot susceptibility parameters (1982 crop) in the fall, 1982 and spring, 1983.

Clone	% Loci		Volume		Color		Index	
	F '82	S '83	F '82	S '83	F '82	S '83	F '82(a)	S '83(a)
A71861-4	42	84	242	616	1.7	2.2	71(7)	185(5)
AC77652-1	75	100	327	843	2.4	2.5	180(5)	250(2)
AC77149-2	80	79	600	587	2.9	1.6	232(4)	126(6)
AC77514-1	100	100	1430	588	3.2	3.1	320(1)	310(1)
Centennial	63	58	381	353	2.0	2.1	126(6)	122(7)
R Burbank	96	88	1237	1129	3.3	2.8	317(2)	246(3)
WC285-18	38	13	294	211	1.7	1.0	65(8)	13(9)
AC77513-1	96	88	1861	1387	2.6	2.6	250(3)	229(4)
TC2-1	46	42	268	552	1.4	1.1	64(9)	46(8)
Mean	71	72	746	779	2.4	2.4	180	170

(a) order of decreasing blackspot severity

Table 5 - Potassium, phosphorus, calcium, magnesium, iron, copper and zinc contents of 9 clones evaluated in the 1982-83 storage season.

Clone	% Potassium	% Phosphorus	% Calcium	% Magnesium	PPM Iron	PPM Copper	PPM Zinc
AC71861-4	1.94(7)	0.096	0.105	0.119	14.5	12.7	13.3
AC77652-1	1.83(2)	0.106	0.108	0.107	13.2	13.6	17.6
AC77149-2	1.92(6)	0.109	0.136	0.103	15.4	13.9	14.6
AC77514-1	1.91(5)	0.119	0.116	0.113	19.5	17.6	18.0
Centennial	1.90(4)	0.185	0.095	0.112	19.6	16.9	15.1
R. Burbank*	1.80(1)	0.158	0.094	0.100	18.2	26.1	9.7
WC285-18	2.04(8)	0.132	0.118	0.107	17.6	24.5	13.7
AC77513-1	2.16(9)	0.116	0.114	0.104	18.2	19.7	16.2
TC2-1	1.84(3)	0.116	0.103	0.103	15.4	19.9	17.0
Mean	1.93	0.126	0.110	0.108	16.8	18.3	15.0
LSD 0.05	0.16	0.014	0.014	0.01	2.1	3.5	1.6
Range	1.80-2.16	0.096-0.185	0.094-0.136	0.100-0.119	13.2-19.6	12.7-26.1	9.7-17.6
% Lowest / Highest	83%	52%	69%	84%	67%	49%	55%

* Standard

E. Tuber Condition of Clones Harvested Fall 1982 on April 8, 1983 After Storage at $4^{o}C$ ($39^{o}F$) (table 6).

The relative humidity in the storage room varied from 60 to 70%. This provided sufficent mositure stress to identify clones with low resistance to moisture loss. AC77149-2, WC285-18 and AC77513-1 showed stem end shrivel while Centennial shrivelled slightly overall. The clones differed in dormancy. Russet Burbank, AC77149-2 and AC77652-1 showed no sprout activity. AC71861-4, AC77514-1, Centennial, WC285-18 and AC77513-1 were just breaking. TC2-1 had 1/16 to 1/8" sprouts.

F. Weight Loss of Cut Seed and Sprout Growth.

Tubers were removed from $4^{o}C$ ($39^{o}F$) on April 27, 1983 and carefully cut into seed pieces weighing from 50 to 59 grams (1.8 to 2.0 ounces). Without treatment 2 replications of the cut seed, weighing about 100 grams per replication, were placed at 18^{o} to $21^{o}C$ (65^{o}-$70^{o}F$) and 60 to 70% relative humidity. The replicated samples were carefully weighed at one or two day intervals. After 15 days, sprouts were removed and weighed and the seed pieces evaluated for condition. The pattern of weight loss is shown in figure 1. After 375 hours, the differences in weight loss between clones were highly significant. Russet Burbank and AC77149-2 lost weight most slowly while AC77514-1 and TC2-1 lost weight most rapidly. Up to 160 hours, however, differences were not large. Beyond 160 hours clonal differences in weight loss were more definite.

Sprout development after 375 hours is shown in figure 2. Only Centennial and WC285-18 produced significantly less sprout weight

Table 6 - Tuber condition of clones harvested fall, 1982 on April 8, 1983 after storage at $4^{o}C$ ($39^{o}F$).

AC71861-4	Just sprouting, quite firm, good condition light attractive periderm.
AC77652-1	Dormant, good tuber shape, firm good condition.
AC77149-2	Firm, moderate skinning, dormant, bad stem ends, poor shape.
AC77514-1	Just sprouting, good tuber shape and appearance, pleasant skin color.
Centennial	Just sprouting, slight shrivel, generally good condition.
R. Burbank	Firm, dormant, poor tuber shape, good condition.
WC285-18	Just sprouting, fair condition, alligator hide, shrivelled on stem end.
AC77513-1	Just sprouting, tubers shrivelled, bad stem ends, poor condition.
TC2-1	1/16" to 1/8" sprouts, good condition.

At 375 hours differences significant 0.01 probability level

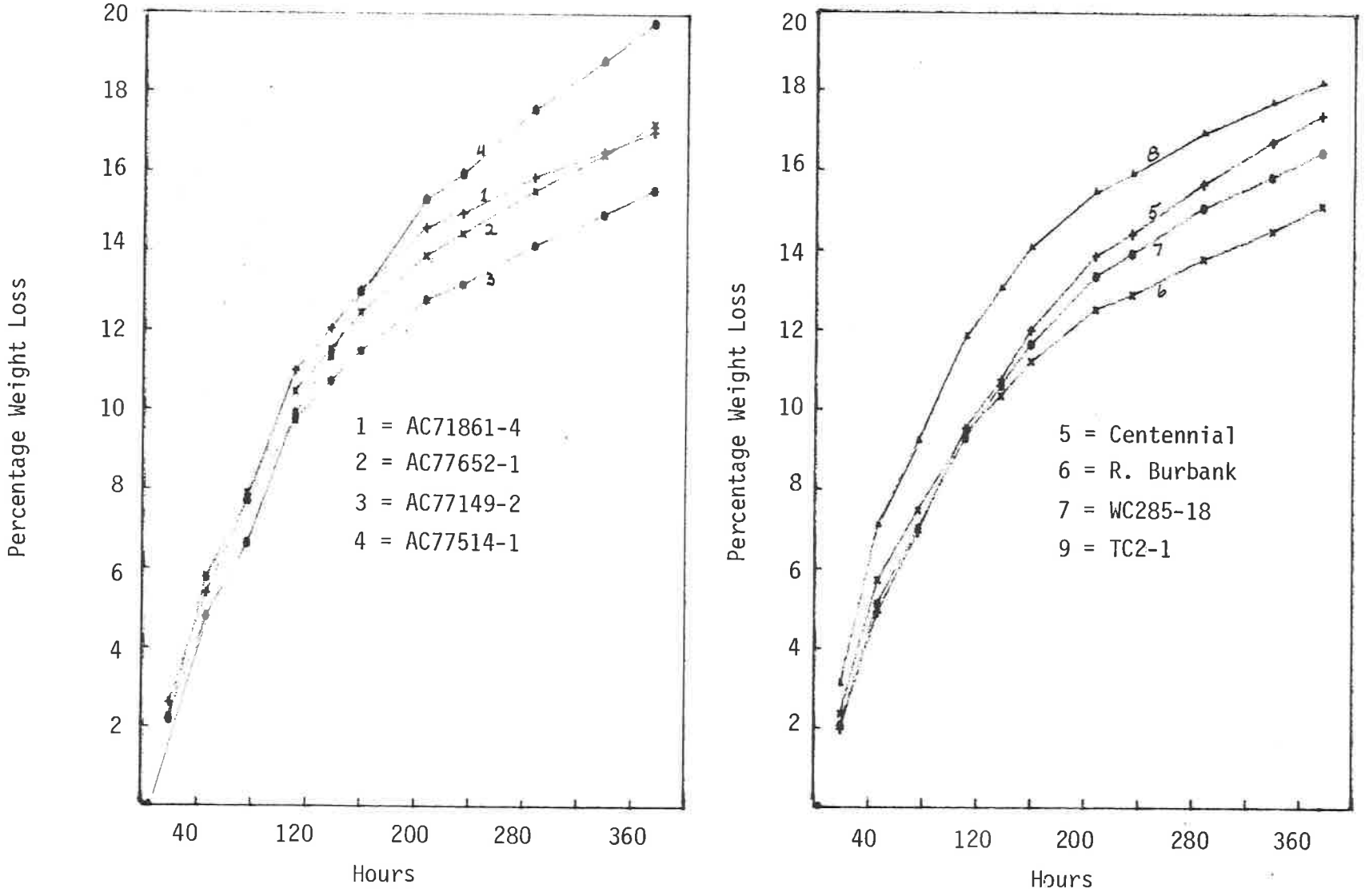

Figure 1 - Weight loss of cut seed at 65^{o}-70^{o}F (18^{o}-21^{o}C) and 60 to 70% relative humidity (1982-83).

Cultivar

1. AC71861-4
2. AC77652-1
3. AC77149-2
4. AC77514-1
5. Centennial
6. R. Burbank
7. WC285-18
8. TC2-1

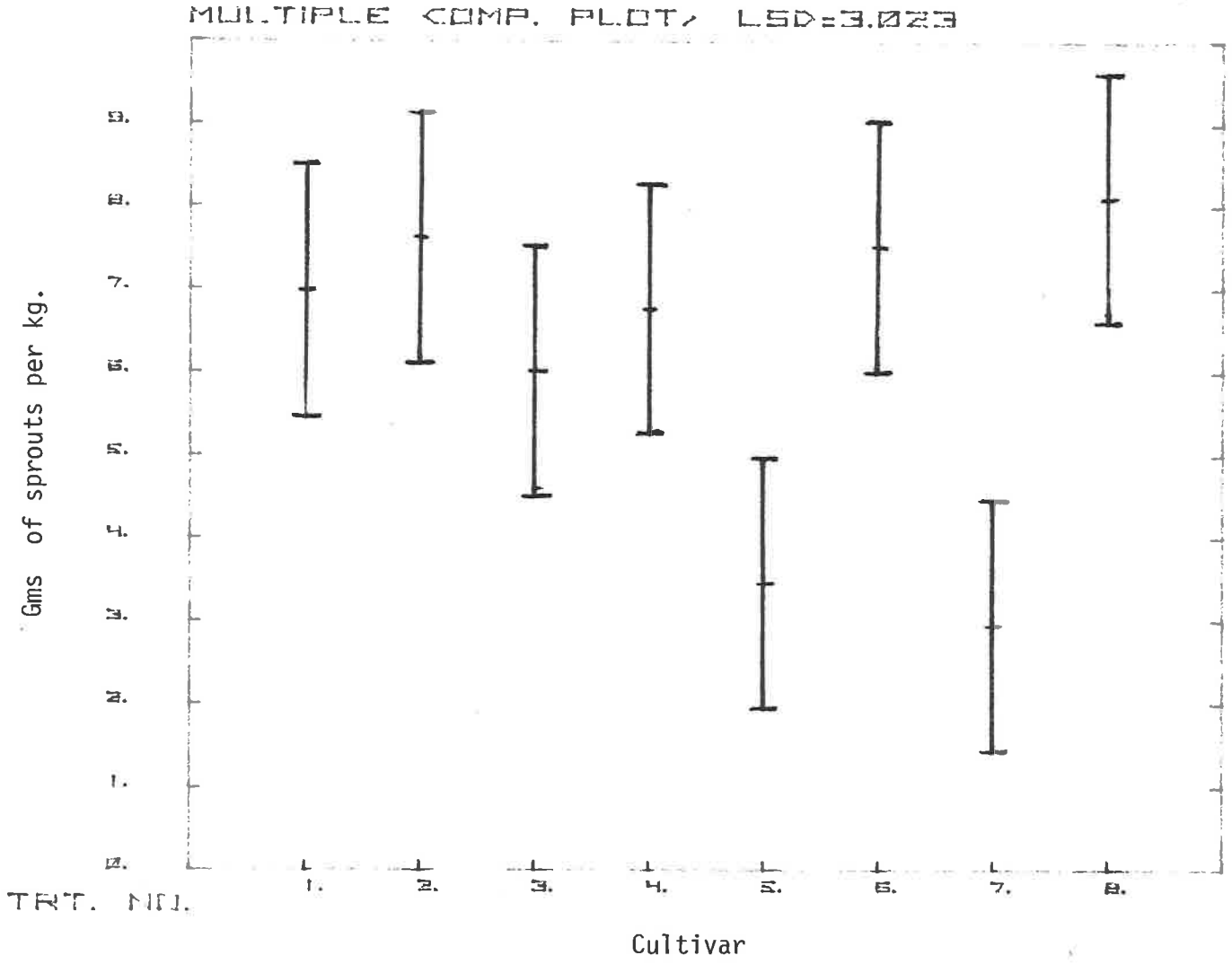

Figure 2 - Sprout growth on cut seed after 375 hours at 65°-70°F (18°-21°C) and 60 to 70% relative humidity (1982-83).

than Russet Burbank. The other clones did not differ significantly from Russet Burbank in sprout production. Sprout production by TC2-1 was good.

Clones differed in the degree of multiple sprouting from one eye. R. Burbank produced single long sprouts, while other clones produced all multiple or mixture of single and multiple sprouts. Data was too limited to make firm conclusions on this. The color of the seed pieces ranged from very light (TC2-1) to very dark (Russet Burbank).

II. OBSERVATION OF CLONES HARVESTED IN 1983.

A. Percentage Dry Matter and Ascorbic Acid Content (table 7).

Dry matter percentages ranged from 21.0 to 25.9%. AC77514-1 and TC2-1 had significantly higher dry matter content, and AC77652-1 significantly lower dry matter content than Russet Burbank. The other clones did not differ significantly from Russet Burbank. Five clones were common to 1982 and 1983. A comparison of the dry matter content in the two years follows:

	Fall 1982	Fall 1983
AC77652-1	21.2	21.0
AC77514-1	22.9	25.9
Centennial	21.4	23.0
R. Burbank	22.3	23.7
TC2-1	25.3	25.3

Russet Burbank, lowest in ascorbic acid in 1982, was again significantly lower than all other test clones in 1983. A comparison

Table 7 - Dry matter percentage and ascorbic acid content of 8 clones measured in the fall of 1983. (To be evaluated again in the spring of 1984)

Cultivar	% D.M.		Ascorbic Acid mg/100 g	
	F '83 (S.D.)[b]	S '84	F '83 (S.D.)	S '84
A72685-2 (3)[a]	24.8 (1.3)		20.4 (3.7)	
R. Burbank	23.7 (0.7)		14.8 (1.3)	
AC77652-1	21.0 (1.8)		20.0 (3.4)	
AC77514-1	25.9 (0.9)		25.5 (3.3)	
TC2-1	25.3 (1.6)		20.7 (2.9)	
AD74135-1 (2)	24.2 (1.3)		22.1 (1.91)	
Centennial	23.0 (1.3)		24.2 (3.2)	
A74212-1 (1)	24.5 (1.2)		19.8 (1.9)	
Mean	24.1 (1.5)		20.8 (3.2)	
$LSD_{.05}$	1.3		2.8	

[a] 1982 yield and grade evaluation

[b] Standard deviation

of the 5 common clones in the two years is given below:

	Fall 1982	Fall 1983
AC77652-1	19.0	20.0
AC77514-1	18.7	25.5
Centennial	18.4	24.2
R. Burbank	12.0	14.8
TC2-1	23.1	20.7

B. Soft Rot Susceptibility Evaluations (table 8).

The eight clones differed significantly in soft rot susceptibility. However, all were quite susceptible. TC-1 was lowest in mean susceptibility and AC77652-1 the highest. Centennial was more suceptible than Russet Burbank. The clones varied in response to 8% carbon dioxide although most increased in susceptibility.

The soft rot indices for the five clones common to the two years are shown below:

	Fall 1982		Fall 1983	
	air	8% CO_2	air	8% CO_2
AC77652-1	196	189	191	188
AC77514-1	172	185	191	181
Centennial	161	147	146	199
R. Burbank	153	187	136	161
TC2-1	154	173	81	181

C. Blackspot Susceptibility Evaluations (table 9).

Each tuber was bruised on opposite sides on the stem, middle and bud end. On one side a 100 gram weight was dropped 45 cm in the three locations and on the opposite side a 150 gram weight was dropped the same distance. The impact portion of the weight was hemi-spherical

Table 8 - Soft rot susceptibility indices of 8 clones evaluated in air and 8% CO_2 in the fall of 1983. (To be evaluated again in the spring of 1984)

	Fall 1983		Spring 1984		Mean				
Cultivar	Air	8% CO_2	Air	8% CO_2	F '83	S '84	Air	CO_2	Mean
A 72685-2	185	189			187				
R. Burbank	136	161			149				
AC77652-1	191	188			190				
AC77514-1	191	181			186				
TC2-1	81	181			131				
AD74135-1	145	192			168				
Centennial	146	199			173				
A74212-1	113	194			154				
Mean	149	186			167				

Analyses of Variance

		Required F	
	F	0.05	0.01
Clones	3.4	2.2	2.9
Atmosphere	21.3	4.0	7.0
C x A	3.1	2.2	2.9

Table 9 - Blackspot susceptibility of 8 clones evaluated in the fall of 1983. (To be evaluated again in the spring of 1984) L-1 = 100 grams dropped 45 cm. L-2 = 150 grams dropped 45 cm.

Cultivar		% Loci showing color			Mean vol. of spot			Color			Mean			
		Stem	Mid	Bud	Stem	Mid	Bud	Stem	Mid	Bud	% Loci	Vol.	Color	Index
A72685-2	L1	25	63	38	415	476	468	2.5	2.2	2.0	42	453	2.2	92
	L2	88	63	38	1005	1384	258	2.6	2.6	1.0	63	882	2.1	132
R. Burbank	L1	25	25	13	253	293	352	1.5	2.0	2.0	21	299	1.8	38
	L2	88	50	13	406	685	318	2.3	3.0	2.0	50	470	2.4	120
AC77652-1	L1	13	13	25	352	550	471	3.0	2.0	1.5	17	458	2.2	37
	L2	63	50	50	398	637	195	2.8	2.7	2.0	54	410	2.5	135
AC77514-1	L1	38	50	0	175	143	0	2.3	1.8	0	29	159	2.1	61
	L2	75	88	50	380	517	496	2.0	2.0	2.0	71	464	2.0	142
TC2-1	L1	25	50	13	266	212	141	1.5	2.0	1.0	29	206	1.5	44
	L2	88	75	100	224	367	299	2.0	1.8	1.4	88	297	1.7	150
AD74135-1	L1	100	88	38	702	1061	1571	3.0	3.1	3.0	75	1111	3.0	225
	L2	100	100	88	1493	1486	2118	3.1	3.0	2.9	96	1699	3.0	288
Centennial	L1	50	50	50	323	474	386	2.8	2.2	2.5	50	394	2.5	125
	L2	75	50	88	577	1128	537	2.0	1.8	1.7	71	747	1.8	128
A74212-1	L1	63	50	50	227	336	397	2.8	2.0	2.8	54	317	2.5	135
	L2	75	38	50	364	492	631	2.7	2.7	2.0	54	466	2.5	135
Mean	L1	43	49	29	339	443	474	2.4	2.2	2.1	40	424	2.2	94
	L2	82	63	60	606	837	607	2.4	2.5	1.9	69	679	2.3	154

Analyses of Variance

	F values			Required F	
	% Loci	Mean Volume	Color	0.05	0.01
Clone	4.0	14.4	5.4	2.32	3.25
Level	26.0	14.1	0.06	4.20	7.50
C x L	1.2	1.1	1.2	2.32	3.25

with a one inch diameter. Eight tuber replicates were used.

The 150 gram weight increased the mean number of bruised loci showing color from 40 to 69%, and the mean volume of bruised area from 424 to 679 mm^3, but mean color only increased from 2.2 to 2.3. The mean blackspot indices were 94 and 154 for the 100 and 150 gram weight, respectively.

Highly significant differences between clones were found in blackspot susceptibility. However, no clone was highly resistant. In most previous comparisons R. Burbank was more susceptible than Centennial but in the fall of 1983 the reverse occurred when impacted with 100 grams. No difference occurred between the two clones when impacted with 150 grams.

The five clones common to 1982 and 1983 were not consistent between years except for Centennial. The blackspot indices were as follows:

	Fall 1982	Fall 1983
AC77652-1	180	135
AC77514-1	320	142
Centennial	126	128
R. Burbank	317	120
TC2-1	64	150

The increase in the blackspot index for TC2-1 was due mostly to an increase in the number of loci showing color rather than a marked increase in color.

A similar inconsistency between years was found in volume of the blackspot:

	Fall 1982	Fall 1983
AC77652-1	327 mm^3	410 mm^3
AC77514-1	1430 mm^3	464 mm^3
Centennial	381 mm^3	747 mm^3
R. Burbank	1237 mm^3	470 mm^3
TC2-1	268 mm^3	297 mm^3

TC2-1 and AC77652-1 were more consistent between years than the other clones. Generally shatter bruise was less in 1983.

When evaluating for blackspot, a high percentage of hollow heart was detected in AC77514-1.

D. Percent Tuber Weight Loss and Sprouting.

Tuber weight loss was followed at 4^oC (39^oF) and 10^oC (50^oF). The relative humidity ranged from 55 to 60% at 4^oC and averaged around 50% at 10^oC. Ten tuber replicates were used for each clone. Each tuber was weighed to an accuracy of one gram. The experiment was started Oct. 14, 1983 and weighings were done monthly. Results up to Jan. 18, 1984 are given in table 10. Significant differences were found between cultivars at each weighing. R. Burbank lost weight most slowly and Centennial most rapidly.

The data from the weighing of Jan. 18, 1984 are shown graphically in figure 3 (10^oC) and in figure 4 (4^oC). At 10^oC all cultivars had lost significantly more weight than Russet Burbank. The actual difference in loss between R. Burbank and most clones ranged between 1.5 and 2% but AC77514-1 and Centennial lost 4 to 5% more than Russet Burbank.

Table 10 - Percentage tuber weight loss and sprouting of 8 clones harvested fall, 1983

Clones	39 days		68 days		96 days		Sprouts after 96 days at 10°C
	4°C	10°C	4°C	10°C	4°C	10°C	grams per kilogram
AC77514-1	2.2	4.4	4.0	6.0	6.0	8.9	1.78
TC2-1	1.2	4.0	2.9	4.6	3.9	6.9	4.04
AD74135-1	1.6	2.9	3.3	4.1	4.4	7.1	6.22
Centennial	3.3	5.9	9.0	7.8	13.3	9.9	2.01
A74212-1	2.6	3.4	3.8	4.4	5.1	6.6	2.54
A72685-2	2.4	2.9	3.5	4.1	4.4	6.4	6.22
R. Burbank	0.8	3.5	2.3	4.3	3.3	5.0	0
AC77652-1	2.0	3.8	3.4	4.9	4.8	6.5	1.64
Mean	2.0	3.8	4.0	5.0	5.7	7.2	
$LSD_{.05}$	0.6	0.9	1.4	1.0	2.1	1.3	

Approximate Vapor Pressure Deficits:

4°C = 2.7 mm Hg

10°C = 4.5 mm Hg

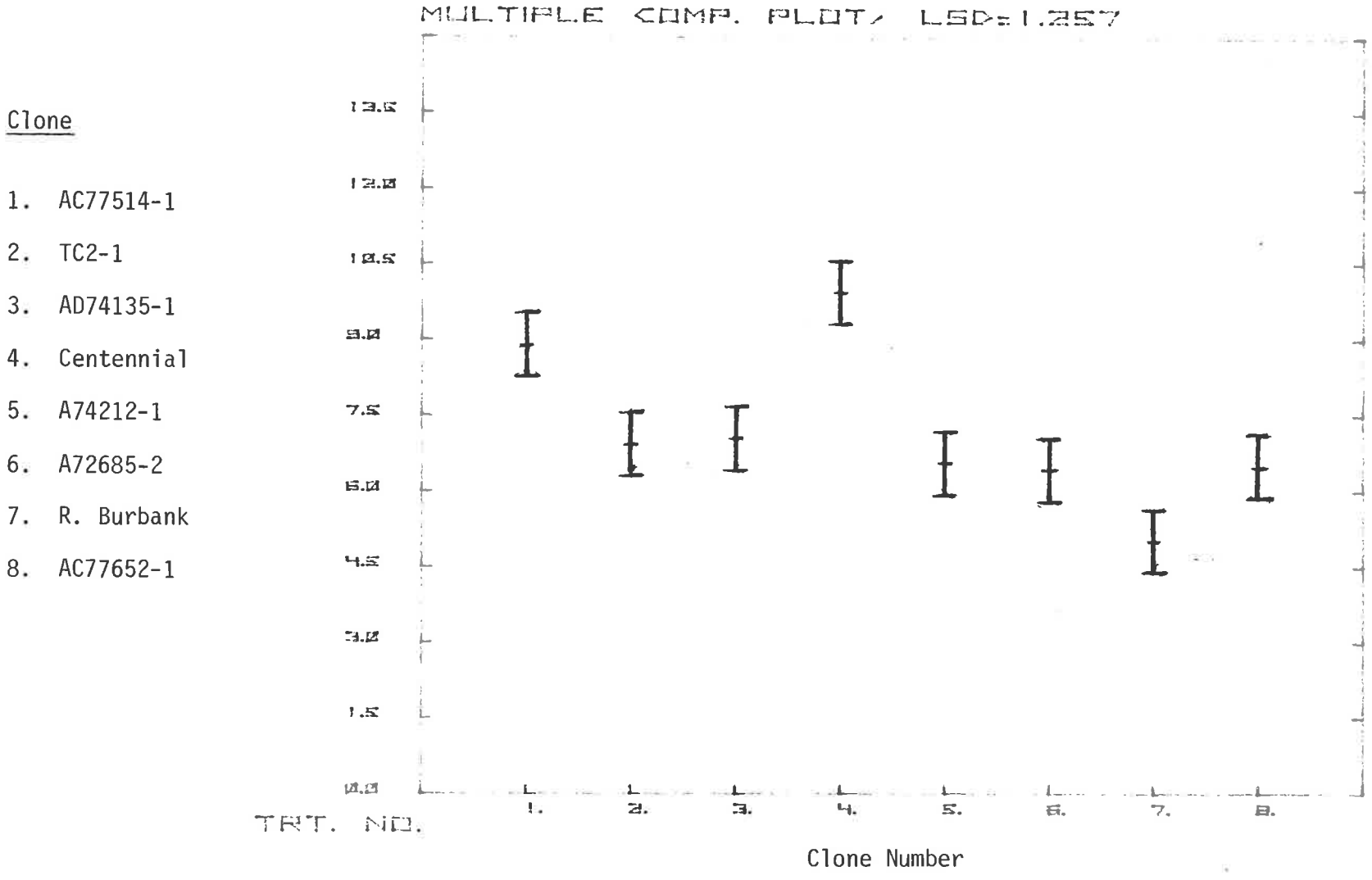

Figure 3 - Accumulated weight loss of whole tubers when stored at 10°C (50°F) from October 14, 1983 to January 18, 1984.

Clone

1. AC77514-1
2. TC2-1
3. AD74135-1
4. Centennial
5. A74212-1
6. A72685-2
7. R. Burbank
8. AC77652-1

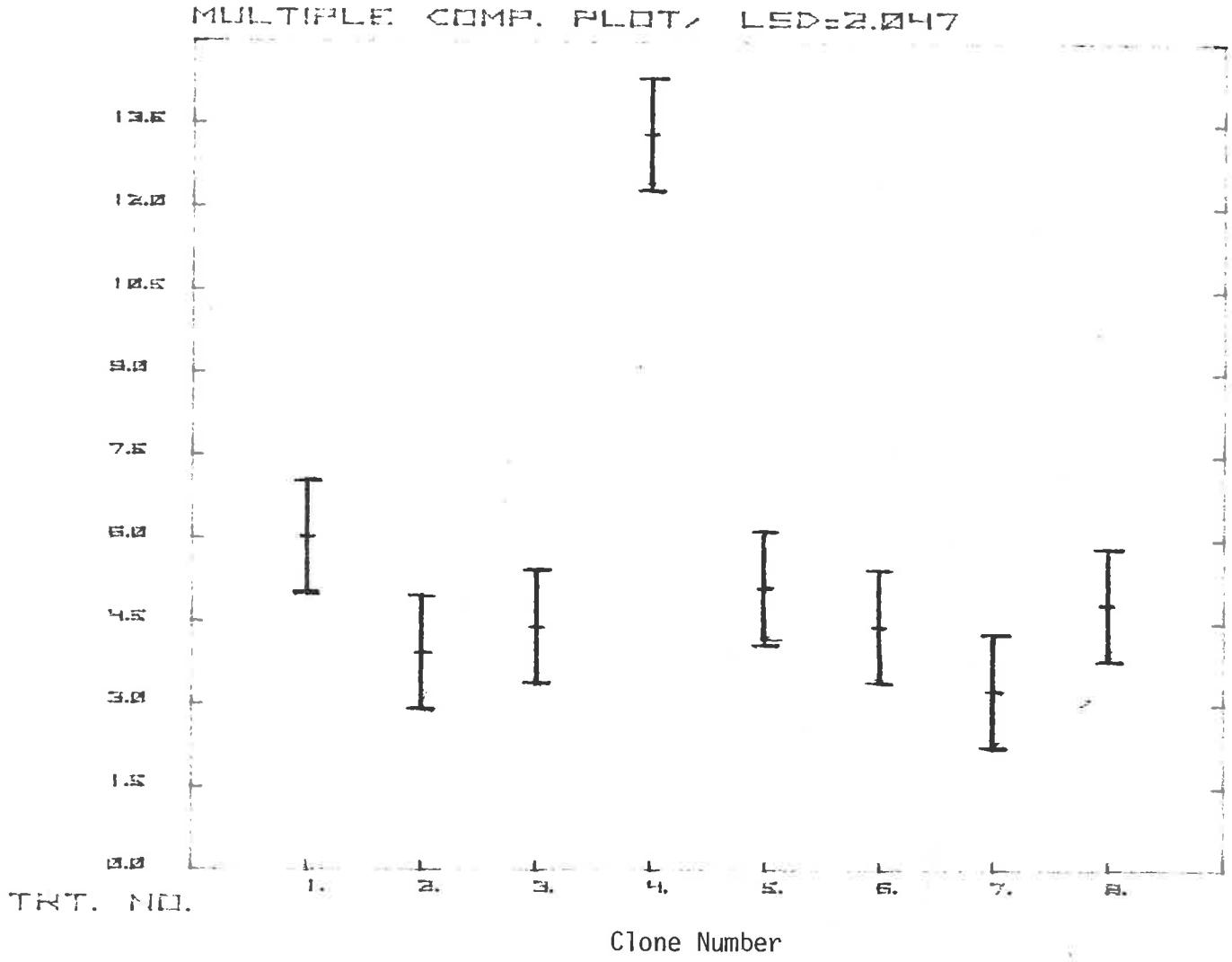

Figure 4 - Accumulated weight loss of whole tubers when stored at 4°C (39°F) from October 14, 1983 to January 18, 1984.

At 4°C, only AC77514-1 and Centennial had lost significantly more weight than Russet Burbank.

Sprouts were removed from tubers stored at 10°C and weighed on Jan. 18, 1984. Significant differences between clones were found. Russet Burbank had not sprouted but the growth on the other clones ranged from 1.64 gms/kg to 6.22 gms/kg (table 10). The sprout growth could have contributed to higher rate of weight loss. However, sprout growth on AC77514-1 and Centennial was small so the greater weight loss perhaps was due to a more porous periderm. As mentioned above, significant differences between these two cultivars and Russet Burbank also occurred at 4°C where sprouting had not occurred.

E. Mineral Content of Clones Evaluated During 1983-84 (table 11).

The test clones differed significantly in concentrations of potassium, phosphorus, calcium and zinc but did differ significantly in magnesium and iron.

Potassium ranged from 1.45 to 1.84%. A72685-2, AC77652-1 and TC2-1 contained significantly more potassium than Russet Burbank while AC77514-1, AD74135-1, Centennial and A74212-1 did not differ significantly.

The potassium content of the five clones common to the two years is shown below:

	1982	1983
AC77652-1	1.83	1.75
AC77514-1	1.91	1.61
Centennial	1.90	1.64
R. Burbank	1.80	1.51
TC2-1	1.84	1.84

Table 11 - Potassium, phosphorus, calcium, magnesium, iron, copper, and zinc content of 8 clones evaluated in 1983-84 storage season.

Clone	% Potassium	% Phosphorus	% Calcium	% Magnesium	PPM Iron	PPM Copper	PPM Zinc
A72685-2	1.71 (.15)	0.146 (.018)	0.308 (.333)	0.094 (.014)	34.2 (18)	5.5 (2)	13.9 (2.1)
R. Burbank	1.51 (.16)	0.122 (.008)	0.446 (.527)	0.091 (.013)	56.5 (7)	2.5 (.9)	10.8 (3.3)
AC77652-1	1.75 (.14)	0.132 (.013)	0.453 (.394)	0.103 (.011)	54.6 (7)	1.5 (.8)	15.3 (3.1)
AC77514-1	1.61 (.11)	0.145 (.020)	0.544 (.288)	0.097 (.014)	51.8 (26)	2.4 (.7)	12.2 (2.8)
TC2-1	1.84 (.21)	0.145 (.023)	0.191 (.140)	0.097 (.017)	43.1 (11)	3.1 (1.5)	9.4 (4.3)
AD74135-1	1.45 (.05)	0.124 (.011)	0.045 (.006)	0.084 (.007)	32.6 (20)	0.9 (.8)	4.3 (1.3)
Centennial	1.64 (.05)	0.170 (.022)	0.041 (.004)	0.094 (.006)	35.6 (25)	0.0 (0)	4.1 (2.3)
A74212-1	1.43 (.07)	0.118 (.008)	0.040 (.008)	0.081 (.009)	27.8 (17)	0.4 (.5)	3.1 (1.6)
Mean	1.618	0.138	0.259	0.093	42.025	2.038	
$LSD_{.05}$	0.18	0.017	0.336	NS	NS	1.34	2.8
Range	1.43-1.84	0.118-0.170	0.040-0.544	0.081-0.103	27.8-56.5	0-5.5	3.1-15.3
% Lowest / Highest	78%	69%	7%	79%	49%	-	20%

III. INFLUENCE OF STORAGE AND TIME OF BRUISING ON BLACKSPOT SUSCEPTIBILITY OF RUSSET BURBANK.

Blackspot of Russet Burbank potatoes is quite often detected by shipping point inspectors in potatoes that are retained a few days on the shipping floor after grading and packaging. The time of the injury which incited the blackspot is unknown. Some feel that the major cause of the blackspot is injury that occurs during post storage handling operations - fluming, washing, grading, packaging, etc.

This rather limited study was done to gain some information on this question.

The treatments and the results are summarized in table 12. The four treatments were replicated four times with ten tubers in each replication. The tubers were bruised on the stem, middle, and bud end with a hemi-spherical 150 gram weight dropping 45 cm.

Treatment one was bruised and immediately placed at 28°C (82°F) and read for blackspot after 36 hours. Treatment two was bruised the same as treatment one but placed immediately in 4°C (39°F) storage and read for blackspot after five months without warming. Treatment three was the same as treatment two but was warmed at 28°C (82°F) for 36 hours before reading. Treatment four was placed in 4°C without bruising and stored five months. Tubers were then bruised and read after holding at 28°C for 36 hours.

The treatments differed significantly in the % loci discolored, color and mean volume of the spot and index. Treatments one and two resulted in nearly identical blackspot as indicated by the % loci discolored,

Table 12 - Influence of storage and time of bruising on blackspot susceptibility of Russet Burbank.

No.	Treatment	% Loci discolored				Color	Mean Volume	Index
		Stem	Mid	Bud	Mean			
1	Bruise at 4°C 9/30/82 Hold 28°C 36 hrs.	63	85	70	73	2.4	498	175
2	Bruise at 4°C 9/30/82 Store 5 mo. at 4°C	55	98	78	77	2.3	494	177
3	Bruise at 4°C 9/30/82 Store 5 mo. at 4°C Hold 28°C 36 hrs.	68	90	73	77	2.6	762	200
4	Store 5 mo. 4°C Bruise at 4°C Hold 28°C 36 hrs.	100	95	88	94	3.2	986	301
	Mean	71	92	77	80			
			sig. 0.01					

Analyses of Variance

Treatment Comparisons				
Factors	F value	0.05	0.01	LSD.05
% Loci discolored	10.0	3.3	5.3	11.0
Color	11.2	3.5	6.0	0.4
Mean volume	4.9	3.5	6.0	327
Index	23.0	3.5	6.0	39

color, mean volume and index. This indicates that bruises before storage will develop blackspot during storage at 4°C identical to that which develops if placed immediately at 28°C.

Treatment three would simulate warming potatoes following storage without additional bruising. This treatment did not differ significantly from treatments one and two. However, the volume of the spot increased from 494 to 762 mm^3 and index increased from 177 to 200.

Treatment four, which was bruised following storage, resulted in a significant increase in the % loci discolored, color, volume of spot and index. This indicates that blackspot susceptibility increased during storage. Perhaps this was due to water loss.

From this small experiment it is apparant that blackspot may develop from harvest and storage bruises and/or from bruises incurred during removal from storage, grading, and packing. Thus, the effect is accumulative. Bruising following storage resulted in more severe blackspot than bruising before storage.

IV. ADDITIONAL STUDIES UNDERWAY

The test clones from the 1983 harvest will be evaluated in April for the same parameters measured last fall. Cut seed weight loss and sprouting behavior will also be assayed.

The following seedling clones are being evaluated for various aspects of cooking quality by Dr. Joe Maga: A72685-1, TC2-1, A74212-1 and A74133-1. Russet Burbank and Centennial will be used for reference.

The relationship of enzymatic browning of tissue slices (frozen and fresh) to blackspot susceptibility of the 1983 test clones is being evaluated. Various materials such as diphenylamine (used to control apple scald), and sulfur carrying substances are being evaluated for their effectiveness to control the browning reaction.

Several tetrazolium dyes (to measure redox potential) are being studied in an attempt to evaluate tuber redox potential and find out if any relationship exists between redox potential and blackspot susceptibility.