

Exp D, a

①

PM

AM

No 7

3-70 Strat fluctuation

41°F to 68°F

(16hrs)

(16hrs)

(8hrs)

Daily Fluctuation

Sus Summit 1969 Seed

Started Jan 5

Date	Time	Into °F	Lot A			Lot B (replicate)			Strat days						
			Tips	Germin.		Tips	Germin.								
			No	Cum	%	No	Cum	%	No	Cum	%				
1970															
Jan 5	4PM	41	0	0	0	0	0	0	0	0	0	0	0		
" 6	9AM	68	0	0	0	0	0	0	0	0	0	0	0		
" 6	4PM	41	0	0	0	0	0	0	0	0	0	0	1		
" 7	8AM	68	0	0	0	0	0	0	0	0	0	0	0		
" 7	4PM	41	13	13		0	0	0	5	5		0	0	2	
" 8	8AM	68	0	13		0	0	0	0	5		0	0	0	
" 8	4PM	41	27	40		0	0	0	19	24		0	0	0	3
" 9	8AM	68	0	40		0	0	0	0	24		0	0	0	0
" 9	4PM	41	19	59		0	0	0	28	52		1	1		4
" 10	8AM	68	0	59		0	0	0	0	52		0	1		0
" 10	1PM	41	3	62		0	0	0	9	61		1	2		5
" 11	7AM	68	7	69		0	0	0	4	65		0	2		0
" 11	10:15A	41													6
" 12	7:00A	68	4	73		0	0	0	4	69		0	2		0
" 12	4:15P	41	5	78		0	0	0	5	74		1	3		7
" 13	7:10A	68	0	78		0	0	0	0	74		0	3		0
" 13	4:00P	41	17	95		1	1		4	78		2	5		8
" 14	8:00A	68	2	97		2	3		4	82		2	7		0
" 14	4:00P	41	11	108		0	3		3	85		1	8		9
" 15	8:00	68	7	115		0	3		7	92		0	8		0
" 15	4:30P	41	7	122		3	6		6	98		2	10		10
" 16	9:00A	68	2	124		2	8		2	100		0	10		0
" 16	4:00P	41	0	124		0	8		6	106		0	10		11
" 17	7:20A	68	0	124		3	11		1	107		0	10		0
" 17	10:20A	41	0	124		0	11		0	107		0	10		12
" 18	6:30A	68	2	126		1	12		2	109		2	12		0
" 18	11:15A	41	2	128		0	12		0	109		0	12		13
" 19	6:30A	68	1	129		0	12		1	110		2	14		0
" 19	4:30P	41	1	130		2	14		0	110		2	16		14
" 20	7:00A	68	1	131		1	15		0	110		2	18		0
" 20	4:00P	41	1	132		7	22		1	111		4	22		15
" 21	6:30A	68	1	133		0	22		0	111		0	22		0
" 21	3:45P	41	0	133		6	28		1	112		4	26		16
" 22	6:45	68	1	134		0	28		1	113		0	26		0
" 22	4:00P	41	0	134		1	29		0	113		9	35		17

Daily

Exp D, 9 Strat. fluctuation 41°F (16hrs) \longleftrightarrow 68°F (8hrs) (2)
Sus. Summit seed

Date	Time of day	Temp °F	135 Lot A			117 Lot B			Days of strat	
			Tips	No	Com %	Tips	No	Com %		
1970 Jan 23	9:00A	68	0	134	2	31	2	115	18	
" "	4:00P	41	0	134	3	34	3	40		
" 24	7:40	68	0	134	0	34	0	40	19	
" "	11:30	41	0	134	0	34	0	40		
" 25	6:30A	68	2	136	5	39	5	45	20	
" 25	11:30A	41	1	137	1	40	9	54		
" 26	6:30A	68	Last tips (End)			3	43	1	55	21
" 26	4:00P	41	(End)			10	53	5	60	
" 27	6:30A	68	(End)			0	53	0	60	22
" 27	3:15P	41	(End)			5	58	5	65	
" 28	6:30A	68	(End)			0	58	0	65	23
" 28	3:10P	41	(End)			5	63	1	66	
" 29	7:20A	68	(End)			0	63	0	66	24
" 29	4:00P	41	(End)			3	66	4	70	
" 30	6:30A	68	(End)			1	67	0	70	25
" 30	3:30P	41	(End)			3	70	1	71	
" 31	6:10A	68	(End)			4	74	3	74	26
" 31	11:30A	41	(End)			0	74	0	74	
Febr 1	7:20A	68	(End)			2	76	1	75	27
" 1	11:30A	41	(End)			0	76	0	75	
" 2	7:35A	68	(End)			1	77	0	75	28
" 2	4:15P	41	(End)			4	81	0	75	
" 3	7:25A	68	(End)			2	83	0	75	29
" 3	4:00P	41	(End)			3	86	2	77	
" 4	7:00A	68	(End)			4	90	1	78	30
" 4	3:15P	41	(End)			7	97	6	84	
" 5	7:00A	68	(End)			0	97	0	84	31
" 5	3:30P	41	(End)			4	101	2	86	
" 6	6:30A	68	(End)			0	101	0	86	32
" 6	2:45A	41	(End)			3	104	6	92	
" 7	6:45A	68	(End)			0	104	0	92	33
" 7	11:30A	41	(End)			0	104	3	95	
" 8	6:30A	68	(End)			2	106	0	95	34
" 8	11:30A	41	(End)			0	106	0	95	

Exp D, g Strat fluctuation $41^{\circ}\text{F} \rightleftharpoons 68^{\circ}\text{F}$ Daily

3

1970			Lot A		Lot B		Strat days	
Date	Time	Temp	Tips	Germ.	Tips	Germ.		
	of day	$^{\circ}\text{F}$	No Cum %	No Cum %	No Cum %	No Cum %		
Febr 9	6:30A	68 $^{\circ}\text{F}$	(Ended)	0 106	(Ended)	0 95	35	
" 9	3:30P	41 $^{\circ}\text{F}$	Jan 25	3 109	Jan 23	2 97		
" 10	6:30A	68 $^{\circ}$	—	0 109	—	0 97	36	
" 10	3:45P	41		0 109		0 97		
" 11	6:30A	68		0 109		0 97	37	
" 11	2:00P	41		1 110		3 100		
" 12	6:40A	68		0 110		0 100	38	
" 12	2:40P	41		1 111		1 101		
" 13	6:45A	68		1 112		1 102	39	
" 13	1:45P	41		1 113		1 103		
" 14	6:25A	68		0 113		0 103	40	
" 14	12:00 noon	41		0 113		0 103		
" 21	4:20P	41		3 116		1 104	47	
" 22	9:00A	68		0 116		0 104	48	
"	3:40P	41		0 116		0 104		
" 23	8:00A	68		0 116		0 104	49	
" 23	2:00P	41		0 116		0 104		
→ 15		41	} Sunday Seed got no attention					
15		41						
16	8:00A	68						
16	4:00P	41						
17	8:00A	68						
17	4:00P	41						
18	8:00A	68						
18	4:00P	41						
19	8:00P	68						
19	4:00P	68						
20	8:00A	41						
20	4:00P	68						
21	8:00A	68						
21	4:20P	41						

(4)

Daily

Exp D₉ Start - fluctuation
Started Jan 5

41°F ↔ 68°F

(4)

Date	135V Lot A			117V Lot B			Start Days
	No	Cum	%	No	Cum	%	
1970							
Febr 22							
23	2:00P	41	0	116	0	104	
24							
25							
26							26 28 13 67
27	8:00A	68	0	116	0	104	
27	4:00P	41	0	116	0	104	
28	10:30A	68	0	116	0	104	
28		68	left in 68°F				
Mar 1	8:00A	41	0	116	0	104	
2	8:30A	68	0	116	0	104	
2	3:00P	41	0	116	0	104	
3	8:00A	68	0	116	0	104	
3	2:00P	41	0	116	0	104	
4	8:00A	68	0	116	0	104	
4	3:00P	41	0	116	0	104	
5	7:45A	68	0	116	0	104	Tips bulging for long time - since seeds went into tip class.
5	2:45P	41	0	116	0	104	
6	7:20A	68	0	116	0	104	
6	3:00P	41	0	116	0	104	
7	8:30	68	0	116	0	104	
7	12:00	41	0	116	0	104	
8	8:00	A	0	116	0	104	
8	11:00	A	0	116	0	104	
9	8:00	A	0	116	0	104	
9	3:00	P	0	116	0	104	
10	8:00	A	0	116	0	104	
10	3:00	P	0	116	0	104	
11	7:00	A	0	116	0	104	
11	3:00	P	0	116	0	104	
12	8:00	A	0	116	0	104	
12	3:00	P	0	116	0	104	
13	7:30	A	0	116	0	104	
13	3:00	P	41	0	116	0	104

End

↓ Into 41°F (Cold Rm) 67 @ 68°F

diagram new on. In stat germination obscured & germ

Exp D, b

①

No 20 16-70 Daily Fluctuation 68°F ↔ 41°F
 Started Jan 12 (16hrs) (8hrs)

Seconville Summit 1969 seed

Date 1970	Time	Into °F	Lot X						Lot Y						
			Tips		Germin		Tips		Germin						
			No	Cum %	No	Cum %	No	Cum %	No	Cum %					
Jan 11	12 ^{noon}		Started soaking. will drain and into 41°F 1/12 7:00A												
" 12	7:00A	41	0	0	0	0	0	0	0	0	0	0	0	0	0
" 12	4:00P	68	0	0	0	0	0	0	0	0	0	0	0	0	0
" 13	7:10A	41	0	0	0	0	0	0	0	0	0	0	0	0	1
" 13	4:05P	68	1	1	0	0	0	0	0	0	0	0	0	0	
" 14	8:00A	41	7	8		0	0	0	12	12	0	0	0	0	
" 14	4:00P	68	4	12		0	0	0	4	16		0	0	0	
" 15	8:00A	41	3	15		0	0	0	3	19		0	0	0	
" 15	4:30P	68	2	17		0	0	0	3	22		0	0	0	
" 16	9:00A	41	10	27		1	1		9	31		1	1		
" 16	4:00P	68	0	27		0	1		0	31		0	1		
" 17	7:30A	41	23	50		0	1		20	51		0	1		
" 17	10:30A	68	0	50		0	1		0	51		0	1		
" 18	6:30A	41	0	50		0	1		3	54		0	1		
" 18	11:15A	68	0	50		0	1		0	54		0	1		
" 19	6:30A	41	1	51		0	1		6	60		0	1		
" 19	4:30	68	0	51		0	1		0	60		0	1		
" 20	7:00A	41	8	59		0	1		5	65		0	1		
" 20	4:00P	68	1	60		0	1		4	69		0	1		
" 21	6:30A	41	10	70		0	1		1	70		0	1		
" 21	4:00P	68	3	73		1	2		1	71		0	1		
" 22	7:00A	41	4	77		2	4		14	85		1	2		
" 22	4:00P	68	7	84		0	4		5	90		0	2		
" 23	9:30A	41	0	84		1	5		7	97		3	5		
" 23	4:30P	68	0	84		0	5		0	97		0	5		
" 24	7:40A	41	1	85		2	7		3	100		1	6		
" 24	11:30	68	0	85		0	7		0	100		0	6		
" 25	6:30	41	8	93		5	12		0	100		0	6		
" 25	11:30	68	0	93		0	12		0	100		0	6		
" 26	6:30A	41	8	101		1	13		9	109		1	7		
" 26	4:00P	68	0	101		0	13		0	109		0	7		
" 27	6:30A	41	0	101		1	14		2	111		4	11		
" 27	3:15P	68	0	101		0	14		0	111		0	11		

Exp D, b Daily fluctuation 68°F ⇌ 41°F (2)

Date 1970	Time	Temp °F	Continued				Started Jan 12 1970 (2)				Days Strat. -12
			Lot X		Lot Y		Lot Y		Lot Y		
			Tips	Germ.	Tips	Germ.	Tips	Germ.	Tips	Germ.	
No	Cum %	No	Cum %	No	Cum %	No	Cum %	No	Cum %		
Jan 28	6:30A	41	2	103	3	17	6	117	0	11	16
" 28	3:15P	68	0	103	0	17	0	117	0	11	
" 29	7:20A	41	1	104	8	25	0	117	3	14	17
" 29	4:00P	68	0	104	0	25	0	117	0	14	
" 30	6:30A	41	0	104	3	28	1	118	2	16	18
" 30	3:30P	68	0	104	0	28	0	118	0	16	
" 31	6:15A	41	2	106	0	28	3	121	3	19	19
" 31	11:30A	68	0	106	0	28	0	121	0	19	
Febr. 1	7:30A	41	3	109	5	33	1	122	4	23	20
" 1	11:30A	68	0	109	0	33	0	122	0	23	
" 2	6:40A	41	0	109	1	33	3	125	2	25	21
" 2	4:20A	68	0	109	0	33	3	125	0	25	
" 3	7:30A	41	2	111	1	34	2	127	1	26	22
" 3	4:00P	68	1	112	0	34	3	129	0	26	
" 4	7:00A	41	0	112	0	34	0	129	1	27	23
" 4	3:20P	68	0	112	0	34	0	129	0	27	
" 5	7:00A	41	1	113	2	36	1	130	3	30	24
" 5	3:30P	68	0	113	0	36	0	130	0	30	
" 6	6:30A	41	2	115	2	38	5	135	6	36	25
" 6	2:50P	68	0	115	0	38	0	135	0	36	
" 7	6:50A	41	3	118	1	39	1	136	1	37	26
" 7	11:30A	68	0	118	0	39	0	136	0	37	
" 8	6:30A	41	0	118	0	39	0	136	0	37	27
" 8	11:30A	68	0	118	0	39	0	136	0	37	
" 9	6:40A	41	1	119	2	41	0	136	3	40	28
" 9	3:30P	68	0	119	0	41	0	136	0	40	
" 10	6:30A	41	0	119	0	41	0	136	0	40	29
" 10	3:50P	68	0	119	0	41	0	136	0	40	
" 11	6:30A	41	0	119	1	42	1	137	1	41	30
" 11	2:00P	68	0	119	0	42	7	144	0	41	
" 12	7:40A	41	0	119 B	0	42 B	0	144 B	1	42	31
" 12	2:40P	68	0	119	0	42	6	144	0	42	

↓ B = Bulging Radicals about to break through embryo sac.

Exp D, 6 Daily fluctuation

68°F \rightleftharpoons 41°F (3)
 (16 hrs) (8 hrs)

Date	Time	Into °F	Lot X			Lot Y			Days strat		
			Tip No	Cum %	Germ No Cum %	Tip No	Cum %	Germ No Cum %			
1970											
Febr 13	7:00 A	41	0	119	0	42	0	144	0	42	
"	1:40 P	68	0	119	0	42	0	144	0	42	
" 14	6:30 A	41	0	119	1	43	0	144	0	42	
" 14	12:00 ^{noon}	68	0	119	0	43	0	144	0	42	
" 21	4:20 P	68	4	123	0	43	6	150	0	42	
" 22	9:00 A	41	0	123	1	44	0	150	0	42	
" 22	3:40 P	68	0	123	0	44	0	150	0	42	
23	8:00 A	41	0	123	0	44	0	150	0	42	
23	2:00 P	68	0	123	0	44	0	150	0	42	
15	}	68	{ Sunday. Seed got no attention								
15	}	68									
16	8:00 A	41									
16	4:00 P	68									
17	8:00 A	41									
17	4:00 P	68									
18	8:00 A	41									
18	4:00 P	68									
19	8:00 A	41									
19	4:00 P	41									
20	8:00 A	68									
20	4:00 P	41									
21	8:00 A	41									
21	4:20 P	68	I returned from Colo, Utah trip								
24											
25											
26											
27	8:00 A	41	1	124	2	44	0	150	1	43	
27	4:00 P	68	0	124	0	44	0	150	0	43	
28	10:30 A	41	1	125	0	44	0	150	3	46	
28			left @ 41°F								
Mar 1	8:00 A	68	0	125	0	44	0	150	0	46	
2	8:30 A	41	0	125	0	44	0	150	0	46	

Exp D, 6 Daily Sterilization 68°F \leftrightarrow 41°F (4)

(16hrs) (8hrs)

Date	Time	Intro °F	Invariable				Days Start
			Lot X		Lot Y		
			Tips No Germ %	Germ No Germ %	Tips No Germ %	Germ No Germ %	
1970							
Mar 2	8:30 AM	41	0 145	0 44	0 150	0 46	
" 2	3:00 PM	68°	0 145	0 44	0 150	0 46	
" 3	8:00 AM	41	5 130 ^{12 hrs}	0 44	5 155 ^{13 hrs}	0 46	
" 3	2:00 PM	68	0 130	0 44	0 155	0 46	
" 4	8:00 AM	41	0 130	0 44	0 155	1 47	
" 4	3:00 PM	68	0 130	0 44	0 155	0 47	
" 5	8:00 AM	41	4 134	0 44	5 160	0 47	
" 5	3:00 PM	68	0 134	0 44	0 160	0 47	
" 6	7:20 AM	41	0 134	0 44	0 160	1 48	
" 6	3:00 PM	68	0 134	0 44	0 160	0 48	
" 7	8:30 AM	41	0 134	0 44	0 160	0 48	
" 7	12:00 Noon	68	0 134	0 44	0 160	0 48	
" 8	8:00 AM	41	0 134	0 44	0 160	2 50	
" 8	11:00 AM	68	0 134	0 44	0 160	0 50	
" 9	8:00 AM	41	0 134	0 44	0 160	0 50	
" 9	3:00 PM	68	0 134	0 44	0 160	0 50	
10	8:00 AM	41	0 134	0 44	0 160	0 50	
10	3:00 PM	68	0 134	0 44	0 160	0 50	
11	7:00 AM	41	0 134	0 44	0 160	0 50	
11	3:00 PM	68	0 134	0 44	0 160	0 50	
12	8:00 AM	41	1 135	1 45	0 160	0 50	
12	3:00 PM	68	0 135	0 45	0 160	0 50	
13	7:30 AM	41	0 135	0 45	0 160	0 50	
13	3:00 PM	48	0 135	0 45	0 160	0 50	
14	9:00 AM	41	0 135	0 45	0 160	2 52	

Intro 41°F from now on. In stat germination observed
Cold Room

Note!

Germination of ungerminated seeds remaining at end of test these seeds into 40°F strat

Exp D

Experiment

Alternation

42°F ↔ 68°F ←

End alternation and into 40°F Mar 13 1970 3:00 PM

Date	Time of day	Germ. time (days)	No.	Tips		Germination			Strat. No. of days
				Cum.	%	No.	Cum.	%	
	Sample A		(19)	(19V)					(10)
Mar 23	9:00A out	0	19	19		0	0	0	
" 24	9:00A	1	0	19		tips 10	10		
" 25	7:30A ← Back to strat	2	0	19		1	11		
April 1	8:00A → out strat	3	0	19		1	12		Left in dish
April 2	8:11A	4				7	19		100%
		5							(End)
		6							
		7							
	Sample B		(13)	(13V)					(10)
Mar 23	9:00A out	0	13	13		0	0	0	
" 24	9:00A	1	0	13		6	6		
" 25	7:30A	2	0	13		0	6		
Apr 1	8:00A out of strat	3	0	13		0	6		
Apr 2	8:00	4	0	13		4	10		
Apr 3	8:00A	5				1	11		
" 6	7:00A Back to strat	6	0	13		0	11		
" 18	10:00A out of strat	7	0	13		0	11		
" 25	10:00A → X Back to " " 91	8	0	13		0	11		
Mar 23	9:00A out	0	85	85		0	0	0	(9)
Mar 24	9:00A	1	5 no tips left	86		9	9		
" 25	7:30A Back into strat	2	4 " "	87		29	38		
Apr 1	8:00A out strat	3	0	87		1	39		
" 2	8:00A	4	2	89		25 tips	64		
" 3	8:00A	5	1	90		1 tip	74		
" 6	8:00A Back to strat	6	0	90		0	74		
" 18	10:00A out of strat	7	0	90		0	74		
	Sample Y		(118)	(118V)					(9)
Mar 23	9:00A out	0	111	111		0	0		
Mar 24	9:30A	1	5 no tips left	113		18 tips	19		
" 25	7:30A Back into strat	2	" "	113		1 sep	19		
April 1	8:00A out strat	3	0	113		tips	21		40
" 2	8:00A	4	2	115		21 tips	21		64
" 3	8:30A	5	0	115		25 tips	26		90
" 6	8:00A Back to strat	6	0	115		1 sep	0		90
" 18	10:00 AM out of strat	7	0	115		1	91		

Experiment **Exp. D, Alternation**

Date	Time of day	Sample	Germ. time (days)	Tips			Germination			Strat. No. of days
				No.	Cum.	%	No.	Cum.	%	
		A		()	()					
		out	0							
			1							
			2							
			3							
			4							
			5							
			6							
			7							
									Ended Apr. 2/70	
		B		()	(2)					
Apr 18	10:00A	out	0							
" 28	10:00A		1							
			2							
May 18	10:00A		3							
" 19			4							
			5							
			6							
			7							
									100% End	
		X = X, Y		(91)	(89V)					
April 18	10:00A	out	0							
" 28	10:00A		1		90	4	78			
			2							
May 18	10:00A		3			0	78			
" 19	8:00A		4			5	83			
" 20			5			2	85			
" 25	Back into 30°		6			0	85			
June 8	17 noon		7			0	85			
									100	
		Y		(118)	(116V)					
Apr 18	10:00A	out	0							
" 28	10:00A		1			4	95			
			2							
May 18	10:00A		3			0	95			
" 19	8:00A		4			8	103			
" 20	8:00A		5			9	112			
" 25	Back into 30°		6			2	113			
June 8	17 noon		7			0	113			
July 15	4 P.M.					0	113			
" 20	11 A.M.					3	116		100	

Ended Apr. 2/70

out of strat
 Only 2 seeds left but no germination
 Back into strat @ 30°F (cold room). Strat 15 days
 out of strat
2
100% End

These were similar conditions treated same as last below

Exp No

(21)

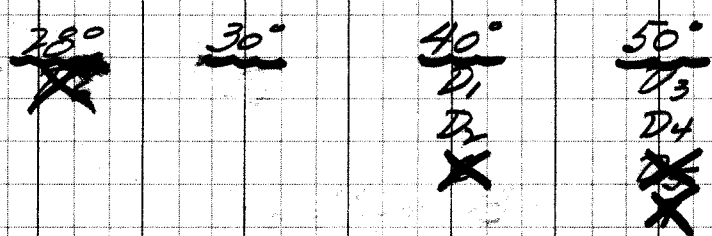
Schedule for moving dishes

Exp. **D** fluctuation 28°, 30° ↔ 40°, 50°

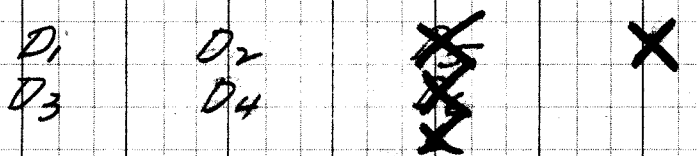
Schedule		Into on date	Schedule cont'd
Date	Time		
June 30	12:00 Noon	B	July 22 8 AM B
July 1		-	24 8 AM Sample ⑦ A
2		A	27 3 PM B
3			29 10 AM A
4			31 12 noon B
5			Aug 3 9 AM Sample ⑧ A
6		B	
7			
8			
9		A	
10			
11			
12			
13		B	
14			
15	10:30 A	A	
16			
17	1:30 PM	B	
20	4 PM	A	

last move
 Samples D₁ & D₂
 @ 40° F until 1 Aug 17

MOVE A



MOVE B



Schedule

Exp D Fluctuations ① to ⑥ & Checks 28° <.....> 50°F

	<u>Date</u>		No of days	temp	Treatment	No of days	Done
May	20	10:00 A	2	under	A		✓
	22	9:00 A	3	"	B		✓
	25	9:00 A	2	"	A		✓
	27	8:00 A	3		⑬	7	✓
	30	8:00 A	2		A		✓
June	1	2:30 P	2		B		✓
	3	9:00 A	2		①	14	✓
	5	9:00 A	3		B		✓
	8		2		A		✓
	10		2		②	21	✓
	12		3		A		✓
	15		2		B		✓
	17		2		④		✓
	19		3		B		✓
	22		2		A		✓
	24		2	3	③		✓
	27		3	2	A		✓
	29		2		B		✓
July	1		2		⑤		✓
	3	5	3		B		✓
	6		2		A		✓
	8		2		⑥		✓
	10	5	3		A		✓
	13		2		B		✓
	15		2		⑦		✓
	17		3		B		✓
	20		2				✓
	22		2				✓
	24		3		Sample		✓
	27		2				✓
	29		2				✓
	31						✓
Aug.	3				Sample		✓

✓ On these dates put samples into temps. shown under A & B on attached sheet

Schedule

Exp. D Fluctuations ① to ⑥ & checks

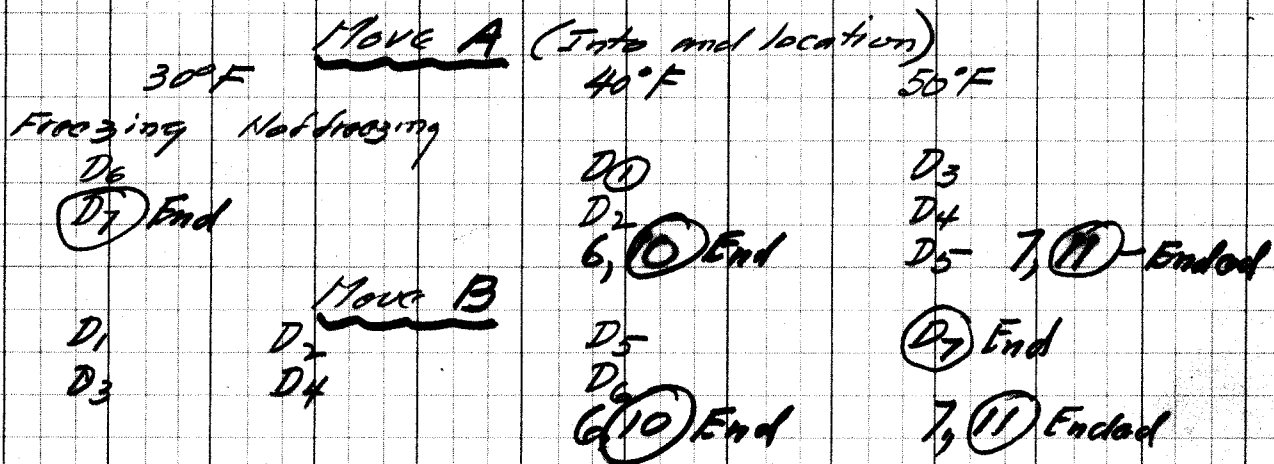
Fluctuations ① to ⑥

No	Treatment	A	B
D		Into	Into
①	30° Freezing ↔ 40°	40°	30° Freezing
②	30° Not freezing ↔ 40°	40°	30° Not freezing
③	30° Freezing ↔ 50°	50°	30° Freezing
④	30° Not freezing ↔ 50°	50°	30° Not freezing
⑤	40° ↔ 50°	50°	40°
⑥	30° Freezing ↔ 40°F	30°	40°
⑦	30° Freezing ↔ 50°F	30°	50°

Checks

6	40° constant	40°	Not fluctuated
7	50° " "	50°	" " "
10	40° " "	40°	" " "
11	50° " "	50°	" " "

Location of samples after moves A & B



Experiment **D₂** $30^{\circ} \leftrightarrow 40^{\circ}$ Wet seed

Started May 20 10:00 A @ 40° **(0)**

Date	Time of day	Germ. time (days)	No.	Tips		%	Germination			No. of days
				Cum.			No.	Cum.	%	
Trout										
		Sample (1) B		(97)			() calc			(7)
May 27	9:00 A	0	0	0	0	0	0	0	0	
28	8:00 A		10	10		0	0	0		
29	8:00 A		4	14		0	0	0		
30	9:00 A		3	17		0	0	0		
31	8:00 A		0	17		0	0	0		
June 1	10:00 A		13	30		0	0	0		
3	9:00 A		6	36		0	0	0		
(End)										
		Sample (2) A		(92)			(78 V)			(14)
June 3	9:00 A	0	4	4		0	0	0		
4	3:00 P	1	42	46		0	0	0		
5	8:30 A	2 (37)	9	55		3	3			
8	1 P M	5	6	61		7	10			
10	11:45 A		1	62		0	10			
(End)										
		Sample (3)		(99)			()			(21)
June 10	11:50 A	0	21	21		0	0	0		
11	8:30 A	(28)	48	69		2	2			
12	9:40 A		7	76		tips 22	24			
13	9:40 A		0	76		" 14	38			
15	9:00 A		0	76		" 3	41			
19	11:00 A		0	76		" 1	42			
(End)										

Experiment

D2

30-40

2

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days
				Cum.	%	No.	Cum.	%	
		Sample	(4)	(131)	(174)	excise	(30)		
June 19	11 AM	0	95	95		0	0	0	
20	10 AM	1	(14)	22	117	tips	15	15	
22	10:30 A	3	3	120		tips	80	95	
23	8:30 A	4	(10)	1	121	tips	1	96	
24	11 AM	5	0	121		"	3	99	
26	10 AM	7	0	121			0	99	80%
10 root tips injured at 30°F as tips started to show?									
(End)									
		Sample	(5)	(113)	(95)				(38)
June 27	10:30 A	0	(24)	89	89	69 tip	0	0	0
29	1:10 P	2	(16)	3	92	5 sup.	74	74	
30	11 AM	3	(14)	2	94	TIP	3	77	
July 1	10 AM	4		0	94	tip	1	78	
2	10 AM	5		0	94	tip	2	80	
6	3:00 PM	9		0	94		0	80	
(END) 84%									
		Sample	(6)	(120)	(108)	excise			
July 15	11:00 AM	0	(14)	38	38		68	68	
16	10:00 AM		(7)	0	38	tips	34	102	
20						tips	6	108	100%
(End)									

Date	Time of day	Sample	Germ. time (days)	No.			Germination			Strat. No. of days
				No.	Cum.	%	No.	Cum.	%	
		Sample 7		(119)	(99V)					
July 24	9 AM	out	0	18	42	42	63	63		to 12 min
31	11 AM		1	germinated but died			36	99		to 5 min
			2							to 60 min
			3							
			4							
			5							
			6							
			7							
							(End)		100%	
		Sample 8		(111)	(96V)					
Aug 3	9 AM	out	0				81	81		
7	3 PM		1				13	94		
17	1 PM		2				7	96		100%
			3							
			4							
			5							
			6							
			7							
							(End)			
		Sample 9		(137)	(124)					
Aug 17	2 PM	out	0	Aug 3-17			124	124		This start @ 40°F
			1							100%
			2							
			3							
			4							
			5							
			6							
			7							
										100% germ viable seeds
							(End)			
		Sample		()	()					
		out	0							
			1							
			2							
			3							
			4							
			5							
			6							
			7							
							(Finished)			

Experiment

D③

28° ← → 50°

Wet seed

Started May 20, 10A @ 50° ①

Date	Time of day	Germ. time (days)	No.			Germination			No. of days	Treat
			No.	Cum.	%	No.	Cum.	%		
Sample ① B										
				90						Calc
May 27	9:00A	0	2	2		0	0	0		⑦
28	9:30A		16	16		0	0	0		
29	8:00A		9	25		0	0	0		
30	9:00A		3	28		0	0	0		
31	8:00A		0	28		0	0	0		
June 1	10:00A		1	29		0	0	0		
" 3	9AM		55	6	35		0	0	0	(End)
Sample ② A										
				93						Calc
June 3	9AM	0	14	14		0	0	0		⑭
4	3PM		36	50		0	0	0		
5	9:00		0	50		0	0	0		
8	1PM		3	53		2	2			
10	11:55		38	2	55		0	2		
After 40°F start sound - many root tips injured at 28°F (End)										
Sample ③										
				88						Calc
June 10	11:55A	0	30	30		sup 1	1			⑳
11	8:30A		15	45		0	1			
12	10:00A		6	51		0	1			
13	9:40A		3	54		1	2			
15	9:00A		1	55		0	2			
19		9	3	58		1	3			(End)

Experiment D3 18-50

Date	Time of day	Germ. time (days)	Tips			Germination			No. of days
			No.	Cum.	%	No.	Cum.	%	
		Sample	(4)			(173) (111)			(30)
June 19	11AM	0	52	52		3	3	Left in dish	
20	10 AM	1	5	57		0	3	tips frozen	
22	11 AM	3	3	60		0	3	None Dead Discard	
23	8:30 A	4	0	60		0	3		
24	11 AM	5	7	67	Tips	1	4	left	
26		7	6	73	Tips	1	5	only 2 normal during germ.	
			8 frozen tips			(End)			2%
		Sample	(5)			(113) (89)			38
June 27	10:30 A	0	26	26	sup	6	6	sprouted & died	
29	1:40 PM	2	49	75		0	6		
30	11 AM	3	3	78		0	6		
July 1	10:30	4	0	78	TIP	1	7		
2	10:05	5	1	79		0	7		
6	10:30 am	9	0	79		0	7	1% only normal	
						(End)			
		Sample	(6)			(130)			
July 15	11:30 AM	0	39	39		1	1	These germs but killed @ 28°F	
16	10:00 AM		16	55		6	7	But so far only 1 normal	
20	9:30 A		6	61		0	7		
24	9:30 A		8	69		2	9	1%	
						(End)			

Date	Time of day	Sample	Germ. time (days)	Tips			Germination			Strat. No. of days
				No.	Cum.	%	No.	Cum.	%	
July 24	9 AM	Sample ② out	0	(78)	(17)	(17)	3	3		Best dead
" 31	11:45 A		1				1	4		
			2							
			3							
			4							
			5							
			6							
			7							
Aug 3	8:30	Sample ⑧ out	0	(116)	()	(Calc)	0	0		
" 7	3 PM		1				1	1		
" 17	1 PM		2				1	2		Stunted
			3							
			4							
			5							
			6							
Oct 14	11 AM		7				78	78		
" 15	9 AM	Sample	0				0	78		
" 16	11 AM	out	1				3	81		
			2					91		
			3							
			4							
			5							
			6							
			7							
Aug 21	9 AM	Sample Supply out	0							
" 21	9 AM		1				2	2		
			2							
			3							
Oct 14	10 AM		4				68	70		
" 15	9 AM		5				1	71		
			6							
			7							

(End)

(End)

Take 41°F strat to
 Check viability
 remaining seeds
 Exposure ungerm. seeds at 78°F not
 harmful?

Note ALL seeds that sprouted
 during 28-50 treatment
 were killed @ 78°F. Those that
 germinated at 68°F apparently
 not stimulated @ 78°F or 50°F
 germinated below that obtained at
 704) 50°F constant

Left @ 50°F at last move
 out of 50°F ←
 Back 40° strat

Total viable (76) Actual

Experiment

D5

40°C → 50°C

Wet seed

Started May 20 10A @ 30°C

⑥

Date	Time of day	Germ. time (days)	No.	Tips		%	Germination			No. of days
				No.	Cum.		No.	Cum.	%	
		Sample	①	B		90		calc		
May 27	9:00A	0	37	37		0	0	0		⑦
28	8:30A		17	54		tips	5	5		
29	8:00A		8	62		tips 3	5	10		
30	9:00A		0	62		sup y	3	13		
31	8:00A		4	66		tips	1	14		
June 1	10:00A		0	66		"	1	15		
3	9:00A		②③	0	66		0	15		
		Sample	②	A		101		calc		
June 3	9:00A	0	54	54		14	14			⑭
4	3PM		18	72		150p	3	17		
5	9AM		②⑤	3	75	tips	2	19		
8	1PM		1	76		"	0	19		
10	12:15A		1	77		1	20	ok		
		Sample	③			93				
June 10	12:15P	0	②⑥	54	54		12	12		⑳
11	8:30A		12	66		tips	3	15		
12	10:00A		2	68		"	4	19		
13	9:45A		1	69		"	3	22		
15	9:30A		0	69		"	0	22		
19	11:00A		0	69		3	25			

Experiment **D5** 40-50

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days	
				Cum.	%	No.	Cum.	%		
		Sample (4)			(148)	(133V)				(30)
June 19	11 AM	0					20	20		
20	10:30 A	1	(23) 101	101		sup	4	24		
22	11 AM	3	2	103		tips	3	27		
23	8:30 A	4	1	104		tips	3	30		
24	11 AM	5	0	104			0	30		
26	10 AM	7	0	104			0	30	23%	
										(End)
		Sample (5)			(115)	(102)				(38)
June 27	11 AM	0	(20) 73	73		22 sup	22	22		
29	1:50 PM	2	(12) 5	78		3 sup	24	46		
30		3	(10) 2	80		TIP	2	48		
July 1	10:30	4	(10) 0	80		Tip	3	51		
2	10:10	5	(10) 0	80			0	51		
6	11:00 AM	9	0	80		tip	2	53		
										(End)
		Sample (6)			(438)	(Calc)				(56)
July 15	10 AM	0			No tips		120	120		
16	10:30 A				Count		30	150		
20	10 AM	5					43	193		
24	9:30	9			into 68° ger		14	207		
31	11:45	16					3	210		
										(End)
										Finish

In strat. observations

Experiment

D6 28° ← → 40°

Stratified seed started

Date	Time of day	Germ. time (days)	No.			Germination			No. of days	
			No.	Cum.	%	No.	Cum.	%		
May 20	10 AM	@ 28°F							(0)	
All seeds left in dish									This essentially tips germination	
Sample (1) only										
May 27	9:00 A	0	Record of seeds that died			11	11			
28	9:00 A		In supply			2	13			
29	8:30 A		Germinated			0	13			
30	8:00 A		No	Cum	%	No	Cum	%		
June 3	9:30 A	-	-	-	-	7	20			
5	9:30 A	-	-	-	-	9	9			
8	1:30 P	-	-	-	-	1	10			
12	10:00 A	5	5			18	28			
22	11:30 A	24	29			9	37		✓	
27	11:00 A	0	29			20	57			
						4	61			
Sample _____										
✓ July 1	10:30	0	(18)	1	?	0	?			
2	10:15			0		TIP 2				
6				2		0				
10				6		TIP 1				
14										
15	10:00	Supply and germinated seeds (prob all dead) into 68°F. Put into 28°F for 72 hrs July 17								
" 17		Out of 28°F and into 68°F								
" 20		All dead								
" 24		0%								
Sample _____										
						Finished				
On June 22	seed distribution	germinated	dead	86	Dish 1					
		"	"	21	} Dish 2					
		tips		25						
		supply		19						
				<u>151</u>						
				Total						

Experiment

D7

28° ↔ 50°

Stratified Seed (tips)

Started May 20 10AM @ 28°F (0)

-27°F

Date	Time of day	Germ. time (days)	Tips			Germination			No. of days
			No.	Cum.	%	No.	Cum.	%	

Observe in strat. Leave germinated seeds in dish

Date	Time of day	Germ. time (days)	Tips	Germination	No. of days
May 27	9AM	0	161	137	137
28	9AM	1	5	0	137
29	8:30A	2	6	1	1
30		3	7	1	2

Only (1) B (161) ()
 growth @ 50°
 ↓
 -2-12mm (7)
 These seeds frozen 2 times so far. All dead
 5 look alive
 1 tips
 17 no tips left
 Live Left in dish
 " " "

This is a record for 24 seeds

Date	Time of day	Germ. time (days)	Tips	Germination	No. of days
June 3	9:30	0			
5	9:30	1			
8	1PM	2			
12	10:00AM	3			

All of these seeds about dead or will die.
 " " " " " " " " " "
 1 more germinated in supply. The rest dead
 All of these seeds now dead

(End)

Seeds killed @ 27°F as growth of radicals was accelerated at 50°F Radicals froze when reached

Sample () ()
0

g length of 1 to 10 mm. Lots of 3 seeds and tips still alive in 3 seeds at end of test

Experiment

D Check 40° 6. Wet seed

Started May 20 10A @ 40°

⑩

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days
				Cum.	%	No.	Cum.	%	
		Sample ① B			57				
May 27	9:00 A	0	1	1		0	0	0	⑦
28	9:00 A		9	10		0	0	0	
29	8:30 A		10	20	14 tips 15 sep	2	2		
30	9:00 A		3	23		0	2		
June 1	10:00 A		2	25		0	2		
	3 9:30 A	③	0	25 31		0	2		
									(End)
		Sample ②			82		74 V		
June 3	9:30 A	0	11	11		0	0	0	⑭
4	3 PM		⑬ 45	56	6 sep 3 tips	9	9		
5	9 AM		3	59	7 tips	7	16		
8	1 PM		2	61	1 sep 15 tips	16	32		
10	12:30 P					1	33	ok.	
									End
		Sample ③			67				
June 10	17:30 A	0	40	40	150 in count	0	0	0	⑳
11	9:00 A		21	61		8	8		
12	10:00 A		0	61		32	40		
13	10:00 A		0	61		5	45		
15	9:30 A		0	61		1	46		
19	11:00 A		0	61		0	46		

Experiment **D check 40 6.**

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days
				Cum.	%	No.	Cum.	%	
		Sample (4)		(83)		(70V)			(30)
June 19	11 AM	0	Many			0	0	0	
20	10 AM	1	(17)	31	31	Sup	35	35	
22	11 AM	3		0	31	28 tips 2 sup	30	65	
23	9 AM	4	(11)	2	33		0	65	
24	11 AM	5		0	33		0	65	
26	10 AM	7		0	33		0	65	93%
(End)									
		Sample (5)		(63)		(54)			(38)
June 27	11 AM	0	(10)	45	45	sup	8	8	
29	2 PM	2	(7)	1	46	44 sup 2 sup	46	54	
30	11:15	3	(6)	1	47		0	54	
July 1	10:40	4	(6)	0	47		0	54	
2		5	(6)	0	47		0	54	
6	11:30	9		0	47		0	54	
(End) 100%									
		Sample (6)		(131)		(118V) excise			(56)
July 15	11:30 AM	0	(10)	37	37		84	84	
16	10:30 A		(9)			tips	28	112	
20	10 AM					tips	6	118	100%
Finished									

Experiment

D Check 50° 7.Ck Wet seed

Started May 20 10A @ 50°

0

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days
				Cum.	%	No.	Cum.	%	
		Sample							
		(1) B			(63)			-calc	
May 27	9 AM	0	26	26	sup	1	1		(7)
28	9 AM		7	33	tips	3	4		
29	8:30 A		6	39	"	1	5		
30	9:00 A		1	40		0	5		
31	8:00 A		2	42	"	1	6		
June 1	10:00 A		0	42		0	6		
June 3	9:30 A		20	0	42		6		
							(End)		
		Sample							
		(2) A			(79)		(68V)		
June 3	9:30 A	0	(38) 39	39	sup	2	2	10.15 mm	(14)
4	3:00 P		6	45	tips	1	3		
5	9:00 A		0	45		0	3		
8	1 PM		3	48		3	6		
10	17:40 P		0	48		0	6	ok	
							(End)		
		Sample							
		(3)			(75)				
June 10	12:40 A	0	(41) 31	31		3	3	25 mm	(21)
11	9:00 A		10	41		1	4		
12	10:00 A		0	41		0	4		
13	10:00 A		0	41		0	4		
15	9:30 A		3	44		0	4		
19	11:00 A		0	44		1	5		

Experiment *D* choice 50° 7.

Date	Time of day	Germ. time (days)	Tips			Germination			No. of days
			No.	Cum.	%	No.	Cum.	%	
		Sample (4)	(60)			(52V)			(30)
June 19	11 AM	0		most		sup	2	2	
20	10:30 A	1		" "			0	2	
22	11 AM	3	(18)	38	38		2	4	
23	9 AM	4		0	38		0	4	
24	11 AM	5		0	38		0	4	
26	10 AM	7		0	40		0	4	8%
(End)									
		Sample (5)	(59)			(55)			(38)
June 27	11 AM	0	(14)	40	40	sup	5	5	
29	2:00	2	(12)	2	42	Tips		6	
✓ 30	11 AM	3	(10)	2	44	tips	2	8	
July 1	11 AM	4		0	44	tip	1	9	
2	10:20	5	(7)	3	47		0	9	
6	11:30 AM	9		3	50		0	9	
(End)									
		Sample (6)	(145)			(56)			(56)
July 15	9 AM	0	(37)	93	93	sup	15	15	
16	10:30 A			2	95		0	15	
20	9:30 A	5				tips	6	21	
24	9:30 A	9				sup	1	22	
(End)									

Finished

Only in strat observations

Exp D Fluctuation Strat. Seed Checks

constant ←

ch.		10	40°F ←			②	50°F →			
		Days germ	No	Cum	%	Germination	No	Cum	%	Excise
May 20	10:00 AM	0	Into				Into			
22	11:00 AM	2	11	11			118	118		
27	9:00 A	In strat	85	96		In strat	18	136	100%	
28	9:00 A		8	104						
30	9:00 A		6	110						(End)
June 3		②	10	120						
5			0	120						
8	1 PM		1	121						
10	1 PM		0	121	100%					(End)

Experiment

D4 30° ← → 50°

Wet seed

Started May 20 10A @ 50°

⑥

Date	Time of day	Germ. time (days)	No.	Tips		Germination			No. of days	
				Cum.	%	No.	Cum.	%		
		Sample ① B			103					
May 27	9 AM out	0	18	18		0	0	0	⑦	
28	8:30 A		21	39		1	1			
29	8:00 A		13	52		2	3			
30	9:00 A		4	56		0	3			
31	8:00 A		0	56		0	3			
June 1	10:00 A		0	56		1	4			
June 3			③ 8	64		0	4			
									(End)	
		Sample ②			113					
June 3	9 AM	0	51	51		0	0	0	⑭	
4	3 PM		18	69	tips	2	2			
5	9 AM		④ 3	72	tips	5	7			
8	1 PM		1	73	"	2	9			
10	12:10 P		5	78		0	9 ok			
July 31	7:30 P	No red tip injury after 40°F start								(End)
		Sample ③			101					
June 10	12:05 P	0	50	50		2	2		⑳	
11	8:30 A		14	64		0	0			
12	10:00 A		0	64		2	4			
13	9:40 A		0	64		0	4			
15	9:00 A		⑤ 3	67		0	4			
19	11:00 A	9	1	68		0	4			

Experiment

24

30-50

Date	Time of day	Germ. time (days)	No.	Tips			Germination			No. of days
				Cum.	%	No.	Cum.	%		
		Sample 4		(100)		(90V)			(30)	
June 19	11 AM	0	46	46	sup	3	3	Root tip injury?		
20	10 AM	1	10	56		0	3			
22	11 AM	3	15	71	tips	3	6	these left in dishes		
23	8:30	4	1	72		0	6			
24	11 AM	5	3	75		1	7	lost		
26	10 AM	7	0	75		0	7	6 normal		
7 with some degree of root tip injury						(End)	7%			
		Sample 5		(102)		(89)		(38)		
June 27	11 AM	0	24	77	sup.	1	1			
29	1:45	2	15	85	tips	12	13			
30	11 AM	3	13	87	tips	1	14			
July 1	10:30	4	0	87		0	14			
2	10:10	5	0	87		0	14			
6	11:00 AM	9	0	87		1	15	17%		
						(End)				
		Sample 6		(111)		(97V)		excise		
July 15	11:30 AM	0	21	77		13	13			
16	10:30 A				27 tips	28	41			
20	9:45 A				15 sup	13	54			
24	9:30 A			1	12 tips	1	55			
						(End)				

Experiment

D4

30-50

3

Date	Time of day	Germ. time (days)	Tips			Germination			Strat. No. of days
			No.	Cum.	%	No.	Cum.	%	
	Sample (7)		(177)	()					
July 24	9 AM out	0	(28) 90	90		9	9		to 35 mm roots slanted
31	11:45 A	7	Back into 40° strat.			33	42		
Aug 17	9 AM	5	out of strat			(End) (84) ()			
20	10 AM	4				38	38		
21	6 AM	5				4	42		
24		7				3	43		
	Sample (8)		(85)	()					
Aug 3	9:30 A out	0				18	18		
7	3 PM	1				72	40		
17	1 PM	2	Back into strat 40°F			6	<u>46</u>		
		3					39		
Oct 14	10 AM	4				76	72		
		5							
		6							
		7	Left at 50° on last move						
	Sample Supply		(178)	()					
Aug 21	9 AM out	0	Out of 50°F ←			21	21		
		1	Back 40° strat						
		2							
Oct 14	10 AM	3				82	103		
		4							+ 3 inside
		5							
		6							
		7							
	Sample		()	()					
	out	0							
		1							
		2							
		3							
		4							
		5							
		6							
		7							

Experiment

D1

28-40

2

Date	Time of day	Germ. time (days)	No.			Germination			No. of days
			No.	Cum.	%	No.	Cum.	%	
		Sample (4)		(99)		(90V)		(30)	
June 19	11:00A	0	25	25		0	0	0	
20	10:00A	1	(38) 36	61	tips	5	5		
22	10:15A	3	10	71	28 tips 4 sup	32	37		
23	8:30A	4	2	73	tips	7	44		
24	11:00A	5	1	74	"	6	50		
25	10:00A	6	0	74		0	50		
26	10:00A	7	0	74		0	50	56%	
<p>Root tip injury on 9 seeds No doubt because 78°F after tips showing</p> <p>(End)</p>									
		Sample (5)		(102)		(92)		(38)	
June 27	10:10A	0	6	6		0	0	0	
29	1:10 PM	2	(2) 33	39	5 tips 42 sup	47	47		
✓ 30	11 AM	3	3	42	tips	7	54		
July 1	10 AM	4	0	42	tips	1	55		
2	10 AM	5	0	42		0	55		
6	2:30 PM	9	3	45		1	56		
<p>(END)</p>									
		Sample (6)		(141)					
July 15	11:00 AM	0	(98) 42	42		1	1		
16	10:00 AM		38	80	12 tips 11 sup	23	24		Abnormal
20		5			50 tips	69	93		germ many
24		9	(13) tips (29) sup	5	13 tips 2 sup	6	99		
<p>(End)</p>									

Date	Time of day	Germ. time (days)	Tips			Germination			Strat. No. of days
			No.	Cum.	%	No.	Cum.	%	
July 24	9 AM out	0	(123)	(36)	(36)	← calc (94)	(0)	(0)	
31	11 AM	7				32 tips	71	71	
Aug 3		10				39 sep	1	72	
		11							
		12							
		13							
		14							
		15							
		16							
		17							
Aug 3	9 AM out	0	(134)	(30)	(30)	-calc (100)	(0)	(0)	
7	3 PM	1					74		
17	1 PM	2				100 Total viable	17	91	
		3							
		4							
		5							
		6							
		7							
Aug 17	3 PM out	0	(198)	(80)	(80)	(160)	(80)	(80)	
19	8 AM	1					53	133	
20	10:00 AM	2					7	140	
21	9 AM	3				Back 40° start	3	143	
		4							
Oct 14	10 AM	5					15	158	
		6							
		7							

Left @ 40°F on last move
 This start @ 40°F Aug 3-17

? ~~tips~~ germination viable seeds
 See record below
 End

+2 viable
 (End)