

Cold Sand Germination as an Indicator of Actual Field Emergence, Lee Hubbell, and Richard List, Monitor Sugar Company, P.O. Box 39, Bay City, MI 48707

Stand establishment is one of the main obstacles our growers experience in producing a successful sugar beet crop. The importance of this problem is accentuated because lack of stand can cause the crop to be destroyed. Our seed sold averages 94 percent lab germination, and field survival to harvest is only 55 percent. This caused us to question the reliability of the warm germination test as an indicator of field performance. Our growers have had a better average stand in recent years, but this only because of closer seed spacing. In 1981, the grower seed spacing was about 6.5 inches, and in the last two years it has been about 4.8 inches.

Table 1
1997

VARIETY	YEAR	SIZE	COLD GERMINATION		LAB GERMINATION		FIELD GERM %
			TEST 1 24 Days	TEST 2 21 Days	5 Days	10 Days	Avg. of Three
ACH 185	1997	3	51	41	65	77	67.5
ACH 185	1997	2	49	37	78	86	71.3
E 17	1997	4	76	66	98	99	74.7
ACH 197	1997	3	39	29	87	99	60.1
ACH 503	1997	3	66	39	87	88	69.2
E 17	1997	4	90	89	93	99	86.0
ACH 308	1996	3	72	66	93	98	62.6
ACH 308	1997	2	76	73	91	95	71.8
E 17	1997	2	92	76	98	98	91.8
E 17	1996	2	83	75	90	93	82.6
E 17	1996	2	88	71	94	97	88.8
ACH 185	1996	2	62	42	78	89	70.6
E 17	1997	3	89	87	98	98	79.3
ACH 308	1996	3	62	60	93	94	66.7
E 17	1997	3	80	73	95	95	81.5
E 9	1997	3	56	40	88	92	79.7
E 4	1997	3	55	39	86	86	65.5
E 10	1997	3	70	46	89	89	65.8
ACH 185	1996	3	62	42	93	94	68.8
ACH 308	1997	3	76	61	97	99	70.4
ACH 308	1997	4	58	39	90	90	69.3
E 17	1997	3	80	61	98	99	80.1
E 17	1997	3	80	66	95	98	76.5
E 17	1997	2	75	73	90	95	86.7
MEAN			70.3	58.0	90.2	93.6	74.5

PURPOSE:

The purpose was to see if germinating sugar beet seed in sand at cold temperatures would be a better indicator of field emergence than the traditional lab germination at room temperature. This would be used to evaluate emergence of different varieties and seed lots being prepared for sale.

PROCEDURE:

Sterile silica sand is used. We mixed 500 ml. of water with 25 pounds of sand. There are 50 seeds planted in a plastic shoebox. One-half inch of sand is placed below the seed and the seed is covered with one and one-half inches of sand. The box is covered with plastic wrap under the cover. After comparing three different temperature combinations in 1996, the correlation was best using 40°F for three days and 50°F for the balance. This temperature regime was used the next two years.

A second part of the test is to have the seed germinated in the normal lab method, using a high moisture chamber at 70°F.

The third part of the test is to plant the different seed lots in the field at three locations each year.

The germination and stand counts for all three methods were counted and compared.

Table 2
1996
CORRELATION

	KNOCHEL	SYLVESTER	WEGENER	AVG. OF 3
FIELD GERM. % EMERGENCE	48.0	33.4	83.4	54.9
<u>CORRELATION</u>				
COLD GERM. *TEST 1, 20 DAYS	.893	.723	.641	.860
COLD GERM. **TEST 2, 14 DAYS	.858	.665	.584	.793
COLD GERM. ***TEST 3, 18 DAYS	.585	.657	.669	.740
COLD GERM. AVG. OF THREE	.902	.773	.708	.907
LAB GERM. 5 DAYS	.555	.552	.235	.480
LAB GERM. 10 DAYS	.481	.628	.413	.556

* Test 1 - Three days at 40 degrees, and then 50 degrees for the balance.

** Test 2 - Three days at 40 degrees, three days at 65 degrees, and then 50 degrees for the balance.

***Test 3 - Four days at 65 degrees, one day at 37 degrees, and then 50 degrees for the balance.

RESULTS:

In 1996, we included new saleable seed lots and a few seed lots up to five years old. The correlation to the cold germination test was much better using only current saleable varieties. This was good, because testing new seed was the original intent.

Table 3
1997
CORRELATION

	BEBOW	KNOCHEL	SYLVESTER	AVG. OF 3
FIELD GERM. % EMERGENCE	66.9	86.3	70.2	74.5
CORRELATION				
COLD GERM. *TEST 1, 24 DAYS	.546	.748	.728	.718
COLD GERM. **TEST 2, 21 DAYS	.530	.708	.639	.667
COLD GERM. AVG. OF TWO	.553	.747	.700	.711
LAB GERM. 5 DAYS	.218	.494	.429	.394
LAB GERM. 10 DAYS	.182	.466	.434	.371

Table 4
1998
CORRELATION

	JUREK	MAXWELL	SYLVESTER	AVG. OF 3
FIELD GERM. % EMERGENCE	36.8	60.7	64.7	54.1
CORRELATION				
COLD GERM. *TEST 1, 22 DAYS	.570	.369	.434	.577
COLD GERM. *TEST 2, 24 DAYS	.753	.441	.349	.668
COLD GERM. AVG. OF TWO	.553	.747*	.700	.711
LAB GERM. 5 DAYS	.488	-.002	.286	.339
LAB GERM. 10 DAYS	.336	.135	.301	.323

Included in Table 1 are the complete numbers from 1997. The line that is highlighted, as an example, has the lowest field germination, 60.1 percent. In the cold germination test, the emergence was 39 percent and 29 percent. The warm lab germination ended up at 99 percent. The cold test was a better indicator of a lower field germination.

Tables 2-4 cover the correlation between the field emergence and the cold germination and lab germination. There is fluctuation between the actual numbers, but the cold germination test has a better correlation with field emergence than the warm lab germination.

The summaries of the emergence and stand counts are in Table 5. The summary of the correlation numbers is in Table 6.

Table 5
COMPARISON

VARIETY	COLD GERMINATION %				LAB GERMINATION %		FIELD GERMINATION %			
	TEST 1	TEST 2	TEST 3	AVE. OF 3	GERMINATION %		1	2	3	Avg. OF 3
					5 Days	10 Days				
1996	67.5	70.8	79.3	72.5	89.0	95.0	47.0	33.6	83.3	54.6
1997	70.3	58.0		64.2	90.2	93.6	66.9	86.3	70.2	74.5
1998	54.5	64.8		59.7	90.5	95.9	36.8	60.7	64.7	54.1

Table 6
CORRELATION SUMMARY

VARIETY	COLD GERMINATION				LAB GERMINATION	
	TEST 1	TEST 2	TEST 3	AVG. OF 3	GERMINATION	
					5 Days	10 Days
1996	.860	.793	.740	.907	.480	.556
1997	.718	.667		.711	.394	.371
1998	.577	.668		.673	.339	.323

CONCLUSIONS:

After three years, this cold germination test has shown a value as an indicator of field emergence. The results from this type of test may be combined with other evaluations to compare varieties and lots of seed before selling.