SEED VIGOR TESTING IN ALABAMA

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The Alabama State Department of Agriculture has been conducting a seed vigor testing program for the past three years. Our vigor tests are limited to four crops; cotton, corn, soybeans and peanuts.

The purpose of our seed vigor testing program is to provide the farmers with additional information concerning the quality of their seeds. Seed dealers may use the results of our vigor tests as an aid in their quality control programs. The results of our vigor tests are not to be used for labeling purposes.

Our vigor tests are designed to identify those lots of seed which will succeed under a wide range of field conditions as distinguished from those that will succeed only under a much narrower range of favorable conditions. High vigor seed should establish a stand under favorable, fair and relatively unfavorable conditions. That is, they will succeed under a wide range of field conditions. Medium vigor seed have been found to be unpredictable in their performance; some will succeed under a relatively wide range of field conditions, while others will succeed only under a more narrow range of conditions. Low vigor seed are expected to succeed only under very favorable conditions, if at all.

We are conducting two basic types of vigor tests in Alabama. The Texas Cool Test or Cool Germination Test which is used as a vigor test for cottonseed and the Accelerated Aging Test which is used as a vigor test for corn, peanuts and soybeans. Since the greatest interest is in cotton and soybeans, this discussion is limited primarily to these two crops.

The first test discussed is the Texas Cool Test or Cool Germination Test. This test was developed by Dr. Luther Byrd, Texas A&M University. The test is conducted by placing the seed on moist paper towels just as one would for the standard germination test. The seed are then placed in a germinator set at 18C or 65F constant temperature. Machine delinted seed remain at this temperature for seven days, acid delinted seed for six days. At the end of this period all seedlings 1½-inch long or longer and otherwise normal are considered as high vigor.

The greatest problem encountered with the Texas Cool Test has been the tendency of new crop cottonseed to revert to a dormant state for several months after harvest. These dormant seed are not dormant when tested by the standard germination procedures. These are steps that can be followed to overcome this problem near the end of the dormancy period.

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The vigor test should relate to what happens in the field under stress conditions. For this reason, we have been conducting field emergence tests in an effort to correlate our laboratory vigor tests with stress conditions in the field. The data in Table 1 permits a comparison among twenty samples of cottonseed tested during 1974.

The first field planting was made April 11, 1974. Note the highest field emergence obtained on this date was 32%. Approximately six days after the first field planting, the temperature dropped to near freezing and was very cool for several days. These seed were subjected to a great deal of stress. Cottonseed are often planted the last week of March or the first week of April in the Tennessee Valley area of north Alabama. It is expected that cottonseed planted at this time will be subjected to a great deal of stress. Some people say that the farmers should not plant their cotton this early, however, early planted cotton usually makes the farmers more money. This being the case, there is good reason for them to plant early.

Further note that of the top six performers in the Texas Cool Test (Table 1) five were in the top six performers in the field at the first planting. Only three of the top six performers by the standard germination test were in the top six in the field at the first planting.

Table 2 gives the data for nine samples of cottonseed tested in 1976. Each of the field emergence test results given are the average of four - 100 seed replicates randomly planted on each date. The top four performers in the cool test were the top four performers in the field for the first planting. Also, the top four performers by the standard germiantion test were the top four performers in the field. Thus, the standard germination and vigor test were equal in determining the best performers in the field in this test.

We determine both rank correlation and percentage correlation when comparing our laboratory vigor and field emergence tests under stress conditions. In this case, both the laboratory vigor and the standard germination tests did a good job in obtaining rank correlation. However, the cool test was far superior for obtaining percentage correlation in both the first and second plantings.

The Accelerated Aging Test is used as a vigor test for soybeans, corn and peanuts. This test is conducted by placing soybean seed in an aging chamber at 41C (106F) and high humidity. The seed are left in this chamber for 96 hours. After aging the soybeans are removed from the chamber. A sample is taken from each tray in the chamber and tested for moisture. The seed should contain between 17 and 18% moisture if the test conditions have been proper. The seed are then placed in rolled towels and germinated as a standard germination test. The seedlings are counted on the fourth day and all seedlings 2-inches long or longer and normal in development are considered as high vigor.

The data presented in Table 3 represents twenty-four lots of soybean seed tested in 1974. The first two field emergence plantings were

Table 1. Laboratory and field emergence test results from 20 lots of cottonseed.

Lab. No.	Standard Germ.	Texas Cool Test	Field Emergence Tests (Planting Dates) 4/11/74	4/26/74	5/14/74
71256	88%	42%	4%	35%	54%
71282	92	52	5	40	66
71285	88	55	5	46	62
71307	71	33	13	38	43
71344	51	3	1	6	6
71357	88	37	2	32	42
71454	91	61	32	60	80
71558	76	46	11	53	65
71622	73	44	5	41	46
71649	91	65	25	54	73
71885	69	33	11	29	33
71889	80	40	13	31	32
71891	80	55	12	49	46
71895	88	47	23	37	46
71898	85	57	16	49	56
71914	84	58	17	42	61
71916	76	47	7	32	46
71917	75	51	2	39	52
71931	81	49	6	52	59
71968	82	55	15	40	31
Average	80.45%	46.50%	11.25%	40.25%	49.95%

Table 2. Laboratory and field emergence test results from nine lots of cottonseed.

Lab. No.	Standard Germ. %	Texas Cool Test %	Field Emergence Tests (Planting Dates) 4/11/74 %	4/26/74 %	5/14/74 %
88394	83	38	38	49	59
88396	76	29	38	37	51
88409	89	56	60	59	70
88416	93	67	56	64	78
88417	92	55	56	64	75
88421	82	44	34	33	52
88422	87	57	38	44	57
88423	80	36	25	33	49
88429	76	25	34	41	50
Average	88.22	45.22	42.11	47.11	60.11

Table 3. Laboratory and field emergence test results from 24 lots of soybeans.

Lab. No.	Standard Germ. %	96-hr. Acc. Aging Test %	Field Emergence Tests (Planting Dates) 4/11/74 %	4/26/74 %	5/14/74 %
70997	79	67	40	25	76
70998	64	43	30	31	49
71001	72	42	38	32	66
71003	51	42	46	19	56
71036	83	73	77	50	61
71145	80	60	36	18	44
71172	87	64	30	24	69
71272	93	87	93	85	93
71332	90	69	57	37	86
71333	92	48	50	32	78
71413	73	26	20	4	33
71414	88	46	60	36	78
71518	82	33	37	14	53
71536	82	29	36	16	62
71541	89	76	88	84	90
71542	88	74	87	78	89
71555	92	85	92	85	92
71564	75	53	66	36	70
71607	75	62	67	38	76
71608	87	66	56	36	75
71633	92	61	67	45	76
71637	84	67	63	56	71
71674	72	41	64	33	61
71675	82	41	58	32	67
Average	81.33	56.46	56.58	39.42	69.62

made at the Tennessee Valley Sub-station, Belle Mina, Alabama. The third planting was made at the Wiregrass Sub-Station, Headland, Alabama, which is approximately 300 miles south of the Tennessee Valley Sub-Station. The Tennessee Valley Sub-Station has a clay soil type, but the Wiregrass Sub-Station has a sandy loam soil type.

These lots of seed were selected for field emergence tests on the basis of high, medium and low vigor ratings in laboratory tests. We considered soybeans with a vigor rating of 70% or better as high vigor. Soybeans with a vigor rating of from 55% thru 69% were considered medium vigor. Those with less than 55% vigor were considered low vigor. Note that in practically every instance the high vigor seed performed extremely well. The medium vigor seeds were very erratic and inconsistent in their performance. Also, note that all seed which met the minimum germination standards for certification were not satisfactory for planting purposes when judged by the field emergence test results.

The data in Table 4 are the results from twelve lots of soybean seed tested in our laboratory with the field emergence tests planted at the Tennessee Valley Sub-Station in 1976. The field conditions were very favorable for germination and emergence on both planting of dates. The field plantings consisted of four - 100 seed replicates randomly planted from each lot on each planting date. Since field conditions were very favorable for germination and emergence at the time of planting it was expected that the field results would agree with the standard germination test results. However, note that the performance of the medium and low vigor seeds was very erratic. The high vigor seeds were very consistent. We concluded that farmers cannot consistently obtain accurate performance from precision planted seed without using high vigor seed. Medium and low vigor seed are unpredictable and often erratic in their performance.

Table 5 gives the average results obtained from twenty-one lots of soybean seed, each representing a different variety. The standard germination and vigor tests were conducted at the Alabama State Seed Testing Laboratory. The field emergence tests, made by Dr. Don L. Thurlow, Auburn University, represent from one to three planting dates at ten locations in Alabama. For 18 of the 19 lots, the aging test was equal or better in predicting field performance than the standard germination test, not including the two treated lots.

In Alabama, we never conduct a vigor test without making a standard germination test. It is our belief that both tests are needed to estimate the quality of the seed. The standard germination test should establish the highest potential field emergence under the most favorable conditions. The vigor test will identify those seed lots most likely succeed or fail under stress conditions.

The number of our farmers who are requesting a vigor test on their cotton and soybean seed is growing rapidly. Also, the number of retail seed dealers who have requested that we conduct a vigor test on all their cotton and soybean seed has increased greatly during the past

Table 4. Laboratory and field emergence test results from 12 lots of soybeans.

Lab. No.	Standard Germ. %	96-hr. Acc. Aging Test %	Field Emergence Tests Planting Dates 5/5/76 %	5/20/76 %
88762	93	91	89	91
09703	91	80	91	88
09706	89	83	90	91
09682	82	64	69	63
88426	91	77	92	86
09708	80	64	77	79
88728	80	65	68	63
09742	74	56	64	60
88870	75	51	74	77
88804	72	53	56	59
90999	91	77	90	88
91005	77	59	78	74
Average	82.92	68.33	78.17	76.58

Table 5. Relation of laboratory germination and vigor rating to field emergence of 21 soybean varieties planted at ten locations in Alabama in 1976.

Variety	Standard Germ. %	96-hr. Acc. Aging Test %	Field Emergence %
Lancer	92	90	31
Mack	92	90	78
Dare 1/	41	13	51 1/
Lee 74	81	65	70
Davis 1/	32	14	34 1/
Lee 68	88	76	70
Tracy	81	63	72
Ransom	59	42	52
Bragg	89	80	79
Hutton	90	85	78
Cobb	75	64	65
Coker 136	70	65	60
Coker 277	91	83	79
Coker 338	88	87	82
Coker 842	86	83	76
FFR 666	80	68	63
FFR 667	92	78	77
FFR 6024	88	79	76
McNair 500	91	90	83
McNair 600	68	63	56
McNair 800	68	46	70
Average	82.58	73.53	71.95

1/ Treated with arasan before field emergence testing.

year. I often ask the retail seed dealers who request this test, "Why do you want a vigor test?" The answer that I have received most often is that farmers are asking for the vigor rating before they will purchase seed from me. I have heard several retail seed dealers and farmers make the statement that they would rather have a vigor test than the germination test. Some wholesale seed dealers who complained about our vigor testing program in the beginning are now requesting a vigor test on some of their seed. One wholesaler, who initially complained the most, requested a vigor test on all cotton, corn and soybean seed samples drawn at his warehouse this spring by our state seed inspectors.

A few individuals have made the statement that they do not want a vigor test on their seed because this is just another factor with which they will have to deal. Every time you sell a lot of seed you are going to deal with the vigor factor inherent in that lot of seed. When a farmer plants your seed will he be very pleased with their performance, mildly pleased, or displeased? If he is displeased, the very best that can happen to you, the seller, is the loss of a customer. What you don't know about your seed can hurt you. It can cost you a customer and possibly your business!

Our vigor tests are intended primarily for the benefit of the farmers. However, if seed dealers would make use of a seed vigor testing program, they could eliminate most lots with potential to give problems in stand establishment. Last year, at the meeting of the Association of Official Seed Analysts symposium on "Seed Vigor Testing," a representative from a seed company stated that, "the vigor test is an indispensible tool in the production of high quality seed. Seedsmen can benefit by improving their business through providing high quality seed at a slightly higher price." This representative further stated in response to a question, "Those companies and farmers who cannot provide their own test information should be able to obtain vigor test results from state and commercial seed laboratories."

Dr. Don Grabe stated in his presidential address to the Association of Official Seed Analysts, "Seed testing has not changed greatly since 1904." He further stated, "We should provide more information on the planting value of seed." Seed vigor testing is a step in this direction.