PREDICTING SEED STORABILITY

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Two of the most important quality problems which a seedsman faces today are seed storage and seed vigor. During the course of routine operations, a seedsman normally handles many different lots of the same kind and variety of seed. Judgements as to the relative quality of these seed lots are based primarily on the results of standard purity and germination tests.

The seedsman, however, faces several situations in which the information normally available to him concerning seed quality does not provide a suitable basis for making a decision. One such situation is a determination of which lots from among many available should be marketed first and which lots should be held for possible carry-over if the market is not strong, or as a hedge against shortage the next year. Germination percentages of the lots provide some useful information for making this decision if there is a considerable range in germination among the lots. However, germination percentages among various lots are often quite similar. Hence, a seedsman is reduced to a more or less random selection of lots for possible carry-over and he often finds the next season that several of the lots have drastically declined in germination. Such experiences involving seed lots of the same kind, variety, chronological age, and germination that do not maintain viability equally well under similar storage conditions are common to many seedsmen. The failure of a seed lot of apparent good germination to maintain that germination in storage at a retail outlet or at the wholesaler constitutes a seriour problem and one that can be most damaging to a seedsman's reputation.

It is apparent that some important aspects of seed quality are not reflected with any consistency in the information provided by standard seed tests. A high germination percentage does not necessarily mean that a seed lot will store well or that it will produce a satisfactory stand even under relatively favorable conditions.

The solution to problems related to storability and vigor of seed lies in the development of a test - other than the standard germination test - which will differentiate among seed lots with respect to storage potential and field emergence capability. It is quite possible that one test would determine both of these important attributes of seed quality.

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Several tests and methods have been advocated for evaluating the vigor and storage potential of seed. In most instances the methods recommended have been either too technical or tedious for economical and practical use by seedsmen. In order for a test to be successful in evaluating any aspect of seed quality, it should meet certain criteria. It should (1) be relatively simple and easy to perform, (2) be equally applicable to the various kinds and varieties of crop seed, and (3) produce the desired information in a consistent and uniform manner.

During the past few years, the Seed Technology Laboratory has been working on the development of an accelerated aging test for evaluating the storability of crop seed lots that - so far with the limited data obtained - has met the criteria indicated above.

TEST PROCEDURE

The accelerated aging test involves the exposure of small samples of seed from the available lots of the same seed kind to very adverse environmental conditions for a specific period. After accelerated aging, the percentage survival of the seed in the various samples is determined by standard germination tests.

Environmental conditions and periods of exposure required to obtain maximum differences in response among seed lots vary with the kind of seed. In general, the most satisfactory conditions are 100 percent relative humidity, temperatures of 40° to 45° C., and exposure periods of 2 to 8 days.

Accelerated aging is accomplished in an accelerated aging chamber where the desired environmental conditions are maintained.

PRELIMINARY RESULTS

Presently, the laboratory is attempting to devise accelerated aging techniques for the following kinds of seed: corn, sorghum, wheat, soybean, crimson clover, alfalfa, striate lespedeza, red clover, tall fescue, timothy, bromegrass, onion, garden bean, lettuce, radish, and watermelon.

The following tables show some of the results obtained from use of the accelerated aging technique in predicting seed storability.

Table 1. Accelerated aging and seed storage data from selected lots of tall fescue.

Lot #	Initial Germ. (%)	A.A.[a] 84 hrs. (%)	Storage 20°-75% 18 wks.	Storage 30°-75% 21 wks.
4	95.5	94.0	95.0	94.0
12	88.0	56.0	75.0	28.0
14	93.5	86.5	94.5	81.0

[a] Germination percentage after exposure of seed for 84 hours at 42° C. - 100% R.H.

Table 2. Accelerated aging and seed storage data from selected lots of corn.

Lot #	Initial Germ. (%)	A.A.[a] 132 hrs. (%)	Storage 20°-75% 6 mos.	Storage 30°-75% 24 wks.
22	97.5	35.0	84.5	32.5
30	99.0	96.0	98.0	98.5
31	96.0	20.0	74.0	31.0

[a] Germination percentage after exposure of seed for 132 hours at 42° C. - 100% R.H.

Table 3. Accelerated aging and seed storage data from selected data of sorghum.

Lot #	Initial Germ. (%)	A.A.[a] 192 hrs. (%)	Storage 20°-75% 24 wks.	Storage 30°-75% 18 wks.
4	96.0	92.5	92.0	92.5
13	89.0	60.5	76.5	51.5
30	89.0	27.5	64.0	31.0

[a] Germination percentage after exposure of seed for 192 hours at 42° C. - 100% R.H.

As shown in the preceding tables, the accelerated aging technique was very effective in predicting eventual deterioration trends of the various seed lots. For example, the standard germination percentages of all 3 corn lots were above 95 percent. However, after accelerated aging for 132 hours, the germination percentage of lot 30 was still very high while lots 22 and 31 were severely reduced in germination. Thus, one would "predict" that lot 30 would maintain viability longer in storage than either lots 22 or 31. The validity of such a prediction, however, can only be vertified by actual storage of a portion of each seed lot under various conditions. As indicated, germination values after 24 weeks storage at 30° C. - 75% R.H. verified the original prediction of the storage potential of each lot. Similar comments could also be made in regards to the fescue and sorghum lots.

SUMMARY

To date, the accelerated aging technique has proved to be very effective in predicting the eventual storage behavior of various lots of the same seed kind. The key to the success of the test lies in determining the period of exposure required to obtain maximum differences in germinative response. This period of exposure varies considerably with the species of seed.

The real potential of the accelerated aging technique may be its use by seedsmen as a rapid screening technique for detecting potential "trouble" lots of seed. These would be lots which would not carry-over well in storage and in all probability would also perform poorly under field conditions. The technique is simple, easy to perform, and the results from the test are expressed as a germination percentage, a term or value understood by all in the seed trade.