In essence, this method consists of placing a small number of cottonseed in a test tube or other container and adding a measured amount of boiling water sufficient to cover the seeds. After allowing leaching to take place for 30 to 90 minutes, and shaking the tube, several drops of solution are withdrawn and read in a sugar refractometer. A high percentage reading on the refractometer is correlated with reduced seed quality.

A number of refractometers are available which should prove usable; citrus refractometers or antifreeze refractometers such as used by service stations. Accuracy of test readings will depend on standardization of experimental conditions, control of variables such as water and air temperature, and use of a standard seed lot for comparison. Leaching time must be held constant.

Probably the phenomenon measured is the loss of hot water soluble sugars, amino acids, salts from within the seed. Preliminary indications are that cracked seeds are responsible for higher refractometer readings, correlated with low seed vigor. Disruption of the integrity of the seed coat would predispose the seed to loss of electrolytes when planted in soil. High percentage of cracked seed is responsible for low field emergence of some cottonseed lots.

Present data was obtained using acid delinted Pima seed. A significantly negative correlation of the rapid hot water test with field emergence percentage at Marana was seen (-0.61*) when 12 Pima seed lots were tested. Preliminary data suggests that the rapid test is equally effective when fuzzy Pima seeds are used. Testing is in progress with delinted short staple seed lots, where sufficient water is absorbed by lint to necessitate squeezing to extract solution.

For reference to earlier work using seed leachates for vigor testing, upon which the present work is based, the reader is referred to: Ching, T.M., Crop Sci. 12: 415, 1972; Abdul-Baki, A.A. and Anderson, J.D., Crop Sci. 13: 630, 1973.

Representative Data: Two high vigor and two low vigor Pima seed lots.

Seed Lot[1]	Rapid Test[2]	Seed Vigor[3]	Emergence Ranking[4]
189	103	1.35	1
199	104	1.50	2
195	106	1.20	3
200	106	1.10	4

[1]Pima cotton planting seed lots.
[2]Percent sugar using refractometer; dry, delinted seed samples; total time for test of 16 samples--one hour.
[3]Twenty seedling fresh weight in grams--three-day germination on blotter paper.
[4]Taken from field data kindly provided by D.R. Buxton.

AMP TREATMENTS IMPROVE EMERGENCE UNDER COLD STRESS

R.G. McDaniel and B.B. Taylor

Our research on chemical seed treatments has been made possible through the support of Supima Association of America. AMP and CAMP chemical treatments have effectively been applied to cottonseed during the commercial acid delinting process. Several tons of Pima planting cottonseed have been treated and field tested in Arizona, New Mexico, and Texas. Field trials for three years have shown that AMP and CAMP seed treatments can significantly increase both numbers of seedlings emerging, and the vigor of these seedlings, especially under marginal cold weather planting conditions. Field tests conducted in 1975 have shown no differences in % emergence. We feel that this was due to lack of an adequate carrier solvent to bind AMP in the seed coat. We hope to initiate studies to determine the best carrier for consistent AMP results in the field. It is of interest to note that researchers at Beltsville and New Mexico State have observed increased vigor and % emergence of AMP treated cotton in greenhouse and growth chamber studies.

AMP and CAMP can be effectively applied to seed during the process in which systemic fungicides and insecticides are incorporated during acid delinting and just before seed is bagged. An additional dipper can be added to commercial chemical treaters to meter 30 cc of AMP in water solution at the same time PCMB, Captan, and insecticide treatments are added to each eight pound "dump" of cottonseed. Alternatively, concentration of AMP can be increased, and it can be used as the aqueous portion of the Captan "slurry" and added as Captan + AMP treatment using a single dipper. AMP is reasonably soluble in xylene, the carrier solvent for several commercial chemical seed treatments, and thus could conceivably be added in this manner also.

Our experience has been that the AMP should be previously dissolved in the solvent used before being added to other treating materials. We have found that adding AMP to Captan - PCMB causes the treatments to spread better, enabling a more even coating of seed with fungicide. Caution is advised in use of a penetrating carrier solvent such as xylene, as excessive amounts of solvent can strip essential fatty acids and lipids from the seed coats, resulting in loss of seedling vigor under low temperature or salt stress. Amounts of xylene based chemical treatments 4 oz. per 8 lbs. of seed or less appear not to elicit such an undesirable solvent effect.

Recommended AMP concentration for applications during delinting is a 10^{-3} molar solution (about 350 ppm) prepared by adding 5 gallons of pure water at room temperature to 1/4 ounce of AMP powder (or exactly 7.4 grams). Shake or stir for several minutes until particles are completely dissolved. Let sit overnight in a polyethylene container with occasional shaking if possible. Solutions should be stored in the dark and used as soon as possible, since AMP and CAMP are "biodegradable." This amount (5 gal.) applied via 30 cc dipper/8 lb. seed will treat 5280 lb. of seed (100 bags), giving a final working concentration of about 5×10^{-5} M AMP on a weight to volume basis.

Solvent carriers to aid in incorporating AMP into the seed coat, such as methanol, DMSO, and xylene, are presently being tested.

COTTON PLANTING SEED

Willard F. Clay and Frank R.H. Katterman

Research conducted at the University of Arizona has resulted in the development of two biochemical tests which can be applied to seed lots for predicting chilling resistance in long staple Pima cotton. First, scientists have demonstrated that plants known to be chilling resistant contain larger quantities of unsaturated fatty acids when compared to sensitive plants. We have shown in Pima cotton that those lines which under growth chamber and field conditions exhibited the greatest chilling resistance also contained the greatest amounts of unsaturated fatty acids in the dormant seeds. The values expressed are ratios of unsaturated to saturated acids and values greater than 2.70 are considered to be excellent.

The second test involves the capacity of cotton seedlings to synthesize the compound DNA, which is crucial to normal growth and development, during exposure to chilling temperatures. The results indicate that the seed lots which exhibit the greatest chilling resistance are most efficient at synthesizing DNA while chilled during germination. DNA synthesis is monitored by the incorporation of radioactive precursors into the DNA molecule by the germinating seedling and the larger the value of the activity, the greater the synthesis.

The tests have been utilized to distinguish chilling resistance between different genotypes and between seed lots of the same genotype grown under different field conditions. The tests have consistently predicted chilling resistance for seed lots grown under controlled laboratory conditions and are also being tested for applicability to field conditions.

To distinguish between genotypes, seed lots E-2, Pima S-3, Pima S-4, and P-23 were planted at Phoenix and Marana in 1973 under cool conditions and monitored for percent emergence (Table 1) and speed of germination. The results correspond closely with the results of the unsaturated fatty acid test (Table 2) and the ability to synthesize DNA test (Table 3). Statistical analysis indicate the differences noted are significant.