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.

Table 1. Percent Emergence of Cotton Lines Planted in the Field in the Spring of 1973.

Genotype	Emergence
E-2	66.2%
Pima S-3	64.0
P-23	60.6
P-21	56.4
Pima S-4	55.1

The data are the average of four experiments and two planting dates. Soil temperatures were as low as 45° F during these tests.

Table 2. Mean Unsaturated/Saturated Fatty Acid Ratios from Cottonseed of Genotypes Planted in 1973.

Genotype	Unsaturated/Saturated Fatty Acid Ratio*
E-2	3.00 a
Pima S-3	2.83 b
P-23	2.73 c
Pima S-4	2.68 d
P-21	2.64 e

*Values followed by the same letter in each column are not significantly different at the 0.05 level according to the Student-Newman-Keuls Test.

Table 3. Effect of Chilling Upon the Capacity of Different Genotype Seedlings to Synthesize DNA.

Genotype	Specific Activity CPM/0.1 mg DNA*
E-2	4784 a
Pima S-3	3444 b
P-23	2855 b
Pima S-4	2017 d
P-21	1848 d

*Values followed by the same letter in each column are not significantly different at the 0.05 level according to the Student-Newman-Keuls Test.

To distinguish between seed lots of the same genotype, samples of Pima S-4 seed grown at different locations were planted in Phoenix and Marana, Arizona in 1974 and monitored for germination properties. The results of the field tests (Table 4) agree closely with the fatty acid (Table 5) and DNA synthesis test (Table 6).

A statistical correlation analysis was run for the two tests, and the high correlation coefficients (greater than 0.70) indicate that the prospective screening tests significantly corroborate each other (Table 7). These results are important in that the application of two tests to seed lots to predict chilling resistance enhances the reliability of the conclusions and minimizes experimental error.

Table 4. Percent Emergence of Pima S-4 from Several Locations Planted in the Field in the Spring of 1974.

Seed Source	Emergence
Marana, Ariz.	63.1%
Salome, Ariz. (Reg.)	62.7
Safford, Ariz.	54.3
Fabens, Texas	26.7

The data are the average of four experiments and two planting dates. Soil temperatures were as low as 54° F during these tests.

Table 5. Mean Fatty Acid Ratios of Pima S-4 Cottonseed Grown at Four Locations in 1973.

Location	Unsaturated/Saturated Fatty Acid Ratio*
Marana, Ariz.	2.69 a
Safford, Ariz.	2.57 b
Salome, Ariz. (Reg.)	2.56 b
Fabens, Texas	2.43 c

*Values followed by the same letter in each column are not significantly different at the 0.05 level according to the Student-Newman-Keuls Test.

Table 6. Effect of Chilling upon the Capacity of Pima S-4 Seedlings to Synthesize DNA. The seed lots were grown at four different locations in 1973.

Location	Specific Activity CPM/0.1 mg DNA*
Marana, Ariz.	8678 a
Safford, Ariz.	5960 b
Salome, Ariz. (Reg.)	5451 b
Fabens, Texas	3848 d

*Values followed by the same letter in each column are not significantly different at the 0.05 level according to the Student-Newman-Keuls Test.

Table 7. Data Correlations Between Field Results and Fatty Acid Analysis (FA) and Capacity to Synthesize (DNA) after Chilling.

Tests	r-Coef.
Genotypes	
Field vs FA	0.93
Field vs DNA	0.83
FA vs DNA	0.84
Locations	
Field vs FA	0.84
Field vs DNA	0.72
FA vs DNA	0.88

The reliability of the DNA predictive test was further evaluated by applying it to 19 commercial seed lots provided by the Arizona Cotton Planting Seed Distributors. The seed lots were planted early in the growing season to ensure unfavorable temperature conditions and evaluated for percent emergence in the field. The data of Table 8 indicate that the DNA test predicted well the performances of the seed lots in the field.

Table 8. Percent Emergence and the Capacity to Synthesize DNA After Chilling in Commercial Seed Lots of Pima Cotton. The DNA test data are specific activities of extracted DNA after radioactive labelling and expressed as cpm/mg DNA. The correlation coefficient between the DNA test and the percent field emergence was r = 0.89.

Genotype	DNA Test	% Field Emergence	Field Rank
1. P-29-3	679	78	1
2. P-28-5	677	72	3
3. P-29-6	674	78	1
4. P-28-3	650	69	4
5. P-28-4	648	73	2
6. P-29-5	645	73	2
7. S4-189	621	69	4
8. S4-191	621	69	4
9. S4-190	540	62	6
10. S4-199	534	66	5
11. P-29-4	500	66	5
12. S4-198	485	61	7
13. S4-192	483	56	10
14. S4-193	474	60	8
15. S4-194	461	57	9
16. S4-197	391	51	11
17. S4-200	386	48	12
18. S4-196	376	56	10
19. S4-195	333	56	10

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