

# Arizona Upland Cotton Variety Testing Program

*J. Silvertooth, R. Norton, L. Clark, S. Husman, R. Cluff, S. Stedman, G. Thacker, T. Knowles, W. Winans, and R. Grumbles*

*University of Arizona Cooperative Extension*

## **Abstract**

*Eleven field experiments were conducted in many of the cotton growing areas of Arizona in 1995 for the purpose of evaluating Upland cotton varieties in terms of adaptability and performance. Seven commercial cottonseed companies participated in the program. Two varieties were submitted from each company at each location. Experiments were conducted on grower-cooperator fields in each case. Locations used in the program spanned the range of conditions common to cotton producing areas of the state from about 150 ft. to 4,000 ft. elevation. Results indicated a broad range of adaptability and competitiveness on the part of each of the participating companies and their representative varieties. The 1995 season offered some extremes in terms of weather conditions, with very cold spring temperatures, followed by very hot conditions in July and August. Variety performance under these extremes offers an opportunity for review and comparison with regard to adaptability. Each of the companies offers a compliment of varieties that can serve to match various production strategies commonly employed in the state as well as showing a strong capacity to be regionally adaptive.*

## **Introduction**

With the increasing number of commercial cottonseed companies operating in Arizona, there is a corresponding interest level on the part of growers relative to adaptability and performance of available varieties. Not only is there an interest on the part of farmers regarding objective, unbiased data describing cotton varieties, but the commercial seed companies are also motivated to support the development and operation of an independently based variety testing program for the state of Arizona. With this serving as a basis of consideration, an Upland variety testing program was conducted in 1995 involving the University of Arizona Cooperative Extension System, farmer-cooperators in eight counties, and six commercial cottonseed companies.

## **Methods**

An Upland variety testing program was conducted at eleven locations in 1995 (Yuma Valley, Parker Valley, Mohave Valley, Buckeye, Gila Bend, Queen Creek, Maricopa, Coolidge, Marana, Sulfur Springs Valley, and Safford), which involved six commercial cottonseed companies (Delta Pine, Stoneville, Sure-Grow (Arizona Processing), Chembred, HyPerformer, and Hartz). At each location, each participating company submitted two varieties, for a total of 12 varieties at each location. All tests were conducted on grower-cooperator fields, with plots (individual varieties) being a minimum of eight rows wide (38 to 40 inch spacings), except at Marana and Coolidge where plots were six rows wide, and extending the full length of the irrigation run. All treatments (varieties) were arranged in a randomized complete block design with four replications in each case. Yield

estimates were made by harvesting a minimum of the entire two, centermost rows, of each plot. Resulting seedcotton weights were obtained from each plot by the use of electronic scales placed at the end of the field. Subsamples of seedcotton were ginned for turnout estimates, and lint samples were subjected to HVI analysis. All data was analyzed statistically in a manner consistent with the experimental design by use of analysis of variance methods (Steel and Torrie, 1980), and procedures outlined by the SAS Institute (SAS, 1988).

## Results

Yield analyses revealed significant effects associated with location differences, which is not at all surprising given the wide range in environmental conditions experienced among locations (Tables 1 - 11). Elevation differences ranged from approximately 150 to 4,000 ft. above sea level. Ranges in dates of planting, in relation to optimal dates for each location, and insect infestations also contributed to location and regional differences.

From the results however, a basic set of conclusions and summary statements can be offered, which are consistent with the 1995 project:

1. It is apparent that there are a number of strong varieties which offer optimum yield potentials available to Arizona cotton farmers. The existence of several competitive companies in this regard, with a broader listing of varieties, should be a benefit to Arizona producers in terms of flexibility.
2. Several varieties are applicable to the broad range of conditions present in Arizona (150 to 4,000 ft. elevation). Also, there is presently a listing of varieties which can serve to fit into several production strategies being employed in Arizona. These various production strategies range from a very short season approach, such as following a vegetable or grain crop or at higher elevation, to a long, full-season production system.
3. The 1995 cotton production season was a year of extremes, from very cold in the spring to very hot in July and August. Accordingly, some varieties which did not have sufficient early season vigor or "heat tolerance" may have been at a disadvantage relative to better adapted varieties. Therefore, it is important for growers to review this information in view of these aspects of the 1995 season.

In terms of reviewing variety testing information, we feel that it is important to look for varieties that have consistency in their performance. Consistency does not necessarily have to include being the top variety in terms of absolute yield at any given location, but more importantly, being among the top varieties at a number of locations, and also over several seasons. In an effort to evaluate consistency to some extent, yield data from all locations were combined and analyzed over locations. Because of the broad ranges in growing conditions across Arizona, we grouped the varieties into four regions (Tables 12 through 15). Regions were based primarily on elevation with the following grouping: region 1, Yuma, Parker, and Mohave; region 2, Paloma and Buckeye; region 3, East Valley (Maricopa County), Coolidge, Maricopa, and Marana; and region 4, Safford, and Cochise Co.. It is important to note when reviewing this information that varieties were not equally represented across locations, which can tend to skew data in one direction or another. The N values reported in Tables 12 - 15 represent the number of observations (rep X plot X location). For example, extreme performance (very high or low yields) at one location can have a strong influence on a regional average. Therefore, the regional summaries presented in Tables 12 through 15 are useful only in relation to the performances outlined by varieties at each location (Tables 1 through 11).

## Summary

Cotton breeders, farmers, and agronomists are constantly in the process of critiquing and reviewing conventional varieties with respect to possible improvements. Regional adaptability of varieties is a factor of interest to any cotton producing region, Arizona being no exception. The companies and varieties under review in this program are the products of rather intense screening and evaluation under Arizona conditions. This project illustrates that there are a good number of viable varieties for Arizona given proper placement and management.

## Acknowledgements

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## References

SAS Institute. 1988. SAS/STAT:Procedures. Release 6.03 ed. SAS Inst., Cary, NC.

Steel, R.G.D., and J.H. Torrie. 1980. Principles and procedures of statistics. McGraw-Hill, New York.

Table 1. Lint yields from Mohave County Variety Test, AVI KWA AMI Farms<sup>¶</sup>.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	1145 a*
HyPerformer 46	1041 ab
HyPerformer 44	979 ab
Delta Pine 5409	943 bc
Delta Pine 5415	939 bc
Sure Grow 125	884 cd
Stoneville 887	788 de
Chembred 232	743 e
Chembred 333	718 e
Hartz 1244	717 e
Hartz 1220	695 e
Sure Grow 501	567 f
LSD ( $\alpha=0.05$ ) <sup>†</sup>	131
OSL <sup>‡</sup>	0.0001
C.V. (%) <sup>§</sup>	4.07

<sup>¶</sup>Planted 11 April, replanted 2 May

Harvested 25 October

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

<sup>†</sup>LSD = Least Significant Difference

<sup>‡</sup>OSL = Observed Significance Level

<sup>§</sup>C.V. = Coefficient of Variation (%)

Table 2. Lint yields from LaPaz County Variety Test, Hancock Farms¶.

Variety	Lint Yield (lbs lint/acre)
Hartz 1560	1033 a*
HyPerformer 44	998 a
Delta Pine 5415	992 a
Stoneville 474	970 a
Delta Pine 5409	956 a
HyPerformer 46	882 a
Sure Grow 125	874 a
Stoneville 887	838 a
Sure Grow 501	807 a
Hartz 1244	784 a
LSD ( $\alpha=0.05$ )†	NS
OSL‡	0.2636
C.V. (%)§	16.573

¶Planted Reps I&II 10 April, Reps III&IV replanted 2 May

Harvested 8 November

Differences due to planting date not significant ( $P<0.05$ ).

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C.V. = Coefficient of Variation (%)

Table 3. Lint yields from Yuma County Variety Test, Marlatt Farms¶.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	1388 a*
Sure Grow 501	1291 a
Sure Grow 125	1284 a
Delta Pine 5409	1265 a
Hartz 1220	1073 b
HyPerformer 46	1067 b
Chembred 232	1041 b
Delta Pine 5415	1005 b
HyPerformer 44	989 bc
Stoneville 887	988 bc
Chembred 1233	940 bc
Hartz 1330	852 c
LSD ( $\alpha=0.05$ )†	160
OSL‡	0.0001
C.V. (%)§	7.379

¶Planted 24 March

Harvested 27 September

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C.V. = Coefficient of Variation (%)

Table 4. Lint yields from Maricopa County Variety Test, Paloma Ranch, Stephens and Sons Farms¶.

Variety	Lint Yield (lbs lint/acre)
HyPerformer 44	1522 a*
Delta Pine 5415	1520 a
HyPerformer 46	1435 ab
Chembred 1233	1411 ab
Delta Pine 5432	1366 b
Hartz 1277	1334 bc
Sure Grow 501	1328 bc
Chembred 232	1209 cd
Stoneville 887	1199 cd
Stoneville 474	1198 cd
Sure Grow 125	1198 cd
Hartz 1244	1070 d
LSD ( $\alpha=0.05$ )†	153
OSL‡	0.0001
C. V. (%)§	5.645

¶Planted 19 March

Harvested 5-6 December

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)

Table 5. Lint yields from Maricopa County Variety Test, Buckeye, H-4 Farms¶.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	1489 a*
Sure Grow 125	1466 a
Delta Pine 5415	1370 b
Sure Grow 501	1327 bc
Hartz 1244	1321 bc
Hartz 1220	1310 bc
HyPerformer 46	1282 cd
HyPerformer 44	1270 cde
Chembred 1233	1258 cde
Stoneville 887	1225 def
Chembred 232	1204 ef
Delta Pine 5409	1176 f
LSD ( $\alpha=0.05$ )†	79
OSL‡	0.0001
C. V. (%)§	3.560

¶Planted 19 March

Harvested 11-12 November

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)

Table 6. Lint yields from Maricopa County Variety Test, East Valley, Lee Smith Farms¶.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	2121 a*
Sure Grow 1001	2029 ab
HyPerformer 44	1995 abc
Delta Pine 5432	1980 abc
Sure Grow 125	1979 abc
Delta Pine 5415	1978 abc
Hartz 1277	1921 bc
Chembred 407	1906 bc
HyPerformer 46	1906 bc
Stoneville 887	1899 bc
Hartz 1244	1856 cd
Chembred 232	1731 d
LSD ( $\alpha=0.05$ )†	156
OSL‡	0.0012
C. V. (%)§	4.047

¶Planted 4 April

Harvested 18 October

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)

Table 7. Lint yields from Pinal County Variety Test, Maricopa Ag Center¶.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	1431 a*
Delta Pine 5415	1289 ab
Delta Pine 5432	1254 bc
HyPerformer 44	1252 bc
Stoneville 887	1232 bcd
Sure Grow 501	1194 bcd
Chembred 1233	1191 bcd
Hartz 1560	1191 bcd
Sure Grow 125	1161 bcd
Chembred 232	1102 cd
HyPerformer 46	1090 cd
Hartz 1277	1060 d
LSD ( $\alpha=0.05$ )†	177
OSL‡	0.0017
C. V. (%)§	8.66

¶Planted 4 April

Harvested 19 October

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)

Table 8. Lint yields from Pinal County Variety Test, Marvin Wuertz Farms¶.

Variety	Lint Yield (lbs lint/acre)
Stoneville 474	1286 a*
Delta Pine 5432	1121 b
Sure Grow 125	1120 b
Hartz 1560	1112 b
HyPerformer 46	1071 bc
Delta Pine 5415	1069 bc
Chembred 1135	1008 bcd
Chembred 1233	998 bcd
HyPerformer 44	994 bcd
Sure Grow 501	937 cd
Stoneville 887	902 d
Hartz 1220	901 d
LSD ( $\alpha=0.05$ )†	143
OSL‡	0.0001
C.V. (%)§	8.078

¶Planted 11 April  
Harvested 9 October

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§C.V. = Coefficient of Variation (%)

Table 9. Lint yields from Pima County Variety Test, Jon Post Farms¶.

Variety	Lint Yield (lbs lint/acre)
Sure Grow 501	1025 a*
Stoneville 474	1022 a
Sure Grow 125	963 ab
Delta Pine 20	919 ab
Delta Pine 5409	915 ab
HyPerformer 46	879 ab
Stoneville 887	879 ab
HyPerformer 44	818 b
Hartz 1330	816 b
Hartz 1215	814 b
LSD ( $\alpha=0.05$ )†	169
OSL‡	0.0281
C.V. (%)§	10.864

¶Planted 3 May  
Harvested 2 November

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§C.V. = Coefficient of Variation (%)

Table 10. Lint yields from Graham County Variety Test, Darren Carpenter Farms¶.

Variety	Lint Yield (lbs lint/acre)
Delta Pine 5690	1018 a*
Stoneville 887	1012 a
Sure Grow 501	1004 a
Delta Pine 90	990 a
Chembred 407	975 ab
HyPerformer 44	972 ab
Sure Grow 1001	952 abc
HyPerformer 46	947 abc
Chembred 1210	940 abc
Stoneville 495	887 bcd
Hartz 1277	855 cd
Hartz 1215	832 d
LSD ( $\alpha=0.05$ )†	107
OSL‡	0.0015
C. V. (%)§	6.643

¶Planted 11 April

Harvested 1st: 20 October 2nd: 6 December

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)

Table 11. Lint yields from Cochise County Variety Test, Ed Curry Farms¶.

Variety	Lint Yield (lbs lint/acre)
Sure Grow 404	1305 a*
HyPerformer 46	881 b
Stoneville 132	842 bc
Hartz 1215	818 bc
Hartz 1330	783 bcd
Sure Grow 125	777 bcd
Stoneville 495	756 bcd
Chembred 333	584 cde
Delta Pine 50	532 de
Delta Pine 5409	527 de
Chembred 1210	400 e
HyPerformer 44	397 e
LSD ( $\alpha=0.05$ )†	269
OSL‡	0.0002
C. V. (%)§	15.123

¶Planted 4 May

Harvested 5 December

\*Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test.

†LSD = Least Significant Difference

‡OSL = Observed Significance Level

§ C. V. = Coefficient of Variation (%)



Table 12. Region 1; Yuma, Parker, and Mohave.

Variety	Lint Yield (Mean)	N
Stoneville 474	1148	11
Delta Pine 5409	1036	11
Hartz 1560	1033	4
HyPerformer 46	990	11
Sure Grow 125	989	11
HyPerformer 44	988	11
Delta Pine 5415	976	11
Chembred 1233	940	3
Chembred 232	871	7
Stoneville 887	861	11
Hartz 1220	857	7
Hartz 1330	852	3
Sure Grow 501	852	11
Hartz 1244	750	8
Chambred 333	718	4

Table 13. Region 2; Paloma and Buckeye.

Variety	Lint Yield (Mean)	N
Delta Pine 5415	1434	7
HyPerformer 44	1378	7
Delta Pine 5432	1366	3
Stoneville 474	1365	7
Sure Grow 125	1351	7
HyPerformer 46	1348	7
Hartz 1277	1334	3
Sure Grow 501	1327	7
Chembred 1233	1324	7
Hartz 1220	1310	4
Hartz 1244	1214	7
Stoneville 887	1214	7
Chembred 232	1206	7
Delta Pine 5409	1176	4

Table 14. Region 3; East valley (Maricopa County), Coolidge, Maricopa, Coolidge, and Marana.

Variety	Lint Yield (Mean)	N
Sure Grow 1001	2029	3
Chembred 407	1906	3
Hartz 1244	1856	3
Hartz 1277	1429	7
Stoneville 474	1421	15
Delta Pine 5432	1404	11
Delta Pine 5415	1397	11
Chembred 232	1372	7
Sure Grow 125	1261	15
HyPerformer 44	1216	15
Stoneville 887	1205	14
HyPerformer 46	1192	15
Hartz 1560	1152	8
Chembred 1233	1095	8
Sure Grow 501	1052	12
Chembred 1135	1008	4
Delta Pine 20	919	4
Delta Pine 5409	915	4
Hartz 1220	901	4
Hartz 1330	816	4
Hartz 1215	814	4

Table 15. Region 4; Cochise and Graham Counties.

Variety	Lint Yield (Mean)	N
Sure Grow 404	1305	2
Delta Pine 5690	1018	4
Stoneville 887	1012	4
Sure Grow 501	1004	4
Delta Pine 90	990	4
Chembred 407	975	4
Sure Grow 1001	952	4
HyPerformer 46	925	6
Hartz 1277	855	4
Stoneville 495	843	6
Stoneville 132	842	2
Hartz 1215	827	6
Hartz 1330	783	2
HyPerformer 44	780	6
Sure Grow 125	777	2
Chembred 1210	760	6
Chembred 333	584	2
Delta Pine 50	532	2
Delta Pine 5409	527	2