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FARM ADVISOR AND SPECIALIST VARIETY TRIALS: APPROVED ACALA TRIALS, CA UPLAND TRIALS—2002

Bob Hutmacher, Ron Vargas, Bruce Roberts, Brian Marsh, Steve Wright, Dan Munk, Bill Weir, Mark Keeley, Raul Delgado, Shane Ball

In the San Joaquin Valley production area, variety choices continue to represent a broad range of options for growers, including Approved Acalas and Pimas plus a wide range of CA Upland and even a few CA Pima varieties. This issue of the *CA Cotton Review* provides the first part of a two-issue series that will cover yield data summaries for the "Approved Acala", "Approved Pima", "CA Uplands Advanced Strains" trials run by the UCCE Farm Advisors, Specialists and staff, plus a brief summary of yield data from SJV Cotton Board / UC variety trials. Due to what we perceived as reduced levels of interest in CA Upland varieties, the CA Uplands Large Scale trials were suspended for 2002.

We decided to present the data as soon as it was summarized this year, so the data will be presented in two separate *CA Cotton Review* issues:

- Approved Acala and CA Upland Advanced Strains yield averages will be presented in this issue
- Approved Pima and SJV Cotton Board / UC yield summaries from Dr. Shane Ball's program will be in the next issue (January, 2003)

The information that follows is by no means a comprehensive presentation of all available data from these variety trials. Information on HVI lint quality in the Farm Advisor/Specialist trials will be available in late-January or early February on the UCCE cotton web site: (http://cottoninfo.ucdavis.edu), and more detailed information can be obtained on individual test plot sites by contacting your county UCCE Farm Advisor.

The methods used to determine entries in the Approved Acala and CA Uplands trials were reviewed in the Jan. 2002 issue of the *CA Cotton Revi*ew (available on the web site), so will not be reviewed here. Eleven Approved Acala varieties were planted in UCCE variety trials at 8 locations in 2002, 6 of them in large grower fields in Kern, Tulare, Kings, Fresno, Madera and Merced Counties. At 2 locations at West Side and Shafter Research and Extension Centers, these same eleven varieties were planted, plus one additional Approved Acala for which there was limited seed, plus two CA Upland varieties for yield comparisons. Planting date, soil type and management practices varied across locations and with grower differences.

Approved Acala variety trial yield and gin turnout summaries for 2002 are in Table 1, while Table 2 shows a long-term summary of Acala variety yield performance during the period of 1994 through 2002, using data from both Farm Advisor and SJV Cotton Board trials. Table 3 shows results from small-plot CA Upland variety trials which were conducted in 2002 to maintain an ongoing UCCE evaluation of newly available Upland varieties. This information can be compared with prior year variety trial information by viewing January or February *CA Cotton Review* issues from earlier years on the website. As in prior years, the recommendation stands that you should consider variety trial results only as a relative indicator of yield performance. Consider planting at least several varieties to get a better handle on performance and potential problems in your own fields under your own management practices.

Support for this publication is provided by California Cotton Growers through their Cotton Incorporated State Support Program.

Table 1. **APPROVED ACALA VARIETY TRIALS (Farm Advisors & Specialist Trials) – 2002.** Lint yields, gin turnouts, statistical analyses in 2002 Acala Approved Variety Trials (11 Approved Acala entries at 8 locations. In addition, due to limited seed availability, one Approved Acala variety (CPCSD "C-192") was grown only at the West Side REC and Shafter REC sites. For comparison purposes, the CA Upland varieties Stoneville "BXN-47" and Delta and Pine Land Co. "DP-5415 RR" were also included in the Shafter and West Side REC trial locations *(UCCE Cooperators: Hutmacher, Weir, Vargas, Roberts, Wright, Munk, Marsh,, Keeley, Delgado in grower/cooperator fields and fields at the West Side and Shafter Research & Extension Centers).*

Seed Company	Variety	40" rows Shafter REC (lbs/acre)	40" rows West Side REC (lbs/acre)	38" rows Kern County (lbs/acre)	38" rows Kings County (lbs/acre)	30" rows Tulare County (lbs/acre)	38" rows Fresno County (lbs/acre)	30" rows Madera County (lbs/acre)	30" rows Merced County (lbs/acre)	Average Lint Yield (lbs /ac)	Average Lint Yield (as % of Maxxa)	Mean Gin Turnout. (%)
CPCSD	**Maxxa**	**1612**	**2032**	**1297**	**1901**	**1356**	**1427**	**1539**	**1917**	**1635**	**100**	**34.8**
CPCSD	**Riata**	1650	2135	1488	1789	1248	1540	1421	1910	**1648**	**101**	**35.2**
CPCSD	**GTO Maxxa**	1783	2149	1470	1972	1450	1616	1340	1975	**1719**	**105**	**37.5**
Delta Pine Land Co	**DP-6207**	1601	1991	1513	1845	1265	1479	1405	1875	**1627**	**100**	**33.6**
CPCSD	**Ultima**	1765	1999	1376	1759	1343	1575	1349	1882	**1631**	**100**	**35.4**
Phytogen	**Phy-72**	1803	2264	1596	1812	1512	1703	1522	2049	**1783**	**109**	**33.5**
CPCSD	**Nova**	1438	1909	1280	1779	1206	1326	1398	1764	**1513**	**93**	**32.4**
Olvey & Assoc.	**OA-249**	1551	2010	1427	1619	1380	1498	1404	1963	**1607**	**98**	**33.6**
Stone-Ville	**GC-546 RR**	1269	1722	1267	1813	1245	1401	1279	1766	**1470**	**90**	**33.3**
Phytogen	**Phy-78**	1563	2219	1571	1806	1349	1596	1533	2057	**1712**	**105**	**32.6**
Delta Pine Land Co.	**DP-6100 RR**	1737	2117	1377	1736	1299	1528	914	1555	**1533**	**94**	**32.3**
Mean		1615 (above Acalas only)	2050 (above Acalas Only)	1424	1803	1332	1517	1373	1883	**1625** (above Acalas only)		**34.0**
CPCSD	**C-192**	1635	2012	-	-	-	-	-	-	1824 * (only 2 locations)	100 * (only 2 locations)	35.9 *
Delta Pine Land Co.	**DP-5415 RR**	1871	2267	-	-	-	-	-	-	2069 * (only 2 locations)	114 * (only 2 locations)	34.8 *
Stone-Ville	**BXN-47**	1757	2018	-	-	-	-	-	-	1888 * (only 2 locations)	104* (only 2 locations)	34.3 *
LSD 0.05		146	95	91	157	115	77	122	75	48		0.3
C.V. (%)		6.2	3.2	4.4	6.0	6.0	3.5	6.2	2.7	5.8		1.6

* data from these varieties not included in over-location averages or statistics LSD = least significant difference between yields required to be significantly different at the 5% level of signficance; C.V. = coefficienct of variation; P = probability VARIETY by LOCATION (for yields): (LSD 0.05 = 119; C.V. (%) = 5.3; P = 0.000)

NOTE: STATISTICS SHOWN BELOW EACH COLUMN (trial site) APPLY TO ALL VARIETIES GROWN AT THAT LOCATION—HOWEVER, STATISTICS FOR ALL-LOCATION AVERAGES WER CALCULATED USING ONLY THE FIRST 11 ENTRIES SHOWN ON THE TABLE.

Table 2. **APPROVED ACALA TRIALS (Farm Advisor / Specialist / SJVCB).** Lint yields of Approved Acala varieties (1994 - 2002) (as % of Maxxa yield). Yields were evaluated at 7 to 8 locations per year in either Farm Advisor / Specialist trials or San Joaquin Valley Cotton Board (SJVCB) trials. Values shown in *"italics"* and outlined are from SJVCB tests in years prior to approval of variety. All other values shown were determined in "Approved Acala" variety trials of the University of CA Cooperative Extension Farm Advisors and Specialist. "Blank" areas in the table indicate that the varieties were not included in tests (either because they were were were were not yet released (more recent varieties) or because acreage was limited and earlier testing had been done (older varieties).

Variety Name Or Number	Lint Yields Across All Variety Trial Sites (as a percent of average yields of variety "Maxxa")									Shafter, Kern & Tulare Co. Average Yields 1994-2002 (as % of Maxxa)	West Side, Fresno & Kings Co. Average Yields 1994-2002(as % of Maxxa)	Madera & Merced Counties Average Yields 1994-2002 (as % of Maxxa)	Average Yields Across All Trial Sites 1994-2002 (as % of Maxxa)
	1994	1995	1996	1997	1998	1999	2000	2001	2002				
Maxxa	100	100	100	100	100	100	100	100	100	100	100	100	100
SJ-2	94	99	99	97	98	98	105			103	97	96	99
Phytogen-33	***97***	***102***	102	103	105	101	105	107		109	102	96	103
DP-6211			***104***	***103***	104	99	105	103		106	104	98	103
DP-6207				***104***	***106***	102	108	106	100	106	105	100	104
C-141(Ultima)		***99***	***103***	98	102	98	102	105	100	104	103	95	101
GTO Maxxa		***104***	***102***	106	104	104	108	104	105	108	107	98	105
GC-500		***94***	***93***	99	100	102	101	100		100	99	96	99
BR-9605				***98***	***97***	100	102			101 *	101 *	96 *	99 *
GLS				***96***	***89***	97	100			98 *	94 *	94 *	95 *
GC-505					***102***	***99***	107	100		102 *	103 *	103 *	103 *
GC-507					***95***	***104***	103			101 *	100 *	99 *	100 *
Riata					***101***	***106***	112	105	101	106 *	104 *	103 *	105 *
C-181 (Nova)					***102***	***101***	***98***	98	93	99 *	98 *	96 *	99 *
Phytogen-72					***119***	***109***	***109***	119	109	118 *	111 *	104 *	113 *
OA-249						***101***	*103*						
												not in 2002	

* = less than 6 years of test results; ** = varieties no longer available; *** = not grown at all test locations in 2002 trials

Table 3. **CALIFORNIA UPLANDS ADVANCED STRAINS (Farm Advisors & Specialist Trials) – 2002.** Lint yields (in lbs/ acre and as % of Approved Acala variety "Phytogen-72") by test location and average gin turnout for each variety in *2002 California Upland Advanced Strains Variety Trial* (2 locations with 1 Acala variety (Phytogen-72) and 19 California Upland varieties). *(UCCE Cooperators: R. Hutmacher, B. Marsh, M. Keeley, R. Delgado, S. Ball, J. Bergman, S. Perkins in fields at the UC Shafter Research & Ext. Centers and Borba Farms ; Borba Farms Cooperators: Mark Borba, Bob Prys).*

Seed Company Or Breeder	Variety Name or Number	40" rows Shafter REC Lint Yields		40" rows Fresno County (Five Points area) Lint Yields		Average Lint Yields Across 2 Locations		Average Gin Turnout Across Two locations (%)
		(lbs lint per acre)	(as % of Phy-72 Yield)	(lbs lint per acre)	(as % of Phy-72 Yield)	(lbs lint per acre)	(as % of Phy-72 Yield)	
Phytogen	**Phytogen-72 (Acala for comparison)**	2288	100	2119	100	**2204**	**100**	**33.4**
Olvey & Assoc.	**OA-85**	2140	93.6	1967	92.8	**2054**	**93.2**	**35.7**
Olvey & Assoc	**OA-87**	2178	95.2	2040	96.3	**2109**	**95.7**	**34.1**
Olvey & Assoc	**OA-90**	1945	85.0	2138	100.9	**2042**	**92.6**	**36.5**
Olvey & Assoc	**OA-91**	2074	90.6	1726	81.5	**1900**	**86.2**	**32.5**
Phytogen	**PSC-355**	1924	84.1	1740	82.1	**1832**	**83.1**	**31.2**
Phytogen	**PSC-355-112**	1899	83.0	1820	85.9	**1860**	**84.4**	**30.2**
Phytogen	**PSC-2983**	2162	94.5	1899	89.6	**2031**	**92.2**	**34.5**
Delta & Pine Land Co.	**DP-555 BR**	2184	95.5	1824	86.1	**2004**	**90.9**	**36.0**
Delta & Pine Land Co.	**DP-565**	2222	97.1	1915	90.4	**2069**	**93.9**	**33.0**
Delta & Pine Land Co.	**DP-5415 RR**	2106	92.0	1562	73.7	**1834**	**83.2**	**33.0**
Delta & Pine Land Co.	**DP-449 BR**	2130	93.1	1647	77.7	**1889**	**85.7**	**33.1**
CPCSD	**CS-1**	2096	91.6	1816	85.7	**1956**	**88.7**	**33.3**
CPCSD	**CS-2**	2100	91.8	2146	101.3	**2123**	**96.3**	**35.1**
CPCSD	**CS-3**	2102	91.9	1924	90.8	**2013**	**91.3**	**33.7**
CPCSD	**CS-4**	1947	85.1	1656	78.2	**1802**	**81.8**	**30.8**
Stoneville	**ST-457**	2105	92.0	1745	82.4	**1925**	**87.3**	**33.1**
Stoneville	**ST-4793 R**	2025	88.5	1752	82.7	**1889**	**85.7**	**33.6**
Stoneville	**STX-0003**	1881	82.2	1707	80.6	**1794**	**81.4**	**34.0**
Stoneville	**STC-9905**	2015	88.1	1755	82.8	**1885**	**85.5**	**32.4**
Average		**2076**		**1845**		**1961**		**33.4**
LSD 0.05		183		240		160		0.8
C.V. (%)		6.2		9.2		8.2		2.5

VARIETY by LOCATION interaction (for yields): (LSD 0.05 = 200; C.V. (%) = 7.2; P = 0.001

FALLOW BED WEED CONTROL

Ron Vargas and Steve Wright

Winter annual weeds left to grow on fallow beds deplete the available soil moisture and can interfere with final seed bed preparation and planting. Many acres of cotton are "bedded up" or listed in the fall prior to winter rains or later on during the winter. Most of the acreage is treated with a dinitroaniline (DNA) herbicide prior to listing.

A pre-irrigation and/or winter rains often germinate and start the growth of many types of winter annual weeds. Weeds in the mustard family, such as shepherds purse, london rocket, and black mustard, and volunteer cereals are not controlled by the DNA's and can germinate and flourish under this environment. In addition, if a dinitroaniline herbicide has not been applied, other weeds such as fiddleneck, chickweed, and annual bluegrass can become severe problems.

When late rains occur in spring, on heavier soils it becomes even more important to have cotton ground prepared well in advance of planting. Besides physical problems created by weed growth during final seedbed preparation and planting, green undecomposed vegetation becomes an ideal host for wireworm and cutworm, which can quickly reduce a stand of cotton during early stand establishment..

Control of fallow bed weed growth can be approached using several methods, which will be discussed below:

Mechanical Cultivation: Mechanical cultivation with the use of rolling cultivators and bed mulchers can be effective if weeds are never allowed to become large. If this is the chosen method of control, depending on winter rainfall patterns, three to four cultivations may be necessary to keep the weeds under control. However, wet weather may prevent timely cultivation, and tillage when soils are too wet can create soil compaction problems. Labor and fuel cost, due to multiple cultivations, must be considered. On fields that have not been listed, allow adequate time for weeds to decompose after disking so that plant residues don't interfere with listing and planting.

Post-Emergence Herbicides: Successful weed control can be achieved with use of postemergence herbicides. Paraquat and glyphosate are both registered to be applied by ground or air for the control of volunteer cereals and winter annual broadleaf weeds. Paraquat should be applied as a broadcast application at the rate of 2 to 3 pints per acre, depending upon weed size. A non-ionic spreader should be added. Glyphosate provides effective broad-spectrum control when applied broadcast at 12 to 16 oz per acre, although repeat applications may be necessary due to later-germinating weeds.

Both materials are weak on larger weeds, especially species such as filaree and mustard. The addition of Goal at 2 to 4 oz per acre will improve control of cheese weed, filaree, and other broadleaves. If weeds are allowed to become large before treatment, the dead, decaying weed skeletons will interfere with final seedbed preparation and planting. Results can be erratic due to wet, dense fog. With applications by air, careful attention must be given to avoiding drift onto non-target crops.

Soil-Applied Residual Herbicide: The third option is the use of a soil applied residual herbicide. At present, Goal is the most common soil applied herbicide for fallow bed weed control. Caparol is also registered for this use but is more commonly applied at planting or as a postdirected treatment. Goal controls many of the weeds that escape dinitroaniline herbicides. It is a broadleaf herbicide that has both contact activity against small, germinating weeds and residual activity. Although not labeled for volunteer cereals, it seems to give good residual control of emerging cereals. Goal can be applied at listing at 1.25 to 2.5 pints per acre or later after bed formation. The lower rate should provide up to 4 weeks for residual control and the higher rate up to 8 weeks of control. The best pre-emergence weed control is achieved when pre-irrigation or rainfall occurs within 3 to 4 weeks following application. It should not be applied within 14 days of planting. If applied after weeds have emerged, it can be tank mixed with either paraquat or glyphosate for increased control of annual grasses. Beds should be worked with rolling cultivators or bed mulchers to a depth of at least 2 inches to thoroughly break up the soil. After this operation, cotton can be safely planted, but no further weed control will be obtained with Goal. Air applications of Goal are limited to the period of October 1 to March 31. Observe labeled waiting periods before planting another crop after Goal is applied.

Trials conducted in Madera County with Valor (currently not registered) have shown promising results in fallow bed weed management, and follow-up research will be continued With the control options discussed above, unwanted weed growth on fallow cotton beds can be effectively and economically controlled. Final seedbed preparation and planting can be accomplished easily, resulting in a greater chance of obtaining a vigorous and uniform stand of cotton.

FUSARIUM WILT UPDATE

R.Michael Davis, Yumee Kim, Bob Hutmacher

Fusarium wilt of cotton is a vascular wilt disease caused by the fungus *Fusarium oxysporum* f.sp. *Vasinfectum* (FOV). In the San Joaquin Valley, Fusarium wilt has not historically caused significant crop losses due to California's mildly pathogenic strains and the high percentage of FOV-tolerant Upland cotton varieties grown. An exception occurs when plants are also infected with root-knot nematodes; in that case, even mild strains of FOV can be very damaging to most cotton varieties. However, a recent increase in Fusarium wilt in Pima cotton, even in the absence of root-knot nematode damage or any other kind of stress, has caused renewed concern about Fusarium wilt.

In addition to causing a general wilt, symptoms of Fusarium wilt include leaf yellowing and necrosis that typically begin on the leaf margins of lower leaves. The vascular system of infected plants is discolored brown to black. This is most easily seen between the upper taproot and the lower stem. In seedlings and young plants, cotyledons and leaves wilt and drop, resulting in bare stems. In mildly-affected plants, the lower leaves will show symptoms but the plant will survive, albeit with reduced vigor. In more severely affected plants, leaves wilt and drop and the plant may die.

Fusarium wilt can affect cotton at any time during the growing season, but is favored by warm weather. The disease is usually found in sandy soil because these soils favor the root-knot nematode. *Fusarium oxysporum* f. sp. *Vasinfectum* (FOV) is a stress-related pathogen that can cause more damage to plants when they become compromised by conditions such as:

- high temperature stress or injury
- nematode damage
- anaerobic conditions associated with over-irrigation
- moderate to severe water deficits
- root injury associated with fertilizer "burn"

The fungus survives indefinitely in soil since it can sustain itself on the outer surface of roots of many species of crops and weeds. The pathogen can also be seed-borne in cotton, a factor that can in part account for long-distance spread of the disease. It is still unclear whether it survives solely on the surface of the seed or if it can also survive within the seed. The pathogen can also be widely dispersed whenever infested soil is transported on farm equipment, with moving irrigation water, or on boots, shovels, siphon tubes or other equipment.

Due to resistant spores and its ability to sustain itself on the roots of many plants and in plant debris, it is nearly impossible to eradicate FOV from large production fields. However, with preventative strategies, early detection, and containment of infested soil and plants, the disease can be somewhat managed and dispersal limited or slowed. In order to avoid increasing populations of FOV spores, general practices to follow are:

- Use clean planting seed
- Nematode control with preplant fumigants if practical within the crop rotation
- Use of nematode-resistant varieties
- Avoid inducing plant stress associated with over-irrigation or too high applications of nitrogen fertilizer associated with root damage
- Consider avoiding land application of gin trash

Early detection of Fusarium wilt can be difficult because early symptoms may resemble some types of seedling disease and symptoms developing much later in the season (during bloom or boll-filling growth stages) may be similar to those occurring with infestations of *Verticillium dahliae* (Verticillium wilt). Differences in symptoms between Fusarium wilt and Verticillium wilt are:

- Vascular discoloration (brown staining of stem tissue) caused by FOV tends to be darker and more continuous, whereas *Verticillium* causes more of a "flecking" or "spotty" type of stain
- Necrosis on leaves by FOV begins on the leaf margins while the leaf necrosis caused by *Verticillium* tends to start between major veins
- Fusarium wilt is favored by warm temperatures while Verticillium wilt is favored by cool temperatures

Even for agriculturalists with field experience with these diseases, symptom differences still can be subtle and somewhat difficult to distinguish. If plants are found with symptoms described here, growers are encouraged to:

- cut stem sections from the lower third of the stem of suspicious plants
- Place them in a plastic bag or container and keep in a cooler or at room temperature (avoid freezing or heating the stem sections)
- take or send samples promptly to your UCCE Farm Advisor, who can send samples to Plant Pathologists for evaluations or help evaluate field symptoms

What to do if there is a positive identification of FOV.

If Fusarium wilt is confirmed in a field, containment options include:

- Reducing equipment and foot traffic to zero in affected patches of the fields where plants with symptoms were identified and confirmed for FOV
- Minimizing and restricting tractor and foot traffic in areas near field locations with symptoms, particularly when the soil is wet and more likely to stick to equipment or shoes
- Destroy affected plants and those within a few yards of plants with symptoms
- Stop irrigation of infested areas of fields, including the flow of irrigation water through the infested areas. Movement of water through infested areas can move plant debris and soil out of the area, spreading the FOV spores to new areas of the field.
- Do not produce planting seed in affected fields

If the affected areas are in relatively small patches, one approach can be to:

- pull out the diseased plants, but don't move them
- burn them at the spot where they are pulled
- Consider solarization of the soil under clear plastic for a minimum of 5 to 6 weeks during warm weather

If the affected areas are in large patches:

- Pull or kill the affected plants, preferably by spraying them with a herbicide
- leave the plants to die in place in the field

If a field is infested with both FOV and nematodes:

- Treatment of soils with nematicides is an option
- This practice will only kill the nematodes, however, and will not reduce the number of FOV spores
- In some circumstances, if soil texture and water availability allow, summer flooding of fields can be a management option

Most cotton crop loss in the San Joaquin Valley associated with Fusarium wilt is probably still associated also with nematode damage. This is particularly likely if you are producing cotton in sandy, sandy loam and silt loam soil in areas with a history of root-knot nematodes or Fusarium in past decades.

However, some Pima cotton varieties have been found to be very susceptible to certain identified California strains of FOV, even without nematode damage. This is not necessarily due to newly introduced virulent strains of FOV, but rather may indicate that certain Pima varieties could be more susceptible to local Fusarium strains than some Acala varieties. Ongoing studies may help provide information on relative susceptibility of available Pima varieties to some of these FOV strains.

With this information and these cautions in mind, growers and consultants should keep an eye out for symptoms of Fusarium, particularly in areas with prior low incidence of these disease symptoms. Contact your Farm Advisor or Specialists with questions or requests for field visits (phone numbers shown on back page).

ANNOUNCEMENTS

VARIETY TRIAL INFORMATION (Pima Trials, SJV Cotton Board Summary, Web Site Posting)

- SJV Cotton Board / UC Approved Pima Variety Trials: see next issue of this newsletter (January 2003) for yield data
- HVI Fiber Quality Summaries and all Yield Data: When all data is available and analyzed, it will be posted on the UC cotton web site: http://cottoninfo.ucdavis.edu

SACRAMENTO VALLEY COTTON PRODUCTION MEETING — February 7, 2003 (9 to noon)

- Winter Cotton Meeting to be held in Colusa, February 7, 2003 (contact Doug Munier, UCCE—Glenn County for information: (530) 865-1107)

CA PLANT AND SOIL CONFERENCE— February 5-6, 2003 (Modesto) (contact Bruce Roberts for info)

CA COTTON GROWERS ASSOC. / UCCE WINTER MEETINGS—February 4, 2003—Visalia

SPECIAL THANKS to the many growers, seed company representatives, and others who helped with variety trials and other field studies in 2002. These trials took up considerable space and required our cooperators to change field operations and provide equipment to accommodate these studies. Your help and patience assist in providing information to the entire CA Cotton industry, and your extra efforts are very much appreciated!