SUMMARY REPORT California Cotton Alliance Supported Project 2014 Project Activities to Date

PROJECT TITLE:	Field Screening Support – Verticillium wilt resistance of new germplasm Pima, Acala and California Upland Varieties
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Objectives of Research:

The overall objective of this research was to identify and utilize field screening locations with a moderate to high level of sustained Verticillium wilt inoculum to provide a location for field screening of cotton germplasm of interest in CA Cotton production. The aim of the work is to utilize locations with a Verticillium wilt population for field screenings to identify relative susceptibility of newer commercial varieties of interest for CA Cotton production, and to then screen experimentals from both commercial breeders or seed companies plus those from USDA-ARS or other public breeding programs.

Project Work to Date

Two test locations were identified with a moderate amount of Verticillium wilt problems evident in field screenings. Varieties entered in the FOV race 4 testing program were also evaluated for verticillium wilt present at the sites. A WSREC test location was evaluated at the West Side REC, and susceptible cotton varieties were again planted in a repeat site in order to develop that site as a repeat location to build up Verticillium inoculums for testing purposes. The entries evaluated included approved Acala varieties still available commercially and non-Acala CA Uplands, experimental Uplands and commercial and experimental Pima varieties from seed companies and public breeders in multiple locations.

The research sites evaluated as possible sites included the West Side REC site where no FOV race 4 was evident, and two sites where both Verticillium wilt and race 4 FOV were both present. In our work done to date, it seems workable to differentiate between verticillium wilt and race 4 FOV vascular stain symptoms in the plants when diagnosis and evaluation of plants was done at the optimum timing for both diseases. It is much more difficult and likely less useful to focus on foliar symptom severity as a relative indicator. In the tables that follow from 2014 screening summaries from two sites for all the entries evaluated, our plan is to focus on the vascular staining data, and the varieties / cultivars to focus on for additional evaluations would in particular be those that showed up as more severely infected (higher incidence of vascular staining) in both test sites (as opposed to a variety, for instance, with a relatively low incidence (% vascular staining) at only one location. The 2014 data summary data for the WSREC site is not complete, but we will be working to summarize those during the next month or two for a more complete report.

In our experience, the relative level of late season foliar damage is not necessarily an important indicator of relative impacts on yield, while the level of vascular staining can be a useful indicator of the areas of inoculum presence in the field and as an indicator of whether or not Verticillium is prevalent enough in the field to become an expanding problem. The best timing for the disease evaluations in the plants (vascular staining ratings) seems to be at about 5 to 8 weeks after planting with the Fusarium race 4 versus about 4 to 8 weeks

SUMMARY REPORT (CA Cotton Alliance) – Hutmacher – September, 2013 "Verticillium Wilt resistance of cotton germplasm") – Hutmacher, University of California

later for the verticillium ratings. The verticillium wilt symptoms were most evident in the second two sites (ones which also had Fusarium wilt symptoms), so the primary efforts in screening were done at those two sites.

Seed amount requirements for these small screening trials were on the order of several hundred seed per entry. This year and in the future the small size of the trial plantings should prevent seed amount from being a constraint to including cultivars that represent new germplasm. The primary trials were very <u>small plot trials</u> with 3 replications, and plots were one row in width by 15 to 20 feet in length, with about 60 seed planted per plot (less if seed availability was a problem with entries).

Data Collection and Results / Future Plans. Verticillium wilt incidence was evaluated in 20 to 25 plants per field replication in the entries at the test locations. Evaluations of plants were done by cutting the stems at an angle and across the stem diameter at a point about 5 cm above the cotyledonary node. The primary evaluation was presence / absence of the streaky vascular staining evident with verticillium wilt, and a secondary evaluation was just a visual ranking of the extent (percent) of leaves on the plant showing some evidence of necrotic areas or yellowing associated with Verticilium wilt. As California producers sort through a wide range of Pima and Upland germplasm going forward with multiple goals of finding high yielding, acceptable maturity timing, and high fiber quality varieties with resistance to diseases such as race 4 Fusarium, the idea behind evaluations for verticillium wilt would be to try to identify relative levels of susceptibility of newer or newly-considered cultivars also to Verticillium wilt.

The evaluations done in 2013 and 2014 at the UC West Side REC indicated a relatively low to moderate population of Verticillium that was not particularly conducive to separating out moderately susceptible from highly susceptible cultivars, since none of the tested cultivars at the site exceeded about 20-25 percent infection rates (vascular staining symptoms) in any replications.

Please contact Bob Hutmacher (Cell: (559) 260-8957 with questions or to suggest possible test plot locations if interested.

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Phy-755 RF U Kern Co 73 BX-1535 GLT U Kern Co 13 Tulare Co 60 60 10 Tulare Co 7 Tulare Co 7 WSREC 10 8X-1535 GLT U Kern Co 13 Daytona U Kern Co 27 BX-1536 GLT U Kern Co 40 RF Tulare Co 47 10 Tulare Co 53	2210								
Tulare Co 60 Tulare Co 7 WSREC 10 WSREC 5 Daytona U Kern Co 27 BX-1536 GLT U Kern Co 40 RF Tulare Co 47 53 53	Phy-755 RF	U				BX-1535 GLT	U		
WSREC 10 WSREC 5 Daytona U Kern Co 27 BX-1536 GLT U Kern Co 40 RF Tulare Co 47 E Tulare Co 53	,					2.1. 2000 021	-		
DaytonaUKern Co27BX-1536 GLTUKern Co40RFTulare Co47Tulare Co53									
RF Tulare Co 47 Tulare Co 53	Davtona	U				BX-1536 GLT	U		
	-	_					-		
			WSREC					WSREC	10

Cultivar	Type of		Percent of		Cultivar	Type of	Location	Percent of
name or	Cotton	Location	20-25		name or	Cotton	of	20-25
Variety	(U=	of	sampled		Variety	(U=	evaluation	sampled
	Upland;	evaluation	plants with			Upland;		plants with
	P=Pima)		verticillium			P=Pima)		verticillium
	- /		wilt			- /		wilt
			vascular					vascular
			stain					stain
DV 4520		Kana Ca	symptoms		04.5	D	Kawa Ca	symptoms
BX-1538	U	Kern Co.	60		OA-5	Р	Kern Co	0
GLT		Tulare Co.	53				Tulare Co	0
12 0252	U	WSREC	10		04.6	Р	WSREC	0 7
13 R352	U	Kern Co	53		OA-6	Р	Kern Co	
B2R2		Tulare Co	40 5				Tulare Co	33 F
12 0240		WSREC	5 40		04.7	Р	WSREC	5
12 R249	U	Kern Co.			OA-7	Р	Kern Co	
B2R2		Tulare Co.	67				Tulare Co	40 10
12 R224		WSREC	10		04.9	Р	WSREC	10
	U	Kern Co.	73		OA-8	Р	Kern Co	0
B2R2		Tulare Co. WSREC	40				Tulare Co WSREC	0 0
12 0210		Kern Co.	15		OA-9	Р	Kern Co	0
13 R310	U		27		UA-9	Р		
B2R2		Tulare Co. WSREC	20 0				Tulare Co WSREC	0 0
14 R1455	U	Kern Co.	33		OA-10	Р	Kern Co	0
	U		33 73		0A-10	P	Tulare Co	
B2R2		Tulare Co. WSREC	20				WSREC	0 0
14 R1456	U	Kern Co.	13		OA-13	U	Kern Co	53
B2R2	0	Tulare Co.	33		UA-15	0	Tulare Co	80
DZNZ		WSREC	5				WSREC	20
Phy-417	U	Kern Co.	40		OA-14	U	Kern Co	80
WRF	0	Tulare Co.	40 67		04-14	0	Tulare Co	80
VVIN		WSREC	15				WSREC	15
Phy-427	U	Kern Co.	47		OA-15	U	Kern Co	0
WRF	0	Tulare Co.	47		04-13	0	Tulare Co	27
vvitti		WSREC	5				WSREC	5
0A-1	Р	Kern Co.	7		OA-16	U	Kern Co	0
UA 1		Tulare Co.	13		07 10	Ŭ	Tulare Co	27
		WSREC	0				WSREC	10
OA-2	Р	Kern Co	7		OA-17	U	Kern Co	33
		Tulare Co	0		0,117	Ŭ	Tulare Co	27
		WSREC	0				WSREC	0
Oa-3	Р	Kern Co	0		OA-18	U	Kern Co	20
		Tulare Co	0		0,710	Ŭ	Tulare Co	20
		WSREC	0				WSREC	10
OA-4	Р	Kern Co	0		OA-19	Р	Kern Co	40
		Tulare Co	0		0,110		Tulare Co	27
		WSREC	0				WSREC	0
L	1	TIGHLE	.	L		1		5

Cultivar	Type of		Percent of	Cultivar	Type of	Location	Percent of
name or	Cotton	Location	20-25	name or	Cotton	of	20-25
Variety	(U=	of	sampled	Variety	(U=	evaluation	sampled
variety	Upland;	evaluation	plants with	variety	Upland;	evaluation	plants with
	•	evaluation	•				
	P=Pima)		verticillium		P=Pima)		verticillium
			wilt				wilt
			vascular				vascular
			stain				stain
			symptoms				symptoms
OA-20	U	Kern Co.	7	ST-6448	U	Kern Co	47
		Tulare Co.	0	GLB2		Tulare Co	33
		WSREC	0			WSREC	20
BX-1531	U	Kern Co	67	DP-348	U	Kern Co	7
GLT		Tulare Co	60			Tulare Co	0
		WSREC	15			WSREC	0
BX-1532	U	Kern Co.	47	OA-EXP08-	Р	Kern Co	0
GLT		Tulare Co.	67	15		Tulare Co	0
		WSREC	10			WSREC	0
BX-1533	U	Kern Co.	20	OA-EXP.11.8	Р	Kern Co	7
GLT		Tulare Co.	33			Tulare Co	0
		WSREC	0			WSREC	0
BX-1537	U	Kern Co.	0	OA-EXP.13.1	Р	Kern Co	0
GLT		Tulare Co.	20			Tulare Co	7
		WSREC	5			WSREC	0
BX-1539	U	Kern Co.	53	OA-EXP.13.7	Р	Kern Co	0
GLT		Tulare Co.	47			Tulare Co	7
		WSREC	20			WSREC	5
FM-1320	U	Kern Co.	13	OA-EXP.13.9	Р	Kern Co	13
GL		Tulare Co.	67			Tulare Co	7
		WSREC	15			WSREC	0
FM-1944	U	Kern Co.	27	OA-EXP.16.9	Р	Kern Co	13
GLB2		Tulare Co.	27			Tulare Co	0
		WSREC	0			WSREC	0
FM-2484	U	Kern Co.	0	OA-EXP.17-	Р	Kern Co	7
B2F		Tulare Co.	0	12		Tulare Co	0
		WSREC	0			WSREC	0
ST-4747	U	Kern Co.	33	OA-EXP.19-	Р	Kern Co	7
GLB2		Tulare Co.	60	14		Tulare Co	7
		WSREC	25			WSREC	5
ST-4946	U	Kern Co	7	OA-EXP.20-	Р	Kern Co	0
GLB2		Tulare Co	53	13		Tulare Co	0
		WSREC	10			WSREC	0
ST-5032	U	Kern Co	27	OA-EXP.20-	Р	Kern Co	0
GLT		Tulare Co	60	16		Tulare Co	13
		WSREC	20			WSREC	10
ST-5289	U	Kern Co	67	OA-EXP.21-	Р	Kern Co	0
GLT		Tulare Co	60	12		Tulare Co	0
		WSREC	5			WSREC	0

Cultivar	Type of		Percent of		Cultivar	Type of	Location	Percent of
name or	Cotton	Location	20-25		name or	Cotton	of	20-25
Variety	(U=	of	sampled		Variety	(U=	evaluation	sampled
,	Upland;	evaluation	plants with		,	Upland;		plants with
	P=Pima)		verticillium			P=Pima)		verticillium
			wilt					wilt
			vascular					vascular
			stain					stain
04.21.150	Р	Kara Ca	symptoms		CN4 0C 2222		Kern Co	symptoms
OA-21-15P	Р	Kern Co.	0		GW-06-3233	U		33
		Tulare Co. WSREC	73 15				Tulare Co WSREC	0 10
OA-	Р	Kern Co	7		GW-07-269	U	Kern Co	47
EXP.23-11	P	Tulare Co	0		GW-07-269	U	Tulare Co	33
EXP.25-11		WSREC	0				WSREC	55 10
OA-	Р	Kern Co.	7		GW-07-373	U	Kern Co	60
EXP.23-14	Г	Tulare Co.	0		000-07-373	0	Tulare Co	53
LXI .25-14		WSREC	0				WSREC	5
OA-	Р	Kern Co.	0		Ark-0614-49	U	Kern Co	53
EXP.24-14		Tulare Co.	0				Tulare Co	47
		WSREC	0				WSREC	20
DP-360	Р	Kern Co.	0		Ark-0615-38	U	Kern Co	73
		Tulare Co.	0				Tulare Co	47
		WSREC	0				WSREC	25
DP-744	Р	Kern Co.	47		Phy-72	U	Kern Co	60
		Tulare Co.	7				Tulare Co	60
		WSREC	10				WSREC	20
Phy-830	Р	Kern Co.	7		PD-07066	U	Kern Co	47
		Tulare Co.	13				Tulare Co	20
		WSREC	5				WSREC	5
FM-2989	U	Kern Co.	27		PD-07116	U	Kern Co	33
GLB2		Tulare Co.	40				Tulare Co	40
		WSREC	10				WSREC	0
OA-EXP-	Р	Kern Co.	7		PD-08039	U	Kern Co	40
15-3		Tulare Co.	7				Tulare Co	47
		WSREC	0		<u> </u>		WSREC	15
OA-EXP-	Р	Kern Co.	0		GA-2009100	U	Kern Co	40
20-9		Tulare Co.	7				Tulare Co	40 1 E
SPR-856/1	Р	WSREC	0 7		CA 2000027		WSREC Kern Co	15 27
354-920/1	٢	Kern Co Tulare Co	0		GA-2009037	U	Tulare Co	27 60
		WSREC	0				WSREC	60 15
SPR-1000	Р	Kern Co	0	-	GA-2010074	U	Kern Co	67
51 1/21000	r.	Tulare Co	0 7		54-2010074	0	Tulare Co	67
		WSREC	0				WSREC	20
SPR-9009-	Р	Kern Co	0		MD-10-6	U	Kern Co	40
6		Tulare Co	0			Ĩ	Tulare Co	20
		WSREC	0				WSREC	15
L	1			I	1	1		

Cultivar	Type of		Percent of		Cultivar	Type of	Location	Percent of
name or	Cotton	Location	20-25		name or	Cotton	of	20-25
Variety	(U=	of	sampled		Variety	(U=	evaluation	sampled
	Upland;	evaluation	plants with			Upland;		plants with
	P=Pima)		verticillium			P=Pima)		verticillium
	,		wilt			,		wilt
			vascular					vascular
			stain					stain
LA-	U	Kern Co.	symptoms			U	Kern Co	symptoms
11309062	U	Tulare Co.	33 20		MS 00415	U	Tulare Co	33
11309062		WSREC	20				WSREC	10
LA-	U	Kern Co	20		MS 0040-19-	U	Kern Co	60
11309040	0	Tulare Co	20		4	0	Tulare Co	00
11309040		WSREC	5		4		WSREC	15
LA-	U	Kern Co.	60		DP-393	U	Kern Co	33
11309005	Ŭ	Tulare Co.	00		01 333	U	Tulare Co	55
11505005		WSREC	20				WSREC	20
OA-185	U	Kern Co.	33		SG-105	U	Kern Co	53
		Tulare Co.					Tulare Co	
		WSREC	5				WSREC	25
OA-173	U	Kern Co.	27		FM-958	U	Kern Co	27
		Tulare Co.					Tulare Co	
		WSREC	10				WSREC	0
PX-06520-	U	Kern Co.	53		UA-222	U	Kern Co	40
42-2-1		Tulare Co.					Tulare Co	
		WSREC	0				WSREC	15
AU 51038	U	Kern Co.	67		DP-491	U	Kern Co	33
		Tulare Co.					Tulare Co	
		WSREC	20				WSREC	5
AU 91411	U	Kern Co.	40				Kern Co	
		Tulare Co.	10				Tulare Co	
		WSREC	10				WSREC	
AU 52034	U	Kern Co.	67				Kern Co	
		Tulare Co.	20				Tulare Co	
NM	U	WSREC	20 13				WSREC	
12Y1002	U	Kern Co. Tulare Co.	13				Kern Co Tulare Co	
1211002		WSREC	0				WSREC	
NM	U	Kern Co	7				Kern Co	
12Y1004		Tulare Co	,				Tulare Co	
12,1004		WSREC	0				WSREC	
NM	U	Kern Co	0	-			Kern Co	
12Y1005		Tulare Co	5				Tulare Co	
		WSREC	0				WSREC	
MS 0043-	U	Kern Co	33				Kern Co	
28-1		Tulare Co					Tulare Co	
		WSREC	5				WSREC	