

Assessment of Fusarium in SJV Cotton: Field Evaluation Support and Variety Screening Evaluations

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PROJECT SUMMARY

In California, Fusarium wilt of cotton has been considered a potentially serious fungal disease caused by the organism *Fusarium oxysporum* *vas infectum* (also called "FOV"). However, in the past, damage associated with Fusarium in SJV cotton has been notable only in production areas with the combination of: (a) moderate to high populations of a specific race of FOV (usually race 1); (b) soils with a sandy or sandy loam texture; and (c) root knot nematodes present in high-enough populations to cause significant galling and root damage. Past research generally indicated that FOV damage was worst when both FOV inoculum and nematodes were present in relatively high concentrations. Methods used in the past to limit damage to cotton associated with Fusarium wilt have been to avoid planting cotton in soils in which the combination of sandy or sandy loam texture is combined with the presence of root knot nematode, or grow cotton only infrequently as part of a crop rotation that includes crops less likely to build soil inoculum loads.

Various stages of this fungal organism can survive for a very long time in the soil, so most past studies have concluded that use of chemicals for eradication will generally be unsuccessful, and at best will give short-term control. Most all past work on Fusarium evaluations done in CA has been with Acala varieties. Some recent work by Pete Goodell (UCCE IPM Regional Advisor) and Phil Roberts, UC Riverside Nematologist has also confirmed that at least two contemporary Pima varieties show significant foliar and vascular staining symptoms when exposed to soils high in Fusarium inoculum and root knot nematodes, with plant damage and stand losses similar to Acala varieties grown previously in the same fields. Assistance from Michael Davis (UC Davis Extension Plant Pathologist) in those studies confirmed that symptoms and plant damage in Pima plants was due to FOV, so evidence indicates that Pima can have at least similar susceptibility to prevalent Fusarium races where the root knot nematode:Fusarium combination exists.

Within the past five years, cotton fields with Fusarium symptoms were discovered in loam and clay loam soil sites which do not support significant populations of root knot nematode. Since mid-summer 2002, the infection of cotton plants, symptoms of FOV-related damage, and sometimes significant stand losses and stunting without involvement of root damage due to root knot nematodes has been confirmed in many fields in four counties of the SJV (Tulare, Kings, Fresno and Kern Counties). In these fields, the damage has been identified by the Principal Investigators as being caused by a different race of *Fusarium oxysporum* *vas infectum*, (namely "Race 4"). Using modified DNA gene mapping methods, Dr. Michael Davis and Yumee Kim of UC Davis Plant Pathology Dept. have worked with samples identified and collected by UCCE staff Hutmacher, Wright, Roberts, Marsh and Munk and their staff. This race 4 FOV can be clearly identified as different from Australian FOV races and different from the most-studied

Fusarium species (mostly races 1, to lesser extent race 3) prevalent in sandy loam soils and problem areas of the SJV for decades.

Capabilities and research continue to be important to allow:

- Assessment of field plant samples for the type of Fusarium occurring in grower fields (When growers request assistance in sample collection and analysis)
- set up and operation of cotton germplasm screening trials under pressure of race 4 FOV to identify relative resistance / susceptibility of both Upland and Pima materials

Screening trials have continued to be conducted at a greenhouse location (UC Kearney Research and Extension Center) which has been used successfully over the past five years. Additional field trials for screening germplasm will be conducted where field sites with race 4 FOV are identified and providing that willing cooperators can be found and retained for continuing studies.

We have been able to gain access to the following field screening sites in infested fields:

- In 2006, we identified and used one small site (about 0.3 acres) in Kern County, and one larger one (about 1.2 acres) in Fresno County for purposes of field screening trials.
- In 2007, a larger Kern County site (about 1 acre) was available for field screening, a 1 acre site is being used in Fresno County, and two smaller sites (about 0.2 to 0.3 acres each) are being utilized for screening, selection and seed increase purposes in Fresno and Kern Counties.
- In 2008, we used the same large Kern County site (about 1 acre) along with the same 1 acre site for large scale screening in Fresno County in an infested site. We also have two additional sites we have used in Kern County, one that is about 0.3 acres and another that is about 0.2 acres in size. Screening has been done at each of these trial sites in 2008.

This project is dependent upon cooperation with Dr. Michael R. Davis (UC Davis Plant Pathology), as Dr. Davis is the pathologist we are working with to send samples for FOV race identification and classification. Results of field screening evaluations for race 4 FOV resistance/tolerance are provided annually (or more often if available) to seed companies who provide materials for testing, as well as to the USDA-ARS genetics program at Shafter and interested cooperating researchers.

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