

**Effects of Weed Control in Grain  
Sorghum on Subsequent Incidence of  
Verticillium Wilt in Cotton**

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ABSTRACT

Incidence of Verticillium wilt in cotton planted after 4 years of grain sorghum infested with *Amaranthus* spp. was higher than in cotton planted after 4 years of weed-free grain sorghum. Wilt was also more severe in three successive annual plantings of cotton which followed only 2 years' culture of weedy grain sorghum.

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*Additional key words:* *Gossypium hirsutum*, *Sorghum bicolor*, *Amaranthus retroflexus*, *Verticillium albo-atrum*, yield, Micronaire.

Grain sorghum is used in rotation with cotton on the Texas High Plains to control Verticillium wilt. A rotation which consisted of soybeans the 1st year, and barley and grain sorghum the second, was effective in reducing the incidence of wilt in two cotton crops which followed (3). Cotton producers, however, have not consistently obtained desired control of wilt from this rotation. Severe weed infestations (primarily *Amaranthus* spp.) are often associated with grain sorghum. However, *Amaranthus retroflexus* L., the most common species in the High Plains area, is a host for *Verticillium albo-atrum* (1, 2, 4), and studies in our greenhouse further confirm that isolates of this fungus obtained from symptomless plants of *Amaranthus* spp. are pathogenic on cotton.

The object of this study was to determine the effects of weed control in grain sorghum on the incidence of Verticillium wilt in subsequent cotton plantings.

The test was initiated in 1966 on Amarillo loam soil used previously to evaluate cotton cultivars and selections for tolerance to Verticillium wilt in weed-free plots. The soil was heavily infested with Verticillium propagules.

Weed-free cotton was grown annually for 3 years after 2 years of weedy and weed-free grain sorghum, and for 1 year after 4 years of weedy and weed-free grain sorghum. Grain sorghum, *Sorghum bicolor* L. Moench (cultivar RS 671), was grown on all plots during 1966-67, and on one-half the same plots during 1968-69. Each year, *A. retroflexus*, the dominant weed species, was not controlled in one-half the plots planted to grain sorghum. Weeds in the remaining grain sorghum and in all cotton plots were controlled chemically with 3-(3,4-dichlorophenyl)-1,1-dimethylurea (Diuron), by mechanical cultivation and hand hoeing. The same plots were used for the same treatments each year.

Seeds of *Gossypium hirsutum* L. 'Blightmaster A5' were planted in 1968 and 1969 in plots previously planted to weedy and weed-free grain sorghum in 1966-67, and in all plots in 1970. On 9 June 1968, cotton seedlings were destroyed by hail. A determinate cotton cultivar, C.A. 491, was used to replant the plots on 13 June. Both these cotton cultivars are moderately susceptible to Verticillium wilt. The cotton seedlings were hand-thinned to uniform spacing (10-cm) between plants.

The experiment was a randomized block design, replicated twice. The plots were four rows, 13.7 m long with 1-m spacing between rows. Foliar symptoms of wilt were recorded in the two center rows of each plot. Movement of plant debris and soil from plot to plot was minimized by establishment of permanent borders, and by the cleaning of farm equipment between plots. Each plot was irrigated individually as needed for normal growth of crop plants. Anhydrous ammonia was applied annually at the rate of 90 kg of N/hectare.

*After 2 years of grain sorghum.*—Incidence of wilt in cotton from 19 July through 22 August was not affected, whether weeds were controlled in the previous sorghum crops. Later (11 September through 3 October), however, incidence was 8-20% higher and wilt was more severe in plots which

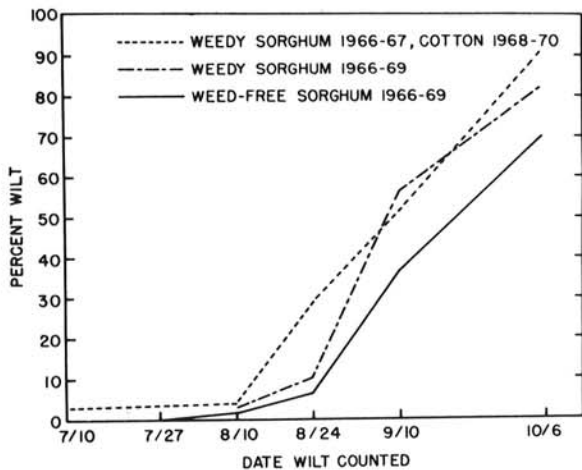


Fig. 1. Incidence of *Verticillium* wilt in cotton planted after the indicated cropping sequence. Weedy sorghum was infested with *Amaranthus retroflexus*.

followed the two weedy sorghum crops than in those plots which followed sorghum kept weed free. Severity of wilt (evaluated 20 September and 3 October) reflected greater adverse effects of weedy sorghum than incidence of disease as indicated by reduced Micronaire of lint (2.7 weed-free and 2.5 weedy) and yield (349 weed-free and 294 weedy kg/hectare, respectively).

*Two years of grain sorghum and 2 years of cotton.*—Incidence of wilt was from 2 to 12% higher in plots which had been planted for 2 years to weedy grain sorghum, compared to those which had followed weed-free sorghum. Differences were greater during September than earlier in the season. Micronaire of lint was again reduced, but yield differences were masked by an early freeze on 14 October.

*Two years of grain sorghum and 2 years of cotton compared to 4 years of grain sorghum.*—Incidence of wilt was not affected by previous treatments in early season (Fig. 1). It was greatest, however, (24 August-6 October) in plots which had been cropped for 2 or 4 years to weedy sorghum. The lowest incidence occurred after 4 years of weed-free sorghum. Wilt was as severe after 4 years of weedy grain sorghum as in the second crop of cotton which followed only 2 years of weed-free grain sorghum. Bolls matured more slowly on plants which followed 4 years of weed-free sorghum than did those on plants which followed 2-4 years of weedy grain sorghum (infested with *A. retroflexus*). An early freeze prevented many of the former from maturing, and resulted in reduced yield. Lint yields (kg/hectare) and Micronaire of lint were as follows: after 4 years of weedy sorghum 874, 3.6; after 2 years of weedy sorghum 631, 3.6; and after 4 years of weed-free sorghum 874, 3.2.

These studies confirm that culture of grain sorghum infested with *Amaranthus* spp. does not reduce the severity of *Verticillium* wilt in subsequent cotton crops.

#### LITERATURE CITED

1. BROWN, F. H., & A. B. WILES. 1970. Reaction of certain cultivars and weeds to a pathogenic isolate of *Verticillium albo-atrum* from cotton. *Plant Dis. Repr.* 54:508-512.
2. ENGELHARD, A. W. 1957. Host index of *Verticillium albo-atrum* Reinke and Berth. (Including *Verticillium dahliae* Kleb.). *Plant Dis. Repr. Suppl.* 244:23-49.
3. HINKLE, D. A., & N. D. FULTON. 1963. Yield and *Verticillium* wilt incidence in cotton as affected by crop rotations. *Ark. Agr. Exp. Sta. Bull.* 674. 15 p.
4. OSHIMA, N., C. L. LIVINGSTON, & M. D. HARRISON. 1963. Weeds as carriers of two potato pathogens in Colorado. *Plant Dis. Repr.* 47:466-469.