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THE FUSARIUM WILT DISEASE NURSERY FOR WATERMELON AT OVERTON

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Background. Watermelons [*Citrullus lanatus,* (Thunb.) Natsum. & Nakai] are one of the most extensively planted and popular summer fruits. Watermelons are grown commercially on at least 222,300 acres annually in the United States, not including production in home gardens and small truck farms. Texas historically ranks first or second in watermelon production with an estimated acreage of 50,000 to 60,000 acres which contributes about $268 M to the Texas economy. East Texas is generally considered the major watermelon production region in Texas with an estimated 25,000 acres. Yields in Texas (7 tons/acre) average lower than states such as California (18.5 tons/acre) due in part to the use of low input production systems and diseases such as Fusarium wilt disease.

Fusarium wilt disease, caused by the soil-borne fungus *Fusarium oxysporum* Schlechtend.:Fr.f.sp.*niveum*(E.F.Sm.)W.C. Snyder & H.N. Hans., is a major yield and quality limitation for watermelon production. Infection with this fungus causes damping-off of seedlings. Plants infected early in the season often produce no marketable fruit. Plants that display wilt symptoms later in the season, near maturity often produce far fewer marketable fruit of poor quality. Initial symptoms include wilting and chlorosis of older leaves. At the plant canopy level, the wilt is often observed during the heat of the day. Although the plants may recover by the following morning, wilt is often observed by the following afternoon. Fusarium wilt causes vascular browning that can be seen in stem cross-sections. Stems of infected plants often form cracks and brown streaks near the crown that often leak a red, brown or black exudate. This pathogen is wide-spread throughout the United States with a high degree of persistence once established in a field. Long-term crop rotations or leaving the soil fallow for several years helps reduce pathogen populations, but, in general, do not eradicate the pathogen.

Research Findings. In the late 1970's, Fuqua and Smith identified an area at the Overton Agricultural Research and Extension Center which showed some degree of infestation with the fusarium wilt pathogen. In 1993 and 1994, two plots in this area, 0.7 acres each, were cleared and infested with laboratory grown inoculum of *F. oxysporum f.* sp. *niveum.* (FON) race 1 and 2. In both years, the highly fusarium wilt susceptible watermelon cultivar 'Black Diamond' was grown as a cover crop. In 1995, the field site was left fallow. In the 1996 cropping season, this site was used to test the ability of a selected, mutated, foliar pathogen, *Colletotorichum magna*, to induce resistance to fusarium wilt. In 1997, with support from the National Watermelon Promotion Board,

this field was reinoculated with both FON races 1 and 2 and indexed for fusarium incidence both spatially across the field and temporally over the growing season.

In 1997, fusarium treatments significantly reduced watermelon yields due to a reduction in both the number of melons/acre and average individual melon weight (Table 1). Based on weekly observations of disease incidence and plant mortality across the field, we concluded that there were no clear temporal or spatial trends in disease incidence in the FON race 1 and 2 treatments. However, the higher yields for the control appear to indicate that in order to utilize this field site for commercial screening, yearly reinoculations with FON race 1 and 2 may be necessary in order to achieve sufficiently high disease pressure.

Application. Genetic resistance to fusarium wilt is very likely the most sustainable, economically sound, and environmentally safe component of an integrated pest management system designed to control fusarium wilt. In addition to screening germplasm and cultivars for resistance to fusarium wilt, this nursery will provide the basis for in-depth field research into the environmental, cultural, and genetic factors influencing disease development and control under conditions that can be readily manipulated and monitored.

Table 1. Effects of Fusarium Wilt Disease treatments on yield, yield components and plant populations for the fusarium wilt susceptible watermelon cultivar 'Black Diamond'.

Treatment	Yield lbs/acre	Melons no./acre	Melon weight lbs/melon	*Dead plants no./acre
Control	32,726 A	2,626 A	12.0 A	152
Race 1	20,124 B	1,944 B	11.4 B	208
Race 2	16,817 B	1,477 B	10.5 B	170

Mean separation by Duncan's multiple range test ($P \leq 0.05$).
*Initial plant population was 1,818 plants/acre.