1976, were positive for *S. citri*. Meanwhile, the seeds collected in 1975 had been germinated in the greenhouse, and three London rocket seedlings were exposed to *S. citri*-infected *S. nitridus* and *C. tenellus*.

Leafhopper vector species and test plants were manipulated as follows:

(1) In the first test, 200 *S. nitridus* were caged on one healthy, greenhouse-grown London rocket plant. These leafhoppers had previously been caged for 18 days on a *S. citri*-infected periwinkle plant and were therefore considered infectious. The leafhoppers fed on the healthy weed for 24 days. Forty days later the test plant became chlorotic, wilted, and died. About 80 *S. nitridus* that still survived were transferred to a healthy periwinkle plant. In 35 days this plant became diseased with *S. citri* (that is, it showed stunt, chlorosis, and small-flower symptoms).

(2) The second test was made with the other two greenhouse-grown London rocket plants (in one pot). About 112 *C. tenellus* were caged on these plants after they had had an acquisition feeding period of 16 days on *S. citri*-affected periwinkle. The insects remained on the London rocket plant for 27 days. Then 60 living leafhoppers were transferred to a healthy periwinkle plant. The two London rocket plants and the periwinkle wilted and died. Also, *S. citri* was cultured from the London rocket and the periwinkle plants.

In other trials *S. citri*-free beet leafhoppers reared in the laboratory were caged on diseased London rocket plants growing at the Moreno stubborn plot. These insects fed for eight days, then were caged on a healthy periwinkle plant. After about four weeks, that plant became diseased, and *S. citri* was cultured from it.

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Several cultivars were tested in the field and the greenhouse for resistance to this wilt fungus.

Fusarium-resistant watermelon cultivars

Albert O. Paulus • Otis A. Harvey • Jerry Nelson • Fujio Shibuya

Fusarium wilt of watermelon, caused by *Fusarium oxysporum* f. *niveum*, can be a limiting factor in California watermelon production. Warm weather, which favors watermelon production, also favors the disease. The fungus lives in the soil for many years, and therefore rotation, although helpful, is not the answer to the problem. Studies were initiated in 1971 to test various watermelon cultivars for resistance to the *Fusarium* wilt fungus.

Field trials

All field trials were conducted at the Duke Layton watermelon breeding farm near Hemet. The soil was a sandy loam, which had been planted to watermelons for 18 consecutive seasons. *Fusarium* inoculum was at a high level in the trial plot area. Twenty-five seeds of each cultivar were planted in a 15-foot row. Plots were replicated four times.

Notes were taken during each trial on number of healthy and diseased plants. Isolations were made from wilting plants to confirm *Fusarium* as the cause of decline.

In the 1971 trial, seeds were planted on August 2, with excellent soil moisture for germination. The final count of healthy plants in each cultivar was made on October 13.

In 1972, watermelon seeds were planted on June 12, and the final count of healthy plants was made on July 23.

In 1973, seeds were planted on July 24, and the final count was made on September 6.

In all three field trials, Calhoun Gray had the highest level of resistance to *Fusarium* (see table). Conversely, Chilean Black Seed was very susceptible to the *Fusarium* wilt fungus. Although cultivar reaction varied somewhat from trial to trial, Charleston Gray, Sweet Princess, Picnic, and Layton 31—2 showed high tolerance to *Fusarium*. Seeds of the cultivars Charleston Gray and Peacock 124 were obtained from two companies, and the wilt reaction was essentially the same for both seed lots. Jubilee showed poor resistance in the 1971 field trial.

Greenhouse trials

Inoculum for the greenhouse trials at U.C., Riverside, was obtained by isolating *Fusarium oxysporum* f. *niveum* from a single wilting plant from the Layton watermelon nursery in the summer of 1971. The culture was single-spored, grown on PDA slants, and then shown to have high pathogenicity to several watermelon cultivars. Twenty watermelon seeds of each cultivar were planted in a 4-inch flat of sandy loam soil in a single row. Twenty-five cc of inoculum (500,000 spores per ml) were applied to each row before it was covered with soil. Flats were then placed on greenhouse benches where air temperature was 75° F, and healthy plants were counted after approximately one month. Isolations were made from wilting plants to confirm the presence of *Fusarium*. Plots were replicated two times.

SUSCEPTIBILITY OF WATERMELON CULTIVARS TO
Fusarium oxysporum f. *niveum*

Cultivar	Percent healthy plants				
	Field trials			Greenhouse trials	
	10/13/71	7/23/72	9/6/73	11/1/71	5/23/72
Calhoun Gray	78	100	93	97	100
Crimson Sweet				95	82
Picnic		87	81		
Charleston Gray	40		71		87
Charleston Gray 133				87	
Layton 31–2			86		
Smokey Lee					86
Jubilee (70200)					76
Dixie Queen				75	
Sweet Princess		74		51	70
Summit					71
Charleston Gray (7535)		69			
Charleston Gray (87469)		66			
Klondike R-7-65			69		
Peacock 60	52		63	68	61
Klondike 155-88	37		67	73	
Klondike Blue Ribbon	38			71	
Peacock 124	39			68	
Jubilee	20			64	
Sugar Baby					64
Klondike 3	27			61	
Louisiana Queen		59			
Peacock 124 (7510)		55			
Summerfield	52			26	20
Peacock 50	35			51	
Chris Cross		48			
Peacock 124 (87498)		44			
Jubilee (R404)					42
RS 57				41	
Klondike Brown No. 7				40	
Klondike 7	33				
Jubilee (60400)					30
Seedless No. 5				28	
Tri X No. 313					27
Triple Sweet					24
Klondike 65	6				
Klondike 57	2				
New Hampshire Midget			2		
Chilean Black Seed	1	9	6	15	17

Calhoun Gray provided the highest level of resistance to *Fusarium* in all greenhouse trials (see table). Cultivars with high resistance were Crimson Sweet, Charleston Gray 133, Charleston Gray, and Smokey Lee. Seed samples of Jubilee were obtained from three seed companies, and healthy plants varied from 30 to 76 percent. Seedless No. 5, Tri X No. 313, Triple Sweet, and Chilean Black Seed were highly susceptible to *Fusarium*.

Summary

Calhoun Gray provided the highest level of resistance to *Fusarium* in field and greenhouse trials. Seedless watermelons were very susceptible to the wilt fungus. Chilean Black Seed was highly susceptible in all trials.

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Using cannery

Before 1974, most of the 160,000 pounds of wet solid waste produced annually in San Joaquin County fruit and vegetable processing plants was disposed of in cut-and-fill dump sites. As this means of disposal became less desirable, incorporation of cannery waste into soil used for forage production was considered. Since cannery wastes are high in nitrogen content, it was necessary to determine whether such forage plants would accumulate levels of nitrate-nitrogen toxic to livestock.

Nitrate levels were measured in a study that began in the summer of 1973 in a 30-acre field 5 miles southwest of Stockton. About 300 to 600 cubic yards of waste per acre were incorporated into the soil in 1973, and data were collected from samples of waste, soil, alfalfa, and weed plants associated with the alfalfa.

Although the top 4 to 6 feet of soil had been removed for land fill before the study began, the remaining soil had not been substantially changed from its original classification of Dinuba fine sandy loam. The waste material was not applied uniformly across the field, and it varied in percentage of dry matter. Nitrogen content of waste samples varied from 0.6 percent for some fruit materials to 3.2 percent for tomato waste, based on dry weight.

Four sampling stations were established across the field; two of them received no waste. Table 1 shows the nitrogen content of the top acre-foot of soil at each station before and after leveling. After the field was leveled and planted to alfalfa, nitrogen per top acre-foot ranged from 740 to 4,540 pounds.

Samples of alfalfa and other plants growing in association with alfalfa were taken at the approximate sites of the four soil sampling stations in May, July, and September 1974. Core samples were also taken from 40 representative hay bales from the first cutting. One particularly weedy bale, estimated to be 25 to 40 percent weed species, was sampled for comparison.

Table 2 shows that alfalfa did not accumulate high levels of nitrate, even though higher than normal levels of nitrogen were present in the soil. Nitrate levels in all alfalfa samples were substantially