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

wastes on forage cropland

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Wet solid wastes from fruit and vegetable canneries were incorporated into soil used for forage production without producing toxic levels of nitrate in alfalfa. But toxic levels did occur in weeds.

TABLE 1. TOTAL NITROGEN PER TOP ACRE-FOOT OF SOIL IN A FIELD TREATED WITH CANNERY WASTE

Sampling site	Waste treatment	Amount of nitrogen per top acre-foot: Before leveling 9/25/73	After leveling 5/20/74
		pounds	
1	None	1,200	2,740
2	600 cu yd/acre	2,400	4,540
3	300 cu yd/acre	1,460	1,800
4	None	920	740

TABLE 2. NITRATE-NITROGEN (NO_3-N) IN ALFALFA AND WEEDS IN A FIELD PARTLY TREATED WITH CANNERY WASTES

Plant and site	Amount of NO_3-N in samples on: 5/20/74	7/31/74	9/18/74	Site average
	ppm	ppm	ppm	ppm
Alfalfa — whole stems:				
Site 1	520	572	806	633
2	468	572	468	503
3	702	650	390	581
4	494	–	–	494
Average NO_3-N	546	598	555	
Lambsquarter (*Chenopodium album* L.) and red root (*Amaranthus retroflexus* L.):				
Site 1	728	3,432	1,560	1,907
2	624	2,080	1,300	1,335
3	2,964	2,652	1,508	2,375
4	1,716	3,328	1,508	2,184
Average NO_3-N	1,508	2,860	1,456	
Watergrass (*Echinochloa crusgalli*)		2,870		

below those which some investigators consider the potential toxic level of 2,078 ppm actual nitrogen (nitrate-nitrogen). Whether or not poisoning will result in the animal depends not only on the amount of high-nitrate forage consumed but also on conditions in the animal's rumen that favor reduction of nitrate to nitrite.

Accumulation of potentially lethal levels of nitrate-nitrogen did occur in weedy plants growing with the alfalfa. Such plants have been reported responsible for nitrate poisoning in California.

The second cutting of the field was fed as green chop to beef cows and suckling calves without any apparent ill effects. The percentage of weeds in the forage was not as high after the first cutting.

It is noteworthy that average nitrate levels in the alfalfa remained relatively constant throughout the season, while the average level in the weed species was 1,508 ppm in May, peaked at around 2,860 ppm in late July, and dropped to 1,456 ppm in September. Core samples of weed-free bales and a weedy bale showed 338 and 6,250 ppm, respectively. This would indicate that higher levels of nitrate-nitrogen were present in the weeds early in July than in late July and conforms to the frequent observation that, as annual plants mature, their nitrate-nitrogen concentration decreases.

Some observations and recommendations

Many factors can affect nitrate accumulation in a plant—species, stage of growth, season of growth, and part of the plant. For example, new growth of alfalfa exhibits a maximum nitrate content early in the growth cycle and a minimum at the beginning of bloom. After full bloom is reached, the nitrate level begins to increase again. This may in part explain the wide range of values (390 to 806 ppm) in whole alfalfa plants in this study. (In a Nebraska study, 71 samples of alfalfa hay also had a wide range of nitrate-nitrogen—140 to 1,972 ppm—or an average of 570 ppm.)

Loading rates and spreading techniques for uniform application of waste have been developed in San Joaquin County. These should decrease the potential for possibly toxic nitrate levels.

Since the grain portion of plants seldom contains appreciable amounts of nitrate, it is suggested that a cereal crop grown for grain, rather than a forage crop, follow an application of waste to cropland.

Finally, if alfalfa is planted after cannery waste application, positive measures should be taken to control weeds capable of accumulating high nitrate levels.

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