Table 9. Effect of seaweed based nutrient sprays on 'Sunny' tomato yields (lb./acre)[z,y] GCREC-Bradenton, spring 1984.

Fruit size and grade	Spray treatment					
	Control	B10	BM86	MZ63	MZ63 and B10	MZ63 and BM86
First pick:						
5x6	1508 (100)	1210 (80)	2056 (136)	2456 (163)	1731 (115)	1756 (116)
5x6 and 6x6	1819 (100)	1623 (89)	2596 (143)	3084 (170)	2233 (123)	2153 (118)
Marketable	1847 (100)	1656 (90)	2646 (143)	3189 (173)	2261 (122)	2178 (118)
Total harvest:						
5x6	14209 (100)	11477 (81)	21262 (150)	24438 (172)	19200 (135)	13418 (94)
5x6 and 6x6	23762 (100)	19051 (80)	33560 (141)	37613 (158)	34085 (143)	26741 (112)
Marketable	29688 (100)	24079 (81)	40410 (136)	42842 (144)	39882 (134)	32262 (109)

[z]Average of 4 replications.
[y]Yield difference (%) compared to control in bracket (control = 100%).

early yield and fruit size. In previous studies at this center (7), minerals supplied by the BM86 spray alone, did not increase yield or fruit size of fall and spring tomatoes. Further studies will be needed to evaluate the effect of seaweed concentrations and timing of application with plant growth stages on tomato yields.

Literature Cited

1. Bryan, H. H. 1976. Response of tomatoes to seed and seedling applications of humates and alpha-keto acids. Proc. Fla. State Hort. Soc. 89:87-90.
2. Chapman, V. J. and D. J. Chapman. 1980. Seaweeds and their uses. 3rd ed. Chapman and Hall, Ltd. London. 334 p.
3. Coombe, B. G. 1976. The development of fleshy fruits. Annu. Rev. Plant Physiol. 27:507-528.
4. Crane, J. C. 1964. Growth substances in fruit setting and development. Annu. Rev. Plant Physiol. 15:303-326.
5. Csizinszky, A. A. 1980. Effect of fertilizers and within-row spacing on tomato fruit size and yield. Bradenton Agr. Res. Educ. Center Res. Rpt. GC1980-10.
6. Csizinszky, A. A. 1983. Investigation of fruit set in tomatoes under high temperature conditions. Tomato Research Report for 1982-83, Inst. Food Agr. Sci., Univ. Florida.
7. Csizinszky, A. A. 1984. Response of tomatoes to seaweed based nutrient sprays. HortScience 19:535. (Abstr.).
8. Long, D. G., and D. J. Cantliffe. 1975. Response of tomatoes to method of seeding and transplanting. Proc. Fla. State Hort. Soc. 88:211-213.
9. Nelson, W. R. and J. Van Staden. 1984. The effect of seaweed concentrate on growth of nutrient-stressed greenhouse cucumbers. HortScience 19:81-82.
10. Skelton, B. J. and T. L. Senn. 1966. Effect of seaweed on quality and shelf-life of Harvest Gold and Jerseyland peaches. Res. Ser. No. 86., Hort. Dept., The South Carolina Agr. Expt. Sta., Clemson Univ., Clemson, SC.

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SEVERITY OF BACTERIAL SPOT (XANTHOMONAS CAMPESTRIS PV. VESICATORIA (Doidge)Dye) ON LEAVES AND FRUIT OF FLORIDA GROWN TOMATO CULTIVARS[1]

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Abstract. **Florida grown tomato** (Lycopersicon esculentum **Mill.) cultivars, 'Sunny', 'Duke', 'FTE-12', 'Hayslip', 'Flora-Dade', 'Walter', and 'Independence', new IFAS cultivar releases 'Horizon' and 'Suncoast'; and heat-tolerant breeding line 7106 were compared to 'Campbell 28' ('C-28') for bacterial spot** (Xanthomonas campestris **pv.** vesicatoria **Doidge) Dye) (XCV) tolerance in the summer of 1983. Four blocks with 5 plant plots of each cultivar were inoculated by spraying a suspension of XCV containing 10^8 colony forming units (c.f.u.)/ml. Leaves were rated for disease incidence twice during the season, and the percentage fruit spot was determined afterwards. The Florida grown cultivars had significantly more foliar disease than 'C-28' for the combination rating derived from the 2 rating periods. All Florida grown cultivars had similar foliage infection for the first rating, but 'Flora-Dade' had greater disease incidence than the other cultivars for the second rating. For the combination rating, all Florida grown cultivars had similar disease ratings except for 'Flora-Dade' which had more disease than all cultivars except 'Suncoast', 'Duke', and 'Independence'. 'Flora-Dade' had significantly greater fruit spot (33.0%) than all other cultivars except Hayslip (23.8%) and Suncoast (8.9%). There were no significant differences in fruit spot between any other cultivars. There were significant correlations between fruit and foliar infection, but r^2 values were less than 0.35.**

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Bacterial spot incited by *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye (XCV) causes significant losses to Florida tomato growers every year (6, 8). None of the cultivars presently grown in Florida have appreciable tolerance to the disease, and control measures (1, 5) are often inadequate in preventing crop losses. Growers often feel some cultivars have greater tolerance than others, but rarely are commercial fields managed in a way to make valid comparisons. The objective of this study was to compare the major cultivars grown in Florida for XCV severity on both foliage and fruit.

Materials and Methods

Genotypes tested were predominant Florida grown cultivars 'Sunny', 'Duke', 'FTE-12', 'Hayslip', 'Independence', and 'Flora-Dade'; the standard cultivar 'Walter'; new IFAS releases 'Horizon' and 'Suncoast'; a heat tolerant breeding line Fla. 7106; and bacterial spot tolerant 'Campbell 28' ('C-28'). Seed was sown in wooden flats containing spent coal (Saf-T-Blast from Mineral Aggregates, Inc.) on June 29, 1983. Seedlings were planted into containers with 1.5 inch cell sizes (#150 Todd planter flats) on July 11, and transplanted to the field of Eau Galle fine sand on August 8. Raised 6 inch high beds, 30 inches wide on 4.5 ft centers, were fertilized with 1856 lb./acre of 18-0-20.8-1.2 (N-P-K-Mg) distributed in 2 bands 18 inches apart. Full bed dressing was 18-0-20.8-1.2 at 329 lb./acre and superphosphate (0-8.7-0 plus FN503 oxide micronutrients at 80 lb./ton) at 599 lb./acre. Thus nutrients were: 394-36.0-454-26.3 lb./acre N-P-K-Mg. The beds were fumigated with 66% methyl bromide —33% chloropicrin at 344 lb./acre, and covered with black polyethylene mulch which was sprayed with white paint.

A randomized block design with 4 blocks of 5 plant plots per genotype was used. Plants were staked and tied. Insecticides were used as needed, and chlorothalonil was used to control fungal pathogens without limiting bacterial spot infection. A culture of XCV grown on nutrient yeast dextrose agar (4) for 48 hr at 25°C was adjusted to 10^8 c.f.u./ml in 0.01 M $MgSO_4$. The resulting bacterial suspension was misted on tomato plants 2 weeks after transplanting early in the morning when heavy dew was present.

Bacterial spot ratings were made 2 times, on September 26 and October 26. Each time the percentage of infected leaf area was rated for the bottom and top half of the plants. For statistical analysis the data were transformed to the Horsefall-Barrett (HB) scale (3). Percentages which overlapped on the HB scale were given a mean HB score, i.e. 3% = 2.5, 6% = 3.5, 12% = 4.5, 25% = 5.5, 50% = 6.5, 75% = 7.5, etc. On October 27 all the fruit, ripe and unripe, greater than 1 inch in diameter were harvested, and the percentage of fruit with bacterial spots was calculated. These data were transformed to $\sqrt{}$ arcsine for statistical analysis.

Results

Most of the XCV foliage infestation at the time of the first rating was on the bottom half of the plants (R1B) (Table 1). For R1B ratings, 'C-28' had significantly less disease than all other genotypes except Fla 7106. Fla. 7106 had less disease than all other genotypes except 'Horizon' and 'FTE-12'. There were no differences between any other genotypes for R1B. When the rating for the top one-half of the plant (R1T) was combined with R1B for the first rating (R1) 'C-28' had significantly less disease than 'Flora-Dade', 'Independence', 'Walter', and 'Duke'. Fla. 7106 had significantly less disease than the latter 2 genotypes only. The disease incidence increased by the second rating (R2). 'C-28' had significantly less disease than all other genotypes. 'Walter had significantly less disease than 'Suncoast' and 'Flora-Dade', and the latter had significantly more disease than all other genotypes. There were no other differences between genotypes. When all ratings were combined (R0) 'C-28' had significantly less disease than all genotypes except Fla. 7106, and the latter had less disease than 'Suncoast', 'Duke', 'Independence', and 'Flora-Dade'; 'Flora-Dade' had significantly more disease than all genotypes except 'Independence', 'Duke', and 'Suncoast'.

'Flora-Dade' had a significantly greater percentage of fruit spot than all genotypes except 'Hayslip' and 'Suncoast', but there were no other significant differences (Table 1). The percentage of fruit spot was not correlated with R1B, but was significantly correlated with all other foliage ratings although the r^2 values were all less than 0.35 (Table 2).

Discussion

'C-28' showed tolerance in this experiment as has been reported earlier (2, 7). A lesser tolerance was evident in Fla. 7106, a heat tolerant line which was consistently selected during summers under high bacterial spot pressure. Fla. 7106 did not have a high level of tolerance, but set fruit much earlier than the other genotypes. Physiologically, Fla. 7106 was under more stress which might have led to relatively greater XCV incidence.

The only difference in foliage infection among the cultivars which have been utilized commercially in Florida was that 'Flora-Dade' had greater foliage disease ratings later in the season and greater fruit spot (Table 1). As expected, none of the cultivars had appreciable tolerance. Under these experimental conditions plants were inoculated

Table 1. Bacterial spot incidence on foliage and fruit of tomato genotypes at Bradenton, Florida during summer-fall 1983.

	Foliage Horsefall-Barrett ratings[z]					
Genotype	R1B	R1T	R1	R2	R0	Infected fruit (%)
Flora-Dade	6.00 a[y]	3.88	4.94 a	8.56 a	6.75 a	33.0 a
Walter	6.00 a	3.38	4.69 ab	6.50 c	5.59 bc	7.6 b
Independence	6.00 a	3.75	4.88 a	7.56 bc	6.22 ab	7.2 b
Duke	5.75 a	3.63	4.69 ab	7.50 bc	6.09 ab	5.6 b
Hayslip	5.75 a	2.75	4.25 abc	7.25 bc	5.75 bc	23.8 ab
Sunny	5.75 a	3.00	4.38 abc	6.69 bc	5.53 bc	7.6 b
Suncoast	5.63 a	3.63	4.63 abc	7.63 b	6.13 ab	8.9 ab
FTE-12	5.13 ab	2.50	3.81 abc	6.88 bc	5.34 bc	6.2 b
Horizon	5.13 ab	2.75	3.94 abc	7.31 bc	5.63 c	6.9 b
Fla. 7106	4.12 bc	2.88	3.50 bc	6.56 bc	5.03 cd	7.9 b
C-28	3.75 c	2.75	3.25 c	5.31 d	4.28 d	5.4 b

[z]R1B = First rating, bottom-half of plant; R1T = First rating, top one-half of plant; R1 = (R1B + R1T)/2; R2 = Second rating (R2B + R2T)/2); R0 = combined rating (R1 + R2)/2.
[y]Mean separation in columns by Duncan's multiple range test, 5% level.

with XCV and nothing was done to prevent bacterial spot. Perhaps if spray programs to control XCV were used (1, 5), some subtle differences between the Florida grown cultivars, not evident here, might emerge. However, if limited to these cultivars, it does not appear from these data that the cultivar choice of growers would do much to prevent bacterial spot.

The correlation of fruit spot infection with most foliage ratings was expected since the proximity of XCV to the fruit would likely lead to greater fruit infection. There was little fruit set at the bottom of the plants, and this may relate to the lack of correlation with that foliage rating (Table 2). However, the r^2 values accounted only for about one-third of the variation, and it would appear that fruit and foliage susceptibility are only partially related. Whereas 'Flora-Dade' had the greatest disease of both foliage and fruit, 'C-28' had less foliage disease but a similar percentage fruit infection compared to most genotypes. Variation among replications was great for fruit spot, thus limiting significant differences between 'Hayslip' (23%) and other genotypes which had less than 9% fruit spot. This variability indicates the difficulty one might have in making accurate field ratings as to the relative susceptibility of cultivars to bacterial spot on fruit.

Table 2. Correlation coefficients (r^2) between fruit infection and foliage infection ratings.

Foliage ratings[z]	Fruit-spot (%)
R1B	.146
R1T	.349**
R1	.291*
R2	.296*
R0	.348**

[z]R1B = First rating, bottom one-half of plant; R1T = First rating, top one-half of plant; R1 = (R1B + R1T)/2, R2 = Second rating (R2B + R2T)/2), R0 = combined rating (R1 + R2)/2.

Literature Cited

1. Conover, R. A., and Gerhold, N. R. 1981. Mixtures of copper and maneb or mancozeb for control of bacterial spot of tomato and their compatibility for control of fungus diseases. Proc. Fla. State Hort. Soc. 94:154-156.
2. Crill, P., J. P. Jones, and D. S. Burgis. 1972. Relative susceptibility of some tomato genotypes to bacterial spot. Plant Dis. Rptr. 56: 504-507.
3. Horsefall, J. G. and R. W. Barrett. 1945. An improved system for measuring plant disease. Phytopathology 35:655 (Abstr.).
4. Jones, J. B., S. M. McCarter, and R. D. Gitaitis. 1983. Association of *Pseudomonas syringae* with a leaf spot disease of tomato transplants in southern Georgia. Phytopathology 71:1281-1285.
5. Marco, G. M., and R. E. Stall. 1983. Control of bacterial spot of pepper initiated by strains of *Xanthomonas campestris* pv. *vesicatoria* that differ in sensitivity to copper. Plant Disease 67:779-781.
6. Pohronezny, K., and R. B. Volin. 1983. The effect of bacterial spot yield and quantity of fresh market tomatoes. HortScience 18:69-70.
7. Scott, J. W. and J. B. Jones. 1985. Evaluation of *Lycopersicon* species for resistance to bacterial spot (*Xanthomonas* pv. *vesicatoria* (Doidge)Dye). Univ. Florida Tech. Bull. (in press.)
8. Volin, R. B. 1979. Selecting fresh-market tomatoes in Florida for resistance to bacterial leafspot, and inheritance studies in improved root development. In: First Intern. Symp. Tropical Tomato. Asian Veg. Res. Development Center, Shanhua, Taiwan.

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NEMATODE POPULATION INCREASES ON SIX LIGHT-FLESHED SWEETPOTATO CULTIVARS AND EFFECTS ON YIELD[1]

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Abstract. **Yields of 6 light-fleshed sweetpotato (**Ipomoea batatas **L.) cultivars were evaluated during 1982 in fumigated and unfumigated plots in a split-plot experiment performed on a Rockdale series soil containing an initial population of 1.7** Meloidogyne incognita **(Kofoid & White) Chitwood and 93** Rotylenchulus reniformis **Linford & Oliveira per 100 cm³ of soil. Fumigation with ethylene dibromide significantly (P≤0.01) reduced populations of both nematode species, but did not affect yields of marketable roots. At harvest, levels of** M. incognita **differed among cultivars, and populations of both nematode species had increased greatly over the initial levels. The cultivars 'Santa Barbara' and 'Blanco' gave the highest yields of marketable-size roots, although 'Blanco' exhibited more damage from the sweetpotato weevil,** Cylas formicarius elegantulus **(Summers), than did 'Santa Barbara'. 'Verde' performed poorly, producing more vine than root biomass, while 'Engorda Muchacho', 'Campeon de Santo Domingo', and 'Picadito' were intermediate in their yields.**

Production of the light-fleshed sweetpotato, or boniato, is increasing in southern Florida, with commercial area now estimated at 1400-2400 ha in Dade County (14). Although 7 cultivars of the light-fleshed sweetpotato have been grown in southern Florida, only 'Blanco', originated there (14). 'Campeon de Santo Domingo' and 'Amarillo Dominicano' came from the Dominican Republic, and 4 cultivars originated from Cuba: 'Verde', 'Engorda Muchacho', 'Picadito', and 'Santa Barbara', also known as 'Amarillo de Cuba'. The qualities and descriptions of these cultivars have been discussed elsewhere (14). All have lightly-pigmented flesh, varying in color from white to light yellow.

Plant-parasitic nematodes are a problem of sweetpotatoes in most regions in which they are grown. In particular, the root-knot nematodes, *Meloidogyne* spp., and the reniform nematode, *Rotylenchulus reniformis* Linford & Oliveira, are the most widespread and troublesome nematode pests (5, 9, 15), and the damage caused to the host by each species has been described (4, 8). Most nematological studies have involved orange-fleshed cultivars, which have exhibited a variety of responses to root-knot nematodes (3). A number of cultivars are now available which have various degrees of resistance to the common species of *Meloidogyne* (16). Differences in cultivar reaction to *R. reniformis* have also been demonstrated (6, 10). In addition,

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