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Chlorflurenol Increases Yield of Processing Tomatoes[1]

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Derivatives of 2-fluorene-9-carboxylic acids (morphactins) are classed as auxin transport inhibitors and are capable of encouraging lateral shoot development in plants (5, 6). These compounds could promote early branching of tomato plants which would increase the potential for maximum, early, uniform flowering and subsequently high yields from once-over mechanical harvesting. Gauss (4) reported that a morphactin increased branching of tomato flower clusters, and number of flowers and fruits but he made no mention of vegetative branching nor effects on fruit yield.

Fruit setting of tomato is frequently a problem during periods of high temperatures. An auxin transport inhibitor (chlorflurenol) improved fruit set in cucumber (3) and gourd (2), and our preliminary studies suggested tomatoes would respond similarly.

We studied the effects of chlorfluroenol on fruiting of the processing 'Campbell 37' tomato in the field in 1979. Seeds were sown April 3, 1979 in flats containing a mix of 1 coarse sand: 1 peat: 1 Wooster silt-loam soil. Plants were grown in greenhouses of the Ohio Agricultural Research and Development Center with 24-27°C day and 16°C night minimum temperatures and normal cultural care. The plants were pulled and field set on the Center farm with a commercial transplanter May 16. The plot design was a complete randomized block of 6 m row for each treatment. Plants were 30 cm apart in the row. Treatments, replicated 4 times, were, 1) 5 ppm chlorflurenol applied to plants in the flats in the greenhouse when the 3rd true leaf was 2-3 cm long (April 27); 2) 5 ppm chlorflurenol when plants were well established and starting regrowth following transplanting (June 12); 3) 5 ppm chlorflurenol when plants were at or near full bloom (July 12); and 4) untreated check. The chemical was applied with a CO_2 compressed-air hand sprayer at a rate of 560 liters of water/ha (60 gal/acre). The chlorflurenol used was the commercial formulation of Curbiset[2] which contained 3.5% methyl 2-chloro-9-hydroxyfluorene-9-carboxylate, 0.9% methyl 9-hydroxyfluorene-9-carboxylate and 0.6% methyl 2,7-dichloro-9-hydroxyfluorene-9-carboxylate.

The third true leaf application caused a severe epinasty of the youngest leaves and shoots (Fig. 1) within 12 hr and remained evident for 3-4 weeks. Later treatment induced epinasty for shorter period than the 3rd leaf application. Plants treated at the 3rd leaf state were stunted initially but appeared to grow, develop, and flower normally after transplanting with no outstanding features of shoot or flower numbers. Plants treated when they were well established following transplanting were noticeably stunted for a period of 2 to 3 weeks but thereafter appeared to grow and develop normally.

The full bloom treatment did not noticeably stunt the plants because growth had nearly stopped at that time. However, this treatment resulted in an apparent 100% set of flowers although no data were taken on fruit set. The incidence of blossom-end rot was extremely high, when fruit had reached about half its final size and, by harvest time, many of the fruits had rotted from secondary pathogenic infections.

Fruits were harvested September 13 as a single, destructive harvest. Yields of ripe fruit were significantly increased by treatments at the 3rd true leaf or at plant establishment (Table 1). The greatest increase occurred from treatment at plant establishment–16.6 MT/ha or a 38% increase over the check treatment. Fruit size data were taken and treatment had no significant influence on fruit size so the increased yield likely resulted from increased numbers of fruit. Whether this was a result of increased numbers of flower clusters and/or numbers of flowers per cluster is not known and is presently under study.

Treatment at full bloom resulted in excessive blossom-end rot and subsequent fruit rot which greatly reduced the usable fruit yield at harvest (Table 1). Bangerth reported that applications of auxin transport inhibitors reduced the Ca content of apples, pears and tomatoes (1).

Results of this study suggest a potential use of chlorflurenol for increasing yields of processing tomatoes and warrant further field studies to establish the potential commercial use under wide ranges of cultivars and environmental conditions.

Table 1. Influence of 5 ppm chlorflurenol on yield of 'Campbell 37' tomatoes.

Treatment and date of application	Yield (MT/ha) Ripe	Green	Rots
Third true leaf–April 27	53.5	36.5	6.5
Plant Establishment–June 12	60.0	29.4	5.2
Full Bloom–July 12	26.5	10.1	20.1
Untreated check	43.4	33.6	7.4
LSD 5%	8.8	10.9	6.2

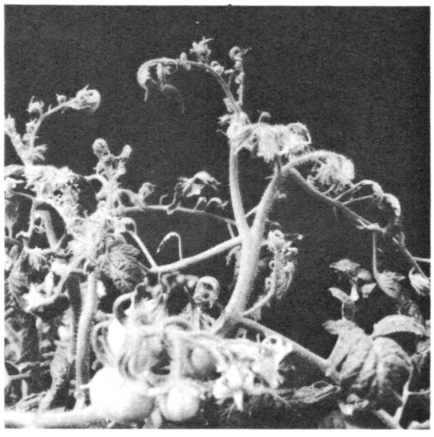

Fig. 1. Epinasty of young leaves and shoots of tomato from application of 5 ppm chlorflurenol. Photographed 10 days after application.

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