

PROCESSING TOMATO, *LYCOPERSICON ESCULENTUM*, AND BLACK BERRY NIGHTSHADE,
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Summary. Field studies were conducted to determine the post-emergence activity of acifluorfen for control of black berry nightshade, *Solanum nigrum* L., in processing tomatoes, *Lycopersicon esculentum*. Application of acifluorfen at 0.14 kg a.i./ha to 15 tomato cultivars at the one to three true-leaf stage of growth showed no interaction between cultivars and acifluorfen. Rates of acifluorfen of 0.034-0.28 kg a.i./ha resulted in significant yield increases over the hand hoed control. Split-applications of acifluorfen resulted in significantly higher yields than single applications. Black berry nightshade control was increased slightly by split-application. Application time was critical during periods of high temperature and yield was significantly reduced when applications were in the afternoon compared to morning.

INTRODUCTION

Black berry nightshade, is the major weed in California's canning tomato industry fields, causing severe yield loss and high hoeing costs amounting to US\$68m p.a. Black nightshade germinates at the same time the tomatoes are emerging from March through May. At the present time, there are no pre-plant or pre-emergence herbicides to control black nightshade that do not injure the tomatoes.

METHODS

Three experiments examined the effect of acifluorfen on tomatoes and black nightshade. Control plots were hand-hoed.

Experiment 1. In 1985 and 1986, fifteen cultivars (Cxd 1000, Hyb 898, Hyb 33790, C1518, UC82B, E6203, H2152, Del Oro, Advantage, Diego, 49'er Hyb, Peto 343, UC204C, Hyb 9889, and Joaquin) of canning tomatoes were treated at the one to two true-leaf stage of growth with a post-emergence application of 0.14 kg/ha acifluorfen. The plot size was 31x16.2 m replicated four times, with application by a CO₂ backpack sprayer to tomatoes grown in a clay loam soil. Plots were harvested with a commercial tomato harvester and weighed electronically.

Experiment 2. Acifluorfen was applied post-emergence to tomatoes at the one to two true-leaf stage. Applications of 0.034 and 0.069 kg/ha were made at the first true-leaf, followed one week later by 0.069 and 0.14 kg/ha. Black nightshade was at the cotyledon to first true-leaf stage. Plots were replicated four times, hand harvested, and weighed to determine yield.

Experiment 3. Over a three year period, the time of day and temperature were examined in relation to acifluorfen application. Post-emergence applications of acifluorfen at rates of 0.034 to 0.41 kg/ha were applied at 0900 versus 1500 h to tomatoes in the two to four leaf stage. Morning temperatures averaged 19°C followed by afternoon temperatures of 33°C at application time. Plots were replicated four times, harvested by hand, and weighed.

RESULTS AND DISCUSSION

There were no differences in tolerance of fifteen tomato cultivars to acifluorfen.

Rate and timing studies showed a significant difference in yield between single rates of application. The 0.14 kg/ha rate was significantly higher yielding than 0.034 kg/ha, and the 0.069 kg/ha rate (Table 1).

Table 1. Influence of rate of acifluorfen on control of black berry nightshade and vigour and yield of tomatoes^a

Rate (kg/ha)	Weed control	Tomato vigor reduction	Yield (t/ha)
0.034	2.25	1.75	50.2
0.069	4.00	2.50	50.2
0.14	5.75	3.00	56.6
0.28	6.50	4.25	47.5
0.44	8.00	6.00	45.0
0.034 + 0.069	3.50	2.50	55.1
0.034 + 0.14	4.75	2.75	59.1
0.034 + 0.28	4.75	2.75	54.9
0.069 + 0.069	6.00	2.50	60.3
0.069 + 0.14	6.75	3.75	60.9
0.069 + 0.28	7.75	5.25	52.4
Treated check (hoed)	0.40	0.20	42.3
l.s.d	0.92	1.91	3.6

^a0 = no weed control or no reduction in tomato vigour

10 = 100% weed control or death of tomato plants

Double applications of split treatments resulted in significantly higher yields than single treatments. The 0.069+0.14 yielded 60.9 t/ha versus 50.2 t/ha of a single 0.069 kg/ha rate. The 0.28 kg/ha rate was the breaking point for significant yield reduction with the single application rate. A combination of 0.069+0.28 kg/ha resulted in very significant yield reductions. All but the 0.44 kg/ha rate resulted in a significant yield increase over the hoed control. Black nightshade control was increased significantly through split applications. At 0.069+0.14 kg/ha versus the single 0.14 kg/ha versus the single 0.14 kg/ha rate. (Table 1)

Time of day, temperature, and rate studies showed that applications in the afternoon when temperatures were around 33°C resulted in significant yield reductions. The 0.14 kg/ha rate applied at 0900 hours yielded 61.8 t/ha versus 45.5 t/ha for the same rate applied at 1500 hours. Black nightshade control increased from 48% in the morning to 63% in the afternoon (Table 2).

Table 2. Influence of time of application of acifluorfen on control of black berry nightshade and vigour and yield of tomatoes^a

Time of applic. (h)	Rate (kg/ha)	Weed control	Tomato vigour reduction	Yield (t/ha)
0900	0.034	2.3	1.2	55.3
0900	0.069	2.8	1.5	59.5
0900	0.14	4.8	1.7	61.8
0900	0.28	6.8	2.7	51.3
0900	0.44	7.5	4.0	52.4
1500	0.034	3.5	1.7	51.6
1500	0.069	4.3	2.2	48.8
1500	0.14	6.3	3.3	45.5
1500	0.28	7.8	5.2	40.8
1500	0.44	9.3	5.8	38.3
0900	1 (hoed)	0.1	0.4	50.6
1500	1 (hoed)	0.4	0.9	50.4
	l.s.d.	0.1	0.7	4.3

^a0 = no weed control or no reduction in tomato vigour

10 = 100% weed control or death of tomato plants

Acifluorfen applied either as a single or split-application will give fair to good control of black nightshade when the tomatoes are in the first to second true-leaf stage and the nightshade is in the cotyledon to first true-leaf (Table 3). Optimum control will be obtained at between 0.069 and 0.14 kg/ha. Acifluorfen should not be applied to tomatoes when temperatures are above 32°C.

Table 3. Effect of acifluorfen on control of blackberry nightshade and on tomato phytotoxicity^a

Rate (kg/ha)	Weed control		Phytotoxicity	
	5/7	5/14	5/7	5/14
0.034	7.9	6.6	0.8	0.6
0.069	8.8	7.6	1.2	0.8
0.14	9.4	8.5	1.7	1.1
0.034 + 0.069	7.9 ^b	7.4	0.8 ^b	0.7
0.069 + 0.14	8.7 ^b	8.8	1.2 ^b	0.9
Unsprayed control	0.0	0.0	0.4.	0.4

^a0 = no weed control or no reduction in tomato vigour

10 = 100% weed control or death of tomato plants

^bEvaluation after first application