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Polyethylene Mulches and Preplant Incorporated Herbicides for Tomato Production

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Abstract
Fresh market tomato production consists of selecting a well-drained site, an early variety, plastic mulch, possibly a row cover, and transplanting in the spring as early as possible. This procedure can result in advanced maturity and top early marketable yields when prices are usually highest. Our previous research has shown wavelength selective plastic (SRM-olive or red) coupled with a row cover has given consistent top, early yields.Clear plastic was also superior provided there was excellent weed control. Early production was highly correlated (r = 0.74) to maximum soil temperature at the 4-in. depth. Thus, clear plastic would be the mulch of choice.

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Polyethylene Mulches and Preplant Incorporated Herbicides for Tomato Production

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Introduction

Fresh market tomato production consists of selecting a well-drained site, an early variety, plastic mulch, possibly a row cover, and transplanting in the spring as early as possible. This procedure can result in advanced maturity and top early marketable yields when prices are usually highest. Our previous research has shown wavelength selective plastic (SRM-olive or red) coupled with a row cover has given consistent top, early yields. Clear plastic was also superior provided there was excellent weed control. Early production was highly correlated ($r = 0.74$) to maximum soil temperature at the 4-in. depth. Thus, clear plastic would be the mulch of choice.

The major preplant incorporated herbicide for weed control is Treflan. But Treflan is known to cause plant stunting, particularly under wet, cool spring conditions (see Vegetable Progress Report 2000 at: http://www.public.iastate.edu/~taber/Extension/Second.htm). Devrinol and Sencor are two other herbicide possibilities but with limitations. Devrinol has limited weed control effectiveness and Sencor can be phytotoxic. Our objective was to evaluate plastic mulch types with preplant incorporated herbicide combinations for early production.

Materials and Methods

The principal soil type is a well-drained, coarse sand with organic matter content of 1 to 1.5%. The various herbicide treatments were applied to the soil surface on May 9 with a backpack small plot CO_2 sprayer. Treatments were incorporated with a rototiller and the plastic mulch applied the same day. Tomato transplants, Mountain Spring, were set May 10. Other cultural practices included trickle irrigation, pruning the plants to the first flower cluster, and staking and tieing according to the Florida stake and weave system.

Early-season growth was evaluated by obtaining plant dry weight, flower cluster number, and the number of open flowers on June 5. Harvest began July 17 and continued weekly to August 7, for five harvests. Fruit were sorted into marketable and unmarketable categories. The unmarketable or cull fruit were the result of cracking, blotchy ripening, rots, or too small in size. Marketable fruit were sized.

Results and Discussion

The 2007 growing season temperatures were considerably above normal. May average daily temperature of 68.5°F was 6.5 degrees above normal. June was one degree below normal. Thus, differences between the plastic mulch types for warming the soil (rootzone) were minimal.

By May 15 the plots with Sencor began to show leaf chlorosis. This effect was reflected in smaller plant size (27% less), and less open flowers (31% less) compared with the Treflan and Devrinol treatments (Table 1).

Early yield was affected by the addition of the Sencor herbicide, a 58% reduction in total early yield compared with the Treflan and Devrinol treatments (Table 2). Marketable and cull yields were similarly affected. However, the effect was one of delayed maturation because total seasonal yield was not affected (325 cwt/acre). No other plastic or herbicide comparison affected early yield.

The tank mix of Sencor and Treflan improves the control of common ragweed and smartweed, but Sencor should be used with caution as a preplant incorporated option on coarse, sandy soils. Although we used the lowest labeled rate, visual injury was noted and early yields were reduced. The same treatments (with higher labeled rates) were tested at the Horticulture Research Station on loam soils. With loam soils, there was no effect of Sencor application on early or total yields. See that station's report for results.

Table 1. Polyethylene mulch and herbicide treatment influence on plant growth and flower development, June 5, 2007.

Treatment	Dry wt., g[2]	Cluster no.	Open flwr no.
1. Black plastic, no herbicide	37.3	4.5	6.0
2. Black plastic, Treflan @ 0.5 lb ai	30.5	4.1	6.2
3. Black plastic, Devrinol 50DF @ 1 lb ai.	34.6	4.3	6.3
4. Clear plastic, Treflan	34.0	4.1	6.1
5. Clear plastic, Devrinol	42.3	4.5	6.6
6. Clear plastic, Treflan + Sencor 75Df @ 0.25 lb ai.	26.5	3.6	5.5
7. Clear plastic, Devrinol + Sencor	29.5	3.3	3.3
Contrast Comparison[1]			
Black plastic vs. Clear plastic (2,3 vs. 4,5)	ns	ns	ns
Devrinol vs. Treflan (3,5 vs. 2,4)	ns	ns	ns
Treflan or Devrinol vs. with Sencor (4,5 vs. 6,7)	38.2 vs. 28*	4.3 vs. 3.5*	6.4 vs. 4.4**
Control (1) to all others (2,3,4,5,6,7)	ns	ns	ns

[1]Comparison: ns = not significant, * or ** indicates significant at the 5% and 1% level, respectively.
[2]Dry wt. = shoot dry weight, expressed as grams, of a representative plant of that treatment.

Table 2. Polyethylene mulch and herbicide treatment influence on early yield, as cwt/acre, harvest July 17 to 24.

Treatment	Marketable	Cull	Total
1. Black plastic, no herbicide	21.4	24.9	46.3
2. Black plastic, Treflan @ 0.5 lb ai	36.3	8.3	44.6
3. Black plastic, Devrinol 50DF @ 1 lb ai.	37.6	14.3	51.9
4. Clear plastic, Treflan	30.7	16.6	47.3
5. Clear plastic, Devrinol	37.8	19.4	57.1
6. Clear plastic, Trelfan + Sencor 75Df @ 0.25 lb ai.	19.5	5.0	24.4
7. Clear plastic, Devrinol + Sencor	13.9	5.2	19.1
Contrast Comparison [1]			
Black plastic vs. clear plastic (2,3 vs. 4,5)	ns	ns	ns
Devrinol vs. Treflan (3,5 vs. 2,4)	ns	ns	ns
Treflan or Devrinol vs. with Sencor (4,5 vs. 6,7)	34.3 vs. 16.7*	18 vs. 5.1*	52.2 vs. 21.8*
Control (1) to all others (2,3,4,5,6,7)	ns	24.9 vs. 11.5*	ns

[1] Comparison: ns = not significant, * or ** indicates significant at the 5% and 1% level, respectively.