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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, a plastic mulch, 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, a plastic mulch, 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 weed control preplant incorporated herbicide is Treflan. But Treflan is known to cause plant stunting, particularly under wet, cool spring conditions (see progress report 2000). Devrinol and Sencor are two other 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 (an identical trial was performed at the Muscatine Island Research and Demonstration Farm. Please see that station's report for details). Our objective was to evaluate plastic mulch types with preplant incorporated herbicide combinations for early production.

Materials and Methods

The principal soil type at the Horticulture Research Station, central Iowa, is a well-drained, fine textured loam. The various herbicide treatments were applied to the soil surface on May 3 with a backpack small plot CO_2 sprayer. Treatments were incorporated with a rototiller and the plastic mulch treatments 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 tying 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 7. Harvest began July 24 and continued weekly to August 21, 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. Marketable fruit were sized.

Results and Discussion

The 2007 growing season temperatures were considerably above normal. May and June average temperatures in central Iowa were 7 and 5^{o}F above normal, respectively. Thus, soil temperature differences (rootzone) between the plastic mulch types were minimal.

By May 15 the plots with Sencor (Treatment 6) began to show a reduced leaf surface area as compared with the other treatments. This effect was reflected in smaller shoot dry weight and less number of open flowers, but the Sencor effect was not statistically significant (Table 1).

Further, there was no affect of any treatment on early or total seasonal yield (Tables 2 and 3). The exception was the comparison between Devrinol and Treflan where Treflan produced 32% more early marketable yield than Devrinol. This trend did not last throughout the season as

total seasonal yield was not affected by herbicide or polyethylene mulch used.

The effect of warm soils negating the Treflan stunting effect was also noted in a fall 2000 tomato-herbicide study (see progress report 2000). Sencor should be used with caution when used as preplant incorporated for tomato production, particularly on coarse sand.

Table 1. Polyethylene mulch and herbicide treatment influence on plant growth and flower development at the Horticulture Research Station, central Iowa, June 7, 2007.

Treatment	Dry wt., g[2]	Cluster no.	Open flwr no.
1. Black plastic, no herbicide	23.1	5.5	4.75
2. Black plastic, Treflan @ 0.75 lb ai	16.5	4.5	6.25
3. Black plastic, Devrinol 50DF @ 2 lb ai.	21.6	4.3	5.75
4. SRM-olive plastic, Treflan	19.4	5.0	6.25
5. SRM-olive plastic, Devrinol	22.7	4.1	5.00
6. Clear plastic, Trelfan + Sencor 75DF @ 0.5 lb ai.	14.4	3.8	3.88
7. SRM-olive plastic, Devrinol + Sencor	20.0	4.9	5.25
Contrast Comparison[1]			
Black plastic vs. SRM-olive plastic (2, 3 vs. 4, 5)	ns	ns	ns
Devrinol vs. Treflan (3, 5 vs. 2, 4)	ns	ns	ns
Sencor addition (4 vs. 7)	ns	ns	ns
Clear plastic vs. SRM-olive plastic (6 vs. 7)	ns	ns	ns
Control (1) to all others (2, 3, 4, 5, 6, 7)	ns	ns	ns

[1]Comparison: ns = not significant, at the 5% level.
[2]Dry wt. = shoot dry weight, expressed in grams each, of representative plant in the treatment.

Table 2. Polyethylene mulch and herbicide treatment influence on early yield, as cwt/acre, at the Horticulture Research Station, central Iowa. Early yield was the first week of harvest July 24, 2007.

Treatment	Marketable	Cull	Total
1. Black plastic, no herbicide	55	35	89
2. Black plastic, Treflan @ 0.75 lb ai	74	21	94
3. Black plastic, Devrinol 50DF @ 2 lb ai.	42	20	62
4. SRM-olive plastic, Treflan	69	16	85
5. SRM-olive plastic, Devrinol	56	16	72
6. Clear plastic, Trelfan + Sencor 75DF @ 0.5 lb ai.	92	23	115
7. SRM-olive plastic, Devrinol + Sencor	52	27	79
Contrast Comparison[1]			
Black plastic vs. SRM-olive plastic (2, 3 vs. 4, 5)	ns	ns	ns
Devrinol vs. Treflan (3, 5 vs. 2, 4)	49 vs. 72*	ns	67 vs. 90*
Sencor addition (4 vs. 7)	ns	ns	ns
Clear plastic vs. SRM-olive plastic (6 vs. 7)	ns	ns	ns
Control (1) to all others (2, 3, 4, 5, 6, 7)	ns	ns	ns

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

Table 3. Polyethylene mulch and herbicide treatment influence on total seasonal yield, as cwt/acre, at the Horticulture Research Station, central Iowa. Seasonal yield was from July 24 to August 21, 2007.

Treatment	Marketable	Cull	Total
1. Black plastic, no herbicide	400	126	526
2. Black plastic, Treflan @ 0.75 lb ai	373	109	482
3. Black plastic, Devrinol 50DF @ 2 lb ai.	389	116	505
4. SRM-olive plastic, Treflan	380	127	507
5. SRM-olive plastic, Devrinol	374	98	471
6. Clear plastic, Trelfan + Sencor 75DF @ 0.5 lb ai.	309	83	392
7. SRM-olive plastic, Devrinol + Sencor	402	130	531
Contrast Comparison[1]			
Black plastic vs. SRM-olive plastic (2, 3 vs. 4, 5)	ns	ns	ns
Devrinol vs. Treflan (3, 5 vs. 2, 4)	ns	ns	ns
Sencor addition (4 vs. 7)	ns	ns	ns
Clear plastic vs. SRM-olive plastic (6 vs. 7)	ns	ns	ns
Control (1) to all others (2, 3, 4, 5, 6, 7)	ns	ns	ns

[1]Comparison: ns = not significant, at the 5% level.