Evaluation of Fully Green and Metalized-striped Green Plastic Mulch Films on the Performance of 'Florida Brilliance'

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Summary

'Florida Radiance' fruit yield and quality did not vary between 100% black and 100% green plastic mulch films. Regardless of the bed shoulder color, adding a metalized center stripe increased December yield by 16%. Yield increases by reflective films (100% metalized, 100% white, and metalized-striped mulch film) have been observed over the last five seasons, although the magnitude of yield increases depends on cultivars, planting date, and heat stress during establishment. Importantly, reflective mulch films do not have adverse effects on fruit quality or late-season yields.

Black plastic mulch with a metalized center stripe

Metalized-striped mulch films are manufactured by applying a thin layer of aluminum as a centr stripe on the top of black plastic mulch (Fig. 1). They have dual advantages of metalized and black films: the metalized stripe can reduce root-zone and canopy temperatures and minimize heat stress during establishment, whereas black shoulders can warm the temperatures during cool wnter months to promote fruit development. The metalized-striped mulch designed for strawberry production in Florida (Can-Block XSB v-TIF silver/black) is manufactured by IMAFLEX (Thomasville, NC).

Green plastic mulch with a metalized center stripe

Green plastic mulch has been used by some cool-season crops, including strawberry in California. It has an intermediate light reflectivity level between black and white colors, and its beneficial light quality modifying effects on fruit development have been documents on some fruit crops. Green plastic mulch films tested in this study are shown in Figure 2.

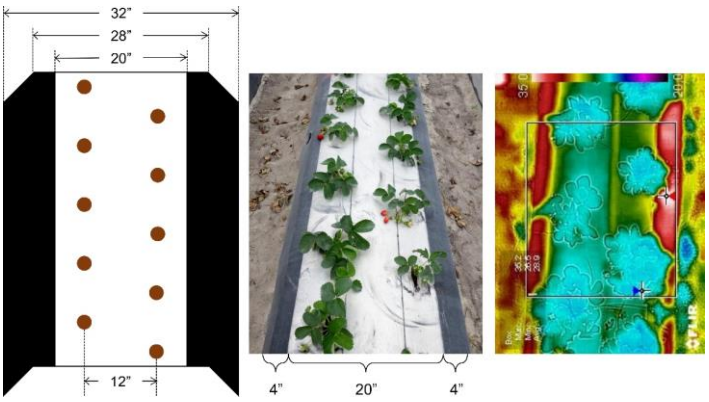

Figure 1. The configuration of plastic mulch with a metallic center stripe. The metallic-striped mulch is manufactured by IMAFLEX Inc.

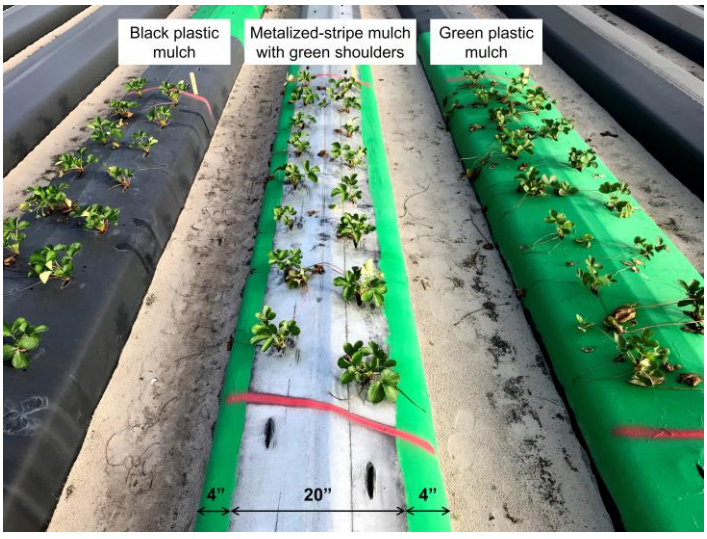

Figure 2. Plastic mulch films tested in the 2021-2022 strawberry field experiment.

Methods

We conducted a strawberry field experiment to evaluate four plastic mulch films, including 100% black, black shoulders with a reflective center stripe, 100% green, and green shoulders with a reflective center stripe, during the 2020-2021 season at the UF/IFAS GCREC in Balm, FL (Figure 2). Bare-root transplants ('Florida Brilliance') were transplanted with 16" plant spacing (16,335 plants/acre) on September 28, 2020. Each treatment had four replicated plots with 16 plants per plot. The plots were arranged in a split-plot design with bed shoulder color as the main-plot factor and the metalized-stripe as the sub-plot factor. Harvests were performed 27 times between November 5, 2020 and February 25, 2021.

Results

Yield

Adding a metalzed stripe increased December yield by 16%, but it did not have significant effects on total season yield or yields in other months. There was no significant difference in yields between 100% black and 100% green plastic mulch films. The bed shoulder color × center stripe interaction was also non-significant throughout the growing season. These results suggest that adding a metalized stripe can increase early season yields regardless of the bed shoulder mulch color. Heat stress during establishment appears to be a major limiting factor on early season strawberry yields in Florida.

Fruit size

The effects of bed shoulder color and the metalized stripe on fruit size was minimal throughout the growing season.

Brix

Fruit Brix measured during the peak harvest (Feb 18, 2021) was unaffected by bed shoulder color and the metalized stripe.

Recommendations

- Metalized-striped mulch has benefits of dual colors: heat stress alleviation by the metalized stripe during establishment and soil warming by the black shoulders during the late season.
- 100% metalized and metalized-striped mulch films are more stiff than standard black plastic mulch, so their installation could be more complicated.
- The major drawback of metalized films is the fading of aluminum coatings caused by high pH water (pH >7.5) during sprinkler irrigation.
- If fading of aluminum coatings and stiff texture of metalized mulch films are problematic, we recommend trying white-on-black mulch.
- We highly recommend trying reflective mulch films, especially when planting strawberries before Oct 10.

Table 1. Monthly and total-season yields of 'Florida Radiance' as affected by plastic mulch color.

Bed shoulder color	Center stripe	Marketable yield (lb/acre)				
		Nov	Dec	Jan	Feb	Total
Black	No stripe	152	371	534 ab	2,034	3,127
	Metalized	150	448	485 b	1,886	3,160
Green	No stripe	155	352	480 b	1,937	3,145
	Metalized	136	394	594 a	1,871	3,243
		Pooled data				
Black		151	410	509	1,960	3,143
Green		145	373	537	1,904	3,194
	No stripe	154	362 B	507	1,986	3,136
	Metalized	143	421 A	540	1,878	3,202

Tukey-Kramer test at $P \leq 0.05$ (lowercase letters) and $P \leq 0.10$ (uppercase letters).

Table 2. Average fruit size of 'Florida Radiance' strawberry as affected by plastic mulch color.

Bed shoulder color	Center stripe	Average fruit size (g)				
		Nov	Dec	Jan	Feb	Total
Black	No stripe	14.1	22.4	28.8	29.6	27.1
	Metalized	13.5	22.9	27.2	29.8	26.6
Green	No stripe	13.3	22.0	28.5	29.3	26.5
	Metalized	13.9	22.5	28.5	29.1	26.6
		Pooled data				
Black		13.8	22.7	28.0	29.7	26.9
Green		13.6	22.2	28.5	29.2	26.6
	No stripe	13.7	22.2 B	28.6	29.4	26.8
	Metalized	13.7	22.7 A	27.8	29.4	26.6

Tukey-Kramer test at $P \leq 0.10$ (uppercase letters).

Table 3. Total soluble solids content (Brix) of 'Florida Radiance' strawberry as affected by plastic mulch color.

Bed shoulder color	Center stripe	Soluble solids content (°Brix)
Black	No stripe	4.59
	Metalized	4.63
Green	No stripe	4.58
	Metalized	4.33
		Pooled data
Black		4.61
Green		4.46
	No stripe	4.59
	Metalized	4.48

Treatment effects were non-significant ($P > 0.10$).

Contact

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