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SUMMER SQUASH YIELD AND FRUIT SIZE WHEN GROWN ON EIGHT MULCH COLORS IN CENTRAL FLORIDA

JAMES M. WHITE
University of Florida, IFAS
Mid-Florida Research and Education Center
2725 Binion Road
Apopka, FL 32703-8504

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Abstract. **Summer squash 'cv' Medallion (*Cucurbita pepo* L.) was grown in the spring of 2001 and 2002 on black, white, black biodegradable, red, blue, silver, silver on black, or white on black mulch and compared for yield and fruit size with bare ground plots. Soil temperature and moisture readings were taken over a 6-week period. Yield ranged from 175 cwt/acre for bare ground to 280 cwt/acre for white on black mulch. There was no difference in yield for bare ground, black biodegradable, red, or blue mulch treatments. Fruit average weight at harvest ranged from 0.241 lb for black biodegradable mulch to 0.293 lb for silver mulch. No correlation for mulch colors and early plant size or early yield was found. Red, blue, silver on black, and black mulches had warmer soil temperatures early, but as plants covered the mulch, fewer differences were found.**

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Squash (*Cucurbita pepo* L.) in 2002-2003 was a $48 million crop in Florida. Ten thousand acres were harvested with an average yield of 302, 42-lb bu per acre (126.8 cwt per acre). The average price per bu was $15.87, resulting in a gross value of $4,800 per acre (Fla. Agr. Stat. Serv., 2003). Plastic mulch has been used for over 20 years on high value crops such as tomato (*Lycopersicion esculentum* Mill.), pepper (*Caspsicum annuum* L.), melons (*Cucumis* and *Citrullis* spp.) and strawberry (*Fragaria* × *ananassa* Duch.). Benefits of plastic mulch are: conserved soil moisture, reduced fertilizer leaching, reduced weed pressure, warmer soil in early spring, and reduced fruit rot by less contact with the soil. Plastic mulch has also been reported to increase early and total yields and to increase watermelon stem growth (Bhella, 1988). The effects of plastic mulch color on crop yield have been studied on several crops including tomato (Brown et al., 1992; Csizinszky et al., 1995; Decoteau et al., 1988, 1989; Diaz-Perez and Batal, 2002), bell peppers (Decoteau et al., 1990; Orzolek et al., 2000), calabaza (White, 2001), pumpkin (White, 2002), watermelon (White, 2003), and many other crops. Tomato responses to colored mulches have been found to be inconsistent, depending on season, year, region (Csizinszky et al., 1995), and light reflecting properties (Decoteau et al., 1989; Diaz-Perez and Batal, 2002). Kasperbauer (Pons, 2003) stated that, ". . . the colored-mulch technology's controlling factor is not the perceived colors themselves, but how they change the amount of blue and the ratio of FR to red light that plants receive." The objective of this study was to evaluate the effect of eight plastic mulch colors versus bare ground on yellow summer squash yield and size in a spring production system in central Florida.

Materials and Methods

Yellow summer squash 'cv' Medallion was planted 22 Mar. 2001 and 28 Mar. 2002 on eight plastic mulch colors and bare ground. The mulch colors were: white on black, silver (gray) on black, black, black biodegradable, silver (gray), white, blue, and red. Before the plastic mulch was laid, 500 lb/acre of a 10-10-10 fertilizer were broadcast and incorporated into a Tavares-Millhopper fine sand. Six-inch raised beds were formed and the mulch laid with a 32-inch top. Beds were 5 ft on center, two rows per bed with plants 18 inches apart within the row. Plots were 50 ft long replicated four times in a randomized complete block design. Three seeds were hand planted and thinned to two plants at the two-true-leaf stage. A drip tape with 4 inch emitter spacing rated at 33 gph per 100 ft was used to irrigate and supply additional N, K, and minor elements.

Harvesting began 30 April and ended 25 May 2001 for a total of 10 harvests. In 2002, harvest began 3 May, ending 28 May for a total of 11 harvests. Data collected included marketable and total weight and number of fruit, and the average weight of marketable fruit (size). In 2002, soil temperature and moisture at 2.5 inches was recorded 21 Mar.-6 May for 19 times between 3:00 and 4:00 PM. Data were analyzed by analysis of variance and means compared using Duncans Multiple Range Test, 0.05 level (SAS Institute, 1999).

Results and Discussion

Early plant growth, measured by an empirical scale of 1-5 at 3 and 6 weeks, was not affected by the eight color plastic mulches used in this study (data not shown). Replication variability was significant at 3 weeks and there were no differences found at 6 weeks.

Table 1. Total and marketable yield and average fruit weight for yellow summer squash grown on colored plastic mulch or bare ground, MREC-Apopka, Fla. (average of 2001 and 2002 spring seasons).

Treatment	Yield (cwt/acre)		Avg. wt (lb)
	Total	Marketable	Fruit
White on black	351b[z]	280 a	0.27 ab
Silver	373 a	278 a	0.293 a
Silver on black	351 b	272 ab	0.274 a-c
White	331 bc	263 ab	0.266 a-c
Black	315 b-d	253 b	0.271 a-c
Blue	315 b-d	247 bc	0.272 a-c
Black biodegradable	273 c-e	223 bc	0.241 c
Red	269 de	221 bc	0.255 bc
Bare ground	207 e	175 c	0.247 bc

[z]Mean separation within columns by Duncans Multiple Range Test, 0.05 level.

Soil moisture in 2002, measured within 4 inches of the plant and at a depth of 2.5 inches, was found to be not significant for plastic mulch colors. Early readings were 45% to 63% of field capacity and late season readings were 40% to 68%. The bare ground readings averaged 37% (data not shown).

Soil temperatures measured at 2.5 in during the afternoon between 3:00 and 4:00 PM were significantly higher for the black plastic mulch (37.5 °C vs. 33-35 °C) during the early part of the growing season (data not shown). As the plants covered the plastic mulch or bare ground, there were no differences in soil temperature. Black plastic mulch had higher soil temperature than black biodegradable, silver, white, and white on black mulches early, but was not significantly different from red, blue, and silver on black mulches. Total yield, which included nonmarketable fruit, ranged from 207 to 373 cwt per acre (493 to 802 42-lb bu per acre) (Table 1). Silver (gray or non reflective) plastic mulch had the highest total yield with bare ground, red, and black biodegradable the lowest. White on black, silver, silver on black, and white had the highest marketable yield with blue, black biodegradable, red, and bare ground the lowest. Marketable yield ranged from 175 to 280 cwt per acre (417 to 667 42-lb bu per acre). The bare ground marketable yield was 175 cwt per acre compared to the 2002-2003 state average of 127 cwt per acre. Silver plastic mulch produced the heaviest (larger) average weight (0.293 lb) marketable fruit while the black biodegradable plastic mulch had the lightest (smallest) marketable fruit (0.241 lb). The harvest interval may have been long for the silver plastic mulch, due to a faster growth rate, and not long enough for the black biodegradable, which may have had a slower growth rate.

The lighter colored plastic mulches generally had higher yields than the darker colored mulches. Low soil and air temperatures were not a factor with the March planting dates. The air temperature at 3:00 PM on 28 Mar. 2002 was 29.5 °C and the soil temperature under the plastic mulch ranged from 29.5 to 35 °C.

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