

Bell Pepper Planting Date and Mulch Color Trial

Vince Lawson and Henry Taber
Muscatine Island Research Farm, Fruitland, IA

This pepper project was made possible by a state specialty crop grant administered by the IFVGA board and conducted at the Muscatine Island Research Farm, Fruitland, Iowa. The trial objective was to evaluate the effect of planting date and mulch color (black vs. white) on production characteristics of bell peppers

Materials and Methods

Pepper plants were grown in the greenhouse and transplanted to the field as replicated trials on three successive dates, May 23, June 16 and July 7. Four bell pepper cultivars (*Aristotle*, *Lafayette*, *Brigadier* and *Conquest*) were used in this study. Each planting date consisted of three replications of each cultivar on two mulch treatments (black vs. white). All plantings were grown on raised beds in a double staggered row system utilizing drip irrigation. The two mulch treatments consisted of .9 mil embossed black and .7 mil embossed white-on-black. Fertilizer was applied preplant incorporated in a band under the plastic mulch and by fertigation through the drip tubes during the growing season. Plant spacing within the row was 17" and rows were approximately 12" apart on the beds for a plant population of 10,249 per acre. Pest control was achieved with practices recommended in FG-600, Midwest Vegetable Production Guide. Immature green fruit were picked when firm and having diameter greater than 2.5". See Table 1 for number of harvests and first picking dates for each planting. Data presented in all tables are of marketable (free of rot, insect damage or not severely misshapened) fruit only. U.S. #1 (or better) fruit were sorted out of the marketable category and are the large, exceptionally well-shaped fruit that have become the norm in supermarkets. U.S. #1 fruit have a smooth blocky shape with a length equal to or greater than the diameter and are not marred by indentations, irregular growth, exaggerated lobing, or pointy ends.

Table 1. Planting and harvest schedule for 2003 planting date and mulch color trial.

Activity	First Planting	Second Planting	Third Planting
Plant in greenhouse*	April 8	May 1	June 4
Transplant to field	May 23	June 16	July 7
First harvest	July 21	August 9	September 3
Number of harvests	7	5	3

* Seed planted into 72 cell trays filled with Metro-Mix 380.

Results and Discussion

Pepper Cultivar and Planting Date: The four pepper cultivars reacted similarly to planting date and mulch color so cultivar data were combined when looking at these effects. Total marketable yields were comparable for the four cultivars at all planting dates. *Aristotle* was the best producer of U.S. # 1 peppers at all dates. *Lafayette* and *Conquest* bore fruit with large 'blocky' shape and performed similarly. *Brigadier* had a tendency to produce more 'pointy' and irregularly shaped peppers than the other cultivars. For a more detailed look at yield potential and fruit characteristics of these cultivars see the separate report, 'Pepper Cultivar Trial - 2003' in this publication.

There were large differences in yields obtained from the three planting dates with the first planting being most productive (Tables 2 & 3). The simple explanation for these yield differences between planting dates would be the number of pickings. The first planting was picked seven times starting on July 21 (Table 1) while harvesting from the third planting did not start until September 3 and was picked only three times. Also, another reason for the high yields harvested this year and one which definitely benefited the May 23 planting was the strong 'stamina' the peppers showed by continuing to produce U. S. # 1 fruit through the whole season. In previous years it has not been unusual for the number of U.S. # 1 peppers to fall off after the early pickings. To circumvent this problem and achieve a more stable, season-long, supply of peppers we started looking at the effect of staggered planting dates on yields. In 2002 we found that three planting dates (May 22, June 13 and July 10) did a good job of providing a uniform supply of peppers through the marketing season. However, 2002 was a hot growing season and production tended to decrease after early pickings. In 2003, three comparable planting dates again provided a more consistent supply of peppers through the season than any single planting date (Table 3). But we also found the production levels stayed high and didn't fall off for the first and second planting dates. Averaging the three plantings results in a rather light yield in July and an exceptionally heavy one in late September. To achieve high yields and a uniform supply of peppers through the season in 2003 the best strategy would have been to make two plantings, such as one on May 23 and again on June 16 in this example.

Mulch Color: Growers normally transplant bell pepper plants onto black plastic mulch when using a plasticulture system in the Midwest. The black mulch provides weed control, protects nutrients from leaching and warms the soil which can stimulate early plant growth resulting in better yields over bare ground culture. While soil warming is advantageous in the spring when temperatures are cool it has been suggested that soil temperatures can get too high under black plastic mulch for optimum root growth during sunny days with high air temperatures, especially when used on coarse sandy soils. So this raises the question - what if we used a light colored mulch instead of black? Light colored mulches such as white and silver reflect most of the incoming solar radiation back into the atmosphere and plant canopy instead of absorbing it. This causes the surface temperature of the mulch and the soil temperature under it to be lower than that of a bed covered with a dark mulch or even that of bare ground.

The 2003 growing season was characterized by extended periods of relatively mild temperatures and low rainfall (with some short exceptions). It is possible that these conditions moderated the effects of plastic color on pepper performance this year. However, pepper plants grown on white mulch consistently produced more marketable (U.S. #1 and #2) yields at all planting dates (Table 4). But when we look at the yield of U.S. # 1 peppers we find no significant difference between black and white plastic in this category. The yield increase came solely in the less desirable U.S. # 2 category - peppers that were of less desirable shape. Also, we found no differences between black and white mulch for pepper fruit weights (Table 4) or fruit lengths (data not presented). Somewhat surprisingly, early pepper yield was not significantly affected by mulch color at any planting date. Although note that the early yields were somewhat higher from the black mulch on the May 23 and June 16 planting dates.

High yields were obtained from both mulch colors and under the conditions of this trial we didn't find strong advantages for using one mulch color over the other. While the use of white mulch did increase total yield it was all in the less desirable U.S. # 2 category. An additional point and problem worth noting while conducting this trial was that after the second planting date (June 16) we experienced three sunny days with high temperatures of 85 F or better. Approximately 25 %

of the young transplants on black plastic mulch were injured due to scalding of plant stem (where they touched the plastic) and had to be replaced. There was no visible injury to plants on the white plastic. Fortunately, mild temperatures followed transplanting on the May 23 and July 7 dates and no plant injury was seen due to hot plastic.

Table 2. Total marketable and fancy yield (bushel/acre) of four pepper cultivars by planting date.

Cultivar	<u>Planted May 23</u>		<u>Planted June 16</u>		<u>Planted July 7</u>	
	Total	U.S. #1	Total	U.S. #1	Total	U.S. #1
Aristotle	836	481	691	368	502	325
Lafayette	934	451	695	307	435	247
Conquest	889	453	643	299	456	245
Brigadier	816	285	652	249	428	216
<i>Average</i>	<i>861</i>	<i>418</i>	<i>670</i>	<i>306</i>	<i>455</i>	<i>258</i>
<i>LSD 5%</i>	<i>n.s.</i>	<i>106</i>	<i>n.s.</i>	<i>89</i>	<i>n.s.</i>	<i>77</i>

Fancy = fruit with good 'blocky' shape, length greater than diameter, not dented or pointed and free of defects.

Table 3. Marketable yield* (bushel/acre) for each planting date broken down by harvest period.

Planting Date	July 16-31	Aug 1-15	Aug 16-31	Sept 1-15	Sept 16-30	Total
May 23	469	538	231	252	218	1707
June 16	---	197	532	295	306	1329
July 7	---	---	---	125	787	911
<i>Avg of all planting dates</i>	<i>156</i>	<i>245</i>	<i>254</i>	<i>224</i>	<i>437</i>	<i>1316</i>
<i>Avg. 5/23 & 6/16 planting</i>	<i>234</i>	<i>367</i>	<i>381</i>	<i>273</i>	<i>262</i>	<i>1518</i>

*Yields are an average obtained from all trial plots harvested during each time period. Bushel = 28 lbs.

Table 4. Early, U.S. #1, total yields and average fruit weights by planting date and mulch color.

Cultivar	<u>Pepper Yield, bushel/acre</u>			<u>Average Fruit Weights, lbs.</u>		
	May 23	June 16	July 7	May 23	June 16	July 7
<u>Early Yield</u>						
Black Mulch	83	44	38	.44	.43	.46
White Mulch	70	36	41	.44	.44	.45
<u>U.S. #1 Yield</u>						
Black Mulch	424	313	263	.42	.42	.45
White Mulch	412	298	254	.42	.43	.44
<u>Total (#1 + #2) Yield</u>						
Black Mulch	815**	635**	438	.40	.41	.43
White Mulch	907**	706**	474	.40	.42	.42

**differences significant at 5% level.