water use by tomatoes with the 0.50 pan treatment. In neither year did the tensiometer treatments do as well as the 0.50 pan level, though Smajstrala and Locascio (1990), found no difference in yields when comparing 0.50 pan rate and soil moisture tension of 15 cb to irrigate spring tomatoes on an Arredondo fine sand (Grossarenic Paleudult).

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USE OF COMPOST AS MULCH ON BELL PEPPERS

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Abstract. **Polyethylene mulch use by Florida agriculture has been estimated at more than 9.5 million kg annually. Organic mulch systems which are recyclable in the soil may reduce production costs and benefit the environment. This study was conducted to compare the effects of organic and polyethylene mulches on growth and yields of bell peppers (*Capsicum annuum* L.). Treatments included fumigated and unfumigated full bed polyethylene mulch, sewage sludge-wood chip compost mulch at 112 and 224 t·ha^{-1}, strip polyethylene mulch combined with compost at 112 t·ha^{-1}, and unmulched beds. Compost and unmulched treatments were applied with and without St. Augustine grass sod placed on the sides of the beds. The use of polyethylene mulch resulted in a significantly higher total fruit yield compared with the other treatments. Total yields from plants with fumigated and unfumigated polyethylene mulched treatments were 39.1 and 38.0 t·ha^{-1}, respectively. Yields with no mulch were 24.5 t·ha^{-1} with sod and 32.8 t·ha^{-1} without sod and yields were significantly lower than with the compost mulch. Mean yield with the low compost rate (32.0 t·ha^{-1}) was not significantly different than with the high rate (34.3 t·ha^{-1}). Mean fruit sizes (g/fruit) with polyethylene mulch (183 g) and no mulch plots (177 g) were significantly higher than the mean with the other treatments (153 g). The use of mulches improved pepper yield. Plants grown with polyethylene mulch treatments produced higher yields than those in which compost was used as a mulch.**

The use of polyethylene mulch has dramatically increased the yields of some vegetable crops. Polyethylene mulch use in the Florida agricultural industry is now estimated to be more than 9.5 million kg annually (Servis, 1992). Disposal of the mulch is a constantly increasing problem and cost, to growers and to society. Disposal costs in some areas have increased by as much as 30% in one year (Servis, 1992).

Mulches can reduce evaporation of water from the soil surface, suppress weed growth, restrict leaching of fertilizer nutrients, control weeds, and moderate diurnal and seasonal temperature fluctuations (Janick, 1986). Polyethylene mulch is also used as a protective sealant for fumigation.

Large supplies of organic materials have been made available by Florida's Solid Waste Act of 1988 (Chapter 88-130, Florida Statute). This law mandated a 33% increase in recycling, and prohibited disposal of yard trimmings in landfills. This makes a large quantity of organic matter available for agricultural uses.

Additions of organic matter to sandy soils can increase water holding capacity and cation exchange capacity; stabilize soil structure and increase permeability; add nutrients; and buffer changes in pH, micronutrients, and heavy metals (Bohn et al., 1985). Application of composts have also reduced growth of plant pathogenic organisms such as *Rhizoctonia solani* on small grains (Chung et al., 1988), *Botrytis cinerea* on lettuce (Dittmer et al., 1990), and *Phytophthora cinnamomi* on lupines (Hoitink et al., 1977).

The objective of this investigation was to study the effects of polyethylene mulch and a sewage sludge/yard trimmings compost on yields and fruit size of bell peppers.

Materials and Methods

The experiment was conducted on a Myakka sand in a commercial bell pepper field in Delray Beach, FL. A sorghum cover crop was grown in the field during the summer of 1991. About two months before transplanting pepper, basic slag was broadcast at 2.24 t·ha^{-1}. Fertilizer at 58

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N, 32 P, and 31 K (kg·ha^{-1}) was broadcast and soil incorporated into 1.7 m center to center beds, 90 cm in width and 20 cm high. Additional fertilizer at 251 N and 247 K (kg·ha^{-1}) was banded in the center of the beds. During ordinary pre-plant bedding and fumigation operations, beds were covered with a 1.25 mil white polyethylene mulch. This mulch was removed except in the plots where polyethylene mulch was to be the treatment.

Treatments consisted of (1) an unmulched control in which no mulch or no sod was used on the raised beds; (2) unmulched beds with 20 × 60 cm strips of 'Floratam' St. Augustine sod placed vertically on bed sides and over the fertilizer band in the middle of the beds; (3) a 15 cm strip of white polyethylene was applied over the fertilizer band, using a hand-operated wheel, and the plots were covered with compost at 112 t·ha^{-1}; (4) treatment (3) with the addition of sod on the sides only; (5) full-bed white polyethylene mulch fumigated with methyl bromide at 202 kg·ha^{-1}; (6) full bed white polyethylene mulch; (7) top of bed covered with compost at 112 t·ha^{-1}; (8) treatment as (7) with the addition of sod on sides; (9) top of bed covered with compost at 224 t·ha^{-1}; (10) treatment as (9) plus sod on sides.

The compost used was a commercial product from Cooper City Utilities, Cooper City, FL, comprised of municipal sewage sludge and yard trimmings. Compost was spread manually on the tops of the beds.

Six-week old 'PR3005' bell pepper plants, were transplanted, 30 cm apart in 2 rows per bed with rows spaced 45 cm apart. Plant population was equivalent to 39,120 pl·ha^{-1}.

Each treatment, except those with full-bed polyethylene, was fertilized manually 3, 4, 6, and 8 weeks after planting with a fertilizer of 7 N, 3.8 P, and 3.7 K (kg·ha^{-1}). Each treatment was fertilized 14 weeks after planting with N at 36 kg·ha^{-1} by injection wheel. Sod growth was controlled by 2 fluazifop sprays at 0.28 kg·ha^{-1}.

Fruit was harvested six times, at 12, 15, 17, 19, 21, and 24 weeks after transplanting. Marketable fruit was counted and weighed for each plot. The first two, second two, and third two harvests were considered early, mid, and late harvests, respectively. Collected data were subjected to analysis of variance and treatments were compared by orthogonal contrasts.

Table 1. Mean marketable fruit yield and size of bell peppers grown in several organic and polyethylene mulch cultures.

Treatment No.	Mulch	Marketable fruit yield (t·ha^{-1}) Early	Mid	Late	Total	Fruit size[z] (g/fruit)
1.	No mulch	21.5	8.4	2.9	32.7	174
2.	No mulch, sod side & top	18.6	4.9	1.0	24.5	181
3.	Strip plastic	19.6	10.0	3.5	33.1	174
4.	Strip plas., sod sides	21.5	10.5	5.7	37.7	173
5.	Full polyethylene fumigation	28.1	7.5	3.5	39.1	188
6.	Full polyethylene	22.0	11.3	4.7	38.0	180
7.	112 t·ha^{-1} compost	19.3	7.3	4.5	31.1	170
8.	112 t·ha^{-1} compost & sod sides	20.6	8.6	3.7	32.9	175
9.	224 t·ha^{-1} compost	19.0	11.5	3.9	34.4	167
10.	224 t·ha^{-1} compost & sod sides	19.7	10.9	3.7	34.3	166
Orthogonal Contrasts						
1&2 vs 3,4&7-10		NS	**	**	**	*
1 vs 2		NS	NS	NS	**	NS
3&4 vs 7-10		NS	NS	NS	NS	*
3 vs 4		NS	NS	NS	NS	NS
5&6 vs 1-4&7-10		**	NS	NS	**	**
5 vs 6		**	**	NS	NS	NS
7&8 vs 9&10		NS	**	NS	NS	NS
7 vs 8		NS	NS	NS	NS	NS
9 vs 10		NS	NS	NS	NS	NS

**, *, NS; Significant at P = 0.01, P = 0.05, or not significant, respectively.
[z]Mean of all harvests.

Results and Discussion

Full bed polyethylene mulch has been reported to increase pepper yields. Yields of bell peppers on polyethylene mulch increased 25% in a wet year and 3% in a relatively dry year compared to the use of no mulch (Locascio and Fiskell, 1977). Early yields with full-bed polyethylene contributed to higher total harvest weights than in all other treatments (Table 1). Most other research has compared polyethylene mulch only to unmulched beds. Palada et al. (1992), however, reported higher fresh weights of basil plants grown on compost mulches than on black polyethylene or weed barriers. The lower basil yield with black polyethylene may have been an effect of high temperatures resulting from radiant energy absorption by the black polyethylene.

Plants grown with fumigation and full-bed polyethylene mulch produced significantly higher early yield than those with the non-fumigated full-bed polyethylene mulch. That trend, however, was reversed in the mid and late harvests, resulting in no differences in the total yield. Plant losses to *Phytophthora* with fumigation resulted in a greater stand reduction than with no fumigation. With fumigation, mean plant stand at the last harvest was 50% as compared with 70% in the unfumigated polyethylene-mulched plots.

Mid, late, and total yields with no compost mulch, with or without sod, were significantly lower, as compared with those with compost. In all harvests, plants grown with sod only yielded significantly lower than those with no sod or mulch (Table 1). Sod competition appeared to affect this treatment, as yields were lowest with this treatment at all harvest dates. In addition, plant loss was greatest, with only a 25% stand surviving by the last harvest.

Yields with strip polyethylene mulch were not significantly different than with the other compost treatments at any harvest date (Table 1). Hayslip and Iley (1966) reported increased tomato yields in beds with strip polyethylene covering the fertilizer bands, when compared with beds without the strip covering. Total pepper yields with strip polyethylene were greater than those with no mulch (Table 1), but did not differ significantly from plants with the compost mulch without the polyethylene strip. Plants with sod had significantly higher yields than those with no sod in the late harvests, but that difference was not significant for the total harvest. This difference at late harvest may have been associated with a collapse of the bed sides in the plots without sod. Plant survival counts at the last harvest were similar in the sodded and non-sodded plots, but plant loss in the latter treatment began earlier, probably accounting for the lower yield at the last two harvests.

At mid harvest, plants grown with the high rate of compost had higher yields than those with the low rate. Although the total N in this compost was less than 1%, the sewage sludge component may have been a source of slow-release N. The large increase in yield may be associated with the release of N and other nutrients by microbiological processes. Nutrition may have contributed to an increase in the total yield of peppers with the high rate of compost, but not enough to make a significant difference.

Average fruit weight (g/fruit) was significantly higher with polyethylene treatments, as compared with the other treatments (Table 1). With no mulch, fruit were significantly heavier than with compost. Lower numbers of fruit per plant in the unmulched treatments may have contributed to larger individual fruit.

Numerous authors have reported improved growth of crops with organic mulches or composts, because of reduced weed growth (Aparbal-Singh et al., 1985; Carter and Johnson, 1988), moderation of temperature (Asghar et al., 1987), retained soil moisture (Asghar et al., 1987; Daisley et al., 1988), changes in soil physical condition (Batista y Cuba, 1943), and suppression of plant pathogens (Bryan and Lance, 1991). This investigation showed similar yield improvement with the use of organic mulch when compared to bare soil, but highest yields were obtained when polyethylene mulch was used.

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EVALUATION OF CULTURAL PRACTICES, NITROGEN RATES, AND CULTIVAR SELECTION FOR SWEET ONION PRODUCTION IN NORTHEAST FLORIDA

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Abstract. **To establish an economic, viable sweet onion (*Allium cepa* L.) industry in northeast Florida, factors which promote earliness must be identified. In 1991, 'Granex 429' was planted in 5 rows across 80 inch beds at 3 plant populations (86,500, 99,000, and 111,500 plants/acre) with 3 N rates (45, 90, and 135 lbs/acre). The N rates applied did not influence growth rates significantly. Yields of large onions (>3 inch) were 16.2, 13.7, and 10.4 tons/acre with the 3 plant populations, respectively, while total yields (>2 inch) were 23.8, 24.1, and 24.3 tons/acre with the populations, respectively. In the 1991-92 season, 'Granex 33' and 'Granex 429' were planted in 6 rows across the 80 inch beds at 85,000 plants/acre. Onions were harvested on 3 dates (25 Mar., 10 Apr., and 25 Apr. 1992). Yields of large (>3 inch) 'Granex 33' bulbs on the 3 harvest dates were 11.1, 32.3, and 38.4 tons/acre, respectively while 'Granex 429' yields were 1.0, 18.8, and 36.2 tons/acre, respectively. The N rates did not significantly influence yields or number of bulbs harvested.**

The potential for a viable sweet onion industry in Florida has been discussed several times (Hayslip et al., 1987; Hensel and Shumaker, 1990; Hochmuth and Hochmuth, 1990; Hochmuth et al., 1990; Olson and Snell, 1989). Yields in these studies have been in the acceptable range of 15 to 30 tons/acre, however, Florida is not considered as a major producer (Fuller et al., 1990). Improved technology in the area of weed and disease control has reduced risks of growing onions while the advent of drying equipment reduced risks of wet weather and limited shelf life. In this study, several plant populations, N rates, and harvest dates were evaluated for maximum onion production in northeast Florida.

Materials and Methods

1990-91 Test. 'Texas Granex 429' onions were transplanted in 5 rows across raised beds spaced on 80 inch centers on an Ellzey fine sand (sandy, siliceous, hyperther-

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