Delray Beach experiments, respectively. By increasing number of plants per hill from 2 to 3, a 6 and 8% increase in marketable pepper yields per acre were obtained in Loxahatchee and Delray Beach experiments, respectively.

Marketable fruit weight and number per plant increased linearly as within-row spacing increased in both experiments (Table 2, 3). Marketable fruit weight and number per plant increased quadratically as number of plants per hill decreased in the Loxahatchee experiments. This quadratic response occurred due to a greater increase in fruit weight and number per plant between 1 and 2 plants per hill when compared with 2 and 3 plants per hill. In the Delray experiment, marketable fruit weight and number per plant increased linearly as number of plants per hill decreased. These results suggests that the increases in pepper yields per acre at higher plant populations were not attributed to higher pepper yields per plant or a larger mean fruit size, but rather to more plants per acre with lower production per plant.

In the Loxahatchee experiment, a darker shade of green colored fruit occurred in the first harvest as within-row spacing increased or number of plants per hill decreased. The light green fruit color could detract from fruit quality at higher plant populations.

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BELL PEPPER CULTIVAR TRIALS: SPRING 1983 AND 1984[1]

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Additional index words. Capsicum annuum, yield trial, fruit characteristics.

Abstract. **Bell pepper (Capsicum annuum L.) cultivars were evaluated at Bradenton in replicated trials in the spring of 1983 and 1984. In 1983, 14 cultivars were evaluated for marketable yield, number of fruit per plant, average fruit weight, and the number of fruit per 25 lb. carton. In 1984, 8 cultivars which looked promising in 1983 were evaluated along with 2 new entries, and were studied by the same parameters with additional information taken for individual fruit dimensions and shape. In the spring of 1983, 'Better Belle' was ranked as the top yielding entry in terms of number of cartons per acre (2357.1 cartons/acre) and the highest number of fruit per plant (10.2). However, there was not a significant difference in marketable yield among 'Better Belle', 'Big Bertha', 'Lady Bell', 'Crispy,' and 'Pro Bell.' Individual fruit weight was greatest for 'Jupiter,' 'Big Bertha', and 'Bell Tower,' (5.5, 5.4, and 5.3 oz, respectively). 'Big Bertha' and 'Lady Bell' had significantly greater yields at the first harvest than 8 other cultivars.**

In the spring of 1984, 'Gator Belle' was ranked as the top yielding entry with 2162.9 cartons per acre, however there was not a significant difference in yield among 'Gator Belle,' 'Crispy,' 'Pro Bell,' 'Bell Boy' and 'Lady Bell'. Individual fruit weight was greatest for 'Big Bertha' with an average fruit size of 4.9 oz. Early yield comparisons show little difference among cultivars in the spring of 1984.

During the 1982-83 pepper season in Florida, 19,700 acres were harvested and yielded 9.5 million bushels with a total value of $89.7 million. When compared to the previous season, production increased 19% due to increased yield per acre and value per bushel rose from $7.00 to $9.45 (2). Florida pepper production accounted for 59% of the total U. S. shipments during the months from October to June in 1982-83, exclusive of incoming shipments from Mexico which decreased Florida's share to 43% (1).

Selection of commercial cultivars by pepper growers is a critical step in the production schedule to assure high and reliable yields from season to season. Numerous pepper cultivars were evaluated at the Gulf Coast Research and Education Center in Bradenton, FL during spring 1983 and spring 1984 for yield and performance characteristics.

Materials and Methods

Spring 1983. Field preparation for the spring 1983 trial began in January, 1982 and consisted of the addition of dolomite at 1 ton/acre and 600 lb./acre superphosphate (0-8.7-0) containing 80 lb./ton micronutrients as F 503 oxide. The land (EauGallie fine sand) was utilized in row crop production of sweet corn in the spring of 1982 and laid fallow in the fall of 1982. Six weeks prior to planting, 7 beds were formed between irrigation furrows on 4.5 ft centers and treated with 66% methyl bromide and 33% chloropicrin at 350 lb./acre. Full bed surface incorporated dressing included 18-0-20.8 (97 lb./acre), (38-0-0 at 97 lb./acre) and superphosphate (0-8.7-0 at 784 lb./acre) containing F 503 oxide micronutrients. A single band of 18-0-20.8 was applied down the center of the bed at the rate of 2352 lb./acre. Beds were covered with black plastic mulch.

Seed of 14 cultivars were sown on December 2, 1982 in wooden flats containing a processed product of spent coal (Saf-T-Blast, Mineral Aggregates, Inc.). Seedlings were transplanted 18 days later into containerized flats (1-1/2 x 1-1/2-inch cells, Todd Model #150) containing a peat, sand, vermiculite, perlite mix (5:3:3:1) amended with superphosphate (2.3 oz), dolomite (15.0 oz), Micromax (2.3 oz), hydrated lime (1.5 oz) and $CaCO_3$ (15.0 oz), all per 0.1 yard^3 of media. Transplants were set in the field on Febru-

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ary 17, 1983. Some resetting was necessary with the final reset occurring 11 days after initial transplanting.

Plants were set in 2 rows per bed with 12-inch spacing between plants and rows. Three replicates of 40 plants per plot were arranged in a randomized complete block design. Registered pesticides were applied for insect and disease control.

Fruits were hand harvested 4 times (May 9, 18, 25 and June 6, 1983). Fruits were graded as marketable or cull, then weighed and counted for both categories. Defects and fruit characteristics were evaluated during grading. Total yield, plant yield, average marketable fruit weight, percent culls and number of fruit per carton were calculated.

Spring 1984. Field preparation for the spring 1984 trial began in April 1983. Since the land had not been farmed in 25 yr, the soil was treated in April 1983 with 1200 lb./acre superphosphate (0-8.7-0) containing 80 lb./ton micronutrients as F 503 oxide and 2 tons/acre dolomite. Beds were formed the following February and were not fumigated. Banded fertilizer was applied as in the spring of 1983; however the full bed, incorporated top dressing included 18-0-20.8 (97 lb./acre), $CaCO_3$ (784 lb./acre) and 34-0-0 (97 lb./acre). Beds were covered with black plastic mulch.

Seed of 10 cultivars were sown on December 15, 1983 in wooden flats containing processed spent coal. Seedlings were transplanted 22 days later into containerized flats (Todd Model #150) containing peat and vermiculite (1:1) amended with dolomite (1.7 lb.), superphosphate (9.0 oz) and Micromax (1.8 oz), all per 0.1 $yard^3$ of media. Transplants were set in the field on February 20, 1984. Severe weather conditions warranted some resetting on March 5, 1984.

Plants were set at the same spacings as in 1983. Four replicates of 40 plants per plot were arranged in a randomized complete block design. Registered pesticides were applied routinely for disease control and as needed based upon results of scouting twice weekly for insect control. Fruits were harvested on May 10, 17, 24, and June 4, 1984, and handled as in 1983. Additionally, data were taken on fruit dimensions and shape. Data from 1983 and 1984 were analyzed separately, then combined and reanalyzed for the 8 cultivars common to both years. Specific information on yield, fruit size, number of fruit per carton, cull production and fruit produced per plant for each harvest has been discussed for spring 1983 elsewhere (3). This paper discusses these parameters for both years from a seasonal perspective only. Prevailing weather conditions during spring 1983 and 1984 are in Table 1.

Results and Discussion

Combined analysis of variance for the 8 cultivars common to both years determined that 1983 and 1984 pepper trials were significantly different from each other (Table 2). Weather conditions in the spring of 1983 were not typical. Particularly heavy rainfall occurred in March (Table 1), however, the lower marketable yields came from the spring 1984 season when plants were battered in late February and early March by strong winds, cool temperatures, and rain. Daily wind run readings between February 26 and 29 were 168.9, 153.7, 136.4 and 100.5 miles per day (mpd) with low temperatures in the 30's (°F) and 40's (°F) for 3 of 5 nights. This was accompanied by 0.96 inches of rain. Daily wind run readings between March 4 and 8 were 106.1, 148.4, 151.5, and 91.6 mpd, with low temperatures in the 40's (°F) for 3 of 5 nights.

Table 2. Annual differences in pepper production averaged over 8 cultivars common to 1983 and 1984 trials.[z]

	Year	
	1983	1984
Marketable yield (cartons/acre)[y]	2035.4 a[w]	1690.4 b
No. marketable fruit/plant	8.7 a	8.1 b
Number of fruit/carton	82.9 b	91.7 a
Culls (%)[x]	9.9 b	21.9 a
Avg. marketable fruit weight (oz)	4.8 a	4.4 b

[z]There was a significant cultivar X year interaction. Cultivars analyzed were: Bell Boy, Better Bell, Big Bertha, Crispy, Early Calwonder, Hybelle, Lady Bell and Pro Bell.
[y]Carton = 25 lb. fruit.
[x]On a weight basis.
[w]Mean separation in rows by Duncan's multiple range test, 5% level.

Generally, in 1984, marketable yields were lower, cull production higher, and fruit weight lower than in 1983 (Table 2). However, because there was a significant interaction effect between pepper cultivar and year for yield, plant production and cull production, the cultivars will be discussed by year. There was no interaction effect between cultivar and year for fruit size or number of fruit per carton. All cultivars produced smaller fruit in 1984 than in 1983.

Spring 1983. Cumulative data for 1983 indicate that 'Better Belle' was ranked as the top yielding entry in terms of number cartons/acre and the highest number of fruit per plant (Table 3), however there was not a significant difference in marketable yield among 'Better Belle', 'Big Bertha', 'Lady Bell', 'Crispy', and 'Pro Bell'. Individual fruit weights for the season were greatest for 'Jupiter', 'Big Bertha', and 'Bell Tower', (5.5, 5.4, and 5.3 oz, respectively) and were significantly different from the 11 remaining entries. Percent culls ranged from 7.1 to 16.8% among the entries with broad statistical overlaps. Number of fruit per carton ranged from 72.7 to 94.3 for 'Jupiter' and 'Ma Belle,' respectively. 'Ma Belle' had significantly more fruit per carton than any other entries.

'Big Bertha' and 'Lady Bell' had significantly greater yields at the first harvest than 8 other cultivars (Table 4). Peak production for the season occurred at the second harvest, and as for the initial harvest, 'Big Bertha' and 'Lady Bell' produced the highest yields which were significantly greater than 6 other cultivars. By the third harvests, 'Crispy'

Table 1. Mean temperatures and total rainfall at the Gulf Coast Research and Education Center during 1983 and 1984 pepper trials.

1983				1984			
	Average daily temp. (°F)				Average daily temp. (°F)		
Month (dates)	max	min	Rainfall (inches)	Month (dates)	max	min	Rainfall (inches)
February (17-28)	72.6	52.1	3.74	February (20-29)	75.6	52.9	1.73
March	72.8	52.8	8.63	March	76.3	52.8	3.65
April	81.0	57.4	2.42	April	80.4	58.1	2.15
May	87.0	63.3	1.17	May	87.5	64.9	2.38
June (1-6)	90.0	67.0	0.32	June (1-4)	83.8	56.0	0.0

Table 3. Yield and performance of pepper cultivars for the entire season, spring 1983. (Harvest dates: May 9, 18, 25 and June 6, 1983.)

Cultivar	Source	Marketable yield			Cullsy (%)	Marketable fruit weight (oz)
		Cartons/acrez	Marketable fruit/plant (no.)	Fruit/carton (no.)		
Better Belle	Ball	2357.1 ax	10.2 a	83.2 cd	9.3 bc	4.8 b-d
Big Bertha	Ball	2269.0 ab	8.6 a-c	73.7 e	16.8 a	5.4 a
Lady Bell	Harris	2116.0 a-c	8.8 a-c	80.9 d	9.2 bc	4.9 bc
Crispy	Burpee	2046.4 a-d	9.4 ab	89.3 b	7.1 c	4.5 ef
Pro Bell	Twilley	2028.0 a-d	8.7 a-c	83.0 cd	7.9 c	4.8 b-d
Bell Boy	Peto	1919.5 b-e	8.2 b-d	82.7 cd	10.0 a-c	4.8 b-d
Hybelle	Harris	1911.8 b-e	8.6 a-c	87.5 bc	10.5 a-c	4.6 de
Jupiter	Northrup King	1889.5 b-e	7.1 c-e	72.7 e	13.9 a-c	5.5 a
Bell Tower	S & G	1751.1 c-f	6.8 de	75.2 e	12.7 a-c	5.3 a
Early Calwonder	Asgrow	1694.0 c-f	7.4 c-e	84.6 b-d	15.9 ab	4.7 b-e
Big Belle	Ferry-Morse	1604.0 d-f	6.7 de	80.9 d	14.2 a-c	5.0 b
Ma Belle	Peto	1523.6 ef	7.4 c-e	94.3 a	13.6 a-c	4.2 f
Keystone Resistant Giant	Peto	1349.4 f	5.7 e	81.2 d	15.3 ab	4.9 bc
Resistant Florida Giant	Ferry-Morse	1345.5 f	6.0 e	86.9 bc	15.3 ab	4.6 c-e

zCarton = 25 lb. fruit.
yOn a weight basis.
xMean separation in columns by Duncan's multiple range test, 5% level.

and 'Better Belle' were ranked as the top yielding entries, but were only significantly different from one other cultivar. On June 6, 'Better Belle' was the top ranked cultivar in marketable yield which was different from 9 other entries.

Table 4. Marketable yields by harvest date for Spring 1983 pepper trial.

Cultivar	Marketable yields by harvest date (cartons/acre)z			
	May 9	May 18	May 25	June 6
Better Belle	426.9 aby	697.9 ab	636.0 a	596.3 a
Big Bertha	472.4 a	791.8 a	522.7 ab	482.1 a-c
Lady Bell	457.9 a	782.1 a	520.8 ab	355.3 c-e
Crispy	271.0 b-e	547.9 b-e	664.0 a	503.4 ab
Pro Bell	356.2 a-c	732.8 ab	606.9 ab	333.0 de
Bell Boy	297.2 b-d	597.3 a-d	579.8 ab	446.2 b-e
Hybelle	274.9 b-e	712.4 ab	505.3 ab	419.1 b-e
Jupiter	402.7 ab	670.8 a-c	505.3 ab	309.8 e
Bell Tower	389.1 ab	446.2 de	451.1 ab	463.7 a-d
Early Calwonder	229.4 c-e	448.2 de	590.5 ab	425.9 b-e
Big Belle	302.0 b-d	482.1 c-e	408.5 ab	411.4 b-e
Ma Belle	280.7 b-e	419.1 de	334.9 b	488.8 a-c
Keystone Resistant Giant	136.5 e	345.6 e	501.4 ab	365.9 b-e
Resistant Florida Giant	150.0 de	336.9 e	470.4 ab	388.2 b-e

zCarton = 25 lb. fruit.
yMean separation in columns by Duncan's multiple range test, 5% level.

Spring 1984. Seasonal data for spring 1984 ranked 'Gator Belle' as the top yielding cultivar in marketable yield (Table 5). Other entries not significantly different from 'Gator Belle' were 'Crispy', 'Pro Bell', 'Bell Boy', and 'Lady Bell'. The greatest number of fruit per plant came from 'Crispy' (10.0) and 'Gator Belle' (9.9), similar to 4 and 5 other cultivars, respectively. Smallest fruit size was produced by 'Crispy' and 'Lady Bell' and is reflected in the number of fruit per carton (96.4 and 95.2, respectively). These were similar in size to the majority of the entries. 'Big Bertha' produced the largest fruit at 4.9 oz, which had an average length of 4.1 inches and was significantly larger than all other cultivars. Blockiest fruit were produced by 'Annabelle' and 'Early Calwonder' as determined by fruit length to width ratio. The number of lobes per fruit ranged from 3.3 to 2.8.

Marketable yields for each harvest date are in Table 6. Greatest yields from all cultivars occurred at the first harvest. There were few significant differences among the entries at that time. Yield performance of the cultivars differed more at the second harvest. 'Gator Belle' gave the greatest marketable yield, but was not significantly different from 6 other cultivars. On May 24, 'Crispy' produced the highest marketable yield and was separated from all other entries. At the last harvest, 'Gator Belle' was top ranked, but inseparable in yield from 'Crispy' or 'Pro Bell'.

Table 5. Yield and performance of pepper cultivars for the entire season, spring 1984. (Harvest dates: May 7, 17, 24 and June 4, 1984.)

Cultivar	Source	Marketable yield			Cullsy (%)	Marketable fruit			
		Cartons/acrez	Marketable fruit/plant (no.)	Fruit/carton (no.)		Weight (oz)	Length (inches)	Diameter (inches)	No. of lobesx
Gator Belle	Peto	2162.9 aw	9.9 ab	88.3 bc	11.0 d	4.5 b	3.3 bc	2.9 c	3.3 a
Crispy	Burpee	2035.3 ab	10.0 a	95.2 a	14.2 cd	4.2 c	3.3 bc	2.9 c	3.2 a
Pro Bell	Twilley	1926.0 a-c	9.0 a-c	90.1 ab	14.8 cd	4.4 bc	3.5 b	2.9 bc	3.4 a
Bell Boy	Peto	1907.8 a-c	9.3 a-c	94.0 ab	15.6 cd	4.3 bc	3.2 c	2.9 bc	3.3 a
Lady Bell	Harris	1821.3 a-d	9.1 a-c	96.4 a	17.8 b-d	4.1 c	3.4 bc	2.9 bc	2.9 ab
Better Belle	Ball	1698.6 b-e	8.2 b-d	94.0 ab	20.2 bc	4.3 bc	3.5 b	2.8 b	2.8 b
Hybelle	Harris	1676.1 c-e	8.1 cd	93.6 ab	22.1 bc	4.3 bc	3.5 bc	2.9 bc	2.8 b
Annabelle	Harris	1494.2 de	7.0 d	90.5 ab	19.9 bc	4.4 bc	3.3 bc	3.1 ab	3.1 ab
Early Calwonder	Asgrow	1445.9 ef	6.5 d	87.7 bc	25.8 b	4.6 b	3.5 bc	3.2 a	3.1 ab
Big Bertha	Ball	1162.4 f	4.9 e	82.4 c	40.1 a	4.9 a	4.1 a	3.0 bc	2.9 ab

zCarton = 25 lb. fruit.
yOn a weight basis.
xDimensions and the number of lobes data were taken on samples of 10 fruit/replication at the initial harvest.
wMean separation in columns by Duncan's multiple range test, 5% level.

Table 6. Marketable yields by harvest date for spring 1984 pepper trial.

Cultivar	Marketable yields by harvest date (cartons/acre)[z]			
	May 10	May 17	May 24	June 4
Gator Belle	868.2 a[y]	537.7 a	300.1 b	456.9 a
Crispy	819.3 ab	468.1 ab	382.9 a	365.0 ab
Pro Bell	946.2 a	380.2 b-d	258.1 b	341.5 ab
Bell Boy	866.8 a	440.3 ab	273.8 b	327.0 bc
Lady Bell	775.0 ab	504.2 ab	237.1 b	305.0 b-d
Better Belle	765.2 ab	416.9 a-c	223.6 b	292.9 b-d
Hybelle	715.9 ab	426.5 a-c	280.3 b	253.5 b-d
Annabelle	777.3 ab	286.8 cd	253.7 b	176.5 d
Early Calwonder	710.7 ab	272.6 d	259.2 b	203.4 cd
Big Bertha	568.1 b	271.5 d	148.2 c	174.6 d

[z]Carton = 25 lb. fruit.
[y]Mean separation in columns by Duncan's multiple range test, 5% level.

Spring 1983 vs. 1984. Of the 8 cultivars ('Bell Boy', 'Better Belle', 'Big Bertha', 'Crispy', 'Early Calwonder', 'Hybelle', 'Lady Bell' and 'Pro Bell') tested in both years the yield was generally lower in 1984. However, 2 cultivars, 'Crispy', and 'Bell Boy', showed little difference in yield between 1983 and 1984. Half of the cultivars showed an increase in the number of marketable fruit produced per plant in 1984, and half showed a decrease. Since the average fruit weight was lower for all cultivars in 1984, any increased fruit production was obscured by packing out more fruit per 25 lb. carton. Cull production for all cultivars was greater in 1984, but was dramatically higher for 'Big Bertha' and only slightly higher for 'Bell Boy'.

Overall, the most consistent performance for both seasons came from the cultivars 'Crispy', 'Pro Bell', and 'Lady Bell', all of which ranked in the top 5 cultivars in marketable yield in both 1983 and 1984. The yields from these cultivars were influenced by a tendency for greater fruit production per plant and lower cull production. The performance of 'Gator Belle' in the spring 1984 season (not examined in 1983) warrants further study.

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NITROGEN SOURCES AND COMBINATIONS FOR POLYETHYLENE MULCHED TOMATOES[1]

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Abstract. **Tomatoes (Lycopersicon esculentum Mill) were grown with paired combinations of 4 N sources or each alone applied at 200 lb. N/acre to evaluate their effect on fruit yield and tissue elemental concentration. The N sources were NH_4NO_3 (AN), KNO_3 — $Ca(NO_3)_2$ [KN-CaN], sulfur-coated urea (SCU), and isobutylidene diurea (IBDU). Yields of extra large, large, and total marketable fruits were highest with combination of IBDU or SCU with KN-CaN or AN, lowest with all of the N from AN or KN-CaN, and intermediate with all of the N from IBDU or SCU. Leaf N and K concentrations and available soil N concentrations were not consistently influenced by N source treatment.**

Most of the N required for tomatoes produced on sandy soils is supplied from soluble N sources. Due to nutrient leaching, the efficiency of applied N may be low; therefore, high rates of N are generally applied. Polyethylene mulch reduces leaching but its use requires that most of the fertilizer be applied before mulch application. If the threshold for soluble salt injury is exceeded, reduced yields can result from this over fertilization. Little difference in soluble N source for tomatoes has been found (1), although part of the N applied as NO_3-N is desirable under conditions of low nitrification. In the early stages of tomato plant growth, N need is low compared to that during fruit set and fruit development. In a study by Shelton (6) with SCU, a slow release N source, tomato production was found to be superior to that with soluble N sources. Similar enhancements in production with SCU have been reported for watermelon (3) and with SCU and IBDU for pepper (4).

The purpose of this study was to evaluate the influence of paired combinations of soluble and slow release N sources for polyethylene mulched tomatoes.

Experimental Procedures

'Tempo' tomatoes were grown during the spring of 1980 on a Sparr fine sand. The soil contained 1.7% organic matter in the upper 6 inches and had been limed to a pH of 6.5 at the time of transplanting. Rate of N applied was 200 lb./acre derived from SCU, KN-CaN, IBDU, and AN. These were applied alone or in combinations of 2 N sources for a total of 16 treatments (Table 1). Treatments were arranged in a randomized complete block design with 4 replications of single row plots 4 ft by 36 ft. Fertilizer was applied at 200-100-180-20 lb./acre N-P-K-micronutrient formulated from the appropriate N sources, concentrated superphosphate, potassium chloride, and FTE 503 (Frit Industries, Ozark, AL), respectively. The soil was fumigated with 22 gal/acre of dichloropropane-dichloropropene mixture. Two weeks later, on March 17, 1980, beds 4 ft apart were prepared, fertilizer was applied broadcast on the bed

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