Table 1. Comparison of root and shoot portions of the indeterminate ('Early Calwonder') and restricted branched type breeding line (82-SPG).[z]

Cultivar or breeding line	Root weight (g)	Stem weight (g)			Leaf number	Leaf weight (g)
		Total	Main stem	Branches		
Early Calwonder	60	71	36	35	47	112
82-SPG	55	54	40	14	31	139

[z]Based on 10 plant average; plants were 4 months old at measurement.

the present indeterminate plant type with a single flower per node. The location of fruits on or close to the main stem in the plant ideotype(s) is a better arrangement from an engineering standpoint compared with the present plant type where the late fruits borne on weak branches are often lost due to breaking of the branches. Physiologically these plant ideotypes are nearly similar to the crops with a strictly determinate habit, as in cereals which show a clear separation of vegetative and reproductive allocation of assimilates, thus a more uniform yield can be expected from one year to the next with the new plant ideotypes. Our preliminary experiments (Table 1) indicate that the plant ideotypes described here have similar root area as the present plant type, however the ideotypes have better leaf to stem ratio. Although the breeding line had fewer leaves, the total leaf area was greater than the present plant type (Table 1). A considerable amount of assimilates thus saved seems to go into the fruit development. Therefore, these plant ideotypes appear to have a better efficiency in the allocation of photosynthetic assimilates (harvest index).

Breeding is in progress to incorporate some of the horticultural characters such as fruit shape, size, wall thickness etc., into the new plant types. From our preliminary observations (e.g. Fig. 3-D, E) on several breeding lines of the new plant types indicate a greater marketable fruit number per plant. Also, because of the compact plant size the new plant types are suitable for high density planting. Thus considerable yield increases are anticipated with the new plant types. A second major advantage of the new plant types are their suitability for once-over harvesting.

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EVALUATION OF CAULIFLOWER IN WEST-CENTRAL FLORIDA[1]

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Abstract. **Twenty-one cauliflower** (Brassica oleracea L. **Botrytis) cultivars were grown in a variety trial consisting of 3 separate replicated plantings during the 1981-82 season. Cultivars were evaluated for curd diameter, curd weight, the percentage of marketable curds per number of plants set, number of harvests, days to harvest from transplant date, and yield in pounds per 100 linear ft of cultivated row. Two of the best cultivars were 'White Summer' and 'White Top' which performed well in all 3 plantings. Yields of 'White Summer' were 69, 82, and 62 lb. per 100 linear ft of bed in the fall, winter, and spring plantings, respectively. Correspondingly, 'White Top' had yields of 89, 64, and 60 lb. per 100 linear ft of bed for the same plantings, respectively. The percentage of marketable curds per number of plants set were 58%, 94%, and 58% for 'White Summer' in fall, winter, and spring plantings, respectively, and 64%, 76%, and 47% for 'White Top' at corresponding times.**

Cauliflower is a minor crop in Florida. In fact, Florida Agricultural Statistics: Vegetable Summary 1981 (2), does not furnish a statistical report for cauliflower and confines its discussions on cauliflower to a single paragraph. However, recent information from another source indicates a steady increase in production and consumption of Florida cauliflower. In 1980, 22,843 thousand lb. of Florida cauliflower were consumed as compared to 13,750 thousand lb. in 1978 (5). In 1981-82, 5,500 thousand lb., about one third of total production, of Florida-produced cauliflower were shipped out of state and sold for $7.00 to $15.00 per 22 lb. carton (1). Major production areas include the Hillsborough-Manatee, Zellwood, and Everglades areas which supply cauliflower from December through April (1, 2).

Selection of cultivars for production in the west-central area of the state is an important step in obtaining high marketable yields. To that end, numerous cauliflower cultivars have been evaluated at the Agricultural Research and Education Center in Bradenton (3, 6) over the last 5 yr. Cultivar evaluation in the 1980-81 season is reported here.

Materials and Methods

Three plantings (Table 1) of cauliflower were grown in the 1981-82 season on old agricultural land of Myakka fine sand prepared the same as for use in tomato culture (4). Raised beds were treated with Dowfume® MC-33 at 350 lb./

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[2]The authors acknowledge the seed companies listed in the text for furnishing seed of cultivars evaluated, and the technical assistance of C. Cook and T. Cline.

Table 1. Mean temperatures and total rainfall at AREC-Bradenton for 1981-82 season.

Month, Year	Planting	Mean temperature (°F) Min	Max	Daily	Dates below freezing temp (°F)	Total rainfall (inches)
September 1981	Fall	71	89	80	—	5.01
October 1981	Fall	64	86	75	—	0.67
November 1981	Fall	51	78	65	—	2.59
December 1981	Fall, Winter	48	74	61	11(32°); 20(28°); 21(28°)	2.36
January 1982	Winter	49	74	62	12(25°)	1.23
February 1982	Winter, Spring	57	80	69	—	2.79
March 1982	Spring	58	80	69	—	7.42
April 1982	Spring	63	84	74	—	2.32

acre (acre = 9685 linear ft of bed). The fall and winter beds were then fertilized with 13 lb./100 linear ft of bed of 18-0-25-2 distributed in 2 bands 18 inches apart, and a full bed top dressing of Nitroform® (38-0-0), superphosphate (0-20-0) containing 80 lb./ton of micronutrients (503 oxide), and 18-0-25-2 each at the rate of 1 lb./100 linear ft of bed. In the spring, the gross acre was fertilized with 600 lb. of superphosphate with 80 lb./ton micronutrients (503 oxide) and one ton of dolomite before beds were formed. Beds were then fertilized at the rate of 16.5 lb./100 linear ft of bed with 18-0-25-2 banded 18 inches apart and a full bed top dressing of Nitroform® (38-0-0) and 18-0-25-2 each at 1 lb./100 linear ft of bed, superphosphate with 80 lb./ton micronutrients (503 oxide) at 1.3 lb./100 linear ft of bed, and incorporated borax at 0.3 lb./100 linear ft of bed. The 30-inch wide beds were mulched with black plastic. The plastic was painted white, in the fall only, to reduce surface temperatures. Beds were spaced on 4.5 ft centers with irrigation ditches every 7 rows.

Seed of all entries (Table 2) were sown in Speedling® trays (2 inch x 2 inch cell size) filled with transplant peat-vermiculite mix (1:1) amended with superphosphate and micronutrients. In the spring, the media was supplemented with 0.3 lb. KNO_3/4 ft^3. Transplants were set 16 inches apart in single rows in the middle of each bed. Three replicates of 12 plants each per entry in the fall and spring and 11 plants each per entry in the winter, were arranged in a randomized complete block design. Standard pesticides were used for insect and disease control.

Wrapper leaves were tied over 2 to 4-inch curds for blanching. Curds were generally harvested 2 to 7 days after tying by cutting the stalk 1 inch below the curd and trimming the wrapper leaves level with top of the curd. At harvest, curds were weighed, the diameter measured and graded for marketability. Unmarketable curds were usually ricey (individual floral parts extended and curd loose), split, or leafy. The percent of marketable curds per number of plants, the total number of harvests, days to harvest from transplant, average marketable curd size and weight were tabulated. Yield was calculated as the weight of marketable curds produced per 100 linear ft of bed.

Results and Discussion

Results for the fall, winter, and spring plantings are given in Tables 2, 3, and 4, respectively, with summary data for the entire 1981-82 season given in Table 5.

Fall 1981 planting. All cauliflower cultivars produced marketable curds in fall 1981 (Table 2). However, there was a wide range in the yield of marketable curds per 100

Table 2. Yield, percent marketable curds per number of plants set, curd characteristics, days to harvest, total number of harvests and plant stand of cauliflower cultivars in fall 1981 planting (transplant date September 14, 1981).

Cultivar	Seed source	Marketable yield Wt/100 linear ft of bed (lb.)	Curds/no. of plants set (%)	Curd diam. (inches)	Curd weight (lb.)	Days[z] to harvest	Total no. harvests per plot	Plant[y] stand (%)
White Top	Sluis & Groot	89.2 a[x]	64 ab	6.2 a-d	1.9 a-c	87 bc	4.7 a-e	75 a-d
Snow Diana	Takii	80.4 ab	59 a-c	6.4 a-c	1.8 a-c	84 b-d	7.3 a	89 ab
White Summer	Sluis & Groot	69.0 a-c	58 a-c	6.3 a-c	1.6 c-e	80 de	4.7 a-e	70 a-d
Starlight	Moran	62.5 a-d	53 a-d	5.9 b-e	1.6 cd	89 b	6.0 a-c	67 a-d
Self Blanche Improved	Moran	52.1 a-e	42 a-f	5.1 e	1.7 b-d	103 a	3.3 c-f	53 a-f
Wallaby	Yates	51.7 a-e	39 a-f	6.3 a-c	1.8 a-c	83 cd	6.7 ab	66 a-d
Christmas White	Sakata	50.6 a-e	72 a	5.4 c-e	0.9 ef	89 b	6.0 a-c	95 a
Snow Queen	Takii	47.3 a-e	53 a-d	5.6 b-e	1.3 c-f	46 i	2.3 ef	69 a-d
White Contessa	Sakata	41.3 b-e	44 a-e	5.7 b-e	1.2 c-f	57 gh	2.3 ef	44 c-f
Tropical 45 Days	Takii	40.2 b-e	72 a	5.4 c-e	0.7 f	48 i	3.0 d-f	80 a-c
Farmer's Early #3	Known You	35.6 c-e	44 a-e	5.2 de	1.1 d-f	57 gh	3.7 c-f	50 b-f
Snow Crown	Takii	34.6 c-e	44 a-e	5.1 e	1.0 d-f	60 fg	4.0 b-f	95 a
Snow King 65	Takii	31.7 c-e	33 b-f	5.5 c-e	1.3 c-f	64 f	2.7 d-f	36 d-f
Tropical 55 Days	Sakata	31.2 c-e	36 a-f	5.6 b-e	1.1 d-f	59 f-h	3.7 c-f	47 b-f
Monarch 73M	Moran	27.8 c-e	20 d-f	6.6 ab	1.9 a-c	86 bc	3.0 d-f	56 a-f
Burpeeana	Burpee	23.8 de	14 ef	7.0 a	2.3 ab	76 e	3.0 d-f	58 a-f
Farmer's Early #2	Known You	18.7 e	25 c-f	5.5 c-e	1.1 d-f	59 f-h	3.3 c-f	39 c-f
Early Snowball A	Burpee	17.3 e	17 d-f	5.7 b-e	1.4 c-f	83 cd	4.3 b-f	75 a-d
Coolabah	Yates	14.6 e	8 f	7.1 a	2.3 a	82 cd	5.3 a-d	64 a-e
Farmer's Early	Known You	10.9 e	14 ef	5.7 b-e	1.0 d-f	54 h	2.0 ef	19 f
501 Fengshan Extra Early	Known You	10.4 e	17 d-f	5.5 c-e	0.8 f	46 i	1.3 f	22 ef

[z]Days to harvest from transplant date.
[y]Plant stand = mature curd-producing plants.
[x]Mean separation within columns by Duncan's multiple range test, 5% level.

Table 3. Yield, percent marketable curds per number of plants set, curd characteristics, days to harvest, total number of harvests and plant stand of cauliflower cultivars in winter 1981-1982 planting (transplant date December 3, 1981).

Cultivar	Seed source	Marketable yield: Wt/100 linear ft of bed (lb.)	Marketable yield: Curds/no. of plants set (%)	Curd diam. (inches)	Curd weight (lb.)	Days[z] to harvest	Total no. harvests per plot	Plant[y] stand (%)
White Summer	Sluis & Groot	82.0 a[x]	94 a	6.0 ab	1.2 a	71 bc	7.0 a	100 a
White Top	Sluis & Groot	64.3 ab	76 ab	5.9 ab	1.1 a	72 bc	7.7 a	97 a
Starlight	Moran	54.1 bc	76 ab	5.8 a-d	1.0 a-d	70 c	6.7 ab	100 a
Self Blanche Improved	Moran	46.0 bc	69 a-c	5.8 a-d	0.9 a-e	69 c	5.7 a-c	100 a
Snow Crown	Takii	44.6 b-d	85 a	5.1 c-f	0.7 b-g	56 d	3.7 d	91 a
Snow Diana	Takii	33.4 c-e	39 cd	5.9 a-c	1.1 a-c	68 c	4.7 a-d	94 a
Christmas White	Sakata	22.1 d-f	43 b-d	5.2 b-f	0.7 c-g	68 c	4.3 cd	100 a
Snow King 65	Takii	19.7 ef	36 cd	5.7 a-e	0.7 b-g	50 e	3.3 d	91 a
White Contessa	Sakata	13.0 ef	27 d	5.2 b-f	0.6 d-g	49 e	1.0 e	27 b
Monarch 73M	Moran	10.0 f	12 d	6.3 a	1.1 ab	72 bc	4.3 cd	100 a
Early Snowball A	Burpee	8.4 f	24 d	5.0 d-f	0.5 fg	56 d	4.3 cd	100 a
Coolabah	Yates	5.7 f	9 d	5.4 b-c	0.8 a-f	84 a	6.0 a-c	100 a
Wallaby	Yates	5.2 f	9 d	5.2 b-f	0.8 a-g	76 b	7.7 a	94 a
Burpeeana	Burpee	5.0 f	12 d	4.9 ef	0.6 e-g	54 de	3.3 d	100 a
Tropical 55 Days	Sakata	3.7 f	12 d	4.5 f	0.4 g	49 e	1.0 e	27 b
Farmer's Early[w]	Known You	—	—	—	—	—	—	—
Farmer's Early #2[w]	Known You	—	—	—	—	—	—	—
Farmer's Early #3[w]	Known You	—	—	—	—	—	—	—
501 Fengshan Extra Early[w]	Known You	—	—	—	—	—	—	—
Snow Queen[w]	Takii	—	—	—	—	—	—	—
Tropical 45 Days[w]	Takii	—	—	—	—	—	—	—

[z]Days to harvest from transplant date.
[y]Plant stand = mature, curd-producing plants.
[x]Mean separation within columns by Duncan's multiple range test, 5% level.
[w]Eliminated from data analysis due to lack of marketable curds.

linear bed ft and in the percent marketable curds per number of plants set. 'White Top' produced 89.2 lb. of marketable curds per 100 linear ft of bed and was at the top of the range in yield, while '501 Fengshan Extra Early' produced the least with 10.4 lb./100 linear ft of bed. The percent of marketable curds per number of transplants set ranged from 72% for 'Christmas White' to 8% for 'Coolabah.'

Average curd diameter at harvest varied by 2 inches among the cultivars and ranged from a high of 7.1 inches for 'Coolabah' to 5.1 inches for 'Snow Crown.' Curd weight varied from 2.3 lb. for 'Coolabah' to 0.8 lb. for '501 Fengshan Extra Early.' Significant differences in curd characteristics and yield overlapped broadly.

Days to harvest from transplant date ranged from a low

Table 4. Yield, percent marketable curds per number of plants set, curd characteristics, days to harvest, total number of harvests and plant stand of cauliflower cultivars in spring 1982 planting (transplant date February 15, 1982).

Cultivar	Seed source	Marketable yield: Wt/100 linear ft of bed (lb.)	Marketable yield: Curds/no. of plants set (%)	Curd diam. (inches)	Curd weight (lb.)	Days[z] to harvest	Total no. harvests per plot	Plant[y] stand (%)
Snow King 65	Takii	71.1 a[x]	78 a	5.1 b-e	1.2 b-e	47 d	3.0 c-d	89 a-c
White Summer	Sluis & Groot	61.7 ab	58 b	6.1 a-c	1.4 a-d	60 a-c	3.7 b-d	75 a-c
White Top	Sluis & Groot	59.8 a-c	47 bc	6.4 ab	1.7 ab	63 ab	6.3 a	89 a-c
Tropical 55 Days	Sakata	54.4 a-c	92 a	5.6 b-d	0.8 c-e	42 de	4.3 a-d	97 a
Snow Crown	Takii	41.3 b-d	55 b	5.2 b-e	1.0 b-e	49 d	4.3 a-d	80 a-c
Self Blanche Improved	Moran	32.3 c-e	36 c	5.3 b-d	1.2 b-e	65 a	5.0 a-c	92 ab
Starlight	Moran	22.3 d-f	14 d	7.0 a	2.1 a	63 ab	4.7 a-c	66 c
White Contessa	Sakata	19.4 d-f	36 c	4.9 c-e	0.7 de	39 e	2.3 d-f	92 ab
Snow Diana	Takii	10.7 ef	17 d	5.3 b-e	0.9 b-e	60 a-c	4.3 a-d	83 a-c
Monarch 73 M	Moran	10.2 ef	8 d	6.3 ab	1.6 a-c	55 c	5.3 ab	80 a-c
Wallaby	Yates	6.0 ef	5 d	5.5 b-d	1.5 a-d	61 a-c	5.3 ab	86 a-c
Farmer's Early #3	Known You	5.4 ef	14 d	4.6 de	0.5 e	42 de	1.3 ef	75 a-c
Farmer's Early	Known You	5.2 ef	11 d	4.6 de	0.5 e	38 e	2.3 d-f	91 ab
Christmas White	Sakata	3.5 f	8 d	4.0 e	0.6 d-e	57 bc	3.0 c-e	72 bc
Burpeeana	Burpee	3.3 f	5 d	4.5 de	0.8 c-e	47 d	4.3 a-d	92 ab
Farmer's Early #2	Known You	2.7 f	5 d	4.5 de	0.7 de	38 e	1.0 f	80 a-c
Early Snowball A	Burpee	1.7 f	3 d	5.8 b-d	0.8 c-e	57 bc	3.3 b-d	75 a-c
Coolabah[w]	Yates	—	—	—	—	—	—	—
501 Fengshan Extra Early[w]	Known You	—	—	—	—	—	—	—
Snow Queen[w]	Takii	—	—	—	—	—	—	—
Tropical 45 Days[w]	Takii	—	—	—	—	—	—	—

[z]Days to harvest from transplant date.
[y]Plant stand = mature, curd-producing plants.
[x]Mean separation within columns by Duncan's multiple range test, 5% level.
[w]Eliminated from data analysis due to lack of marketable curds.

Table 5. Annual results for yield and percent marketable curds per number of plants set of cauliflower cultivars during the 1981-1982 growing season.

Cultivar	Seed source	Marketable yield: Wt/100 linear ft of bed (lb.)	Marketable yield: Curds/no. of plants set (%)
White Top	Sluis & Groot	71.1 a	62 ab
White Summer	Sluis & Groot	70.9 a	70 a
Starlight	Moran	46.3 ab	48 a-c
Self Blanche Improved	Moran	43.5 bc	49 a-c
Snow Diana	Takii	41.5 b-d	38 a-d
Snow King 65	Takii	40.8 b-d	49 a-c
Snow Crown	Takii	40.2 b-d	61 ab
Tropical 55 Days	Sakata	29.8 b-e	47 a-d
Christmas White	Sakata	25.4 b-e	41 a-d
White Contessa	Sakata	24.6 b-e	36 a-d
Wallaby	Yates	21.0 b-e	18 cd
Monarch 73M	Moran	16.0 c-e	13 cd
Snow Queen	Takii	15.8 c-e	18 cd
Farmer's Early #3	Known You	13.7 de	19 cd
Tropical 45 Days	Takii	13.4 de	24 b-d
Burpeeana	Burpee	10.7 e	10 cd
Early Snowball A	Burpee	9.1 e	15 cd
Farmer's Early #2	Known You	7.1 e	10 cd
Coolabah	Yates	6.8 e	6 d
Farmer's Early	Known You	5.4 e	8 cd
501 Fengshan Extra Early	Known You	3.5 e	6 d

of 48 days for 'Tropical 45 Days' to a high of 103 days for 'Self Blanche Improved.' Overnight temperatures near freezing in mid-December may have contributed to the latest maturity date. The number of harvests to clear experimental plots of either marketable or unmarketable curds ranged from an average of 1.3 for 'Fengshan Extra Early' to 7.3 for 'Snow Diana.' The concentrated maturity of some cultivars may reflect a low number of viable plants in the field (plant stand) which could form curds and, therefore, require fewer harvests.

Plant stand in the fall was influenced by an infestation of *Fusarium oxysporum* (Schlecht.) amend. Snyd. et Hans. which girdled plants at the level of the soil. It is assumed that *F. oxysporum* was an invading organism subsequent to mole cricket damage on the stems of young transplants.

Overall, the best yield and quality performance came from 'White Top,' 'Snow Diana,' and 'White Summer.' These 3 cultivars had highest yields; these yields were reliant upon curd size and weight, curd marketability, and plant stand.

Winter 1981-82 planting. Only 15 out of 21 cultivars set in the field produced marketable curds in the winter planting. Within 4 days of field introduction there were 3 nights in which temperatures dropped to 38°F. This incident and other periods of cold temperatures in December (Table 1) were the most likely cause of "buttoning," the premature production of very small heads, for 6 cultivars. The data in Table 3 were analyzed only for those cultivars which produced any marketable curds.

Marketable yield ranged from 82.0 lb./100 linear ft of bed for 'White Summer' to 3.7 lb./100 linear ft of bed for 'Tropical 55 Days.' 'White Summer' gave significantly greater yield than all but 1 other cultivar, 'White Top,' its sister line. Percent marketable curds per number of plants set varied from 94% to 9% (Table 3) exclusive of buttoned cultivars. 'White Summer,' 'White Top,' 'Starlight,' and 'Snow Crown' all had above 70% marketable curds per number of plants set in the field.

Curd diameter varied from 6.3 inches for 'Monarch 73M' to 4.5 inches for 'Tropical 55 Days.' Curd weight averaged from 1.2 lb. to 0.4 lb. for 'White Summer' and 'Tropical 55 Days,' respectively. The poor curd quality of 'Tropical 55 Days,' is probably due to its sensitivity to below freezing temperatures which occurred on January 12, 1982 (Table 1).

Days to harvest ranged from 49 days for 'White Contessa' and 'Tropical 55 Days' to 84 days for 'Coolabah'. Total number of harvests required were from a high of 7.7 for 'White Top' and 'Wallaby' to a low of 1.0 for 'White Contessa' and 'Tropical 55 Days.' The concentrated harvest intervals for 'White Contessa' and 'Tropical 55 Days' are biased due to inferior plant stands (27%) for each cultivar. These 2 early, tropical types were very sensitive to the below freezing temperatures of January 12, 1982 cited earlier. Both cultivars lost viable plants and marketable curd production.

Under winter conditions, 'White Summer,' 'White Top,' 'Starlight,' 'Self Blanche Improved', and 'Snow Crown' were the most acceptable cultivars based on overall yield, curd quality, and percent marketable curds per number of plants set. Most are later maturing (about 70 days) types.

Spring 1982 planting. Seventeen of the 21 entries evaluated produced marketable curds in the spring of 1982 (Table 4). Three of the unproductive cultivars ('501 Fengshan Extra Early,' 'Snow Queen,' 'Tropical 45 Days') "buttoned", while the fourth cultivar 'Coolabah' had some "buttoning," and the "non-buttoned" plants of 'Coolabah' produced no marketable curds. Data from these 4 cultivars were not subjected to statistical analysis.

There was a wide range of marketable yield from the spring planting. 'Snow King 65' was at the top of the range with 71.1 lb./100 linear ft of bed, whereas only 1.7 lb./100 linear ft of bed was produced by 'Early Snowball A.' Percent marketable curds per number of plants set varied from 92% to 3% for 'Snow King 65' and 'Tropical 55 Days', respectively.

Curd diameter ranged from 7.0 inches to 4.0 inches for 'Starlight' and 'Christmas White,' respectively. Average curd weight ranged from 2.1 lb. for 'Starlight' to 0.5 lb. for 'Farmer's Early' and 'Farmer's Early #3.' 'Starlight' excelled in producing large, compact curds; however, with the lowest plant stand (66%), the total yield was reduced.

Days to harvest ranged from a low of 38 days ('Farmer's Early' and 'Farmer's Early #2') to a maximum of 65 days ('Self Blanche Improved'). It took from 1.0 to 6.3 harvests, on average, to cut all curds produced. No cultivar produced 100% stand and only a few significant differences existed among the cultivars.

Annual results 1981-1982 season. The most consistent performance over all 3 plantings was from 'White Top' and 'White Summer' based on marketable yield and percent marketable curds per number of plants set (Table 5). Observations made during the year led to the conclusion that these 2 cultivars are not as sensitive to climatic changes as other entries. Additionally, 'White Top' and 'White Summer' were also reliable self-blanching cultivars. 'Snow Crown' and 'Self Blanche Improved,' both commercially favored by Florida growers, ranked in the top 7 cultivars in annual performance.

In general, maturity varies with the time of year. Fall plantings take the longest to mature followed by winter and spring which take progressively shorter periods to mature. Curd characteristics, diameter and weight, followed no annual trend and should be examined by cultivar for each season.

Growers in west-central Florida should consider 'White Summer' and 'White Top' in their production schemes. 'Starlight' (also a self-blanching type), 'Snow Diana,' 'Self Blanche Improved,' and 'Snow Crown' may also be reasonable choices. 'Tropical 55 Days' may be a viable option for spring production only. These cultivars will be tested again during the 1982-83 season.

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EFFECT OF FERTILIZER RATE ON NUMBER OF MALFORMED STRAWBERRY FRUIT[1]

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Dover, Florida 33527

Abstract. **'Dover' and 'Tufts' strawberry (Fragaria X ananassa Duch.) plants were fertilized at 65, 130, and 195 lb. N/acre with isobutylidene diurea and evaluated for number of malformed fruit of marketable weight. Phosphorus and potassium were supplied to all treatments at 27 and 162 lb./acre, respectively. The percent of the fruit malformed increased with increased nitrogen rate. The effect was most noticeable in the March and April harvests. A greater percentage of the 'Tufts' than of the 'Dover' fruit were malformed. Leaf N and soil NO_3-N increased with increasing rates of applied N. Foliage color was darker green and plant size was larger with higher rates of applied N.**

The incomplete pollination of the strawberry flower results in malformed fruit. The extent of the malformation is related mostly to the number of pistils not fertilized. If the malformation is severe enough, the fruit are not marketable. This problem occurs in Florida, and its severity varies with the year, the cultivar, the grower, and even the particular field of a grower. There are many reasons for malformed strawberry fruit. On some cultivars, the number of malformed fruit increases as the temperature increases above 104°F (40°C) because of decreased pollen activity (6). Fungicides sprayed on day of flowering can inhibit pollen germination and cause malformed fruit, as can lack of pollinating insects (6). Malformed fruit can also be caused by frosts or freezes, cold but not freezing temperatures accompanied by wind and/or rain, parasite damage, overcrowded plant beds, fungi, cold soils, and, with some cultivars, poor quality pollen (3, 4). Parker (5) lists frosts, herbicide injury, the tarnished plant bug, boron deficiency, and localized rot caused by blossom petals adhering to fruit as some causes of malformed fruit. A *Rhizoctonia* sp. fungus can cause malformed fruit (1) as can larvae of army worms and other insects feeding on flowers.

In observing grower's fields and ARC-Dover research plots, the number of malformed fruit seemed to be greater in higher soil fertility areas. To investigate the possible relationship of soil fertility to fruit conformity, a study was conducted. One of the objectives of this study was to determine the effect of soil nitrogen rates on the number of malformed marketable size fruit.

Materials and Methods

A split plot experiment with 4 replications was conducted during the winter of 1980-81 with 3 rates of isobutylidene diurea (IBDU) on 2 strawberry cultivars. The main plots were strawberry cultivars 'Dover' and 'Tufts'. The sub-plots were IBDU rates which resulted in 65, 130, and 195 lb. N/acre (73, 146, and 219 kg N/ha). Phosphorus and potassium were applied at 27 and 162 lb./acre (30 and 181 kg/ha), respectively. One-third of the P and K and 65 lb. of N/acre from IBDU were placed 5 inches (13 cm) under the plant row and the remainder of the fertilizer was banded 2 inches (5 cm) deep in center of bed. *Beds* were fumigated with methyl bromide (67%) and chloropicrin (33%) at the rate of 400 lb./acre of bed area (448 kg/ha) and mulched with black polyethylene; plants were set on October 10, 1980. Fruit were harvested twice weekly, counted, weighed, and number of malformed fruit determined. A malformed fruit is one that is deformed but does not include those fruit which have a "normal" fan shape or are "split". Pesticide and cultural practices standard to the area were used (2). Tissue samples of the youngest mature leaf of 'Dover' were taken in December 1980 and analyzed for total N. Soil samples across the plant bed were taken in December and April from the 'Dover' treatments and analyzed for NO_3-N. Plants were evaluated for size and color of foliage on January 25 and February 28, 1981.

Results and Discussion

The percent of the marketable size fruit which were malformed increased with increased rate of applied N (Table 1). Differences were significant in March, April, and for the

Table 1. Main effects of nitrogen rate on percent of malformed fruit of marketable size.

lb. N/acre	Fruit malformed (%)				Total
	January	February	March	April	
65	1.10	2.38	3.04	1.57	2.23
130	0.70	2.02	4.21	1.56	2.74
195	1.05	2.78	7.54	3.04	3.47
Significance[z]	ns	ns	*	*	*
Dover	0.61	1.98	2.16	2.28	2.18
Tufts	1.29	2.80	7.70	1.84	3.45
F value[z]	ns	†	*	ns	*

[z]Linear significance and F values significant at 5% (*), 10% (†), or nonsignificant (ns). February interaction significant.

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