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CRITERIA FOR GRADING FLORIDA SWEET CORN

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ABSTRACT

Commercial grading practices were evaluated by measuring the physical characteristics of 4,645 packed and discarded ears. In the warm spring months, 92 percent of the fancy grade Iobelle sweet corn sampled in the Everglades

area had ears at least 1 or 2 inches longer than the 6 inch minimum requirement. In the cool winter months, ears harvested in eastern Palm Beach and Broward counties were shorter and had poorer tip fill.

Sixty eight percent of the ears which were discarded as non-fancy culls had marketable lengths of 3 to 6 inches and could have been husked and trimmed to meet the requirements of the U.S. consumer standards. Longer ears had higher percentages of their length filled with

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Table 1. Cob length distribution for fancy grade and discarded ears of Iobelle sweet corn harvested in the East Coast and Everglades areas.

Harvest month	Number Ears	Cob length - inches						Ave. Cob length inches
		4	5	6	7	8	9	
<u>Percent of total number ears</u>								
<u>Fancy - East Coast</u>								
Feb.	230			30	64	6		7.1
March	288		2	42	52	4		6.9
April	682			10	70	20		7.5
<u>Fancy - Everglades</u>								
April	634			6	70	24		7.5
May	310			2	25	69	4	8.1
<u>Discards - East Coast</u>								
Feb.	862	8	32	56	4			5.9
March	502	1	17	51	30	1		6.5
April	120		2	21	68	9		7.2
<u>Discards - Everglades</u>								
Feb.	757	5	22	60	13			6.1

Table 2. Filled ear length distribution for fancy grade Iobelle sweet corn harvested in the East Coast and Everglades areas.

Harvest month	Number ears	Filled ear length - inches						Ave. fill length inches
		4	5	6	7	8	9	
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<u>Percent of total number ears</u>								
<u>East Coast</u>								
Feb.	230	10	51	34	5			5.7
March	288	22	37	32	9			5.6
April	682	1	18	48	20	3		6.5
<u>Everglades</u>								
April	634	1	7	42	44	6		6.8
May	310		1	9	36	52	9	7.8
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Table 3. Marketable ear length distribution for Iobelle sweet corn discarded during grading in the East Coast and Everglades areas.

Harvest month	Number ears	Market ear length* - inches					Ave. length inches
		0	3	4	5	6 and longer	
<u>Percent of total number ears</u>							
<u>East Coast</u>							
Feb.	862	23	16	48	12	1	4.4
March	502	32	14	33	16	5	4.6
April	120	33	3	21	24	19	5.3
<u>Everglades</u>							
Feb.	757	42	2	22	30	4	4.7

*Length free from defects after husking and trimming.

kernels than shorter ears. Ear fill and diameter increased with ear maturation.

INTRODUCTION

Grade requirements in the United States standards represent demands by growers, shippers, and buyers. These standards are revised and new ones developed as physical characteristics and industry requirements change. Grades establish a minimum quality, and any portion of the commodity falling below this minimum is considered as cull. Size requirements are included in some grade standards. For sweet corn, minimum cob length is specified for each grade classification. For tomatoes and watermelons, size is an important factor but not a requirement for a specific grade.

Three United States standards are available for grading fresh sweet corn. The minimum cob length and fill requirements of the top grade in each standard are:

U. S. Fancy (green corn standards) 6 inch cob 75 percent filled

U. S. Grade A (consumer standards) 3 inch cob well filled

U. S. No. 1 (processing standards) 4 inch cob completely filled

The green corn standards are generally used in Florida. Consumer standards for husked corn on the cob, developed primarily for prepackaging, were used by one Florida grower in 1965. Sweet corn standards for processing are not used in Florida. The U. S. Department of Agriculture (2) reported that standards for fresh vegetables

Table 4. Ear fill for fancy grade Iobelle ears of varying lengths and maturities in the East Coast and Everglades areas.

Production area	Cob length inches	Ear maturity*			Ave. fill length inches
		OP	M	OM	
<u>Percent ear fill**</u>					
East Coast	6.0 - 6.25	77	79	--	4.8
	6.5 - 6.75	79	81	84	5.4
	7.0 - 7.25	83	85	86	6.0
	7.5 - 7.75	85	88	88	6.6
	8.0 - 8.25	88	91	91	7.2
	Ave. fill				
	Length inches	6.1	6.2	6.3	
Ever- glades	6.5 - 6.75	89	91	--	6.0
	7.0 - 7.25	87	92	--	6.4
	7.5 - 7.75	89	93	93	7.0
	8.0 - 8.25	90	95	98	7.7
	8.5 - 8.75	93	96	99	8.3
	Ave. fill				
	Length inches	6.7	7.2	8.1	

*Maturity ratings OP-optimum M-mature OP-optimum

**Percent fill based on each cob length group.

packed in large containers were inadequate to serve the needs of prepackagers who pack higher quality products in small packages ready for distribution to consumers.

Florida has a unique seasonal production pattern with harvesting from Oct. to July. Sweet corn is a warm weather plant; temperatures and day length have a marked effect on ear size. In a 1950-52 study in Palm Beach county (1) ears measured 5 inches in January and 8 inches in May. This paper presents results of a study made to evaluate criteria presently used in grading the principal variety of sweet corn (Iobelle) now grown under varying climatic conditions in Florida.

PROCEDURE

In 1963 and 1965 physical characteristics of commercially packed sweet corn ears were measured. In 1965 ears discarded during grading were measured in addition to ears packed for shipment. Crates of U. S. Fancy grade sweet corn were opened, and data were obtained on cob length, filling of cobs, ear diameter and maturity. Similar data were obtained from ears discarded during grading on mobile harvesters and at packing bins. Crates were selected at random from various growers. An attempt was made to obtain representative samples of sweet corn harvested during the warm and cool seasons.

Measurements of fancy grade ears were made in the Everglades during April and May, 1963, and in eastern Palm Beach and Broward counties during Feb., March, and April, 1965. Measurements of discarded ears were made in the Everglades in Feb., and in the East Coast area in Feb., March, and April, 1965. The data reported here were all obtained from the Iobelle variety except for 260 ears of Florigold 106A shown in Table 6.

RESULTS AND DISCUSSION

Cob lengths of U.S. Fancy grade Iobelle ranged from 5 to 8 inches (Table 1) among lots harvested in the East Coast area during February, March, and April, 1965. The range and the average cob length for the fancy grade harvested in the Everglades in April, 1963 were very similar to those of the April harvests on the East Coast. In May, the predominant cob length increased to 8 inches, and 98 percent of

the ears sampled were at least one inch longer than the minimum of 6 inches required by the U. S. Fancy green corn standard.

Over 2,200 ears of Iobelle sweet corn that were discarded during grading in Everglades and East Coast fields were measured during February, March, and April, 1965. Cob lengths ranged from 4 to 8 inches with the majority measuring 6 or 7 inches.

The length of cob filled with kernels ranged from 4 to 8 inches (Table 2) among fancy grade, East Coast lots. The average ear fill increased from 5.6 inches in March to 6.5 inches in April as the weather became warmer. A striking increase in filled length was found in the corn harvested in May, when 90 percent of the ears had at least 7 inches of the cob filled with kernels. In March, 95 percent of the ears had less than 7 inches of fill.

In measuring the filled portion of fancy grade ears, the portion at the tip with poorly developed or missing kernels was considered as unfilled. This is the procedure used for grading under green corn standards. Ears were usually discarded during grading because of insufficient length or fill, immaturity, shriveled kernels, or worm damage. After husking these ears, the portion free of defects was measured for marketable length using the requirements for U. S. Consumer Grade A. Ears with less than 3 inches of grade A kernels were considered non-marketable. From 23 to 42 percent of the ears discarded as culls under the U. S. Fancy standard during February, March, and April were also culls under the consumer standards (Table 3). The remainder of the ears could have been trimmed to Grade A marketable lengths of 3 to 6 inches after husking.

In studying relationships of different criteria used to grade sweet corn, it was found that longer ears had higher percentages of their length filled with kernels than shorter ears (Table 4). Thus, ears of optimum maturity with a 6 inch cob length had an average fill of 77 percent, while ears with an 8 inch cob length had an average fill of 88 percent. Among the fancy grade ears from the East Coast, the average filled length increased 0.6 inch for each increase of 0.5 inch in cob length. Percent ear fill also increased with cob length in the Everglades ears.

Percent ear fill increased as the ears matured. Overmature ears from the Everglades had an average fill of 8.1 inches compared with only 6.7

inches of fill for the optimum ears. Table 4 also showed that percent ear fill was higher for the Everglades corn grown in warmer weather, than for the cooler weather, East Coast corn.

Ear diameter and maturity frequency distribution for fancy grade Iobelle (Table 5) showed that smaller diameter ears tended to be less mature than larger diameter ears. This indicated that ears increase in diameter as they mature. Corn harvested in the warm season showed a much greater frequency of overmature ears than corn harvested in the cool season. Corn of optimum maturity predominated in the cool season distribution. Many of the ears harvested during the warm season were larger in diameter than

those of the same grade harvested in the cool season.

In addition to the Iobelle variety, data were obtained on discarded ears of the Florigold 106A variety harvested during February and March, 1965 on the East Coast. Frequency distributions for maturity and ear diameter (Table 6) showed a much higher frequency of immature and 15/8 inch (1%) diameter ears than among the fancy grade ears (Table 5). Immaturity was a principal reason for these ears being discarded as culls. Over one-half of the Iobelle and almost one-half of the Florigold 106A discards were 1% inch diameter. Diameter sizing would have separated out many of the immature ears, but

Table 5. Ear diameter and maturity distribution for fancy grade Iobelle sweet corn harvested in cool and warm seasons.

Season	Ear diameter 1/8 inch	Ear maturity*				Frequency (diameter)
		I	OP	M	OM	
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		Number ears				
Cool**	15	7	36	5	1	49
	16	8	207	97	4	316
	17	3	162	131	9	305
	18	1	33	90	20	144
	19	0	0	9	10	19
	Frequency (maturity)	19	438	332	44	833
Warm***	15	5	3	1	0	9
	16	2	11	5	1	19
	17	1	44	30	3	78
	18	0	14	54	30	98
	19	0	5	35	26	66
	20	0	0	10	21	31
	21	0	0	3	18	21
	22	0	0	0	2	2
	Frequency (maturity)	8	77	138	101	324

*Maturity ratings

I - immature

M - mature

OP - optimum

OM - overmature

**Harvested in Feb., March and April.

***Harvested in May.

Table 6. Ear diameter and maturity distribution for Iobelle and Florigold 106A sweet corn discarded during grading.

Variety:	Ear diameter 1/8 inch	Ear maturity*				Frequency (diameter)
		I	OP	M	OM	
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		Number ears				
Iobelle	15	105	134	23	0	262
	16	10	95	51	1	157
	17	6	13	15	1	35
	18	0	1	3	0	4
	Frequency (maturity)	121	243	92	2	458
Florigold 106A	15	25	90	8	2	125
	16	19	43	32	2	96
	17	6	8	15	6	35
	18	0	0	2	2	4
	Frequency (maturity)	50	141	57	12	260

*Maturity ratings

I - immature
OP - optimum

M - mature
OM - overmature

would not have isolated many of the over-mature ears.

Demands for more uniform sizing have resulted in mechanical sizing of many fruits and vegetables. In this study wide ranges in ear dimensions were found in the U. S. fancy grade. Packing wide ranges of ear size together does not conform to the demands of supermarkets or the uniformity concept of the U. S. Fancy grade. Ear size specifications in the sweet corn standards refer to the minimum ear length, but there is no limitation on maximum length. During warm months, Florida growers have marketed large volumes of corn with ear lengths well beyond the 6 inch requirement. During cool months, much corn failed to meet the U. S. Fancy requirements because of ear shortness. In many standards for vegetables the grade classifications are based on uniformity of quality and freedom from damage, but not size (2). The size requirements

for tomatoes and watermelons are not grade requirements. The Florida sweet corn industry has achieved a superior national reputation for the excellent appearance of its unclipped, worm-free ears. If the ear length requirement was removed from the green corn standard, some high quality ears now discarded because of shortness would grade U. S. Fancy. Sizing should separate the range of ear dimensions into more uniform lots, reduce packing problems, and provide for seasonal differences in ear length without removing the ears from the U. S. Fancy grade classification.

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