

be preferred as has been previously reported for Florida oranges (1).

Most of the fruit decay was caused by green mold (*Penicillium digitatum* Sacc.). Several fruit had a small rind tear (plugging) at the stem end but did not decay during the test period. There was no evidence of pitting to the rind during the test. Fruit flavor was still good 5 weeks after harvest.

Test 2, degreening and storage. Following 57 hr of degreening and 2 weeks' storage at 34°F, all fruit were sound. Then, after 7 days at 70°F, there was no decay, but 2% of the fruit showed rind pitting. After 14 days at 70°F, 1.0% decay had occurred from stem-end rot (*Diplodia natalensis* P. Evans). Rind scald was evident on 5.5% of the fruit and may have resulted from the high-temperature problem during degreening. The test was terminated after 14 days at 70°F. Rootstocks had no influence on postharvest characteristics of 'Ambersweet'.

Test 3, degreening, color-add, and storage. The purpose of this test was to determine if color-add treatment following degreening would have detrimental effects on the storage life of 'Ambersweet' fruit. The commercial packinghouse that color-added the fruit routinely used SOPP as a step in the packinghouse operation. Therefore, the color-added fruit also received an additional fungicide that may have aided in fruit decay control. Although this added variable prevented statistical comparisons, it is interesting to note that the percentage of fruit decay after holding 7 days was zero and less than 1% after 14 days (Table 2). These are very similar to data from Test 1 and Test 2 where 34°F

Table 2. Cumulative average percentage decay of 'Ambersweet' fruit following degreening, color-add, and SOPP treatment prior to storage at 34°F for 14 days and holding at 70°F in 1989²

Treatment	Days Held at 70°F			
	7	14	21	28
Check	0	0.3	8.4	11.6
Color-add	0	0.3	0.6	3.8

²Fruit were harvested November 13, 1989, and were degreened 43 hours before treatment. Check and color-add fruit were treated with TBZ. Only color-add fruit received SOPP treatment.

storage was used prior to holding at 70°F. After holding 14 days, there was no evidence of rind pitting of fruit receiving either treatment. The above results suggest that the color-add treatment did not cause detrimental effects on storage and holding of 'Ambersweet' fruit. In fact, the color-add improved the orange peel color. Further work is needed to give a more reliable comparison. Commercially, fruit would not be held more than 14 days, but decay was evaluated after 21 and 28 days at 70°F. The fruit still had a good flavor at the end of that test.

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FLORIDA'S CITRUS JUICE STANDARDS FOR GRADES AND THEIR DIFFERENCES FROM UNITED STATES STANDARDS FOR GRADES AND UNITED STATES FOOD AND DRUG ADMINISTRATION STANDARDS OF IDENTITY

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Abstract. Standards for grades of the eleven major processed and fresh citrus juice products (seven orange, four grapefruit) produced in Florida are discussed. Tables are presented for ten products listing the Florida state grade requirements for the 100-point grading system, which includes the quality factors of flavor, color and defects; requirements for the quality factors of appearance, separation, coagulation and reconstitution; and finally, the analytical requirements for the quality factors for °Brix, °Brix to percent acid ratio, pulp, and recoverable oil. Differences between Florida requirements for Standards of Grades and those of U.S. Standards of Grades and U.S. Food and Drug Administration Standards of Identity are noted. Major U.S. federal and Florida special situations for each product are discussed.

Florida as a major world producer and processor of citrus has developed a host of regulations necessary to market high quality juice and provide a reasonable return on investment.

All fruit whether destined for the fresh fruit or processed juice markets must meet minimum quality or maturity standards. These standards are complicated, depending mainly on cultivar and time of year. Details of citrus fruit maturity standards appear in the volumes "Florida Citrus Fruit Laws, Chapter 601, Florida Statutes" (1989; overseen by the Florida Legislature and requiring legislative action for amendment) and "Official Rules Affecting the Florida Citrus Industry" (1975; overseen by the State of Florida, Department of Citrus and amended by the Florida Citrus Commission as necessary). Maturity standards are based on several factors including peel color break, juice content, total soluble solids or °Brix, percent acid and the ratio of °Brix to percent acid. Florida Department of Agriculture inspection personnel are responsible for the enforcement of rules and regulations involved in Florida's maturity standards.

Any Florida regulations, however, must be tempered by the absolute federal authority provided by the U.S.

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Table 1. Florida requirements for certain quality factors as adopted from U.S. Standards for Grades of the major processed citrus juices.

Product ^z	Word description for quality factors							
	Appearance		Separation		Coagulation		Reconstitution	
	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B	Grade A	Grade B
CSSOJ	—	—	—	—	None	Slight	—	—
POJ	Fresh OJ	Fresh OJ	No material	Some	None	None	—	—
OJFC	Fresh OJ	Fresh OJ	No material	Some	None	None	—	—
COJFM	—	—	—	—	—	—	Recons ^y properly	Recons properly
FCOJ	Fresh OJ	Fresh OJ	—	—	—	—	Recons properly	Recons properly
GJ	Fresh GJ	Fresh GJ	—	—	None	Slight	—	—
GJFC	Fresh GJ	Fresh GJ	—	—	None	Slight	—	—
FCGJ	Fresh GJ	Fresh GJ	—	—	—	—	Recons properly	Recons properly
CGJFM	—	—	—	—	—	—	Recons properly	Recons properly

^zAbbreviations: CSSOJ, canned single-strength orange juice; POJ, pasteurized orange juice; OJFC, orange juice from concentrate; COJFM, concentrated orange juice for manufacturing (reconstituted basis); FCOJ, frozen concentrated orange juice (reconstituted basis); GJ, grapefruit juice; GJFC, grapefruit juice from concentrate; FCGJ, frozen concentrated grapefruit juice; CGJFM, concentrated grapefruit juice for manufacturing (reconstituted basis).

^yReconstitutes.

Food and Drug Administration's (U.S. FDA) Standards of Identity (1990) and the Florida-adopted U.S. Department of Agriculture's (USDA) Standards for Grades of Orange Juice (1982) and for Grapefruit Juice (1983). One of the main purposes of this paper is to detail major differences between U.S. federal regulations and Florida regulations.

Typically, wording for Florida grades of the various products begins: "Florida grades shall be identical with current United States Department of Agriculture adopted U.S. Grades, with the exception that . . .". Then for each product the exceptions are enumerated and explained. In many cases, these exceptions allow Florida to market higher quality products than allowed by U.S. federal law and create avenues for marketing essentially 100% of the fruit produced in a product form that is most advantageous for the fruit and its quality.

Data in Tables 1 through 4 summarize a considerable amount of the quality standards required by Florida in the nine major processed citrus juice products. Some of the quality factors (excluding flavor, color and absence of defects) in certain of the products include appearance, coagu-

lation, reconstitution (in reconstituted concentrates), and separation (Table 1).

In tallying the total score points (Table 2) for determining product grade, one must always be cognizant of the limiting rule that applies: The lowest score of any of the single factors of flavor, color or absence of defects determines the grade even though the total score for the product might place it in a higher grade. Finally, of course, product failing to meet requirements of Grade B would be considered substandard in quality.

The analytical data presented in Tables 3 and 4 are for the 10 major processed and fresh citrus juice products. The product, orange juice, in the tables refers to the freshly squeezed, unpasteurized, unfrozen product. Orange juice from concentrate (OJFC) generally exists as juice packed in fiberboard cartons, plastic containers or other containers and is marketed at refrigerated temperatures and less commonly as canned or bottled single-strength orange juice marketed at ambient temperature. In the former form in Florida, it is also known as one form of "chilled" orange juice.

Table 2. U.S. Standards for Grades based on a 100-point grading system for quality as adopted by Florida for processed citrus juice products.

Quality factor	Processed Orange Juice Products			
	Florida Grade A		Florida Grade B	
	Score points	Word description	Score points	Word description
Flavor	36-40	Very good	32-35	Good
Color ^z	36-40	Very good	32-35	Good
Absence of defects	18-20	Practically free	16-17	Reasonably free
Minimum score ^y	90		80	
Grapefruit Juice and Grapefruit Juice from Concentrate ^x				
Flavor	54-60	Good	54-60	Reasonably good
Color	18-20	Good	16-17	Reasonably good
Absence of defects	18-20	Practically free	18-20	Reasonably good
Minimum score ^y	90		88	

^zColor word descriptions for Florida Grades A and B, respectively, for the products canned single-strength orange juice, concentrated orange juice for manufacturing and dehydrated orange juice are "good" and "reasonably good".

^yA limiting rule applies in which the lowest score of any one factor determines the grade.

^xThe products, frozen concentrated grapefruit juice and concentrated grapefruit juice for manufacturing, have exactly the same standards except that score points for Grade B flavor is 48-53 and absence of defects for Grade B is 16-17, with the total minimum score to achieve Grade B being 80.

Table 3. Florida state grades for °Brix and ratio of °Brix to percent acid analytical requirements for the major citrus juice products, unsweetened.

Product ^z	°Brix		°Brix to % acid ratio			
	Grade A	Grade B	Grade A		Grade B	
	Minimum	Minimum	Minimum	Maximum	Minimum	Maximum
OJ	y	y	y	y	y	y
CSSOJ	10.5	10.0	x	20.5	9.5	20.5
POJ	11.0	10.5	12.5	20.5	10.5	23.0
OJFC	11.8	11.8	12.5	20.5	11.0	23.0
COJFM	11.8	11.8	12.0 ^w	19.5 ^w	12.0 ^w	19.5 ^w
FCOJ	11.8	11.8 ^v	13.0 ^w	19.5	13.0 ^{w,v}	19.5 ^{w,v}
GJ	9.0 ^u	9.0	8.0	14.0	7.5 ^w	—
GJFC	10.0	10.0	8.0	14.0	7.5 ^w	—
FCGJ	10.6	10.6	9.0	14.0	8.0	—
CGJFM	—	—	6.0	—	5.5	—

^zOJ, orange juice; see footnote "z" in Table 1 explaining the remaining product abbreviations.

^yFor Florida Grade A (there is no Grade B) product marked with the Florida Sunshine Tree certification mark, from Aug. 1 through Nov. 30, °Brix shall not be less than 10.0^w and the minimum ratio shall not be less than 10.5^w nor greater than 19.5^w; from Dec. 1 through July 31, °Brix shall not be less than 11.0^w and the minimum ratio shall not be less than 12.5^w nor greater than 19.5^w.

^xFrom Aug. 1 through Nov. 30, the minimum ratio shall be 11.0^w; from Dec. 1 through the following July 31, the minimum ratio shall be 10.0.

^uValues different from those found in U.S. Standards for Grades.

^vSince Florida regulations require both Grades A and B to have Grade A flavor, there essentially is no Grade B juice produced in Florida.

^wWhen canned.

Although orange pulpwash, which is technically known as water extracted soluble orange solids (WESOS), or grapefruit pulpwash (water extracted soluble grapefruit solids or WESGS) are produced in Florida, state law forbids their usage in any 100% pure juice product. Common usage is as citrus solids for citrus-based drinks and allied products. In the preparation of frozen concentrated orange juice (FCOJ), outside of Florida, WESOS (usually about 4-8%) recovered from the excess pulp of the juice from that particular batch of oranges may be added back into the juice going to the evaporator. However, WESOS generally is of extremely poor flavor and color quality (Fellers, 1985), and will generally act to lower quality in the resultant juice.

Concentrated orange juice for manufacturing (COJFM) and concentrated grapefruit juice for manufacturing

(CGJFM) are nearly always stored as unfrozen product generally from 9° to 25°F (−12.8° to −3.9°C), often in tank farms, but may also be held frozen below 0°F (−17.8°C) in 55-gal drums. COJFM is the product utilized in the citrus futures market of the New York Cotton Exchange and FCOJ may be manufactured directly from the future's product. However, when COJFM is utilized as a future's contract for trading on the New York Cotton Exchange, it must have a minimum of both 37 color and 37 flavor score as well as an overall minimum of 94 total score points. Florida regulations require that imported COJFM to be used in making FCOJ in Florida, must also be certified as having minimum 37 flavor and color scores. The products grapefruit juice and grapefruit juice from concentrate (GJFC) may be canned or bottled and marketed at ambient temperature, or packed in fiberboard, plastic or other type

Table 4. Florida's recoverable oil and pulp analytical requirements for the major citrus juice products, unsweetened.

Product ^z	Pulp (% by volume)		Recoverable oil (% by volume)			
	Grade A	Grade B	Grade A		Grade B	
	Maximum	Maximum	Minimum	Maximum	Minimum	Maximum
OJ	—	—	—	—	—	—
CSSOJ	—	—	—	0.035	—	0.050 ^y
POJ	—	—	—	0.035	—	0.045
OJFC	—	—	—	0.035	—	0.045
COJFM	—	—	—	0.120 ^y	—	0.012 ^y
FCOJ	12 ^y	12 ^{y,x}	0.010 ^y	0.035	0.010 ^{y,x}	0.035 ^{y,x}
GJ	10	15 ^x	—	0.020	—	0.020 ^{y,x}
GJFC	10	15 ^x	—	0.020	—	0.020 ^{y,x}
FCGJ	10	10 ^y	0.008 ^y	0.020	0.008 ^y	0.020 ^y
CGJFM	10	12	—	—	—	—

^zOJ, orange juice; see footnote "z" in Table 1 explaining the remaining product abbreviations.

^yValues different from those found in U.S. Standards for Grades.

^xSince Florida regulations require both Grades A and B to have Grade A flavor, there essentially is no Grade B juice.

of container to be marketed at refrigerated temperatures. In Florida, these latter products are sometimes known as "chilled" grapefruit juices.

Florida standards for grades for processed citrus juice products require continuous USDA quality inspection during production; continuous inspection is optional by U.S. federal law.

For each citrus juice product, there generally exist grade specifications peculiar to Florida. The major special considerations will be discussed for each of the products covered here.

Orange Juice

Florida law stipulates that before addition of any additive, raw juice must contain at least 8.5% total soluble solids. U.S. federal law allows the addition of not more than 10% by volume of the juice of *Citrus reticulata* or hybrids thereof. Special ratio requirements are listed in footnote "x" in Table 3. Canned orange juice is an unusual product in that it carries minimum and maximum acid requirements.

Canned orange juice packed in Florida also has certain storage requirements that must be met: (1) Temperature cannot exceed 100°F (37.8°C) following cooling prior to casing; however, a tolerance of one in six or two in thirteen samples is permitted. A product lot failing the temperature requirement may be cooled for 24 hr and reinspected for compliance, if during the initial inspection no more than three in six or six in thirteen samples exceeded 100°F (37.8°C) and no sample exceeded 110°F (43.3°C); (2) for product not packed in metal or fiber containers, storage must be in facilities maintained at 50°F (10.0°C) or less, except for periods not to exceed a total of seven days, however, the product need not be refrigerated during processing nor shipment.

Pasteurized Orange Juice (POJ)

Only the unfermented juice of mature sweet oranges (*Citrus sinensis*) may be used in its manufacture. If this product is marked with the Florida Sunshine Tree certification mark, then there exists only a single grade, Florida Grade A. This grade conforms to U.S. Grade A pasteurized orange juice for the factors of flavor, color and absence of defects, except that the range for color score is 32-40 making a minimum total score of 86. Footnote "y" in Table 3 describes certain analytical requirements peculiar to orange juice marked with the Florida Sunshine Tree certification mark. Regular inspection is by the Florida Department of Agriculture and Consumer Services. The package is labeled with the maximum shelf life which must not exceed 17 days from the time of packaging, or the package may be labeled with the date the juice was extracted. This shelf life labeling need not be done if the packer extracts juice from less than 50,000 90-lb boxes per year, packs for retail sale directly to consumers and not for resale, and sells the juice from the same location where the juice is extracted, or sold by the packer at his (her) retail outlet located within 50 miles. The words "fresh squeezed", "freshly squeezed" or "fresh" may be used on the label.

Canned Orange Juice

Florida does not clearly distinguish POJ from orange juice from concentrate when chilled and collectively designates these products "chilled orange juice". Florida has just

two differences in regulations for its chilled orange juice from U.S. federal regulations: (1) all facilities in which the product is stored shall, except for periods not to exceed seven days in the aggregate, be maintained at temperatures not to exceed 50°F (10°C). However, the product need not be refrigerated during processing nor shipment, and (2) the product must have continuous quality inspection during production.

U.S. FDA's Code of Federal Regulations make two important allowances in POJ's manufacture: (1) not more than 10% by volume of *Citrus reticulata* type fruit may be added (primarily for upgrading color in the base juice); and (2) the orange juice soluble solids may be adjusted by the addition of FCOJ or COJFM. In the latter statement, this concentrate addition must be stated on the label and cannot contribute more than 25% of the total orange juice soluble solids in the finished juice. In a POJ having such additional solids, the label must state "prepared in part from concentrated orange juice" or "with added concentrated orange juice" or "concentrated orange juice added".

Orange Juice from Concentrate (OJFC)

As stated above for POJ, Florida does not clearly distinguish OJFC from POJ, instead calling these products collectively (when chilled) "chilled orange juice". Chilled orange juice has Florida grades identical with U.S. Grade standards for OJFC with two exceptions: (1) all facilities in which the product is stored shall, except for periods not to exceed seven days in the aggregate, be maintained at temperatures not to exceed 50°F (10°C). However, the product need not be refrigerated during processing nor shipment; and (2) continuous USDA quality inspection is required during production.

Orange juice from concentrate may be made from either FCOJ, COJFM, or both. The following products may be added to the reconstituted product: orange juice (as described in an earlier subsection), frozen orange juice (orange juice as described earlier, except that it is frozen), POJ or orange juice for manufacturing (when preserved by chilling or freezing but not by canning).

Frozen Concentrated Orange Juice (FCOJ)

FCOJ is the citrus juice product having probably the most number of Florida state grade regulations different from a multitude of U.S. federal regulations. Analytical differences are presented in Tables 3 and 4 for °Brix, °Brix to percent acid ratio, recoverable peel oil and percent sinking pulp. Even though Florida's minimum ratio of 13 is a half point higher than the U.S. Grade A minimum of 12.5 for areas other than California and Arizona, the average for this very important quality factor for 234 FCOJ samples which had been from a monthly survey of Florida production from 1983 through 1985 was considerably higher at 15.14 (Fellers, 1986).

A gel test is mandatory for FCOJ produced in Florida according to Florida's standards. No product is allowed to have a number 3 or greater gel after the abuse test. No such test is required by U.S. federal standards.

A provision in the U.S. FDA Standards of Identity for FCOJ allowing for the use of as much as 10% of the highly colored juice of *Citrus reticulata* or hybrids thereof is important for blending purposes in Florida production because of Florida's significant quantities of yellowish-colored Hamlin orange juice. Additionally, as much as 5% of sour

Citrus aurantium may be added primarily to blend down the ratio of occasional excessively high ratio juice.

Bulk citrus juice used in the production of FCOJ in Florida must have a ratio of not less than 11:1, a provision not applicable to product made solely from tangerines or *Citrus aurantium*.

Concentrated Orange Juice for Manufacturing (COJFM)

This product is generally stored or transported in bulk at very cold temperatures or kept frozen in 55-gal drums below 0°F (-17.8°C). As a product of commerce, COJFM most commonly occurs at a high °Brix such as 65°. Florida's minimum and maximum ratio and maximum recoverable peel oil requirements are more strict than are U.S. Standards for Grades A and B (see Tables 3 and 4). As is the case for FCOJ, Florida requires COJFM to be tested for degree of gelation; product cannot have a number 3 of greater gel.

Orange Juice for Manufacturing (OJFM)

There are no Florida or U.S. Standards for Grades for this product—only that as defined in the U.S. FDA Standards of Identity. OJFM is being produced in Florida to satisfy demand for its use primarily in POJ. Much OJFM is unpasteurized; chilled to below 38°F (3.3°C), and transported in insulated tank trucks to destinations within or outside Florida (R. Carter, Florida Department of Citrus, personal communication). The OJFM can then be adjusted for oil and pulp levels, pasteurized by the receiving processor, and stored in tank farms, chilled warehouses or frozen until utilized. Since there are no United States or Florida grade standards for OJFM, processors have requested USDA inspectors to score the juice on the basis of POJ Standards for Grades.

Grapefruit Juice

A major difference between U.S. Standards for Grades of orange juice products and grapefruit juice products is that flavor commands a more realistic 60% of the entire 100 score points devoted to quality than the 40% used for orange juices (Table 2).

The FDA Standards of Identity for grapefruit juice carry two provisions that are of special interest: (1) not more than 10% by volume of juice obtained from mature hybrids (presumably, chiefly K-Early) may be added to grapefruit juice; (2) concentrated grapefruit juice may be added (without label declaration) to adjust the solids in grapefruit juice, but cannot contribute more than 15% of the grapefruit juice soluble solids in the finished food.

According to Florida state standards, the percent soluble solids of the raw juice to be used in the processed juice products cannot be less than 7.5 and the ratio cannot be less than 7.5:1.

Analytical factors for grapefruit juice are presented in Tables 3 and 4 with differences from U.S. federal regulations noted. An important difference is that Florida requires a minimum of 7.5 ratio for Grade B instead of 7.0 allowed for U.S. Grade B.

Perhaps the major difference between U.S. and Florida regulations for grapefruit juice is that Florida has placed maximum limits on either limonin or naringin (bitter constituents) for the period August 1 to December 1 of each season for finished product packed in retail-sized containers of 64 oz or less. The juice must contain less than 5.0

ppm limonin measured by high pressure liquid chromatography or contain less than 600 ppm naringin, measured by the Davis Test.

Finally, for Florida only, the temperature of grapefruit juice after packing but prior to storing cannot exceed 100°F (37.8°C). However, a tolerance of one in six or two in thirteen samples is permitted. A product lot failing to meet the temperature requirement may be cooled for 24 hours and reinspected for compliance, if during the initial inspection no more than three in six or six in thirteen samples exceeded 100°F (38.7°C) and no sample exceeded 110°F (43.3°C).

Grapefruit Juice from Concentrate (GJFC)

As in the case for grapefruit juice, Florida Grade B GJFC has a 7.5 minimum ratio instead of U.S. requirements of 7.0. A major grade difference between grapefruit juice and GJFC is the minimum °Brix requirement of 10 for GJFC versus 9 for the grapefruit juice. For Florida juice only, maximum amounts of either limonin or naringin are specified for the period August 1 to December 1 of each season, the same as detailed in the earlier subsection for grapefruit juice.

The same temperature conditions apply for GJFC after packing but prior to storage as has also been detailed in the subsection on grapefruit juice.

Frozen Concentrated Grapefruit Juice (FCGJ)

There is no FDA Standard of Identity for FCGJ. Minimum °Brix is given in U.S. grades for FCGJ as 38°. This translates to about 10.6 °Brix when reconstituted with three volumes of water. Analytical data are shown in Tables 3 and 4 where several differences between U.S. and Florida values are documented. Florida requirements for limonin and naringin in FCGJ are more complicated than for grapefruit juice or GJFC. For the period August 1 to December 1 of each season (a) Grade A finished product shall meet at least one of the following requirements: (1) contains less than 5.0 ppm limonin, measured by high pressure liquid chromatography, or (2) contains less than 600 ppm naringin, measured by the Davis Test; (b) Grade B finished products shall meet at least one of the following requirements: (1) contains less than 7.0 ppm limonin, measured by high pressure liquid chromatography, or (2) contains less than 750 ppm naringin, measured by the Davis Test; (c) All products failing to meet the permissible limits of subsection (b) for Grade B product, shall be labeled Substandard Frozen Concentrated Grapefruit Juice, and may be held in appropriately marked bulk containers for subsequent blending into Frozen Concentrated Grapefruit Juice for Manufacturing only; (d) Maximum naringin and limonin requirements set forth in subsections (a) and (b) shall not apply: (1) to finished product produced solely from concentrate processed between December 2 and July 31 or (2) to finished product produced from concentrate or bulk single strength juice processed between December 2 and July 31, provided any raw juice blended therewith meets the permissible limits of naringin or limonin for Grade A product, respectively.

Concentrated Grapefruit Juice for Manufacturing (CGJFM)

This product is known as Frozen Concentrated Grapefruit Juice for Manufacturing in the publication "Official Rules Affecting the Florida Citrus Industry", State of

Florida, Department of Citrus (1975). There is no FDA Standard of Identity for CGJFM. The pulp and ratio requirements are listed in Tables 3 and 4.

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FLAVOR AND COLOR PROFILES OF FROZEN CONCENTRATED ORANGE JUICE AND ORANGE JUICE FROM CONCENTRATE SAMPLES SUBMITTED FOR FLORIDA'S SEAL OF APPROVAL OR SUNSHINE TREE PROGRAMS, 1986 THROUGH 1989

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Abstract. Florida's Seal of Approval and Sunshine Tree programs guarantee purity and quality when the certification marks appear on citrus products. Flavor and color are two of the major quality factors that are determined on each sample. Together, flavor and color constitute 80% of the 100 total score points possible when product is graded using the United States and Florida Standards for Grades for orange juice products. Only the products frozen concentrated orange juice and orange juice from concentrate are considered here, numbering 797 and 2,741 samples, respectively. Mean values and comparison of the means for hedonic flavor scores and color numbers are presented for each product by year, product type, and by Florida and non-Florida product. Correlation analysis between flavor scores and color numbers revealed some significance for each product by year and by origin of fruit (Florida and non-Florida).

Since 1985, the Florida Department of Citrus has been actively engaged in a rebate program for the citrus industry and retailer to build consumer confidence in quality of citrus juice products (1). Florida's Seal of Approval and Sunshine Tree programs are designed to guarantee purity and quality when their certification marks appear on citrus juice products. The "Seal" guarantees 100% pure juice that meets or exceeds Florida Grade A standards and meets or exceeds U.S. Grade A standards regardless of origin of the

juice or where the juice was packed. The "Tree" guarantees the same as the "Seal" except that the product must have been produced from 100% Florida-grown citrus. Two of the several subjective and analytical quality factors determined on each juice submitted for "Seal" or "Tree" certification are flavor and color. When taken together, these two key quality attributes constitute 80% of the 100 total score points possible when orange juice product is graded using either United States or Florida Standards for Grades. The other quality factors which are determined in the certification process include: °Brix, percent acid and the °Brix to percent acid ratio; testing for possible adulteration such as addition of sugar or pulp wash, dilution with water, use of preservatives such as sodium benzoate or potassium sorbate, use of color additives, especially turmeric or annatto, addition of juices from other cultivars such as grapefruit juice to orange juice, and use of natural juices from other commodities, especially that from apples or pears.

Fellers (2) reported results on analyses of 234 frozen concentrated orange juices (FCOJs) and 52 orange juice from concentrates (OJFCs) produced in Florida over three years' time for flavor (as determined by 15-member panels) and color in addition to several other quality characteristics. Mean values and comparison of means for flavor scores and color numbers by product type, year, month of production and processing plant were presented. Correlation analysis between flavor and color was also made. In another study, Fellers et al. (3) utilized 72 Florida-packed FCOJs drawn from the retail market outside Florida. Large consumer panels evaluated samples for flavor and other quality attributes. The relationship between flavor and color was explored showing a complex situation, including a significant ($P < 0.05$) negative correlation between the two factors.

Several types or forms of citrus juices are involved in the "Seal" and the "Tree" programs, but for purposes of this study, only FCOJ and OJFC which constituted the bulk of the samples will be discussed.

Analysis of the great number of samples coming into the "Seal" and "Tree" programs have given the opportunity to compile and analyze a large amount of data on

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