portions of the outer petioles. No differences in toughness and fibrousness between any of the portions of the outer or inner petioles were found. The upper portion of the inner petioles was considered greener than the middle and the middle was greener than the lower. The upper and middle portions of the outer petioles were greener than the lower.

SUMMARY

The composition and organoleptic ratings of various portions of celery stalks were determined.

There was considerable difference between outer, inner and heart petioles in all of the constituents determined except potassium. There was an interaction of petiole position and storage temperature on all constituents except nitrate nitrogen, alcohol-insoluble solids and potassium.

The organoleptic ratings by the taste panel showed a great difference between outer, inner and heart petioles in flavor, bitterness, toughness, fibrousness and greenness.

There was a difference between portions of outer petioles in amount of dry weight, alcohol-insoluble solids, reducing and total sugar, crude fiber and potassium. Portions of the inner petioles varied in chlorophyll, alcohol-insoluble solids, reducing and total sugar, crude fiber, sodium and potassium.

The outer petiole portions differed in flavor and greenness while the inner petiole portions differed in flavor, bitterness and greenness.

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PREPARATION OF CELERY-TOMATO JUICE BLENDS FROM FLORIDA-GROWN CELERY

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The growers and processors of food crops are constantly searching for new outlets and methods of utilizing their products. Recently, interest has increased in the preparation of vegetable juices and juice blends. Previous studies have shown that celery and celery products can be utilized in the production of juice, juice blends, pickles, and livestock feeds (1, 2).

Considerable variability occurs in the quality of different preparations of celery juice. Some of this variation is due to the quality differences of the fresh celery used, but many changes occur in the celery juice during preparation.

Studies are being made of the changes which take place under various processing conditions. This paper is a report of some of the differences in flavor and physical measurements of celery-tomato juice blends when either single strength or concentrated celery juice is used.

MATERIALS AND METHODS

Juice was prepared from summer pascal type celery in two different experiments. Experiment No. 1 was carried out in the laboratory on small size equipment. Experiment No. 2 was conducted at a commercial pilot plant.

Experiment No. 1. The celery was ground in a comminuter and a large basket-type centrifuge was used for separating the juice from the pulp. The juice was strained through several layers of cheesecloth and then frozen. The frozen material was crushed and centrifuged in order to separate the ice phase from the liquid phase that contained most of the celery flavor. The liquid was approximately a three-fold (15° Brix) concentrate. The ice phase was melted, mixed with single strength juice, and concentrated to about 25° Brix in a low pressure concentrating unit. The two lots of concentrate were mixed to obtain juice of the desired Brix. A portion of the single strength juice was clarified by centrifuging and decanting off the liquid.

Experiment No. 2. The celery was comminuted in a Fitzpatrick mill and the com-

minuted material was run through a finisher for separation of the juice and pulp. The juice was placed in a steam-jacketed kettle and heated to 190°F. The solids were removed by running the juice through a clarifier. The juice was frozen and later a portion of this was concentrated, as in experiment one, to approximately seven-fold (27.3° Brix).

For both experiments, the single strength and concentrated celery juices were blended, in varying amounts, with commercially canned tomato juice. The blended juices were heated to 190°F., placed in cans, sealed, and sterilized 12 minutes at 212°F. The samples for storage were held at 70°F.

Subjective evaluations were made by a taste panel consisting of a minimum of eight members each time the samples were examined.

The objective color measurements were made with a Hunter Color and Color Difference Meter. The a/b ratio was used as a numerical value for the color. The amount of separation between the liquid and solid phases of the juices was measured by putting 100 ml. of juice in a graduate cylinder, placing in a room held at 70°F., and observing the amount of clear liquid after two hours. The viscosity was measured with a Brookfield viscometer.

Results and Discussion

Experiment No. 1. When single strength celery juice and tomato juice are combined, the color of the blend is much poorer than that of the tomato juice alone. Usually, some separation of the solids and liquid phases develop.

In an effort to determine if some of the objectionable features might be corrected by using concentrated celery juice, samples of blended juices were prepared using concentrated celery juice as well as the single strength juice. Four-fold celery concentrate was used. The amount of celery juice added was based upon the single strength juice in all cases. Celery-tomato juice blends were prepared which contained 0, 10, 20, 30, 40, and 50 percent celery by volume, respectively.

When the four-fold concentrated celery juice was used instead of single strength juice in the blends with tomato juice, a much better color was obtained and no separation of the juices was observed (Table 1). As the percentage of celery juice was increased in the blends, the red color value decreased sharply with the use of single strength juice, but there was only a slight decrease with the use of the four-fold concentrate. When the single strength juice was used in the blends,

Table 1. The color values and separation of tomato and celery juices blended in varying percentages using single strength and four-fold concentrated celery juice.

% Tomato Juice	% Celery Juice	Color Value*		Separation**	
		Single Strength	Four-Fold	Single Strength	Four-Fold
100	0	141	145	0.0	0.0
90	10	138	144	1.0	0.0
80	20	119	142	2.0	0.0
70	30	99	138	4.0	0.0
60	40	82	135	6.0	0.0
50	50	51	129	8.0	0.0

* Measured with Hunter Color and Color Difference Meter (a/b x 100)

** Ml. of serum separated in 100 ml. of the blend after standing two hours.

there was a progressive increase in the separation between the two juices as the percentage of celery juice was increased.

Taste panel preference ratings of the tomato-celery juice showed that the blends made with the four-fold concentrate were preferred over those made with the single strength juice. The blends containing 20 percent celery juice had the highest preference rating. Those blends with 10 and 30 percent celery juice, respectively, were preferred to the tomato juice alone.

Experiment No. 2. Tomato-celery juice blends were made with single strength celery juice and the seven-fold concentrated juice. Samples of blended juices were made with the following percentages of celery juice: 0, 6, 12, 18, 24, and 30. When the seven-fold concentrate was used, the percentage of juice added was calculated on the basis of single strength juice.

Objective and subjective quality evaluations were made of the blended juices after 0, 3, and 6 months' storage. The objective measurements for color, viscosity, and separation of the liquid and solid phases of the juices are given in Table 2. When the single strength celery juice was used in the blends, there was a progressive decrease in the red color as the percentage of celery was increased. When the concentrated celery juice was used, there was only a slight decrease in the red color with the larger percentages of celery juice in the blends. The viscosity of the blended juices with increasing percentages of celery juice decreased only slightly when the concentrated celery juice was used, but there was a very sharp decrease

Table 2. Objective quality measurements (color, viscosity, separation) of tomato-celery juice blends after 0, 3, and 6 months' storage.

Percent Celery Juice	Color*			Viscosity**			Separation***		
	0 Mo.	3 Mos.	6 Mos.	0 Mo.	3 Mos.	6 Mos.	0 Mo.	3 Mos.	6 Mos.
				Single Strength Celery Juice					
0	160	-	156	244	253	241	0	0	0
6	153	-	151	203	212	200	0	0	0
12	153	-	149	167	163	177	0	0	2
18	145	-	136	137	119	149	5	3	2
24	141	-	138	97	86	132	9	4	5
30	131	-	121	70	73	68	10	6	5
				Seven-Fold Concentrated Celery Juice					
0	155	150	153	267	258	232	0	0	0
6	150	147	150	251	243	226	0	0	0
12	146	144	146	232	207	202	0	0	0
18	154	144	148	240	226	213	0	0	1
24	143	141	143	225	218	189	0	0	0
30	140	140	143	199	209	208	0	0	2

*Hunter Color and Color Difference Meter (a/b x 100)

**Brookfield viscometer with number 2 spindle

***Ml. serum separated in 100 ml. of the blended juices

when the single strength celery juice was used. There was no separation in the blends between the solid and liquid phases when the concentrated celery juice was used, but when 18 percent or more of the single strength juice was added to the tomato juice there was some separation. The time in storage did not appear to cause any consistent changes in the quality factors which were measured.

The taste panel members expressed the opinion that the flavor of the juice blends prepared in experiment 2 was inferior to tomato-celery juice blends prepared in experiment 1. The inferior flavor was possibly due to oxidative changes which occurred in the celery juice. Facilities were not available for blanching the celery prior to comminuting and most likely undesirable flavor changes occurred before the juice was heated to retard enzyme activity. Further studies are planned to determine the changes taking place in the celery juice as a result of the enzyme activity.

SUMMARY

Studies were made of some of the differences found in tomato-celery juice blends when single strength and concentrated celery juice were used. The blends made with concentrated celery juice had better red color, greater viscosity, and no separation between the liquid and solid phases. As the percentage of single strength celery juice was increased in the blends, the values for color and viscosity dropped sharply and when 18 percent or more of the celery juice was used, there was some separation of the liquid and solid phases. The subjective ratings of the juice blends showed that the taste panel preferred the blends made with the concentrated celery juice.

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PRELIMINARY STUDIES OF THE UTILIZATION OF CULL TOMATOES

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During the 1955-56 season approximately 13½ million bushels of tomatoes were shipped from Florida with a gross return of over 54 million dollars (1). During the same period there were over five million bushels of tomatoes which were rejected. These did not enter the fresh marketing channels because they failed to meet the grades and standards established under the Federal Marketing Agreement.

The large quantity of tomatoes which are not marketed represent an economic loss and create a disposal problem for the growers, packing-house operators and the health authorities. At the present time, most of these cull fruits are either scattered in open fields or dumped in open pits.

There is an urgent need to find methods for the utilization of the cull tomatoes. The waste or unmarketable products from certain of the fruit and vegetable crops have been converted to valuable by-products. Some of the by-products obtained from citrus as reported by Hendrickson and Kesterson (2) are pulp, molasses, peel oil, seed oil, alcohol, pectin, bland syrup, and feed yeast.

Several products have been prepared from some vegetable wastes, e.g. livestock feed, carotene, chlorophyll, vitamins, seed oil, organic acids, and other by-products. However, no information has been found on the commercial utilization of cull tomatoes which have not reached the red ripe stage of maturity.

Studies to develop possible *methods of* utilizing the cull tomatoes were initiated during the past year. The utilization of the fruits

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