Various suggestions have been made that foul areas be treated with creosote, or other agents to kill the micro-organisms which are producing the odor. I prefer the viewpoint that partly decomposed organic matter is the source of the odor—hence, do not eliminate the only possible control measure we have by killing the beneficial microorganisms. By adding nitrate to help the organisms, and lime to counteract odors as they are formed, the organic matter will completely decompose and eventually disappear. Odor from soggy ground areas can be controlled by the application of lime alone, or by lime and nitrate. Odorous pools, either underground or on the surface, present a research problem. No sugar remains in the liquid and application of lime offers help only if the pH is carefully controlled. Liming to a pH of 7.5 or higher, results in a different, but still unpleasant, “burned” odor. This odor may come from nitrogen material, and it should be investigated. Odorous water of this type is very dark in color and shows no inclination to ferment. It is high in bacteria, and low in yeast. It has a solids content of less than half of one percent.

Another research problem involves the study of a satisfactory biologically balanced pool, with sufficient plant and animal life to maintain it in an odorless condition.

FROZEN CONCENTRATED ORANGE JUICE - PAST, PRESENT AND FUTURE

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It is difficult to point to any food industry that has expanded as rapidly as that concerned with the manufacture of frozen concentrated orange juice. Very few food products have met with consumer acceptance so quickly. Praise for this product has been spread across the country by articles in all types of publications from the “Reader’s Digest” to “The Wall Street Journal.” A recent report indicated that the product has become the largest selling item in the frozen food field and accounts for approximately 30 percent of total frozen food volume. When 17 distributors in 13 large cities throughout the country reported on their best selling items for August, 1949, orange juice concentrate received all first place votes except one, which went to frozen peas. Among frozen fruits orange concentrate was first and strawberries second. This success of frozen concentrated orange juice can be largely attributed to the fact that it is a high quality, standardized product, retaining the flavor and nutritional characteristics of fresh fruit. Also from the consumer’s point of view it is convenient to handle and serve and will soon be available on a year round basis. The following approximate production figures, which are based on statistics from the Florida Citrus Commission and the Florida Canners’ Association, indicate the rapid growth of the frozen concentrate industry:

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945-46</td>
<td>225,000</td>
</tr>
<tr>
<td>1946-47</td>
<td>860,000</td>
</tr>
<tr>
<td>1947-48</td>
<td>939,000</td>
</tr>
<tr>
<td>1948-49</td>
<td>9,911,000</td>
</tr>
</tbody>
</table>

One million gallons of frozen concentrate is sufficient to fill approximately 21 million six-ounce cans, which are the familiar consumer package units. The following figures indicate the number of oranges needed to supply the juice necessary for one six-ounce can of concentrate:

<table>
<thead>
<tr>
<th>Brix</th>
<th>Number of Oranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>11.9</td>
</tr>
<tr>
<td>9</td>
<td>10.6</td>
</tr>
<tr>
<td>10</td>
<td>9.8</td>
</tr>
<tr>
<td>11</td>
<td>8.6</td>
</tr>
<tr>
<td>12</td>
<td>7.8</td>
</tr>
<tr>
<td>13</td>
<td>7.2</td>
</tr>
<tr>
<td>14</td>
<td>6.7</td>
</tr>
</tbody>
</table>

The development and success of frozen con-
centrated orange juice has been brought about by the initiative, research, salesmanship, and hard work of many people and companies. The preparation of a concentrated orange juice product requires the removal of water. Methods for the removal of this water by crystallization and evaporation have been the subject of research for many years, as adequately reported by Moore, et al.

Stahl described the characteristics of frozen concentrated citrus juices which had been concentrated by freezing at the University of Florida in 1942. Samples of 48° Brix frozen Valencia orange concentrate, that had been in frozen storage for 22 months, showed no changes in acidity, taste or color, and could not be distinguished from fresh juice. The retention of volatile flavoring constituents and the absence of off-flavors, that could be caused by heating, were noted as advantages of this freezing method over evaporation processes of concentration that were then available.

Many difficulties, both technical and economic, encountered in the concentration of orange juice by freezing and the subsequent separation of ice crystals, have resulted in the commercial application of this method only to a limited extent. One commercial plant in Florida produced a 3-fold frozen concentrated orange juice by this method during the 1948-49 season.

During the 1943-44 season, research personnel of the Florida Citrus Commission working in cooperation with the U. S. D. A. Citrus Products Station, Winter Haven, Florida, investigated, as reported by MacDowell and by the U. S. Bureau of Agricultural and Industrial Chemistry, a type of frozen orange juice concentrate in which the juice, concentrated 5- to 8-fold by vacuum evaporation, was diluted with freshly extracted juice to obtain a 3- or 4-fold concentrate, which was then frozen. A patent covering this process, based on work of the 1943-44 and 1944-45 seasons was applied for in 1945, granted in 1948 to MacDowell, Moore, and Atkins and assigned to the United States of America as represented by the Secretary of Agriculture. All major concentrate manufacturers are now using this basic process. Frozen citrus concentrate, as known today, is an excellent example of where money spent for research has paid immediate dividends, which in a very few years have dwarfed the initial investment in research.

As an indication of the nationwide publicity and recognition given to the Florida frozen concentrate industry, mention is made of the 1949 Food Industries Award to the Florida Citrus Canners Cooperative, Lake Wales, Florida, for outstanding technological achievement in food processing. Information in reference to the development and operation of pilot or commercial plants for the manufacture of frozen citrus concentrates at Plymouth, Lake Wales, Highland City and Florence Villa, Florida, has been presented in various publications.

Concerning the present situation in this rapidly expanding field, we find that ten plants are ready to begin operation for the 1949-50 season and that five plants are in various stages of completion. Since mid-season and late-season oranges are preferred for concentrate manufacture, processing usually begins about the first of December. It is estimated that the final production capacity of all Florida processors for the 1949-50 season will be approximately thirty million gallons of frozen citrus concentrate during a processing season of 140 days of 20 hours each, or a total of 2800 hours. This capacity indicates that the equipment in all of these plants will be evaporating water from juice (12° Brix) at the rate of 31,800 gallons per hour. Thirty million gallons of citrus concentrate will be enough to supply each of the forty-two million families in the country with approximately 15 six-ounce cans. During the coming season all of this capacity may not be used, but it has been estimated that from 20 to 25 million gallons of frozen concentrate may be produced. Since slightly more than one gallon of concentrate is secured from each box of oranges, the estimated production of 20-25 million gallons of concentrate during the coming season will require approximately 20
million boxes of fruit, or about 30 percent of the estimated orange crop. This volume of oranges, destined for the frozen concentrate industry during this season, is approximately five times the 4,126,598 boxes of oranges, reported by Willson as being used for all types of canned orange products during the 1941-42 season.

The process used today for the commercial manufacture of frozen citrus concentrate is based primarily on three operations. The first of these is the removal of water from the juice by evaporation under vacuum at temperatures sufficiently low to avoid impairment of the natural flavor of the juice. The second step is the blending of the concentrated juice with a quantity of freshly extracted juice, in order to give the finished product sufficient fresh fruit aroma and flavor. The final operation is the preservation of the product by freezing. A brief description of the process used today for the manufacture of frozen citrus concentrate follows. Fresh fruit is thoroughly washed, and the juice is extracted by various types of juice presses, that have been standard in citrus canning plants for years. After extraction the juice is placed in various types of evaporators, where it is concentrated by evaporation of the water under vacuum at temperatures of 60°-80°F, until a product of 55°-58° Brix is secured. This concentrated juice is then blended in refrigerated tanks with sufficient fresh juice so that the finished, standardized product will have a total solids content at 41.5°-43.5° Brix. The amount of fresh juice added to the original concentrate amounts to approximately 10 percent of the total fresh juice required to prepare the finished product. Compared to the volume of the 55° Brix concentrate used, the fresh juice added amounts to approximately 50 percent. The finished, chilled concentrate is pumped from the blending tanks to a continuous freezing unit where the product is slush frozen, and subsequently filled into six-ounce cans, that are vacuum closed by either steam closure or mechanical vacuum. Immediately after closing, the cans are passed through a freezing tunnel, where the entire contents are quick-frozen, after which the cans are packed in cartons and stored at temperatures of 0°F or lower. This product must be maintained at these cold temperatures, because it is not pasteurized and storage at higher temperatures will result in deterioration and fermentation.

The 42° Brix frozen orange concentrate is often referred to as a 4-fold product, which means that the solids content is four times that of 12° Brix fresh juice. Therefore, when the consumer uses this product, three cans of water are added to each can of concentrate; and when this is done, the solids content of the reconstituted juice will be approximately 12° Brix.

Looking toward the future, one question that will have to be answered is what effect the consumption of frozen citrus concentrate will have upon the consumption of fresh or canned citrus products. Indications are that the sale of the concentrate will cause a decrease in the consumption of both fresh fruit and canned products. However, there are also indications that a large proportion of the concentrate actually represents new and increased consumption. The Florida Citrus Commission is now conducting consumer surveys in an attempt to secure definite answers to this question.

A recent report stated that in April, 79 percent of the retail food stores in the United States were handling fresh oranges, 90.8 percent were handling canned orange juice and only 16.7 percent of the stores handled frozen orange juice concentrate. It can be anticipated that, as facilities for handling this product increase, a greater number of retail stores will make it available to consumers. Competition between frozen concentrates and canned pasteurized citrus juices should challenge the canners to improve by every means available the quality of their products.

In an industry as large as the concentrate industry problems will arise in the future concerning the manufacture, transportation and preservation of the product. In order to help solve some of these problems, processing equipment has been installed at the Citrus Experiment Station at Lake Alfred for the
manufacture of frozen citrus concentrates. Packs of orange, grapefruit and tangerine were processed in the 1948-49 season. A new evaporator has been designed and is being installed at the Station to be used during the 1949-50 season. This evaporator is a single-effect, two stage recompression type, having a capacity of approximately 20 gallons per hour of 42° Brix concentrate, and is similar to some of the commercial installations.

How will the concentrate industry affect the grower? With over 50 percent of the total citrus fruit produced in Florida being processed, the grower should give more consideration to the production of the type of fruit best suited for processing. In growing fruit for the fresh fruit market, both the external appearance and the internal quality are of prime importance. Concerning fruit that is to be processed, internal quality is of utmost importance, while external appearance is of little significance. Therefore, certain production practices which are necessary to insure good external appearance may not be necessary if the fruit is to be processed.

The manufacturers of frozen citrus concentrate desire fruit that will give high juice yields. Desirable qualities of the juice are high solids content, proper Brix/acid ratio, good color and flavor. High-solids juice is desired for two reasons. First, more 42° Brix concentrate can be secured from a box or a ton of high-solids fruit than from a box or ton of low-solids fruit as is illustrated by the following calculations:

| Number of boxes of oranges of different solids content to yield 100 gallons of 42° Brix concentrate based on yield of 4½ gal./90 lb. box. |
|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| °Brix | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Number of Boxes | 127 | 113 | 101 | 92 | 84 | 77 | 71 |

Secondly, processors have to remove more water from low-solids juice than from high-solids juice in order to produce the same quantity of 42° Brix concentrate. The evaporation of water during processing requires time and is expensive. Since more water has to be evaporated from low-solids juice than from high-solids juice, the processing cost to the manufacturer will be greater when low-solids juice is used. The following calculations indicate how the hourly yield of concentrate varies as the solids content of the juice used varies from 8° to 14° Brix:

| Production of 42° Brix concentrate in relation to the solids content of the fresh juice. Based on rate of evaporation of water at 10,000 lb./hr.: |
|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| °Brix | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Concentrate—gal./hr. | 238 | 275 | 316 | 358 | 404 | 453 | 504 |

Since juice of high-solids content is very desirable, indications are that in the future processors may pay a premium for fruit of high-solids content. Offering a premium price to the grower for high quality fruit should cause him to expend more effort in growing fruit of better internal quality.

The demand for fruit by the frozen concentrate industry has definitely helped to solve the surplus problem in citrus fruits, which existed several years ago. A freeze in Texas and production problems in California have temporary effects on the Florida citrus situation, but the use of huge volumes of fruit by the concentrate industry should in the future be a stabilizing factor.

In order that a successful industry may continue to have a bright future, manufacturers of frozen citrus concentrate should strive to keep the quality of the product at the high level that has been maintained in the past and also continue to educate wholesalers, retailers and consumers in the proper handling of this excellent product.

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ORNAMENTAL SECTION

ROSE CULTURE IN FLORIDA

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Roses are grown in all parts of Florida in home gardens and, in some areas, for commercial cut flower production. However, in this paper the culture of roses on the home grounds will be the only phase discussed. They are not so difficult to grow if suitable precautions are taken in regard to the location of the garden, soil preparation, selection of varieties and planting stock.

The rose garden should be located so that the plants will receive adequate sunlight and where roots from trees and large shrubs will not rob the soil of plant food and moisture. In preparing the rosebed, the soil should be spaded to a depth of six to eight inches at least two weeks prior to planting, after making a liberal application of superphosphate and potash spread broadcast over the surface, together with some good organic material. The fertilizer materials should be applied at the rate of not less than 8 pounds of superphosphate and four pounds of sulphate of potash for each 100 square feet of the garden but, in many instances, a greater amount will give better results. If separate materials are not available, 0-14-10 will be satisfactory, applied at about 20 pounds per 100 sq. ft.

The plants can be set any time during the dormant season, but generally best results will be obtained by planting during November and December, using a handful of bone meal mixed with the soil in each hole. The soil is then made firm and watered thoroughly. The entire garden should be covered to a depth of six to eight inches with an organic mulch such as oak leaves or some other good material which may be available. This mulch is left in place to conserve moisture and should not be disturbed until fall or winter when it can be spaded into the soil.

It should be pointed out that only strong, two-year, Number one plants should be used, if the most satisfactory results are to be obtained with newly planted roses. The plants can be set either 18 or 24 inches apart each way in the bed, and they should be unpacked and transplanted immediately upon arrival from the nursery but, if there is a delay, they should be placed in a trench and the roots completely covered with soil and thoroughly watered. After setting and before the holes are completely filled, flood the entire garden with water so as to settle the soil thoroughly about the roots.

The plants give best results when pruned to about 12-inch stems at the time they are transplanted. Subsequently, they are given