

# *Commercial Preservation* **of** **APPLE JUICE**

by

ERNEST H. WIEGAND and H. Y. YANG  
Food Technology Department

A good apple juice is the result of careful selection of raw materials, varieties of the proper maturity, and the blending of these varieties to obtain a proper sugar-acid ratio. Apples should be mature but on the firm side for the best juice. Overripe fruit lacks character and should not be used for juice manufacture. Usually the blending of two or more varieties of apples of the sweet and tart types is desirable. A juice of proper balance in sugar and acid content will provide the best flavor. Fruit used for the manufacture of apple juice should be carefully sorted to remove all wormy and decayed material.

After sorting, the fruit should be thoroughly washed in a rotating cylinder or brush type washer with a continuous flow of plenty of fresh water. Agitators containing brushes are by far the best—providing a series of high pressure water sprays are used to assist in removal of spray residues lodged in the calix or stem end of the fruit. Careful washing usually improves the flavor and appearance of the final juice. It also facilitates the preservation as it reduces contamination.

After the fruit is thoroughly cleaned it should be run through an apple grater which shaves the fruit into very small pieces so that the juice can be readily extracted. Hammer mills are often used also for reducing the apples to a pulp before pressing. The finer divided the material is the higher the yield of juice. After the fruit is pulped, it is made up into cheeses which are supported on wooden racks, usually in a screw press or a hydraulic press. When screw presses are used, however, the greatest yield of juice cannot be obtained because the pressure is not sufficient to extract the last traces of juice from the fruit. Comparisons between the screw press and

the hydraulic have indicated the difference to be as much as 10 to 15 gallons per ton in favor of the hydraulic press. In most instances the hydraulic press will give a yield of at least 160 to 170 gallons per ton. Most hydraulic presses exert a pressure of 160 pounds per square inch or more.

The drawing on page 3 shows the arrangement of the press cloths and racks as they are built up in the hydraulic press or in a screw press. This arrangement gives greater efficiency in pressing and a greater yield of juice.

In view of the fact that apple juice contains considerable sediment and coarse material from extraction as well as considerable colloidal material carried over with raw juice it becomes necessary to remove this if a bright, sparkling juice is to be obtained.

To accomplish this removal, the use of some clarifying agent is necessary. Usually pectinol,<sup>1</sup> which is an enzyme preparation, is used to assist in the collection and settling of the colloidal material before filtration. About 20 ounces of pectinol should be used per hundred gallons of juice if the best results are to be obtained. If the juice is warmed to a temperature of 100° F., the pectinol works much more rapidly and will clarify the juice in a period of one to two hours. If the juice is cool and kept at room temperature, however, it will take from 10 to 12 hours for complete coagulation and precipitation of the colloidal material. The juice should be filtered immediately after precipitation.

To filter the juice, it is necessary to use a filtering aid with the typical filter press. This filter aid can be a product such as Hyflo Supercel.<sup>2</sup> To use this material it is essential that the filter cloths be first coated with Hyflo Supercel. To accomplish this, a water solution is made up containing a small quantity of the filter aid, and this mixture is then pumped through into the filter and through the filter cloth. The Supercel will be deposited on the surface of the filter cloth and it can be washed with further applications of fresh water. An additional amount of Hyflo Supercel is added to the juice to be filtered and is thoroughly stirred in, then pumped through the filter in the usual manner.

The resultant juice, after filtering, will be highly clarified and can be immediately pasteurized by running it through a flash pasteurizer, which is a continuous tube kept at a temperature of at least 200° F. The flash-heated juice flowing through the tube will emerge at a temperature of not less than 180 to 190° F.

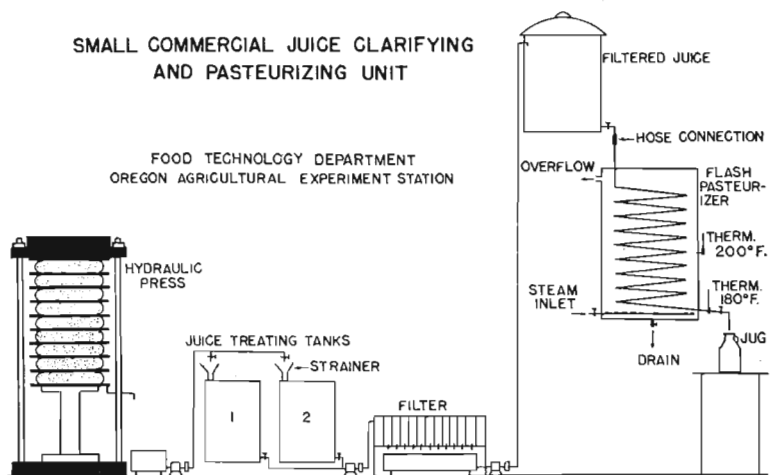
---

<sup>1</sup>Further information on Pectinol may be obtained from the Rohm-Haas Co., Philadelphia, Pa.

<sup>2</sup>Further information on Hyflo-Supercel may be obtained from the Johns-Manville Co., Portland, Oregon.

## SMALL COMMERCIAL JUICE CLARIFYING AND PASTEURIZING UNIT

FOOD TECHNOLOGY DEPARTMENT  
OREGON AGRICULTURAL EXPERIMENT STATION



Scale 1" = 5'. Capacity 50 gallons per hour.

For best results it is desirable to have the juice actually enter the bottle or container at a temperature not less than 180° F. If this temperature is used, it has the effect of sterilizing the container in case the container has become contaminated in the handling process after it has been washed and sterilized. As soon as it is filled, the container can be sealed immediately. Holding this container at the filling temperature for two or three minutes tends to sterilize the contents and the can or bottle walls sufficiently so that the juice will keep and the product can be slowly cooled.

To prevent oxidation and unnecessary changes in the juice on storage, it is desirable to have as small a head space as possible, consistent with the type of container that is being used. The use of ascorbic acid (Vitamin C) at the rate of 2.5 ounces per hundred gallons assists in preventing color and flavor changes in storage.

If tin containers are used for canning the juice, enamel lined containers of the berry type are preferred to prevent corrosion and maintain the color of the original juice.

It is possible to preserve apple juice with chemicals and still retain a good product. Under the food law, it is possible to use sodium benzoate in concentrations of 1/10 of 1 per cent. The label should clearly designate if sodium benzoate is added. Highly refined sodium benzoate should be purchased to prevent undesirable flavors.

Do not add sodium benzoate directly to the juice. Thoroughly dissolve the sodium benzoate in hot water before adding and mixing in with the apple juice which you desire to preserve in this fashion.

For the best results in keeping bulk juice (even with sodium benzoate) storage should be at 31 to 32° F. The flash pasteurization process previously mentioned will reduce the contamination as much as possible before the sodium benzoate is added. This assists materially in holding bulk cider in cold storage over long periods of time.

Canned apple juices (either in metal or glass containers) are classified into three grades by the Production and Marketing Administration of the United States Department of Agriculture. The grade is ascertained by considering the respective ratings for the factors of color, absence of defects, and flavor. The relative importance of each factor is expressed numerically on the scale of 100. The maximum number of points that may be given each factor is:

<i>Factor</i>	<i>Points</i>
Color .....	20
Absence of defects .....	20
Flavor .....	60
<hr/>	
Total score .....	100

"U. S. Grade A" or "U. S. Fancy" quality canned apple juice possesses a very good color; is practically free from defects; possesses a very good flavor; and scores not less than 85 points when scored in accordance with the scoring system outlined above.

"U. S. Grade C" or "U. S. Standard" quality canned juice possesses a good color; is fairly free from defects; possesses a good flavor; and scores not less than 70 points when scored in accordance with the scoring system outlined above.

"U. S. Grade D" or "Substandard" is the quality of canned apple juice that fails to meet the requirements of "U. S. Grade C" or "U. S. Standard."