

Fruit Cooker

juices, purees, pastes produced by modernized proven process

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Processors of certain fruits and vegetables can steam scald, crush, preheat the crushed fruit, extract the juice, and flash pasteurize after screening in one operation by the use of a modified Henze cooker.

The Henze cooker was used widely in Germany in the early years of the twentieth century to cook and disintegrate potatoes for the production of alcohol.

The application of the Henze cooker to modern processing was investigated with tomatoes.

Present methods of preheating tomatoes before processing are often inadequate. They fail to inactivate completely the pectic enzymes which results in appreciable losses of pectic substances in the tomato puree and lowering of the consistency of the concentrated paste below requirements. The preheating temperature generally attained in the tomato before and during crushing may not be sufficient to control effectively the mold counts of the finished products. The color of the tomato products, usually regarded as a good criterion of quality, is not fully preserved.

Tomatoes

As applied to tomatoes, the Henze cooker method consists in placing whole tomatoes—after being properly washed and trimmed—into a stainless steel conical pressure cylinder with a blow-out valve at the bottom.

Introducing live steam into the cylinder drives out the air and the product is preheated. The apparatus is closed and the steam pressure raised to about three atmospheres for two–three minutes. Then the steam inlet is shut and the blow-out valve at the bottom of the cylinder is opened quickly, discharging the entire contents of the cylinder.

During the heating under steam pressure all the tissue cells of the fruit are completely heated and when the mass is released into the ordinary atmosphere the cells are usually ruptured. The mass blown out in such a manner is completely disintegrated, achieving three purposes: sterilization of the fruit, complete disintegration, and immediate inactivation of the pectic enzymes before crushing the whole tomato.

Repeated comparative tests indicate

that steam pressure of 30 pounds per square inch is about the minimum required for tomatoes in a small pilot plant apparatus. Better results are obtained at 40 pounds per square inch.

The holding time depends on the amount of fruit in the apparatus, but two minutes are generally sufficient.

Both the pressure and the holding time must be checked separately for every apparatus, as well as for every individual plant material to be processed.

To prevent excessive dilution of the resulting juice with steam condensate it is important that all possible condensate be trapped from the live steam prior to its introduction to the cooker.

The high temperature to which the fruit is subjected in the cylinder is immediately reduced as soon as the blown out mash of tomatoes is released into the atmosphere.

The mash is screened in an ordinary screw juice extractor or finisher to remove the seeds and the fragments of epidermis.

The juice obtained has a good color and texture although slightly diluted with the live steam condensate in the pilot scale tests. When the quantity of fruit is sufficient the degree of dilution can be reduced to a mere minimum. Tomato juice thus obtained can be canned or concentrated into puree or paste in the ordinary ways.

Citrus, Apricots

Citrus peels and even whole citrus fruit have been disintegrated successfully by this method. A citrus mash obtained in this way can be used for pie fillers, or similar purposes.

Experiments were carried out to obtain a clear juice from a disintegrated mass of citrus peels by pectic enzymes. After treatment with Pectinol 46 AP for two hours the mass was pressed and filtered with some filter aid. On the average, 70% to 75% of clear peel juice was obtained, with a total soluble solids content of 15.2%.

In contrast to the citrus peel juice generally obtained by liming, this juice can probably be used for the preparation of edible sirups.

Such citrus peel juice sirups still contain high concentrations of vitamin C—about 300 milligrams per 100 grams—and

do not have the musty flavor of peel effluents obtained by liming.

Apricots were used in a number of trials applying the same principle of disintegration to whole apricots. Here the steam pressure must be considerably reduced—25 to 30 pounds per square inch—because with high pressure the apricot stones will burst incorporating into the juice some of the kernels. This method could be conveniently used for the preparation of baby-foods from apricots, or for the manufacture of nectars.

Pear Waste

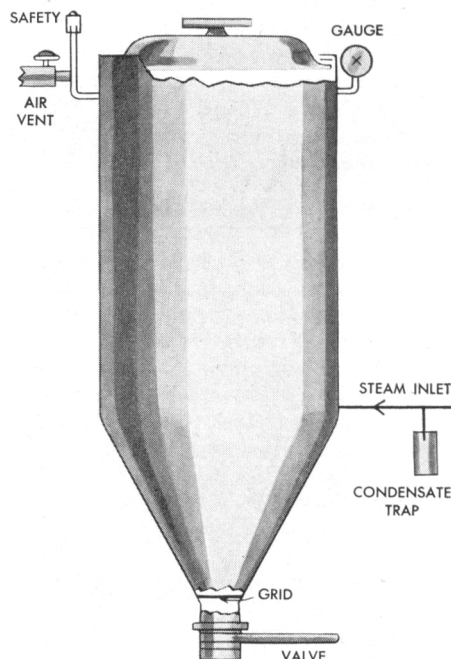
Pear cores and peelings—usually waste at canneries—were used in experimental attempts to recover some of the juice. Several pounds of such cannery waste products were treated by this pressure procedure.

The steam pressure was maintained at 50 pounds per square inch for three minutes. The resulting mash has lent itself easily to screening through a finisher, producing a smooth pear sauce of good appearance, but which quickly darkens on standing. This is to be expected in the case of pears but can be prevented by the addition of sulfur dioxide.

Rate of filtration tests showed that such a sauce is at least four times more readily filterable than macerated pear cores. Further experiments are required to determine whether exposure for a short time to pectic enzymes may be used in this case to speed up filtration.

The clear pear juice was concentrated in vacuo to 60° Brix and a pleasant sirup

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The modified Henze cooker as adapted to modern processing of certain fruits and vegetables.

COOKER

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obtained. Such sirups may be profitably used by returning them to the canned pears.

The pilot apparatus used in these preliminary experiments was three feet high, one foot in diameter and built of a three millimeter thick glass lined steel. It is important that the whole column should end with a smooth and gradual cone.

If the bottom of the heating chamber is straight or only rounded there will be created a considerable obstruction to the material blown out. This will result in the steam forcing a passage out and leaving a considerable part of the fruit in the cylinder.

The quick opening valve at the bottom should be proportionally wide enough to let through the entire mass as fast and as freely as possible. The bottom valve in the laboratory pilot plant used was 1½ inches in diameter, but for large scale equipment at least three to four inch valves should be used.

A wide grid in the form of a cross should be inserted at the bottom of the conical apparatus just above the outlet

to prevent whole fruit from clogging the valve.

Grids or screen with small holes are inadequate because the outer skin of the tomato is so strong it would prevent the mass from passing through during the blow-out operation.

Further Studies Needed

Further detailed study is required on the application of this method in the processing of various fruits and agricultural waste material; the control of conditions; and, the value of the resulting products.

Some of the specific problems to be studied in connection with this method are:

1. The influence of the high temperature used on the retention and preservation of color and vitamin C.

2. The degree of inactivation of the pectic enzymes as well as the viscosity of the final products.

3. The degree of sterilization attained by this method.

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SHEEP

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home and abroad have aided in the upward price movement. The outlook for wool prices at home and abroad is that they will continue to be firm. An added factor in their strength will be rearmament as servicemen require several times the amount of wool normally used by a civilian.

As with lamb, wool prices at present are within the range of authority for control. The substitution of other fibers, especially synthetics, has increased since the close of the war. Undoubtedly part of this has come through price relationships.

The present differentials in prices will tend to encourage an increase in the substitution of synthetic fibers for wool—wherever and whenever this can be done.

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A more complete report of the sheep and wool situation—Sheep and Wool Situation in California 1950, by Edwin C. Voorhies—Exp. Sta. Cir. 399, may be obtained by writing to the Publications Office, 22 Giannini Hall, University of California, Berkeley 4, California.

SQUASH

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Starch generally accounted for slightly over one third of the alcohol-insoluble solids. In the Summer Crookneck variety it increased for about the first eight days and then decreased. In the other varieties there was a tendency for starch to remain constant for the first few days and then to decrease. When the fruits were in the best edible state, those of Summer Crookneck were the highest in starch followed in order by Bush Scallop, Early Prolific, and Black Zucchini.

All varieties were similar in sugar content and reducing sugars were dominant. There was a marked increase in sugar during the four days after bloom and then a gradual leveling off for the next six days. During the period of prime edibility fruit of White Bush Scallop had the highest sugar content and Summer Crookneck and Zucchini the lowest.

Taking the Early Prolific variety as an example, fruits on the fifth day after bloom, when they are considered as of prime market condition, had slightly over 6% total solids, nearly 3% alcohol-insoluble solids, slightly over 2% reducing sugars, about 1% fructose, and about .2% sucrose.

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The above progress report is based on Research Project No. 1175.

Average growth rate of fruits of four varieties of summer squash.

