

Liquid Sugars

studied in the freezing of apricots, peaches and nectarines

M. A. Joslyn

Experimental packs of frozen apricots, peaches and nectarines—to study the protective effect of sugar—were begun in the summer of 1946.

The studies were conducted to investigate the various methods of applying sirup; to compare sucrose-sirups with those containing 30%, 50%, and 90% invert sirup, and with sirups prepared from corn sugar, low conversion and high conversion corn sirup; and to compare the effectiveness of several antioxidants both with and without added citric acid.

The average scores for the Blenheim apricots used in the studies indicated rela-

tively little difference in appearance between apricots frozen in sucrose sirups and those frozen in invert sirups at the first and second testing, but a definite decrease in score due to progressive discoloration in all invert sirups was apparent at the last testing.

There was no definite trend in texture, probably due to variability of samples, except a marked increase in relative toughening of the skin with increase in storage period.

In flavor, at the first testing, there was a noticeable difference between the 70% invert sirups and those of lower degree

of inversion. This difference persisted in subsequent testing. There was a noticeable decrease in flavor retention with storage time, the decrease being greater in apricots packed in invert sirups than those packed in sucrose sirups.

Peaches

In the Rio Oso Gem peaches studied there was little readily detectable difference in color between fruit frozen in sucrose sirups and those frozen in invert sirups at the first testing, except at 90% inversion.

The color score decreased with the lengthening of storage time, the decrease being most noticeable at eight months, but it was similar in sucrose and invert sirups.

There was a noticeable decrease in texture at 90% inversion, but the trend was not definite owing to variations within the samples. The texture of the samples was appreciably poorer with increase in storage time.

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QUALITY

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The exact dosage used will depend on the conditions under which the sterilizing agent is added and on the type of package used.

Propylene oxide boils at 95° F., so it must be kept cool at all times prior to application.

The container must be sealed immediately after the addition of propylene oxide in order to prevent its loss by volatilization.

As soon as the bag is sealed, it should be placed in a case which must be tightly sealed immediately after being filled. This procedure is necessary in order to enable sterilization of the fruit.

The sealed cases should be stored in a cool place, preferably cold storage if possible.

Fruit packed according to the procedure outlined here has a superior flavor which it retains even after several months of adverse storage at 80° F. Although the flesh darkens slowly, the skins tend to attain a purple color during storage. This is particularly true of skins showing little color when first dried.

The procedure outlined above is not feasible for large commercial operations. It would be impossible to pack all dried prunes as they are taken from the dehydrator. For the present it would even be difficult to attain universal acceptance of the idea of blanching with the view of improving quality of the dried product.

In commercial practice it is customary to treat prunes in boiling water—processing—prior to packaging. This treatment

probably inactivates the enzymes. However, since packaging is ordinarily done several months after drying a great deal of enzyme deterioration can take place in storage before the fruit is processed.

Until the procedure is given further consideration in the way of large-scale trials under commercial conditions, recommendation of its widespread use is not justified.

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The studies covered by this report were conducted by C. N. Chari and C. P. Natarajan, graduate students in the Division of Food Technology, under the direction of Dr. E. M. Mrak and Dr. H. J. Phaff.

CULLS

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much smaller stores of vitamin A were found.

In the first generation on dry food, one prune-fed female had nearly three times as much liver vitamin A as the nonprune-fed female, and the prune-fed male had more than twice as much as that stored by the nonprune-fed male.

It is interesting to note that the females, regardless of diet, had considerably larger liver vitamin A stores than the comparable males. Probably this may be ascribed to the greatly increased food intake which accompanied reproduction.

Three dogs of the second generation as well as three of the first generation were

given whole prune paste containing pulverized pits. They made good growth and maintained normal health.

In a series of digestibility experiments with whole and ground prunes, it was noted by other experimenters that hogs, sheep and cattle utilized prunes in both forms very well and that hogs and cattle cracked the kernels and swallowed the pits when the prunes were fed whole.

The prune feed is low in protein and must be supplemented with protein-rich roughages or concentrates, and because of its laxative nature should not be overfed. For dogs, the proportion used may be as great as 20% of the dry feed.

The dogs fed canned food, either with or without prunes, had 10 to 20 times as much liver vitamin A as those fed the dry food but among the latter, the prune-fed dogs, especially of the first generation, had larger stores than did the nonprune-fed dogs.

The prune supplement appeared to make a contribution of provitamin A to the dry food mixture, but this cannot be assumed to explain in full the favorable results.

Whole prunes ground to a paste and including pits were used in several cases and found to be as satisfactory as the prune flesh alone.

It is concluded that such prune paste may be regarded as an advantageous ingredient of dog foods.

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Acorn-shaped citrus fruit, evidence of stubborn disease.

STUBBORN DISEASE

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source used to topwork healthy trees of the same age formed a healthy top.

Characteristics

Stubborn disease is characterized by abnormal branching and formation of multiple buds which produce a brushlike growth of twigs.

The foliage, especially on the south side, usually consists of untimely autumn growth, which becomes somewhat chlorotic during the winter months. There is often a tendency for blossoming during the late fall and winter.

Some of the fruits develop abnormally into forms that resemble an acorn in shape with the rind of the stem half—or some portions of it—growing normally in thickness and the rest of the rind developing less in thickness and with the thinnest

portions of the rind near the navel end.

When the fruit is severely affected the pulp opposite the thin portions of the rind has a sour or bitter taste.

The crop decreases until in advanced cases of the disease very few or no fruits are formed.

More Study Needed

It is not known certainly whether it is transmitted by any means other than by propagation of nursery trees but observations would indicate that it is increasing and is suspected of having other ways of spreading. The sudden appearance of the trouble on trees that have been healthy for many years suggests that an insect vector is spreading the disease.

Pending further information regarding the stubborn disease, every effort should be made to select trees entirely free from this disease as a source of propagation for nursery trees. When trees develop pronounced cases of this disease and become nonproductive, they should be replaced. It appears to be useless to topwork these trees with healthy buds, since as has been proved, the subsequent growth will be infected and, in time, the tree will manifest the same trouble.

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There was a definite change in flavor at 70% inversion and a noticeable one at 90% which was more marked to the more discerning tasters. The flavor of the peaches decreased with increase in storage time, and this decrease was greater in the peaches frozen in 70% and 90% invert sirup. It was particularly noticeable as a combination of oxidized and foreign flavor.

Nectarines

In Kim nectarines there was an appreciable discoloration at 90% inversion which persisted throughout the storage period.

Kim nectarines retained their color better than did the apricots or the peaches. In texture there was little difference between the sucrose and invert sirup samples. Unlike apricots, the nectarine skin was thinner and tender, and remained so during storage. In flavor there was a slight difference at first in invert sirup, noticeable at 70% inversion, but this difference did not persist, owing largely to variability of samples.

In general, nectarines were of higher flavor initially and retained their color and flavor better during freezing storage than did the apricots or peaches.

In Gower nectarines there was no appreciable difference in color, flavor or texture between sucrose and 90% invert sirup samples.

Preparation of Syrups

One method of preparing sirups was to dissolve the necessary amount of granulated sugar in water at 20° C with vigorous stirring. In another case, the water was brought to boiling and the sugar was dissolved with minimum of stirring and then allowed to cool to 20° C in uncovered beakers. There was little difference in oxygen content of the sirups under these conditions at lower densities but the percentage difference progressively increased with increase in density.

Protective Effect

That sugars do exercise a protective effect on nonenzymic oxidation of ascorbic acid has been established but there is a question as to the relative effectiveness of the sugars.

Of the pure sugars tested, the most efficient in retarding oxidation of ascorbic acid in solutions containing about 50 mg. per cent of ascorbic acid allowed to stand quietly exposed to air at room temperature were maltose, levulose and lactose; the least effective was dextrose.

In the case of sirups, the most efficient were puritose and invert sirup.

Under conditions of vigorous oxygenation, the order of decreasing protection was maltose, dextrose, sucrose and lactose. The order of decreasing protection in sirups was puritose, sucrose, invert sirup and low conversion corn sirup.

More work in this field is now under way.

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Work on establishing *Physcus testaceus*, parasite of the Mediterranean fig scale imported from Italy, has been resumed by the Division of Entomology at Riverside, following wartime interruption.