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## DRIED FRUIT PRODUCTS AND PROCESSES RESEARCH

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In research oftentimes the development of results or the information obtained by the research scientist does not coincide with the simultaneous needs of the industry. As a result, research findings may not find immediate application or receive proper attention at the time of their development, though they may turn out to be of great value at some later date (for example, WRRL work on sorbate).

I would like to review some of the highlights of our research on dried fruits and concentrates, on more recent processes and products and other research of interest to your industry.

1. Studies on sulfur dioxide in dried fruits: Information was obtained on the fate of sulfur dioxide in dried fruits. Proper temperature controls for dried fruits in overseas distribution channels were specified to improve dried fruit quality reaching foreign markets. Specifically, rates of loss of  $\text{SO}_2$  in commercially packaged apricots and golden raisins were calculated (see table 1). As a result of this study it was determined that when  $\text{SO}_2$  content of stored dried apricot (30% moisture) and golden raisins (16% moisture) had fallen to 700 and 500 ppm, respectively, the quality of fruit was no longer acceptable. Under extreme temperature

conditions such as may occur on loading docks, etc., loss of  $\text{SO}_2$  is greatly accelerated. At  $110^\circ \text{F.}$ , for example, the rate of loss determined by extrapolation is about 65 ppm per day for apricot and 25 ppm for golden raisins. Under these conditions a relatively short period of storage will result in discoloration and adverse quality changes.

Table 1. Loss of  $\text{SO}_2$  per day in ppm

<u>Temperature (F)</u>	<u>Apricots</u>	<u>Golden Raisins</u>
90	22.4	9.3
70	6.6	3.3
50	2.4	1.2

2. Control of raisin paste consistency: A patented process was developed that inhibits the age old problems of raisin paste "setting" and thus makes increased utilization of raisins possible. More recent work on this process includes the effect of thermal treatment prior to and after grinding raisins. Taste panel evaluation of the products obtained by the two heating methods shows a statistically significant difference. Results also indicate a slight setting of the paste when raisins are ground hot compared to heated after grinding.

3. Improved hydration method: A patented process was developed for hydrating dried fruits for tenderizing or remanufacturing use. This method involves heat treatment of the fruit followed by immediate immersion in cold water. The process is a potential improvement over standard methods of the trade for most dried fruits and improves hydration rate by a

substantial margin (see tables 2 and 3), while at the same time avoids excessive heat exposure and leaching effects.

Table 2. Calimyrna Figs (14 percent moisture)

Time of contact with hot water (minutes) (200° F.)	Moisture % before cold water treatment	Moisture % after cold water treatment (3 minutes)
0	14	16.0
2.5	19	25.0
5.0	26	32.5
10	32.5	44.5

Table 3. Calimyrna Figs (14 percent moisture)

Time of contact with steam (minutes)	Moisture % before cold water treatment	Moisture % after cold water treatment (3 min.)
2	17.0	24.0
5	19.5	27.0
10	20.5	32.5

Improvement of flavor in prune products. A patented process has been developed for enhancing the flavor of the juice prepared from fresh prunes. Taste panel evaluation of the juice having 2.5 to 10 percent by volume of dried prune pit extract shows a significant improvement in the juice (see table 4). Research is continuing on this study with the objective of developing processing methods for improvement of flavor in pitted and diced prunes and pitted canned prunes.

Table 4

Sample	Water extract of ground prune pits added (percent by vol.)	Preference for flavor fortified product Percent (of judges)
3	2.5	90
2	5	96
1	10	89

In addition to the above research a number of new products as well as process specifications for their production were developed. These include low moisture (2-4%) dried fruit flakes produced by a modified atmospheric double-drum drier and production of fruit disks from them by reconstruction and molding in a pellet press. Other lines of products developed were gelled dried fruits and dried fruit foams.