COLOR STABILITY & QUALITY

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We have talked about the changes that take place in dried fruits that are held at certain temperatures and relative humidities. An important thing to know is how fast these changes take place and what can be done to slow them down. During our research on stability of dried fruits we have measured various quality attributes, one of which is color. One means of doing this is by measuring the optical density of alcoholic extracts of the fruits. Another method is to have samples judged by a trained taste panel to determine what conditions are necessary to cause the first detectable change from the control. In addition, we have asked groups of people from the industry their opinions as to whether the various samples were good, passable, or poor. In this presentation I will give a greatly condensed report on these various experiments.

First, let us review the alcohol-soluble color data. This is something that can be measured quite precisely with an instrument. The values in Table 1 show the amount that the optical density of the alcohol extracts change per day at 90° and 70° F. Also noted is the optical density value at which the color of the samples was judged to be of doubtful acceptability by the people running the experiments.

Table 1. Changes in Optical Density per day at 90° and 70° F.

	Δ O.D./Day		Limit of Optical Density
	90° F.	70° F.	
Apricot*	.0103	.0016	.3
Prune	.0050	.0021	1.3
Raisin	.0073	.0011	1.0
Fig	.0075	.0019	.75

This leads to the question: How long did it take these samples to reach the limits of optical densities indicated in Table 1? The values listed in Table 2 are estimates, to the nearest month, of the times it took samples to reach these limits.

*After induction period (approx. 2 months).

Table 2. Number of Months Required to Reach Limit of Optical Density at 90° and 70° F.

	Months to reach limits of O.D.	
	Storage Temperature	
	90° F.	70° F.
Apricot[1/]	3	12
Prune	5	12
Raisin	4	(18)[2/]
Fig	2	9

1/ Including induction period

2/ Extrapolated value

Now, let's look at color changes as evaluated by a trained panel. The panel is asked to compare three samples, note the duplicates, and thereby distinguish when the test samples have changed significantly from the control. The samples are viewed under a "daylight" fluorescent light. The judges become surpassingly discerning of differences. The samples are just as they come from the retail packages that have been held under the various conditions. You see in Table 3 that this panel can detect differences long before the limit of optical density has been reached (compare with Table 2).

Table 3. Panel Detection of the First Noticeable Differences in Dried Fruits, stored at 90° and 70° F.

	Months to First Detectable Color	
	Storage Temperature	
	90° F.	70° F.
Prune	1	2
Raisin	1/2	1
Fig	1/2	1

This shows how soon a detectable change can take place in these dried fruits.

Now, the panel on which many of you served is the Industry Panel. Those of you who assisted in this recall that we asked you to note if a sample was GOOD, NOT GOOD BUT PASSABLE, or POOR. Your subjective ratings were then assigned numerical values and the scores were used to estimate what conditions were necessary to make the fruit of doubtful acceptability. In Table IV are the estimated times at each temperature when the fruit may be of inferior quality.

Table 4. Evaluation by Dried Fruit Industry Panel of Limits of Acceptability of Various Dried Fruits.

	Months of Storage at Temperatures	
	90° F.	70° F.
Apricot	3	15
Prune	3	14
Raisin	5	15

These values correlate more closely with the optical density values in Tables 1 and 2 than with the trained judges' evaluations of Table 3. This is to say that small differences, or the onset of change, can be measured very precisely by a trained panel; changes of a magnitude that may affect acceptability and sales are better measured by the extractable color method or by subjective appraisal by experienced personnel. Further work of this nature is in order and we may request your assistance again for testing experimental samples.

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