Factors in Prune Skin Texture

marked skin toughness of dehydrated prunes investigated in effort to identify probable cause of the texture problem

Leonora Hohl Strohmaier and Jane Magee Loomis

No direct relationship between thickness and toughness of the skins of dehydrated prunes could be found in studies of the thickness, structural and textural characteristics of four varieties of fresh and dehydrated California prunes.

One of the problems encountered in dehydrating—rather than sun-drying—prunes is the marked toughness of the dehydrated prune skins. To collect data on some of the factors which may influence the texture of prune skins a study was made of the actual thickness of the skins, size, structure and arrangement of cells making up the skins, and the chemical nature of the cell wall constituents.

Effect of Locality

Prunes grown in different areas in California behave differently with respect to stem abscission and, consequently, harvesting practices have differed. In the cool coastal areas prunes tend to drop shortly after becoming firm ripe, and therefore are harvested from the ground. The time interval between dropping and dehydration is of considerable significance in determining quality. In the warm interior valleys, the abscission layers do not form as readily and consequently the great bulk of the fruit must be harvested from the trees.

Fresh prunes of the French, Imperial, Sugar, and Robe de Sergeant varieties were collected from special trees—designated for the study—in representative prune growing districts throughout the state.

French prunes were collected from orchards in the Sacramento Valley, Santa Clara Valley, Alexander Valley, and the Napa Valley. Imperial prunes were represented by samples from the Sacramento and Alexander valleys. Robe de Sergeant samples were collected in the northern Sacramento Valley and the Sugar variety samples, from the Alexander Valley. Each type of sample was collected at approximately five-day intervals throughout a period of from 4–8 weeks.

Skin thickness studies were made on 15 fresh prunes from each sample. The thicknesses of the skins—as measured with a dial gauge calibrated in thousandths of an inch—indicated a progressive thinning with advancing fruit maturity. Then, on most samples, the thickness again increased late in the season, generally beyond the optimum harvest maturity. This measurable thickening in the late part of the season was generally associated with a visible wrinkling of the skins.

Variety Differences

In French prunes the minimum skin thickness usually fell closer to the optimum harvest maturity than was found for the other varieties. In the Alexander Valley samples this correlation was closest, while in samples from the Sacramento, Santa Clara, and Napa valleys the optimum harvest maturity was reached a few days ahead of the minimum skin thickness, especially in the Sacramento Valley sample.

In Imperial prunes the optimum harvest maturity occurred considerably ahead of the minimum skin thickness, especially in the Sacramento Valley sample. In the Sugar prune sample, likewise, the optimum harvest maturity preceded minimum skin thickness by two weeks or more. In the Robe de Sergeant prune, minimum skin thickness came about a week after optimum harvest maturity.

If thickness of the fresh skins had any direct relationship to toughness of the dehydrated skins, then the French prunes were mostly being harvested during a relatively favorable period with respect to their skin thickness. On the other hand, the Imperial, Sugar, and Robe de Sergeant prunes were harvested commercially and their optimum maturity occurred ahead of their minimum skin thickness.

Immediately after harvesting each collection sample a separate portion of the fresh prunes was dehydrated in a laboratory tunnel dehydrator until the moisture content was reduced to 18% or 19%. After four months of storage at 48°F in closed fruit jars, the thicknesses of the skins of some of the dehydrated samples were measured.

The skin thicknesses of the dehydrated samples which were measured—French and Imperial from the Sacramento Valley—did not follow the same trend as the fresh samples. The dial gauge measurements of dehydrated skins remained at nearly the same level throughout the season and corresponded rather closely to the thinner portions of plotted curves for the fresh material. The greater thickness of the fresh skins in the early part of the season may be brought about by fuller, more succulent cells, which lose their water during dehydration and thus become thinner. Since the moisture content of the dried prune is reasonably uniform there is correspondingly less variation in the skin thickness of the dried prune.

Because the thickness of the fresh skin ran almost exactly on opposite course and thickness of dehydrated skin remained practically level, it seems obvious that toughness of French prune skin was not directly related to skin thickness. The Imperial prune did not show a definite trend toward toughening as the season progressed.

Prune Skin Structure

Microscopic study of the fresh French prune skin shows that a thick cuticle covers a single row of epidermal cells with no hairs. The hypodermal layer consists of three or four rows of cells with conspicuously thickened walls and four or five rows of cells with moderately thickened walls. The underlying fresh tissue has noticeably larger cells with thinner walls. The anatomy of the Imperial prune is essentially similar.

Microscopic study of dehydrated specimens of the same lot of French prunes showed that the cell structure of the dehydrated skins appeared to be somewhat more compressed and distorted with noticeable thickening of the walls. Possibly dehydration affects the chemical or physical nature of these epidermal and hypodermal cell walls, causing them to become tough, especially after the prune has gone beyond its optimum maturity.

The reason for the marked toughness of the skins of dehydrated prunes was not determined by these investigations. However, French prunes—which are the toughest variety—showed the heaviest cell wall structure.

Leonora Hohl Strohmaier was Assistant Mycologist, Food Technology, University of California, Davis, when these studies were conducted.

Jane Magee Loomis was Senior Laboratory Technician, Food Technology, University of California, Davis, at the time the above studies were made.