Snacks Based on Popcorn

It would be redundant to emphasize the commercial importance of popcorn and the snacks derived from it since everyday observation confirms the fact. What may not be so obvious is the firm bases on which the popularity of these snacks rests. The crisp texture, fluffy white appearance, and convenient piece size of popped corn provide an almost unique combination of properties that can be utilized to advantage in many different kinds of snack products. When the ease of processing and the relative cheapness of the raw material are also considered, the widespread use and acceptance of popcorn snacks can be readily understood.

Popcorn does have a number of disadvantages, among them its fragility, its nonuniformity, and its response to adverse environmental influences.

FACTORS AFFECTING THE QUALITY OF POPCORN

The Bases of Quality

The consumer is primarily interested in price, flavor, appearance, and texture. Flavor is strongly influenced by the butter or oil used as a topping and by the salt. In discussions of popcorn quality in the literature, flavor is rarely mentioned. Yet, freshly popped corn does have a distinctive and appealing flavor. This soon dissipates, and most commercial corn provides a very bland base for the oil and salt. Texture and appearance are the main quality factors arising from the corn itself.

Texture is strongly related to the intrinsic specific volume of the popped kernel, which may be quite different from the apparent specific volume, the latter being much affected by the shape of the kernel. Texture also reflects in part the presence of hard particles, the remnant of the hulls. In addition, the moisture content of the popped corn at the moment of consumption has a direct effect on the texture.

The hull is the outer covering or pericarp of the corn kernel. It varies considerably in thickness among the different varieties, but no variety is completely hull-less, even though this description has been applied to some of the better ones. Larger kernels generally have thicker pericarps than do smaller ones. The hull is torn and fragmented as the kernel vio-
lently expands, and some of it is dislodged from the corn, but most of it remains. Light-colored pericarp is much less noticeable and, if it is also very thin, the hull-less condition may appear to be achieved on casual inspection. In addition to the undesirable appearance contributed by residual hulls, the texture of popped corn is adversely affected and the hulls “get between the teeth” (a common complaint).

Shape of the kernel is affected by variety, moisture content, and popping conditions. Popped corn with a round or ball shape is called the mushroom type, whereas kernels yielding a highly irregular pronged shape are known as butterfly corn. Kernels having the mushroom configuration are preferred by manufacturers of coated or flavored corn because they break up less during the mixing operation and accept a more even coating of syrup. The same resistance to rough handling makes it more acceptable to vending machine operators and by wholesale distributors of popped corn. Butterfly corn has a lower apparent bulk density and retains salt well. In most cases, its texture is also considered superior to mushroom-type corn. For these reasons, it is selected by the majority of on-site poppers, such as theater concessionaires.

White popcorn is rarely used for commercial production of snacks. This category includes varieties ranging in size from small kernels up to the size normally associated with the large yellow varieties. Small kernel size generally leads to the highest-volume popped corn, but fragility of these kernels leads to excessive crumbling when they are processed on a large scale.

Popcorn is unique among grains in that a high degree of expansion can be achieved when it is heated at atmospheric pressure. Other grains must be superheated in pressurized vessels and then suddenly passed to a region of lower temperature if much expansion is to be obtained. Popcorn evidently behaves as it does because of the physical structure of the entire kernel and the microscopic structure of the endosperm.

The endosperms of different types of grains show different degrees of starch granule gelatinization when the kernels are expanded by popping. In barley and wheat, which do not expand greatly, some starch granules undergo complete gelatinization without apparent expansion while other gelatinized granules expand and fuse. Localized cell-wall rupturing occurs when the kernels split open, and a few intracellular voids or enlarged bubbles can be seen in the gelatinized starch granules as a result of the explosion. Ungelatinized and partly gelatinized starch granules predominate immediately below the aleurone layer and near the scutellum. Localized cell-wall rupturing also occurs in the expanded endosperms of popped grain sorghum, popcorn, and dent corn, but the spongy expanded endosperms consist of intact cells within which the gelatinized starch granules form a characteristic structure of “soap bubble” appearance, each bubble representing a starch granule. The cell walls are not destroyed and remain clearly identifiable except where wall rupturing contributes to both expansion and formation of voids. The starch granules are not exploded, but are gelatinized and dried into a three-dimensional network or reticulum.