

The physical mechanism of denting in maize.

The physical mechanism of denting in maize must be understood before the genetics of denting can be explored intelligently. Denting generally has been attributed to a differential shrinkage of the horny and floury endosperm regions during final drying down of the kernel. It has been said that the floury endosperm shrinks more than the horny endosperm, causing the kernel to collapse in the crown region. This is not literally true; denting is caused by the collapse of a region within the floury endosperm. This conclusion is based on studies of several varieties of corn, including corn belt inbreds, eight-row Northern flints, Southern dents (extremely dented varieties), and eight-row flour varieties.

A region of comparatively starch-free cells, which often contains an acellular, fluid-filled cavity, was found in the central portion of immature endosperms of all varieties of corn studied. This region, hereinafter referred to as the region of "loose-starch cells," is located within the floury endosperm zone, but its cells are distinct from the starch-packed cells of the floury endosperm. It extends from the base of the endosperm to a point near the crown of the kernel. The loose-starch cells and the acellular cavity collapse when the endosperm becomes dehydrated at maturity, and the region is represented in the mature kernel by collapsed and fragmented cells containing diminutive starch grains.

The amount of denting of an individual kernel depends primarily upon the degree of extension of the loose-starch region into the crown of the kernel. If there are several layers of starch-packed cells (cells of either horny or floury endosperm are equally effective) between the top-most extension of the loose-starch region and the pericarp) the kernel will not dent, for during endosperm dehydration the layers of starch-packed cells form a supporting arch and prevent collapse of the crown. However, if the loose-starch zone extends entirely to the pericarp in the crown region, the pericarp alone is not strong enough to support itself when the loose-starch region collapses; it is pulled down (or sometimes merely collapses) into the cavity left by the shrinkage of the loose-starch cells and acellular cavity, thus causing the kernel to dent. The volume occupied by the loose-starch zone, especially in the more basal portions, generally is filled in after its collapse with ingrowing floury endosperm tissue, whether or not the kernel has dented.

The "denting potential," that is, the proximity of the loose-starch region to the crown of the kernel, is the primary factor for determining denting in corn. The more of the crown region occupied by loose-starch cells, the deeper the dent. Differences in kernel length-width proportions, vigor and size will affect the degree of denting, but only within the limits prescribed by the denting potential. It is probable that the proportion of horny to floury endosperm is not a causative, but rather a consequent or a corollary phenomenon of denting.

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