Food-grade Corn for New Mexico

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CORN IN NEW MEXICO

Corn, first grown in New Mexico over 4,000 years ago, has been a staple food crop throughout much of our history. It has been dried, ground, and eaten as a gruel or mush. It has been nixtamalized by treatment with lime water to remove the hull and prepared as pozole, or ground into masa for tortillas and tamales. Much of the corn grown for food in New Mexico is for family and community use, with little commercial production. Although corn production for food in the U.S. comprises only 3% of all corn produced, the market for food made from corn has been expanding with growing demand for ethnic foods and gluten-free products. This growing demand for corn-based foods supports the production of food-grade corn at a commercial level.

FOOD-GRADE CORN

U.S. Department of Agriculture (USDA) grain quality standards define the quality parameters for food-grade corn. Corn is graded based on test weight, the percentage of corn that is damaged, and broken corn and foreign material (BCFM). Kernels of corn can be damaged by contact with the ground, weather, frost, disease, mold, sprouting, mechanical impact, or insect boring. Corn can also be materially discolored and damaged by heat. The amount of BCFM is determined by sieving a sample through a 12/64 round hole sieve. Everything that passes through the sieve, com-

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Figure 1. **Food-grade corn can be white, blue, or yellow.**

bined with anything other than corn that remains in the sieve, is considered broken corn and foreign material.

Most food manufacturers want U.S. Grade 2 corn or better. The requirements for U.S. Grade 2 are a minimum test weight of 54 pounds/bushel; a maximum of 5% damaged kernels, of which no more than 0.2% can be heat damaged; and a maximum of 3% BCFM. The requirements for Grade 1, which may command a higher price, are a minimum test weight of 56 pounds/bushel; a maximum of 3% damaged kernels, of which no more than 0.1% can be heat damaged; and a maximum of 2% BCFM.

Food-grade corn also has stringent thresholds for the presence of the mycotoxins aflatoxin and fumonisin. These are produced by fungal pathogens belonging to the *Aspergillus* and *Fusarium* genera, respectively, and can present a threat to human health. The U.S. Food and Drug Administration (FDA) regulatory limit of aflatoxin is <20 ppb, while the advisory limit for fumonisin is 2–4 ppm in whole corn.

Food-grade corn can be white, blue, or yellow (Figure 1). USDA defines three classes of color for corn: yellow, white, and mixed. Yellow corn can contain no more than 5% other colors of corn. White corn can contain no more than 2% other colors of corn. Mixed corn is everything that does not meet the color requirements for yellow or white corn. There is no USDA color standard for blue corn.

White-kernelled corn may be an open-pollinated variety or a hybrid with specific starch properties; it is primarily dry-milled for flour and grits or used in nixtamalization (alkaline) processing for the masa used in making tortillas and chips. In the Southwest, food-grade blue corn usually comes from open-pollinated varieties, with kernels comprised mainly of soft (or floury) starch. It is prized for making specialty foods, such as tortillas, bread, muffin and pancake mixes, and snacks. Most U.S. Grade 1 and Grade 2 food-grade yellow corn comes from hybrids that have been bred to have a higher percentage of hard endosperm, and it is used primarily in making snack foods and cereal. U.S. Grade 2 yellow corn (not specifically food-grade/hard endosperm) is used in producing corn oil, corn syrup, and high fructose corn syrup. Red corn also exists, but there seems to be little demand for it in food processing.

SEED CHOICE

Open-pollinated varieties have been the traditional choice in New Mexico for individual and community use. These varieties can be highly variable in plant characteristics and have relatively low yields compared to hybrids. Seed from open-pollinated corn can be saved and used to plant the next year's crop. Red glumes from red cobs can affect the appearance of finished products; for instance, they will appear as black flecks in tortillas. To avoid this potential problem, it may be preferable to save the seed from only white cobs when there is a mix of red and white cobs.

Yellow and white hybrids specifically marketed for food grade have been selected for a higher percentage of hard endosperm. Most of these hybrids have been developed for production in the Midwest—they may or may not perform well in the hot, dry conditions of New Mexico.

PRODUCTION

Production is the same as for standard grain corn, with a few additional considerations. Crop rotation is important in producing food-grade corn. Corn for food production should never follow corn or small grains. Corn and small grain residue from the previous year's crop may contain spores of *Aspergillus* and *Fusarium* fungi. They can serve as a source of inoculation for these mycotoxin-producing pathogens. The best field choice is one in which a legume or mixed species cover crop was grown the previous season.

Isolating the crop from potential pollen drift from nearby fields is also an important consideration in field choice. Pollen can affect kernel color; for example, the pollen from a field of yellow or blue corn could drift onto an adjacent field of white corn, resulting in ears with a combination of white and colored kernels. Knowing what types of corn are being produced in neighboring fields is also important for producers of food-grade corn for the non-GMO, or organic, markets. Pollen can drift from GMO corn grown in nearby fields and contaminate a non-GMO crop.

Food-grade corn must be identity preserved in order to maintain its value. To do this, contamination through pollen drift needs to be minimized either by planting in isolated fields or maintaining a 660-foot buffer zone between adjacent fields. Risk of pollen drift between fields that are close to the distance can be minimized by staggering the planting dates of varieties with similar maturity, or planting varieties with earlier and later (non-overlapping) maturity.

HARVESTING

The effects of pollen drift resulting in GMO or off-color contamination can be further reduced by separately harvesting border rows and keeping the corn separated until it can be tested for the presence of GMO or inspected for off-color kernels.

Machine harvesting should begin when grain contains 18–20% moisture. Lower moisture levels can result in more cracking of the kernels. Rotary combines are the preferred means of harvesting. To begin harvesting, set a wider concave setting and lower rotor speed than recommended. Once harvest has begun, the settings can be adjusted to meet current field conditions and minimize kernel breakage. Picker-shellers can also be used for harvest, but they often produce more cracked kernels than rotary combines. After harvest, grain must be air-dried to 13% moisture or below for safe storage.

MARKETING

In the Midwest and other areas where large acreage is devoted to food-grade corn, there are specialty grain handlers who purchase cleaned food-grade corn. In New Mexico, most food-grade corn is grown under contract. These contracts may dictate the varieties grown, number of acres, and means of production and harvesting.

Food-grade corn can be sold directly to a food processor. In this case, corn should meet grade requirements for damaged kernels and BCFM, and be tested for the presence of aflatoxin and fumonisin. It should be near 13% moisture and delivered in new bags.

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