Blue Corn Production and Marketing in New Mexico

Cooperative Extension Service
College of Agriculture and Home Economics

Guide H-226

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This publication is scheduled to be updated and reissued 7/03.

Maize or corn has been the basis for many great cultures in the New World including those of the Inca, Maya and Aztec Civilizations. Corn continues to be the backbone of modern American agriculture.

Coronado found corn to be a major staple of Pueblo Indians on his expedition into the Southwest in 1540. In the past and present, corn is an important element in Native American religious rituals.

Although Pueblo tribes planted may different colored corns, blue corn became one of the most important. It was generally dried on rooftops, stored as grain on the cobs, shelled, and ground into meal as needed.

KERNEL CHARACTERISTICS

Most blue corns grown in the Southwest are typically flour corns. Kernels are made up of almost all soft, floury endosperm covered by a thin, evenly distributed layer of hard, corneous endosperm. The outer endosperm is made up of a single layer of cells containing blue pigment, and is called the aleurone layer. A thin, transparent layer of crushed cells called the pericarp covers the entire kernel and serves and the seed coat.

Pigmentation can occur in the pericarp and the main body of the endosperm, but the blue associated with the blue corn is normally found in the aleurone layer. the small blue aleurone grains in this layer can become so dense that kernels appear to be black.

The shape of the kernel is highly variable. Shape can range from small, flint-type kernels to large hominy types.

PLANT CHARACTERISTICS

Unlike most commercial hybrid dent corn that can yield 8,000 to 10,000 pounds of grain per acre, blue corn is open-pollinated and is characterized by relatively low yields of 1,000-4,000 pounds per acre. Most blue corn strains exhibit highly variable plant characteristics, including long flowering periods and uneven plant heights. Blue corn also tends to produce more than one stalk (tiller) per plant and stalks fall over (lodge) in field heavily, making machine harvesting somewhat more difficult than for hybrid dent corn. Many strains occasionally produce blank plants that do not produce ears.

PLANTING AND FERTILIZATION

Blue corn is best adapted to deep, well-drained, sandy loam soils with plenty of organic matter. Field preparation is the same as other types of corn (chiseling, plowing, disking, listing). Depending on soil type, seed should be planted 1 to 2 inches deep in preirrigated beds or watered up.

Yields will fluctuate greatly with plant spacing fertility level and the amount of water applied. Optimum yields can be achieved when native blue corn plants are 9 inches apart in the row on 36 inch centers under full irrigation. Nitrogen fertilizer should be applied in split applications with 50 to 100 pounds per acre of elemental nitrogen applied before planting, and another 50 to 100 pounds applied as a sidedressing when plants are 12 to 18 inches tall. Preplant phosphorus should be banded into the beds at a rate of 80 pounds of $P_2 0_5$ per acre.

Although potassium is rarely a limiting factor on most New Mexico soils, there are indications that supplemental potassium tends to reduce lodging. Growers might want to consider applying potassium at a rate of 50 to 100 pounds of $K_2 0$ per acre, particularly if a soil analysis indicates low soil potassium levels.

Blue corn is often sold as organically grown. Blue corn grown without supplemental synthetic fertilizers should be spaced farther apart in the row (12 inches between plants on 36-inch centers). Manure should be applied in the fall at a rate of 20 tons per acre. Blue corn also performs well when deep-rooted le-

gume crops like alfalfa are turned under 2-3 months before planting.

PEST CONTROL

Pest of blue corn are the same as those of other field corns. Growers should consult their local county agent for the latest recommendations on registered pesticides for use on corn for grain (flour). Pesticide labels should be carefully followed for control of all weeds, insects and diseases.

Blue corn differs from other corns in that it often has longer flowering period. This can affect a corn earworm control program. One, two or more applications of appropriate insecticides might be needed for effective control.

Blue corn sold organically normally requires that the crop be grown without the use of either synthetic pesticides or synthetic fertilizers. Organic growers should consult their buyers for definitions of what they consider organically grown.

Birds can be a major pest on blue corn. Propane guns are often used to frighten birds from fields.

BLUE CORN IMPROVEMENT

Because there are few commercial blue corn varieties, most growers develop their own strains. Blue corn strains are improved by selecting next year's planting seed from superior plants in the field before harvest.

There are two phases in the selection process. Ears should first be selected from plants in the field with superior traits. The ears should then undergo a second selection phase by discarding all ears with poor kernel traits.

When selecting ears in the field, growers should select only those ears that come from plants that have not lodged. Depending on the amount of variability in the plant population, growers should also select ears from plants with few extra stems and those that have ears that flop over on the plant. Plants with floppy ears tend to have less water and bird damage. Birds find it difficult to peck on ears that have flopped over.

After shucking, the ears should undergo further selection pressure by saving only those large, dark blue ears with small kernels. Small kernels tend to exhibit a higher quality, nuttier blue corn type taste. The higher quantity of starchy (white) endosperm in larger seeded varieties also tends to dilute the blue color in the flour after processing. Ears with dented kernels should be rejected.

Seed corn can be stored shelled or on the cob in a cool, dry area until the following spring. All cracked kernels and foreign debris should be removed from shelled corn before storage.

HARVESTING

Machine harvesting of blue corn generally begins when grain contains 18 to 20% moisture. Lower moisture levels generally result in more cracking of the kernels. Rotary combines are the preferred means of harvesting over picker-shellers because they result in fewer cracked kernels. After harvest, grain must be air-dried to 13% moisture for safe storage.

MARKETING

Most blue corn is grown under contract. Large buyers often require the recleaned seed be free of disease, insect infestations, frost damage, extraneous matter and other imperfections. The Federal Food, Drug and Cosmetic Act requires the seed be free of unsafe chemical residues. Seed should be near 13% moisture with no more than 10% stress cracks. A good, dark blue color is important. Most processors also require the grain be delivered in new burlap or paper bags.

TRADITIONAL BLUE CORN PRODUCTS

Blue corn has a coarser, sweeter and nuttier taste than other types of flour corns. It is the basis for many traditional Native American foods.

Blue corn tortillas have traditionally been one of the most popular foods made from blue corn. Blue corn flour tends to have a coarser, grainier consistency than yellow or white corn flours, resulting in a somewhat denser tortilla.

Piki or paper bread is less well-known than blue corn tortillas. Prepared from a thin batter of fine blue corn meal and boiling water, the resulting paste is spread on a hot, flat stone or metal griddle that has been oiled with crushed seeds of squash, sunflower or watermelon. The wafer-thin cake that results is peeled off and folded or rolled ike a newspaper.

Chaquegue is a gruel made from finely ground blue corn meal, and is similar to cornmeal mush. The kernels are

toasted before being ground, giving the meal a slightly different flavor.

Atole de maiz is similar to chaquegue, but is a drink with a consistency more like cream. Aztecs and Mayas often added other ingredients like chile, honey or chocolate. Each atole had a special name, depending on its ingredients.

Nixtamal or lime hominy is made by treating dried kernels with lime water to remove hulls. It is the primary ingredient for stews and other dishes. The washed nixtamal can be ground to make masa for tortillas and tamales.

Pinole is made up of a mixture of toasted blue corn meal and toasted acorns or other seed. This lightweight, highly nutritious food can be used directly as food or mixed with water to drink. Sugar, honey or other sweeteners are occasionally added to pinole to make a more palatable drink.

Chicos are corn in the soft dough stage that has been steamed in the husk and dried. Traditionally, a pit was dug in the ground and the soil heated by burning wood in it for 1 to 2 days. The fire is removed and green ears in the husks are then placed in the pit and covered with soil. The partially roasted ears are removed, the husks stripped back, and the ears tied together in pairs and hung out to dry. The kernels were roasted to kill the grains, and to help them dry faster to preserve their food value. Chicos are generally cooked with chile and green onions, or in stews.

NON-TRADITIONAL BLUE CORN PRODUCTS

Although the traditional blue corn tortilla will probably remain the backbone of the blue corn market, new products have expanded the uses of blue corn flour. These products include items like blue corn chips, pancakes, muffins and corn flakes. Expansion of the blue corn industry depends on promotion of both traditional products and new products.

Reprinted July 1998

Las Cruces, NM
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