

Vegetable Uses of Maize (Corn) in Pre-Columbian America

W.F. Tracy¹

Department of Agronomy, 1575 Linden Drive, University of Wisconsin–Madison, Madison, WI 53706-1597

Maize (*Zea mays* L.) was an important vegetable throughout the Americas in pre-Columbian times. It may have been particularly important for people in temperate zones, where the selection of cultivated vegetables was relatively limited. In this review I shall use the term “corn” rather than maize, given that corn is used in the older literature upon which this review is based. My objective in this review is to focus on vegetable uses; however, some grain uses will also be discussed because the distinctions are somewhat arbitrary.

Corn, when grown for grain, is one of the most efficient crop plants in terms of calorie production. Because the grain may be stored for long periods, corn was (and is) the primary source of food energy for most of the major civilizations in the Western Hemisphere. In addition to an energy source, corn has been used as a vegetable by all these civilizations.

For the purposes of this paper, I define vegetable as any plant part, usually high in moisture when consumed, that usually undergoes minimal processing beyond cooking. In contrast, a grain is a seed or seedlike fruit that is dried to low moisture for storage and usually processed before consumption. Processing of grains frequently results in a product that is unrecognizable as the original plant part.

HISTORY

Corn was domesticated between 5000 and 8000 years ago in what is now central Mexico to northern Guatemala (Galinat, 1988). Its wild ancestor is teosinte [*Zea mays* ssp. *mexicana* (Schrad.) Iltis] (Galinat, 1988; Iltis and Doebley, 1980). Corn culture spread throughout the hemisphere, reaching Peru and Chile by 3000 to 5000 years ago (Galinat, 1979), then moved more slowly north; ≈600 years ago it was first cultivated in New England and New Brunswick (Galinat, 1979). While the environments in which it was cultivated were remarkably diverse, the vegetable uses of corn were quite similar throughout the hemisphere.

About 300 distinct races of corn existed when Europeans arrived in the Western Hemisphere (Hallauer, 1987). Races are defined by certain morphological characteristics and ecogeographic adaptation. There can be enormous genetic diversity within races, with variations in size, vigor, maturity, kernel color and texture, and many other traits. Of particular interest here is the *sugary1* (*su1*) mutation and pre-Columbian races that had this mutation. Until recently, all modern sweet corn cultivars were based on this mutation (Tracy, 1997). Many of the tribes that cultivated corn had *su1* cultivars (Manglesdorf, 1974; Weatherwax, 1954; Will and Hyde, 1917). The most ancient *su1* corns appear to be Chullpi from Peru and closely related races from other Andean countries (Goodman and Brown, 1988). A second pre-Columbian race of *su1* corn is Maiz Dulce from Jalisco, Mexico (Wellhausen et al., 1952). Most authorities agree that *su1* corn also was grown in most places where corn was cultivated in what is now the United States (Carter, 1948; Manglesdorf, 1974; Weatherwax, 1954; Will and Hyde, 1917). Anthropological data indicate that many of the peoples of the southwest, the upper Missouri, and the northeast maintained *su1* corn (Carter, 1948; Will and Hyde, 1917). Unlike our present use of this mutation as green corn, *su1* corn was seldom if ever used for roasting ears or green corn (Carter, 1948; Weatherwax, 1954; Will and Hyde, 1917); nonsugary cultivars were. Buffalo Bird Woman, a North Dakota Hidatsa, said that “for green corn, boiled and eaten fresh we

used all varieties except the gummy” (gummy = *su1*) (Wilson, 1917). Dried *su1* grain was roasted and eaten like popcorn or ground to make sweet confections. Despite its widespread occurrence, *su1* corn was not used as a vegetable in pre-Columbian America.

VEGETABLE UTILIZATION

Corn for consumption as a vegetable was harvested at three distinct times, pre-pollination, green corn (20–30 d after pollination), and as mature dry grain. Ears harvested pre-pollination are what we now call “baby ears.” Baby ears were harvested sparingly so as not to eliminate the main crop, except when plants produced multiple ear shoots and lower ears could be harvested without damaging potential grain yield. Baby ears were probably a great treat, because they are somewhat sweet and highly perishable (Weatherwax, 1954). Sahagun in 1585 (cited by Weatherwax, 1954) indicated that baby ears were also chopped and mixed with dough in making tortillas.

The harvest of green corn was very important to most pre-Columbian corn-growing peoples, even as it is today. Many tribes had special festivals and dances when the green corn was ripe (Parker, 1968; Weatherwax, 1954; Will and Hyde, 1917). The green corn ceremony and green corn dance of the Montana Mandan tribe was described in detail by Caitlin in 1841 (in Atkinson and Wilson, 1915). Caitlin said that this was a joyful occasion marked by feasting, dancing, and singing songs of thanksgiving. The green corn dance and Cherokee harvest festival are described in *Itse Selu*, a wonderfully illustrated children’s book (Pennington and Stewart, 1994). The Aztecs had a special festival to honor the goddess Xilomen, guardian of immature ears (xilototes) from silking to green corn harvest (Weatherwax, 1954). Excitement surrounding green corn harvest is not surprising; stored food supplies would be at a low point, most other cultivated vegetables would not yet have matured, and fresh green corn would have been a flavorful treat. Green corn was so valued that many people made delayed plantings to extend the harvest season (Wilson, 1917).

Green corn was used in a number of ways, some of which are quite familiar to us and others much less so (Emerson, 1878; Parker, 1968; Weatherwax, 1954; Will and Hyde, 1917; Wilson, 1917). Corn on the cob was boiled, roasted on top of coals with husks on or off, and baked by burying ears in the husks in coals. Fresh corn was also scraped or cut from the cob and then roasted, boiled, fried, or baked. Cut corn was wrapped in husks and buried in coals (Parker, 1968). Fresh cut corn was also boiled with beans or other vegetables. When available, bison or bear fat was frequently added to these foods. Fresh kernels, cut or scraped from the cob, were often pounded into a mush and then used to bake green corn cakes.

One of the most important uses of green corn was as a preserved food for use throughout the year (Parker, 1968; Will and Hyde, 1917; Wilson, 1917). For preservation, the corn was boiled on the cob; then, kernels were removed by cutting or plucking and then dried. Buffalo Bird Woman said that she dried them in the sun for ≈4 d (Wilson, 1917). She covered them at night to protect them from dew and pests. Others dried kernels by the fire. Until the advent of modern food processing, this method of preservation was so common and important that Carter (1948) wrote “in the past sweet corn had at least one other widespread meaning—what we should call dehydrated corn.” This dried green corn could be kept for long periods, then prepared for consumption by boiling either alone or with other vegetables, such as beans or dried squash. When available, some type of fat was added. Europeans who consumed soups and other foods made from dried green corn indicated that it maintained a fresh, delicious flavor distinct from that of corn harvested at the mature stage.

In all areas of cultivation, the main use of corn was as a grain, harvested at the mature dry stage. Often, dried corn was ground into meal and the meal was baked, fried, boiled in soups, or prepared as a

Received for publication 16 July 1998. Accepted for publication 1 Dec. 1998. Contribution from the Wisconsin Agricultural Experiment Station. Research supported by the College of Agricultural and Life Sciences, Univ. of Wisconsin–Madison. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

¹E-mail address: wtracy@facstaff.wisc.edu

mush. Dry grain was also parched or roasted, then either consumed directly or ground for meal.

In many cultures, one of the most important aspects of corn consumption was alkali processing of dried grain; dried corn was boiled in water with lime or wood ash (Parker, 1968; Weatherwax, 1954; Will and Hyde, 1917; Wilson, 1917). This process removes the pericarp and improves flavor and nutritional quality. Pellagra, caused by niacin deficiency, is a common disease in many parts of the world in which people consume large amounts of corn, but is virtually never seen in native American cultures that employ alkali processing (Serna-Saldivar et al., 1990). Corn contains bound niacin and has an unfavorable isoleucine to leucine ratio. Alkali cooking increases bioavailability of niacin, improves the isoleucine to leucine ratio, and reduces aflatoxin concentration (Serna-Saldivar et al., 1990). When lime is used as the alkali source, the amount of available calcium is increased >20 times (Serna-Saldivar et al., 1990).

Many North American cultures used steeped wood ashes (lye) as their alkali source (Parker, 1968; Will and Hyde, 1917; Wilson, 1917). Wood ash processing has the same nutritional benefits as lime processing except for the tremendous increase in calcium; the product is called hominy, which could be considered a vegetable. After processing, hominy was consumed directly, boiled alone, or mixed with other vegetables and/or fat, and fried or baked. In Mexico and the southwestern United States, lime was the preferred alkali source and most of the processed product was ground into a meal (masa) and immediately made into tortillas or other baked products. Some was consumed in whole kernel form (Serna-Saldivar et al., 1990). The flavor of lime-processed corn is different from that of wood ash-processed corn.

CORN SMUT

A special vegetable use of corn was the consumption of corn smut [*Ustilago zae* (Beckm.) Unger], a fungus that grows on all parts of the plant. Corn smut growing on the ear was most highly prized. Buffalo Bird Woman said that her people looked upon smut that grew on the corn ear as a kind of corn (Wilson, 1917). Corn smut was harvested before the gall was fully mature (Pataky, 1991) and was usually consumed directly after harvest, prepared like any mushroom. Some people, however, preserved corn smut by parboiling and then drying (Buffalo Bird Woman, in Wilson, 1917). Dried smut was then cooked by boiling it with dried green corn. Buffalo Bird Woman mentioned that her people did not eat smut fresh from the garden (Wilson, 1917).

SUMMARY

Corn was a staple crop, providing energy for most agricultural peoples of pre-Columbian America, and also an important vegetable, providing dietary variation. People throughout the hemisphere devel-

oped or adopted similar cooking methods and uses for corn. While I have written about the various uses in the past tense to emphasize the pre-Columbian era, essentially all uses and practices described still take place today to a greater or lesser degree. In addition to modern processing technology, the main change is the increased sweetness of green corn due to the current emphasis on endosperm mutants (Tracy, 1997). However, for many important current uses, such as hominy and soups, very sweet types are not desirable and more traditional varieties are still preferred.

Literature Cited

- Atkinson, A. and G.W. Wilson. 1915. Corn in Montana. Montana Agr. Expt. Sta. Bul. 107.
- Carter, G.F. 1948. Sweet corn among the Indians. Geog. Rev. 38:206–221.
- Emerson, W.D. 1878. History and incidents of Indian corn and culture. Wrightson and Co., Cincinnati. Reprinted in 1973 by Scholarly Resources, Inc. Wilmington, Del.
- Galinat, W.C. 1979. Botany and origin of maize, p. 6–12. In: E. Hafliger (ed.). Maize. Ciba-Geigy, Basel, Switzerland.
- Galinat, W.C. 1988. The origin of corn, p. 1–32. In: G.F. Sprague and J.W. Dudley (eds.). Corn and corn improvement. Amer. Soc. Agron., Madison, Wis.
- Goodman, M.M. and W.L. Brown. 1988. Races of corn, p. 33–79. In: G.F. Sprague and J.W. Dudley (eds.). Corn and corn improvement. Amer. Soc. Agron., Madison, Wis.
- Hallauer, A.R. 1987. Maize, p. 249–294. In: W.R. Fehr (ed.), Principles of cultivar development, vol. 2. Macmillan, New York.
- Iltis, H.H. and J.F. Doebley. 1980. Taxonomy of *Zea*. II. Subspecific categories in the *Zea mays* complex and a generic synopsis. Amer. J. Bot. 67:994–1004.
- Manglesdorf, P.C. 1974. Corn; its origin, evolution, and improvement. Belknap/Harvard Univ. Press, Cambridge, Mass.
- Parker, A.C. 1968. Parker on the Iroquois. In: W.N. Fenton (ed.). Syracuse Univ. Press, Syracuse, N.Y.
- Pataky, J.K. 1991. Production of cuitlacoche on sweet corn. HortScience 26:1374–1377.
- Pennington, D. and D. Stewart. 1994. Itse Selu, Cherokee harvest festival. Charlesbridge Publ., Watertown, Mass.
- Serna-Saldivar, S.O., M.H. Gomez, and L.W. Rooney. 1990. Technology, chemistry, and nutritional value of alkaline-cooked corn products. Adv. Cereal Sci. Technol. 10:243–295.
- Tracy, W. F. 1997. History, breeding, and genetics of supersweet corn. Plant Breed. Rev. 14:189–236.
- Weatherwax, P. 1954. Indian corn in old America. MacMillan, New York.
- Wellhausen, E. J., L.M. Roberts, and E. Hernandez X. 1952. Races of maize in Mexico. Bussey Inst., Harvard Univ., Cambridge, Mass.
- Will, G.F. and G.E. Hyde. 1917. Corn among the Indians of the upper Missouri. W.H. Miner, St. Louis.
- Wilson, G.L. 1917. Agriculture of the Hidatsa Indians: An Indian interpretation. Univ. of Minnesota, St. Paul. (Republished in 1987 as Buffalo Bird Woman's Garden, Minnesota Historical Society, St. Paul.

Metallurgy in pre-Columbian America is the extraction and purification of metals, as well as creating metal alloys and fabrication with metal by Indigenous peoples of the Americas prior to European contact in the late 15th century. To date "no one has found evidence that points to the use of melting, smelting and casting in prehistoric eastern North America."^[3] In South America the case is quite different. Indigenous South Americans had full metallurgy with smelting and various metals being purposely alloyed. Metallurgy in Mesoamerica and Western Mexico developed from contacts with South America through Ecuadorian marine traders.^[4]