New Mexico Climate Center

The Wonders of New Mexico Chile

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"Chile ... is a crop that has been grown ... for many years. It is a vegetable rapidly coming into popular favor, not only locally, but throughout the country." (Fabian Garcia) Professor Garcia was right about the popularity of chile, but it took another 70 years before the New Mexico chile industry expanded to its predicted prominence. New Mexico now produces 60 percent of the chile crop in the U.S. and the chile was recognized in 1965 as our official state vegetable

New Mexico Chile Production

In 1992, chile acreage in the U.S. exceeded that of celery and honeydew melons, while per capita use of chile exceeded that of asparagus, cauliflower, and green peas. Indicative of the increasing popularity of chile, New Mexico's chile production has increased from 7,780 acres in 1973 to more than 34,500 acres in 1993. The crop produced was worth $67.3 million at farm-gate, but with processing its value exceeded $250 million.

New Mexico has an optimum climate for growing chile with good yields and quality. Irrigation is essential for chile production in New Mexico because annual precipitation seldom exceeds 7 inches. The climatic factors typical of high-desert conditions important for chile production include high solar radiation, broad temperature ranges, and consistent wind. An average altitude of approximately 3,000 ft allows for a high intensity of sunlight on the crop. The days are warm, 95F (35C), and the nights cool, 65F (18C). A temperature fluctuation of 15-20 C over a 24-hour period is common. A daily breeze helps dry the plants after a morning dew or rain**,** thus reducing disease development.

Chile terminology is confusing. Pepper, chili, chile, chilli, aji, paprika, and *Capsicum* are used interchangeably for plants in the genus Capsicum. The word *Capsicum* comes from the Greek *kapto*, meaning to bite (a reference to pungency). In Mexico, Central American, and the southwestern U.S., *Capsicum* is called chile.

Capsicum is not related to the Piper genus, which contains *Piper nigrum* L., the source of black and white pepper. The Spanish word "chile" is a variation of "chil" derived from the Nahuatl (Aztec) dialect that referred to plants now known as *Capsicum.* The *e* ending in chile is the authentic Hispanic spelling of the word, but some have changed the *e* to an i. Nowadays, "chili" identifies the Texas official state dish that is a combination of beans, meat, and pungent chile cultivars. "Bell pepper" generally refers to non-pungent blocky chile types, while "chile pepper" has come to mean pungent chile cultivars.

The genus *Capsicum* is a member of the Solanaceae family that includes tomato, potato, tobacco, and petunia. Chile grows as a perennial shrub in suitable climatic conditions. A plant may live for a decade or more in tropical Central America, but it is cultivated as an annual in New Mexico. All wild chiles have small fruits that birds, the natural dispersal agent for chile, eat with ease.

Chile is native to the Western Hemisphere and probably evolved from an ancestral form in the Bolivia/Peru area. The first chiles consumed were probably collected from wild plants. Apparently the indigenous peoples were growing chile plants between 5200 and 3400 B.C., which place chiles among the oldest cultivated crops of the Americas. Prehistoric Americans took the wild chile piquin and selected for the various pod-types known today. However, domesticated chiles apparently were not grown prehistorically in New Mexico.

It is not known exactly when chiles were introduced into New Mexico. Chiles may have been used by the indigenous peoples as a medicine, a practice common among the Mayans. By the time the Spanish arrived in Mexico, Aztec plant breeders had already developed dozens of varieties. According to historian Bernardino de Sahagùn, who lived in Mexico in 1529, "hot green chiles, smoked chiles, water chiles, tree chiles, beetle chiles, and sharp-pointed red chiles" existed. Undoubtedly, these chiles were the precursors to the large number of varieties found in Mexico today. However, the green and red chile grown in New Mexico had not been developed. Whether chiles were traded and used in New Mexico pueblos is still not clear. However, chiles have been grown in New Mexico for at least four centuries, as Don Juan de Oñate grew chiles in 1598 with irrigation from the Rio Chama in northern New Mexico.

Chile fruits are considered vegetables when green, a spice when red and dried, but are berries botanically. Fruit characteristics (i.e., pungency, color, shape, flavor, size, and use) usually classify chile types. Despite vast trait differences, nearly all chile varieties commercially cultivated in New Mexico belong to one species, C. *annuum.* Other species are the tabasco *(C. frutescens)* and habañero *(C. chinense).*

Several hundred chile varieties of C. *annuum* are grown in New Mexico. These include bell, New Mexican, jalapeño, cayenne, yellow wax, ancho, pasilla, mirasol, and de arbol, but most of New Mexico's commercial acreage is limited to a few varieties. The most common variety in the U.S. is the "bell pepper," but fewer than 200 acres of bell pepper are grown in New Mexico. The three major pod-types grown in New Mexico are New Mexican, cayenne, and jalapeño. The New Mexican pod-type is further divided into three categories: green chiles red chiles, and paprika.

The growth of the New Mexico chile industry began with Fabian Garcia at the NMSU Agricultural Experiment Station. He did not create the first chile, but did introduce a new pod-type, 'New Mexican', which opened commercial markets for New Mexico chile and established the New Mexico chile food industry. He began developing this pod-type in 1894 by crossing chile pasilla and chile colorado. Garcia introduced 'New Mexico No. 9' in 1921. The New Mexican type chile is also called long green or 'Anaheim'. 'Anaheim' seed originated in New Mexico and was brought to Anaheim, California, where it was widely cultivated. The varietal type is New Mexican and 'Anaheim' is a cultivar within this type. Table 1 lists chile cultivars developed at the NMSU Agricultural Experiment Station.

Other famous New Mexican chile strains grown in northern New Mexico are named for the growing area, such as Chimayo, Dixon, and Velarde. Northern New Mexico chile fruits have a flat or "square" shoulder, compared to the cultivars adapted to southern New Mexico with a sloping or "round" shoulder. "Hatch" chile is green chile grown in the Hatch Valley of southern New Mexico, but "Hatch" is not a specific cultivar.

Table 1. Chile cultivars developed at NMSU.

Cultivar	Pod Type	Heat Level	Year
New Mexico No. 9	New Mexican	Medium	1921
New Mexico No. 6	New Mexican	Medium	1950
Sandia	New Mexican	Hot	1956
New Mexico NO. 6-4	New Mexican	Medium	1958
Rio Grande 21	New Mexican	Medium	1967
New Mex Big Jim	New Mexican	Med.-hot	1975
Expanola Improved	New Mexican	Hot	1984
New Mex R Naky	New Mexican	Mild	1985
New Mex Sunset, NuMex Sunrise, NuMex Eclipse	New Mexican	*	1988
NuMex Centennial	Piquin	*	1989
NuMex Conquistador	New Mexican	No Heat	1989
NuMex Sweet	New Mexican	Mild	1990
NewMex Joe E. Parker	New Mexican	Medium	1990
NuMex Sunglo, NuMex	de Arbol	*	1991

Sunflare, Numex Sunburst			
NuMex Bailey Piquin	Piquin	V. Hot	1991
NuMex Twilight	Piquin	*	1991
NuMex Mirasol	Mirasol	Med.-Hot	1993

*Mainly used as an ornamental, thus heat level is not given.

Uses for Chile

New Mexican green and red chile represent two developmental stages of the same fruit. First, the plant produces green fruits, which turn red if the pods are left on the plant. The red fruits are usually dried and ground into chile powder (paprika if non-pungent). New Mexican green chile is roasted and peeled for fresh consumption, canning or freezing. The flavor of green chile is completely different from red chile because the pods are picked at a different age. Green chile cannot be transported long distances for fresh consumption because its quality will be reduced during shipping. Red chile and paprika are dehydrated and sold as whole pods or ground into powder.

Paprika is currently used as coloring in sausages, cheeses, fruit gelatins, drugs, and cosmetics, as well as for improving the feather color of flamingoes in zoos! Good-quality paprika has high red color, which is most important, and no pungency. Because paprika is defined as a product, not a pod-type in the U.S., it may be obtained from any one of many types of *C. annuum.* The word "paprika" means "chile" in Hungarian. Oleoresin, a red oily mixture of carotenoids and other non-volatile compounds, can be extracted from paprika with solvents.

Our third most important chile, in terms of acreage, is cayenne. Cayenne, named for a city in French Guiana, has wrinkled red mature fruit and is characteristically 5-10 inches long. It is highly pungent (30,000-50,000 Scoville units*) and is used to make hot sauces or a dried powder, commonly known in U.S. households as "red pepper." Cayenne pods are also made into a mash with salt and shipped to the southeastern U.S. to be made into the popular Louisiana hot sauce. *Scoville heat units measure the heat of chile powder. A one part per million concentration of capsaicinoids (heat compounds) equals 1.5 Scoville heat units.

Jalapeños derived their name from Jalapa, Mexico and are principally used as a spice and condiment. Most jalapeños are preserved by canning or pickling, while a few are dehydrated in either the green or red stage. The fruits are thick-walled, conical, green or red, and highly pungent. Most jalapeño slices used on nachos in the U.S. comes from New Mexico. Jalapeño's thick walls do not dry naturally, so mature red jalapeños are dried by smoking them over mesquite or hardwood. The dried product is called "chipotle."

Chile must be processed and stored correctly to maintain quality. Traditionally, chile was dehydrated by sun-drying. The fruits were spread on roofs or even on the ground, but contamination by birds and rodents caused poor quality for processors. People then began tying chile together in strings (ristras) and hanging them on the wall. This method was replaced by controlled artificial drying, now practiced by all commercial processors in New Mexico. The fruits are dried to 4-6 percent moisture content, and the chile is ground and rehydrated to 8-11 percent moisture, an optimal level for storage. The dried red powder is classified into five groups: non-pungent or paprika (0-700 Scoville heat units), mildly pungent (700-3,000), moderately pungent (3,000-25,000), highly pungent (25,000-70,000), and very highly pungent (>80,000).

Chiles are nutritious, producing high amounts of vitamin C, provitamin A, E, B, (thiamine), B_2 (riboflavin), and B_3 (niacin). A green chile pod can contain six times as much vitamin C as an orange, but vitamin C content diminishes about 30 percent in canned and cooked chile, and nearly vanishes from dried chile. A 5.5-ounce serving, equal to one medium-sized chile, provides 130 percent of the RDA for vitamin C. As green pods turn red, provitamin A content increases until they contain twice the vitamin A of a carrot. The provitamins are transformed into vitamin A in the human liver. The daily vitamin A requirement can be met by consuming ½ tablespoon of ground red chile. Chile has been cited as a therapeutic agent for cancer, as a higher intake of carotene or vitamin A may reduce the risk of cancer. Chile does have a strong anti-oxidative property, and the binding of free radicals may be therapeutic.

Chile's most recognizable trait is pungency. The pungency comes from a mixture of seven homologous branded-chain alkyl vanillylamides, named capsaicinoids, often are called capsaicin after the most prevalent one. The capsaicinoids are produced in glands where seeds are produced. While seeds are not the source of pungency, they occasionally absorb capsaicin because of their location.

We feel heat from the capsaicinoids as a results of irritation of the trigeminal cells**,** which are pain receptors located in the mouth, nose, and stomach. The capsaicinoids trigger a mechanism that releases a chemical messenger, which signals the brain about pain. In turn, the brain floods the nerve endings with endorphins, the body's natural painkillers. The endorphin release gives the body a sense of pleasure and may be why people become "addicted" to chiles and build a tolerance to very hot foods. Capsaicinoids are not destroyed in the mouth, and the body masks their presence. This is why many chile eaters have found some chiles will "burn the next day."

It has been shown that humans can not only note intensity of pungency, but also perceive each capsaicinoid differently. Some capsaicinoids produce a heat that lingers, while others produce a heat that disappears quickly. A fast-dissipating heat is preferred for food items, while medicines would need a lingering heat.

Chile's medicinal applications have brought renewed interest. The pharmaceutical industry uses capsaicin as a counter-irritant balm for external application. It is the active ingredient in Heet and Sloan's Liniment, two rubdown liniments used for sore muscles. Capsaicin has been prescribed for severe chronic pain conditions, where it is usually administered topically for periods of several weeks, as in the case of *Herpes zoster* or "shingles." It has also been shown to be effective against cluster headaches and useful for temporary relief of pain associated with rheumatoid arthritis and osteoarthritis. The minor capsaicinoid, dihydrocap-saicin, protects against serum hyperlipidemia in guinea pigs fed a cholesterol-enriched diet.

Anti-mugger aerosols with capsaicin as the active ingredient have replaced mace and tear gas in more than a thousand U.S. police departments. The spray causes attackers to gasp and twitch helplessly for at least 20 minutes.

The future of New Mexico chile looks promising. Chile is growing not only in total acreage, but also in industries moving or expanding in New Mexico. The first oleoresin extractor in New Mexico was built in 1992 at Rincon, NM to extract red color from New Mexico paprika. There is a rising demand for paprika oleoresin because many western countries have taken legislative action to ban synthetic red colorants in the food industry.

The growth of the greenhouse industry may bring an opportunity for ornamental chiles to be produced in greater numbers. These chiles have all the colors of the rainbow, often displaying pods in four or five colors simultaneously on the plant. An ornamental chile plant may replace the usual chrysanthemum or poinsettia as a nice gift for friends who enjoy New Mexico and spicy food.

As new uses of chile are continually found, the greatest benefit of chile may yet be discovered. The NMSU Agricultural Experiment Station has played an important role in the growth of the New Mexico chile industry and remains one of the world's most progressive and prestigious institutions for chile research. As NMSU's former president Halligan said, "Chile is what gives New Mexico its national identity."

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