

The Chile Cultivars of New Mexico State University

Released from 1913 to 1993



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The New Mexican-type chile is an important ingredient in the Southwestern food industry. Chile has grown from a regional food for tourists to an important international export. Improvement of New Mexican chile cultivars through breeding and genetics has been a major research thrust at New Mexico State University (NMSU). With improved cultivars, production costs decrease, yields increase, incomes increase, consumer costs decrease, and product quality improves.

NMSU has the longest continuous program of chile improvement in the world. The chile improvement program began in 1888 with Fabian Garcia. All New Mexican-type chiles grown today gained their genetic base from cultivars first developed at NMSU. Historically, the most important cultivar is 'New Mexico No. 9'. 'New Mexico No. 9' and several other cultivars have a release date that is different than the published date, because publishing the cultivar release is dependent on a journal's reviewing and publishing schedule. It can take several years before the cultivar is seen in print.

'New Mexico No. 9' was released in 1913 by Dr. Garcia (Garcia, 1921). This cultivar was important historically not only because it was the first chile cultivar released from NMSU, but also because it introduced a new pod type, New Mexican, to the world. Until this release, the New Mexican pod type did not exist. Selecting for the New Mexican pods began in 1894, when Dr. Garcia began improving the local chiles grown by Hispanic gardeners around Las Cruces, New Mexico. Today, the New Mexican pod type is also called long green or 'Anaheim'. Actually, the pod type is New Mexican, and chiles like 'New Mexico Big Jim' and 'Anaheim' are cultivars within this pod-type. 'Anaheim' seed originated in New Mexico and was taken to Anaheim, California, where it was widely cultivated.

Chile's most recognizable trait is pungency. Capsaicinoids, chemical compounds produced in glands on the fruit's placenta, produce pungency. While seeds are not the source of pungency, they occasionally ab-

sorb capsaicin because of their proximity to the placenta. The chile's genetics, weather conditions, growing conditions, and fruit age affect capsaicinoid content. Plant breeders selectively develop cultivars with varying degrees of pungency. Also, growers control pungency by subjecting their plants to different amounts of stress. Stress means hotter pods. Thus, the chile heat levels listed are relative to the year and location grown.

This publication describes the cultivars released from New Mexico State University (table 1.). New Mexico's chile growers plant most of the chile acreage to cultivars developed at NMSU or to cultivars that have NMSU cultivars in their pedigrees. Seed sources for the NMSU cultivars are also included (table 2).

New Mexico No. 9

Before Dr. Garcia developed the New Mexican pod type, there was no control over the genetic constitution of the chile seeds planted, so farmers could never predict size or heat of the pods. Dr. Garcia thought that if he made the chiles milder, consumption would increase among the Anglo population. He had two colors of chile to choose from red (colorado) or black (negro). He chose the red strain. This was fortuitous for New Mexico, because 100 years later, chile (paprika) used as a red coloring agent has become an important part of the New Mexico chile industry. He improved native chile by selecting and cross breeding. His goal was to produce a chile cultivar that was a "larger, smoother, fleshier, more tapering and shoulderless pod for canning purposes." He selected 14 chile accessions growing in the Las Cruces area. The lines were from pasilla (dark brown), colorado (red), and negro (black) chiles.

After nine years, only line No. 9 remained; Dr. Garcia said it had "proven to be the best." He said, "While No. 9 is not quite as hot or pungent as most of the unimproved varieties, it seems to be hot enough. Most of the plants produce pods having the characteristics desired,

Table 1. Chile cultivars developed at New Mexico State University and their pod type, relative heat level, and the year officially released.

<u>Cultivar</u>	<u>Pod-Type</u>	<u>Heat Level</u>	<u>Year</u>
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
NuMex Big Jim	New Mexican	Med.-Hot	1975
Española Improved	New Mexican	Hot	1984
NuMex R Naky	New Mexican	Mild	1985
NuMex 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
NuMex Joe E. Parker	New Mexican	Medium	1990
NuMex Sunglo, NuMex Sunflare, NuMex Sunburst	de Arbol	*	1991
NuMex Bailey Piquin	Piquin	Very Hot	1991
NuMex Twilight	Piquin	*	1991
NuMex Mirasol	Mirasol	Med.-Hot	1993

*Mainly used as an ornamental.

but there are always some plants in the field which tend to revert back; consequently, it is very necessary to select the seed in the field.” Pungency of No. 9 is estimated to have been in the range of 1,000 to 1,500 Scoville Heat Units (SHU), because it was reported to be twice as hot as ‘New Mexico 6’ (Harper, 1950). Dr. Garcia did not realize that his chile lines were cross pollinating and causing new variability. In retrospect, it was serendipitous that he had picked the pasilla, colorado, and negro types. They probably intercrossed and produced progeny that contained novel gene combinations, allowing him to select for the new cultivars.

Dr. Garcia also said, “No special effort (has been) made to produce a blight (chile wilt) resistant strain at this time. Naturally in the work of roguing and selection, incidentally the hardier and more blight resistant plants were also selected. With this (chile) variety at the present time is not entirely immune to the blight, it does show that it is not so susceptible to the wilt as the unimproved varieties. It is hoped that in the near future more intensive work can be undertaken to produce and establish an absolutely blight resistant variety.” New Mexico No. 9 had uniform pungency and a standard pod size and shape. It became the chile standard until 1950 and helped established the Mexican food industry in the United States.

New Mexico No. 6

In 1950, Dr. Roy Harper released this cultivar from a selection made in 1947 from an undesignated local chile

(Harper, 1950). It yielded 23 percent more dry chile than ‘New Mexico No. 9’. ‘New Mexico No. 6’ was particularly well suited for the processing industry and for producing green chile for the fresh market. It produced a high proportion of large, smooth, thick-fleshed pods that ranged from 6 to 8 inches in length and averaged 2 inches in width. The pods were long-elliptical to oblong in shape, bluntly pointed, and small-based in proportion to their size. The shoulders of the green pods were generally well rounded and smooth. ‘New Mexico No. 6’ produced a higher proportion of well-shaped pods than ‘Anaheim’. The pods were a uniform medium green in color. The fruit had thick walls and dried more slowly than those of ‘New Mexico No. 9’. ‘New Mexico No. 6’ ranged in pungency from 700 to 900 SHU—half that of ‘New Mexico No. 9’. Under average conditions, ‘New Mexico No. 6’ plants branched lower and did not grow as tall as the ‘New Mexico No. 9’.

In 1957, the ‘New Mexico No. 6’ was modified, made less pungent, and renamed ‘New Mexico 6-4’. It was released to a local green chile processor and is still a popular chile cultivar. ‘New Mexico 6-4’ matures earlier than ‘New Mexico No. 9’. The fruit are thick-fleshed, medium-green, very smooth with well-rounded shoulders, blunt-tipped, and suitable for canning.

Sandia (Sandia A)

Dr. Roy Harper released this cultivar in 1956. He originally called it ‘Sandia A’. In 1967 the New Mexico Crop Improvement Association met and decided to

Table 2. Seed sources of NMSU cultivars.

Enchanted Seeds
P.O. Box 6087
Las Cruces, NM 88006

New Mexico Crop Improvement Assoc.
Box 3CI
New Mexico State University
Las Cruces, NM 88003

Old Southwest Trading Co.
P.O. Box 7545
Albuquerque, NM 87194

Shepards Seeds
6116 Highway 9
Felton, CA 95018

Solar Dry Chile Products
P.O. Box 310
Salem, NM 87941

change the name to ‘Sandia’. The cultivar originated from a cross between ‘New Mexico No.9’ and a Californian ‘Anaheim’-type cultivar. It matured earlier than ‘New Mexico No. 9’. ‘Sandia’ produced long, medium-wide pods with medium-thick walls. Pods were straight with a slightly roughened surface, but devoid of severe folds that were commonly present on ‘Anaheim’. ‘Sandia’ pods were slightly flattened and had the greatest width toward the stem end. Its shoulders were rounded, and the pods tapered gradually to the blossom end. Mature ‘Sandia’ pods averaged 6.64 inches in length and 1.58 inches at their widest dimension. The pod’s flesh portion averaged 62.6 percent of the total weight of the dry red fruit. This was similar to ‘New Mexico No. 9’ and slightly less than the average for ‘Anaheim’. Green chile yields of ‘Sandia’ averaged 12,207 lbs/acre. Average yields were 33 percent higher than that of ‘New Mexico No. 9’, but less than ‘New Mexico No. 6’. ‘Sandia’ plants set fruit well on the lower nodes during high temperature periods. Plants were upright in growth habit, and averaged 24 to 30 inches in height. The cultivar, which is highly pungent with a rating of 1,500-2,000 SHU, is popular with home gardeners.

Rio Grande 21

A selection from a cross between ‘New Mexico 6’ and ‘Anaheim’ produced this cultivar. Dr. Harper released it in 1967 (Harper, 1967). The cultivar was similar in maturity to ‘New Mexico No. 9’. It produced large, smooth, green pods with thick flesh. Mature succulent pods were slightly flattened, elliptical in shape, with a slight longitudinal depression toward the blossom end. The stem end was cylindrical and without prominent shoulders. The blossom end tapered to a medium point that did not have prominent lobes. ‘Rio Grande 21’ mature pods averaged 6.70 inches in length

and 1.73 inches at its widest dimension. ‘Rio Grande 21’ averaged 8.5 mature green and 44.3 dry red pods per pound. The fleshy dry portion of the pod, exclusive of stem and seeds, averaged 66.2 percent of the dry red fruits total weight—higher than the average for either ‘Anaheim’ or ‘New Mexico No. 9’. The cultivar’s green chile yield averaged 15,436 lbs./acre. It was reported that ‘Rio Grande 21’ plants showed a slight tendency for poor fruit set during extremely high temperature periods. The lower nodes on some plants were devoid of fruit, and heavy fruit set on the upper nodes resulted in a spreading-type plant. Plants were normally 24 to 32 inches in height. Today, this cultivar is not grown widely in New Mexico.

NuMex Big Jim

Released by Dr. Nakayama in 1975, this cultivar is listed in the Guinness Book of Records as the world’s largest pepper (Nakayama, 1975). It produces long, thick, smooth, fleshy fruits. Mature green fruits are moderately flattened. The round-shouldered fruit taper to a hook at the apex. Mature green fruit average 7.68 inches in length and 1.89 inches in width. It has a slightly higher pungency than ‘New Mexico 6-4’, but not as much as ‘Rio Grande 21’ and ‘Sandia’. Pungency varied from plant to plant, with some plants producing mild pods and others producing hot pods. In addition to use as green chile, the fruit was adapted for dry red chile products. It is higher in extractable red color than ‘New Mexico 6-4’. Mature green fruit color ranges from light to medium green. Fruit set is more concentrated and is thought to be adapted to mechanical harvesting. Its average yield for green chile is 31,761 lbs/acre. Plant height averages 16 to 26 inches. Because of the large pods, the cultivar is a favorite of home gardeners and chefs for making chile rellenos.

Española Improved

Drs. Matta and Nakayama released this cultivar in 1984 (Matta and Nakayama, 1984). It resulted from a cross between ‘Sandia’ and a northern New Mexico strain of chile. It is an early maturing red chile cultivar (155 days). It was bred for earliness and adapted to the shorter growing season in northern-central New Mexico. It produces long, smooth, fleshy fruit with broad shoulder tapering to a sharp point at the apex. This shape is common among native pod shapes in the area. The dark green mature green fruit of ‘Española Improved’ average 6.18 in length and 1.23 in width. Relatively high green chile yields, fruit size, and marketable characteristics (long smooth pods) make it superior to native strains for use as green chile. Fruit are also adapted for dry red products. It has high pungency, 1,500 to 2,000 SHU, and a smooth, well-shaped pod that dries well. It

has been a popular cultivar for northern New Mexico and other areas needing an early maturing cultivar.

NuMex R Naky

Dr. Nakayama released this cultivar in 1985, and named it after his wife, Rose (Nakayama and Matta, 1985). In its pedigree it has 'Rio Grande 21', an early maturing native type, 'New Mexico 6-4', and Bulgarian paprika. It sets fruit under high temperature and low humidity. Its yield in Las Cruces was 30,930 lbs/acre, significantly better than 'New Mexico 6-4' (22,783 lbs/acre). When red color was measured using the American Spice Trade Assoc. (ASTA) method, it had a color rating of 188 ASTA, which was better than 'New Mexico 6-4' (127 ASTA). The pungency level was 260 to 760 SHU. The pod is slightly longer and wider than 'New Mexico 6-4'. 'NuMex R Naky' is used as a paprika cultivar in New Mexico, because of its low pungency. Paprika is defined in the United States as red pepper powder with undetectable or no pungency.

NuMex Sunset, NuMex Sunrise, and NuMex Eclipse

These cultivars were released in 1988 by Drs. Bosland, Iglesias, and Tanksley. The cultivars were unique in providing alternative mature fruit color in the New Mexican pod type (Bosland et al., 1990). 'NuMex Sunrise', 'NuMex Sunset' and 'NuMex Eclipse' have fruits that begin green, and then turn yellow, orange, and brown, respectively. They are used primarily as ornamental chiles. It has been a New Mexican tradition to harvest and string mature red chile into ristras. Ristras are hung near the entrance of homes as symbols of hospitality. Only chile types that dehydrate sufficiently to eliminate rotting can be used to make ristras. All three cultivars originated from a cross between 'Permagreen' and 'New Mexico 6-4'. They are similar in pungency to 'New Mexico 6-4'.

NuMex Centennial

This was the first ornamental chile released from NMSU intended for growing in small containers (Bosland & Iglesias, 1994). It was released in 1988 to celebrate NMSU's centennial celebration. Many seed companies offer seed of this cultivar, unfortunately, under different names. The compact plant was developed for the commercial greenhouse industry, but it is suitable for cultivation in a formal garden bed. 'NuMex Centennial' has purple flowers and purple foliage. The fruit are purple, then ripen to yellow, orange, and, finally, red. It was selected from a seed accession acquired from Chihuahua, Mexico.

NuMex Conquistador

This cultivar released in 1989 originated as a single plant selection from 'New Mexico 6-4', a pungent cultivar (Bosland et al., 1991). 'NuMex Conquistador', a non-pungent cultivar, is considered to be a paprika-type chile. The fruits have round shoulders, pointed tips, a smooth surface, thick flesh and two locules. Mean fruit length is 6.18 in and fruit weight is 2.76 oz. Plants have a single, strong, main stem with sturdy branches. Mean plant high is 29.5 in and plant width is 25.0 in, which is similar to that of 'New Mexico 6-4' and 'NuMex R Naky'. High-performance liquid chromatography analysis revealed that capsaicinoid levels are < 10 ppm, which is below the level that humans can taste. This cultivar is used as a paprika cultivar in the mature red stage. When harvested in the green stage, it is stuffed with jalapeño flavored cheese to produce chile rellenos with uniform pungency.

NuMex Joe E. Parker

The name of this cultivar was selected to honor Mr. Joe E. Parker of Las Cruces, New Mexico, a 1950 graduate of NMSU's College of Agriculture and Home Economics (Bosland, et al., 1993). Parker evaluated this specific selection. 'NuMex Joe E. Parker' originated as a single plant selection from a field planted to an open-pollinated population of 'New Mexico 6-4'. 'NuMex Joe E. Parker' was released in 1990 and is recommended for green and red chile production in southern New Mexico. This cultivar exhibits less variability for horticultural traits than 'New Mexico 6-4', the standard chile cultivar for southern New Mexico. 'NuMex Joe E. Parker' plants have single, strong, main stems and are uniformly branched providing foliage cover for sunscald protection and support for an excellent fruit set. Plant height and plant width are similar to 'New Mexico 6-4'. In addition, there are no significant differences between the two cultivars for pungency, fruit width, green fruit color, or days to maturity (149 days). The major features of this cultivar are red chile yield, fruit wall thickness, outstanding mature green chile yield, and red chile yield after a harvest of green fruits, which are all better than 'New Mexico 6-4'. The increased fruit set after the first green harvest results in a high "red after green" dry fruit yield, which gives the grower the choice of either continuous picking of a green crop or a green chile harvest followed by a later red fruit harvest. After peeling, a thicker fruit wall produces a better "pack-out" yield of green chile than thin-walled fruits. 'NuMex Joe E. Parker' has a high percentage (88%) of two locule fruit, a desirable characteristic for canning whole pods. An ASTA red color of 122 is similar to that of 'New Mexico 6-4'. Pungency is in the mild range at 811 SHU.

NuMex Sweet

A paprika-type chile that was released in 1990, 'NuMex Sweet' originated as a single plant selection from a field planted to an open-pollinated population of 'New Mexico 6-4', a pungent New Mexican-type chile cultivar (Bosland et al., 1993). A single plant was increased in the greenhouse after three generations of selfing and tested two years in field trials. This cultivar incorporates the plant and fruit characteristics determined by the paprika processors as an ideal paprika-type chile. 'NuMex Sweet' is a low-pungent, round-shouldered, pointed-tip, smooth-fruited, two-locule, high-colored, New Mexican-type chile. It exhibits less variability for horticultural traits than 'New Mexico 6-4' or 'NuMex R Naky'. The plant has a single, strong main stem and sturdy branches that provide foliage cover for sunscald protection and support for an excellent fruit set. Plant height and plant width of 24 and 30 inches, respectively, are similar to 'NuMex Conquistador' and 'NuMex R Naky'. Fruit thickness of 'NuMex Sweet' is less than 'NuMex Conquistador' or 'NuMex R Naky', permitting for greater "dry down" in the field. 'NuMex Sweet' pungency level is at 302 scoville heat units. The most remarkable characteristic of 'NuMex Sweet' is the outstanding yield of a single harvest of dry red at 7,781 lbs/acre. This yield is 40% and 51% greater than 'NuMex R Naky' and 'B-18', respectively, two standard New Mexico paprika cultivars.

NuMex Sunglo, NuMex Sunflare, NuMex Sunburst

These cultivars are used to provide a source for making mini-ristras and chile wreaths (Bosland, 1992). Immature fruit color is green, while mature fruit color is yellow, red, and orange for 'NuMex Sunglo', 'NuMex Sunflare', and 'NuMex Sunburst', respectively. They were developed at the request of New Mexico chile producers interested in making mini-ristras. A mini-ristra is made of chiles that are smaller than the usual New Mexican-type. The mini-ristra chiles are popular as tourist items because they are easier to transport than traditional New Mexican-type ristras. They were derived by pedigree breeding from a seed source from India and released in 1991. Individual plants were self-pollinated in the greenhouse for five generations, and then grown and evaluated in the field for two years. Bosland selected for traits deemed essential for ristra use. These included, but were not limited to, mature fruit color, non-corkiness, pointed tip, round shoulder, attached calyx, and appropriate fruit length and fruit width and a compact plant type. Two traits, pungency and flavor, were not evaluated. The fruits dry down on the plant under the environmental conditions of southern New Mexico. The plants have an upright, semi-

determinant and non-spreading growth habit. The fruits are pendulate with an attached calyx. Leaves are sufficiently dense on the plant frame to prevent solar injury to the pods. 'NuMex Sunglo', 'NuMex Sunflare', and 'NuMex Sunburst' have pod lengths of 3.26 in, 2.87 in, and 2.78 in, and pod widths of 0.54 in, 0.47 in, and 0.50 in, respectively. These fruit sizes are in the range of chile types known as de Arbol chile. All three cultivars are pungent, however, the level has not been measured.

NuMex Bailey Piquin

This cultivar released in 1991 was named in honor of Mr. Alton L. Bailey, NMSU Extension vegetable specialist emeritus, who helped evaluate this selection (Bosland and Iglesias, 1992). This machine-harvestable chile piquin originated as a single plant selection from an open-pollinated accession collected in the Caribbean area of Mexico. It has an upright, semi-determinate, and non-spreading plant growth habit, and produces fruits that are upright, and set high in the plant canopy. 'NuMex Bailey Piquin' is the first machine-harvestable piquin. It is homozygous for the deciduous fruit characteristic allowing fruit separation from the calyx at maturity. This trait allows the fruits to be shaken from the plant by a machine. A one-row harvester has been developed. It shakes the plant, and an attached conveyor belt carries the fruits to the rear of the machine for collection. Dried fruit powder has a pungency of 97,000 SHU. In trials at Las Cruces, dry fruit yield averaged 3,984 lbs/acre. Shrinkage of the fresh red and green fruit was 38%, meaning yield would decrease by 38% when dried.

NuMex Twilight

This ornamental chile has fruit color that ripens from purple to yellow to orange, and, lastly, red (Bosland & Iglesias, 1994). The various fruit colors enhance their value as commercial greenhouse potted plants. This cultivar is well accepted by the potted plant industry. Unlike standard chile cultivars, which have a dichotomous growth pattern, the polychotomous branching of the basal branches makes these ideal for container production. These compact plants were developed for growing in small containers, but are suitable for cultivation in a formal garden bed. 'NuMex Twilight' has a white flower and green leaves as compared to 'NuMex Centennial' with a purple flower and purple foliage. Also, the yellow fruit color stage is more pronounced in 'NuMex Twilight'. Both cultivars have erect flower pedicels at anthesis, and fruits are upright and smooth with a cup-shaped calyx. Flowers begin to open at 120 days after sowing, and fruits mature to red in an additional 90 days. The plants grow erect and have stems with no pubescence. Leaf texture is smooth. Pungency

level and flavor were not evaluated. Seed of 'NuMex Twilight' was originally from Jalisco, Mexico. The cultivar was derived from selection within the original population. 'NuMex Centennial' and 'NuMex Twilight' have been grown commercially in New Mexico as potted plants. Greenhouse growers have noted that along with the polychotomous growth habit, the four-colored fruits serve as important marketing traits. 'NuMex Twilight' also has become an important source of cucumber mosaic virus resistance for plant breeders.

NuMex Mirasol

The word mirasol in Spanish means looking at the sun. The chile type is called mirasol because the fruit are erect and point to the sun. 'NuMex Mirasol' was developed over six years using a pedigree breeding method that included hybridization and repeated single plant selections. Drs. Bosland and Gonzalez released the cultivar in 1993. It originated from a cross between 'La Blanca' and 'Santaka'. Selection was carried out for upright fruit, fruit size and color, the number of fruit per cluster, and the number of clusters per plant. At maturity, it is a multi-stemmed bush, 23.8 in tall and 15.3 in wide. The fruit is green when immature and turns red at maturity. The fruit are pungent. Each plant produced an average of 15.7 fruit clusters per plant, with 4.5 fruits per cluster. Fruits are 2.17 in long and 0.75 in wide. The fruits are conic shaped and have two locules. 'NuMex Mirasol' is used both as an ornamental on wreaths and a ground powder in cooking.

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