HortScience 45(11):1751–1752. 2010.

# 'NuMex Las Cruces' Cayenne Pepper

**Paul W. Bosland**[1]
*Department of Plant and Environmental Sciences, New Mexico State University, P.O. Box 30003, MSC 3Q, Las Cruces, NM 88003*

**Carl A. Strausbaugh**
*USDA-ARS-Northwest Irrigation and Soils Research Laboratory, 3793 North 3600 East, Kimberly, ID 83341*

*Additional index words. Capsicum annuum*, open-pollinated, curly top resistance

'NuMex Las Cruces' is a high-yielding, high-heat, cayenne pepper with a maturity similar to that of 'Large Red Thick', an early-maturing cayenne cultivar. In addition, it possesses resistance to curly top virus, having resistance to at least three *Curtovirus* species: Beet curly top virus (BCTV; formerly Cal/Logan strain), Beet severe curly top virus (BSCTV; formerly CFH strain), and Beet mild curly top virus (BMCTV; formerly Worland strain).

In the United States, cayenne pepper (*Capsicum annuum* L.) is used fresh, dried, or chopped fresh and mixed with ≈20% salt and then allowed to ferment (DeWitt and Bosland, 2009). The resulting "mash" is the key ingredient in Louisiana-style hot sauces. In the United States, New Mexico leads in commercial production of cayennes for hot sauces with two large processing facilities located in the Las Cruces, NM, area producing cayenne mash. Retail sales of hot sauces topped $2.0 billion in 2006 (Lazich, 2008). New Mexico growers produce only 50% of the total cayenne tonnage needed by the New Mexico mash processors, providing the New Mexican cayenne pepper industry room for expansion (A. Jurado, personal communication).

Since first reported in 1927, curly top epidemics have occurred sporadically in the southern New Mexico chile pepper-growing areas (Crawford, 1927). The curly top species are vectored by the beet leafhopper, *Circulifer tenellus* Baker, and virus outbreaks are erratic in New Mexico but are generally preceded by higher fall precipitation, which is associated with higher leafhopper populations. In four of the last 10 years, New Mexico chile pepper production sustained substantial losses as a result of curly top. The virus exists as a number of different species that can cause a variety of symptoms that can vary in severity depending on the host and/or cultivar involved (Strausbaugh et al., 2008). Creamer et al. (2005) identified the new curly top virus strains in chile pepper plants growing in southern New Mexico that differed from BCTV, BSCTV, and BMCTV. They found that ≈19% of symptomatic chile pepper plants had BMCTV, 48% had BSCTV, and 33% of the chile plants had a mixture of the two virus species. In 2010, again a year with high curly top incidence, chile pepper fields at the Leyendecker Plant Science Research Center, located 5 km south of Las Cruces, NM, had 30% curly top incidence (P. Bosland, personal observation). In cayennes, the disease causes leaves to turn yellow, twist, and curl upward. The leaves become thickened and stiff, causing reduced fruit quality and yield. There are no insecticides available for controlling the virus vector to limit curly top incidence. Several cultural practices can reduce infections, but host resistance has the smallest environmental footprint and is the most effective control for curly top.

## Origin

'NuMex Las Cruces' originated from a hybridization between two of the most prominent cultivars, Large Red Thick and Mesilla, grown in southern New Mexico. 'Large Red Thick' is an open-pollinated cultivar that in southern New Mexico is favored because of its early maturity date (≈70 d) and has large fruits. 'Mesilla' is an $F_1$ hybrid that has high yield but is late-maturing (≈90 d). The two parents were hybridized to combine the earliness and large fruits of 'Large Red Thick' with the high yield of 'Mesilla'. At hybridization, selecting for curly top resistance was not planned. Beginning with the $F_2$ progeny, single plant selection using phenotypic recurrent selection with pedigree breeding for earliness, desirable fruit shape, and size, yield, and ease of destemming was accomplished. After five generations of selfing, seed from the single plant selection, New Mexico Breeding Line 03C477-4, was increased under insect-proof cages (Bosland, 1993). This increased seed became 'NuMex Las Cruces' and was used in subsequent field plot trials. In 2005, a year with high curly top incidence in northern Mexico and southern New Mexico, including the Las Cruces area (Velasquez-Valle, et al., 2008), it was serendipitous that in the replicated yield trial plots, 'NuMex Las Cruces' was observed to have significantly less curly top symptoms as compared with the other cultivars and breeding lines in the trial. Therefore, 'NuMex Las Cruces' was advanced as not only a high-yielding cultivar, but as a curly top-resistant cayenne cultivar.

## Description and Performance

'NuMex Las Cruces' is a high-yielding, high-heat cayenne pepper with a maturity similar to that of 'Large Red Thick', an early-maturing cayenne cultivar (Fig. 1). Replicated trials were conducted at the Leyendecker Plant Science Research Center 5 km south of Las Cruces, NM. Data for fruit size and yield were based on a randomized complete block design with four replications containing up to 30 plants each over 3 years. The plants were grown using standard growing practices commonly found in southern New Mexico (Bosland and Walker, 2005). The plots were harvest three times. Table 1 shows the yields for each harvest with the percentage that the yield represented. To calculate means for fruit quality traits, 10 randomly selected fruit from each plot were used. In replicated trials in 2005, 2006, and 2007, 'NuMex Las Cruces' fruit length (17.2 cm) was not significantly different from 'Large Red Thick' and 'Mesilla' (data not shown). Fruit width of 'NuMex Las Cruces' is most similar to 'Mesilla' (2.6 cm), and both are wider than 'Large Red Thick' (Table 1). Individual pod weight for 'NuMex Las Cruces' at 25.4 g is between 'Large Red Thick' and 'Mesilla' (Table 1). Hand removal of the pedicel and calyx was rated "easy" (personal observation), and ripe mature pod color of 'NuMex Las Cruces' was scarlet (Munsell color rating: 7.5R 3/12). In limited field testing, 'NuMex Las Cruces' was conducive to hand or machine-harvesting (personal observation).

The heat level of 'NuMex Las Cruces' was determined by a reverse-phase high-performance liquid chromatography system with fluorescence detectors (Collins et al., 1995). 'NuMex Las Cruces' at 17,400 Scoville Heat Units (SHU) is significantly hotter than 'Large Red Thick' (12,900 SHU) or 'Mesilla' (13,200 SHU). 'NuMex Las Cruces' is well suited for the cayenne mash industry for hot sauce production as a result of its high heat level.

'NuMex Las Cruces' average yield over the 3-year period was 50% higher than 'Large Red Thick', the standard open-pollinated cultivar grown in the southern New Mexico production area. 'NuMex Las Cruces' yielded as well as the high-yielding $F_1$ hybrid 'Mesilla' (Table 1).

In 2010, another year of high curly top virus incidence in the Las Cruces, NM area, 'NuMex Las Cruces' had 67% less curly top incidence than 'Large Red Thick' and 75% less curly top incidence than 'Mesilla'. Besides field observations of curly top virus resistance, 'NuMex Las Cruces' was tested under controlled conditions at the USDA-ARS-Northwest Irrigation and Soils Research Laboratory. Nine plants of 'NuMex Las

Received for publication 26 July 2010. Accepted for publication 19 Aug. 2010.
A contribution of the New Mexico Agricultural Experiment Station, New Mexico State University, Las Cruces, NM.
We thank Drs. Jit Baral and Yayeh Zewdie for there assistance in developing this cultivar.
[1]To whom reprint requests should be addressed; e-mail pbosland@nmsu.edu.

Fig. 1. Fruits of 'NuMex Las Cruces'.

Table 1. A 3-year mean for yield, fruit heat, fruit weight, and fruit width of 'Large Red Thick', 'Mesilla', and 'NuMex Las Cruces' at the Leyendecker Plant Science Research Center.

| | Yield[z] (MT/ha) | | | | Fruit width[y] (cm) | Fruit wt[y] (g) | Heat[x] (SHU) |
|---|---|---|---|---|---|---|---|
| | First (% of total) | Second | Third | Total | | | |
| NuMex Las Cruces | 9.7 a[w] (27%)[v] | 17.5 a (49%) | 8.6 a (24%) | 35.8 a | 2.36 a | 25.4 ab | 17,400 a |
| Large Red Thick | 7.0 b (29%) | 11.6 b (48%) | 5.6 b (23%) | 24.2 b | 2.01 b | 19.8 b | 12,900 b |
| Mesilla | 5.2 b (15%) | 19.1 a (55%) | 10.4 a (30%) | 34.7 a | 2.57 a | 30.6 a | 13,200 b |

[z]Yield is fresh weight less the weight of diseased, immature, or undesirable fruits.
[y]Fruit width and fruit weight was the average of 10 fruits/replication.
[x]Scoville Heat Units (SHU), 1 mg·kg$^{-1}$ capsaicinoid = 16 SHU per dry weight basis.
[w]Mean separation in columns by least significant difference test at $P \leq 0.01$.
[v]The percentages are the percent that each harvest contributed to the total yield. 'NuMex Las Cruces' and 'Large Red Thick' had greater percentages in the first harvest indicating earlier maturity as compared with 'Mesilla'.

Cruces' (resistant) and 'Large Red Thick' (susceptible) were inoculated with the three most common *Curtovirus* species (BCTV, BSCTV, and BMCTV) by placing six viruliferous beet leafhoppers in a clip cage per plant. A non-inoculated plant served as the control. The plants were evaluated 3 months later for the presence of *Curtovirus* species by polymerase chain reaction (PCR) amplification of the replication-associated protein gene using species-specific primers and methods described previously (Strausbaugh et al., 2008). For samples that did not produce an amplicon using the species-specific primers, we developed an internal standard to prove inhibitors of PCR were not present as described previously (Strausbaugh et al., 2008). No detectable virus was found in the leaves of the inoculated plants of 'NuMex Las Cruces' and the non-inoculated checks, whereas the inoculated 'Large Red Thick' had BSCTV and BMCTV present. The inheritance of curly top virus resistance within 'NuMex Las Cruces' is not known. The open-pollinated nature of 'NuMex Las Cruces' may explain why the cultivar is not 100% resistant, or alternatively, a situation similar to the *VAT* gene in melon (*Cucumis melo* L.) may be occurring (Klingler et al., 2001). The *VAT* gene, a single dominant gene, produces both an antixenosis and an antibiosis response in the melon plant. Genetic studies to determine the inheritance of curly top resistance in 'NuMex Las Cruces' are underway and will be reported later.

## Availability

Commercial seed amounts of 'NuMex Las Cruces' can be obtained by contacting Jurado Inc., Las Cruces, NM 88007; (575) 525-0034. A seed sample (30 seeds) is available from the Chile Pepper Institute, New Mexico State University, P.O. Box 30003, MSC 3Q, Las Cruces, NM 88003. The Chile Pepper Institute can be contacted at http://www.chilepepperinstitute.org, hotmail@nmsu.edu, or phone: (575) 646-3028.

## Literature Cited


Bosland, P.W. 1993. An effective plant field-cage to increase the production of genetically pure chile (*Capsicum* spp.) seed. HortScience 28: 1053.

Bosland, P.W. and S. Walker. 2005. Growing chiles in New Mexico. Cooperative Ext. Guide H-230.

Collins, M.D., L. Mayer-Wasmund, and P.W. Bosland. 1995. Improved method for quantifying capsaicinoids in *Capsicum* using high-performance liquid chromatography. HortScience 30:137–139.

Crawford, R.F. 1927. Curly top in New Mexico. U.S.D.A. Off. Rec. 6:8.

Creamer, R., H. Hubble, and A. Lewis. 2005. Curtovirus infection of chile pepper in New Mexico. Plant Dis. 89:480–486.

DeWitt, D. and P.W. Bosland. 2009. The complete chile pepper book: A gardener's guide to choosing, growing, preserving, and cooking. Timber Press, Portland, OR.

Klingler, J., I. Kovalski, L. Silberstein, G.A. Thompson, and R. Perl-Treves. 2001. Mapping of cotton-melon aphid resistance in melon. J. Amer. Soc. Hort. Sci. 126:56–63.

Lazich, R.S. (ed.). 2008. Retail sauce sales. Market Share Reporter. The Gale Group, Farmington Hills, MI.

Strausbaugh, C.A., W.M. Wintermantel, A.M. Gillen, and I.A. Eujayl. 2008. Curly top survey in the western United States. Phytopathology 98:1212–1217.

Velasquez-Valle, R., M.M. Medina-Aguilar, and R. Creamer. 2008. First report of beet mild curly top virus infection of chile pepper in north-central Mexico. Plant Dis. 92:650 (Abstract).