

'NuMex Trick-or-Treat', a No-heat Habanero Pepper

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The New Mexico State University Agricultural Experiment Station announces the release of the cultivar NuMex Trick-or-Treat, an open-pollinated, no-heat *Capsicum chinense* Jacq. In tropical regions, *C. chinense* is very popular, and in the Caribbean, it is the most common chile pepper species grown. This species contains some of the hottest pod types found in the world (Bosland and Baral, 2007; Bosland et al., 2012). Habanero peppers are increasing in popularity with the general public and the U.S. food processing industry not only for their heat levels but also for their unique aroma and flavor (Rodriguez-Burrueto et al., 2010).

One of the best known pod types/cultigens in *C. chinense* is the "habanero" named after the city of Havana, Cuba. Habanero types possess an orange lantern-shaped pod, and are grown extensively in the Yucatan of Mexico (Canto-Flick et al., 2008). Today, the largest producer is Mexico's Yucatan Peninsula (Bosland and Votava, 2012). While Mexico is the largest consumer of this spicy ingredient, its flavor and aroma have become increasingly popular all over the world. Mild or "low-heat" *C. chinense* cultivars have been released (Crosby et al., 2005; Votava and Bosland, 2004), but none are completely without heat.

Capsaicinoids are the determinants of chile pepper heat/pungency. They are specialized secondary metabolites found only in *Capsicum* species. In *Capsicum*, the heat level is both a qualitative and a quantitative trait. The ability for the fruit to be hot or not can be inherited as a single-dominant gene, *CS/Pun1* (*Capsaicin Synthase/Pungency*) located on chromosome 2, which condenses vanillylamine from the phenylpropanoid pathway with 8-methyl 6-nonenoyl-CoA from the branched-chain fatty acid pathway (Ogawa et al., 2015). A second gene for lack of heat in the fruit is caused by the absence of vesicles on the placental tissue, *Loss of Vesicles* (*lov*) (Votava and Bosland, 2002). No studies on the inheritance of the *lov* gene have been done, but appears from anecdotal observations to be a quantitative gene. The

lack of heat in the fruit of 'NuMex Trick-or-Treat' is associated with the *lov* gene.

The cultivar name, NuMex Trick-or-Treat, is a play on words because the 'Orange Habanero' from the Yucatan is very hot with a heat level of greater than 150,000 Scoville Heat Units (SHU), while 'NuMex Trick-or-Treat' has no heat, i.e., zero SHU. 'NuMex Trick-or-Treat' has an orange lantern-shaped pod reminiscent of the 'Orange Habanero' (Fig. 1).

Origin

'NuMex Trick-or-Treat' originated from the hybridization between 'Orange Habanero' (Siegers Seeds, Holland, MI) and a no-heat *C. chinense* accession (NMCA 30036) from Colombia. The accession, NMCA 30036, matures to a red color and has a lantern-shaped pod reminiscent of the 'Orange Habanero'. A pedigree breeding method that included a backcross to 'Orange Habanero', and four generations of single-plant selection from the BC₁F₂ generation was accomplished (Fig. 2) in a greenhouse.



Fig. 1. Mature fruits of 'NuMex Trick-or-Treat'.

During each generation, selection for horticultural traits that were similar to the phenotype 'Orange Habanero' was accomplished. Also fruit were sampled organoleptic for the absence of heat. Seed from the single-plant selection, NM Breeding Line 05C607-2, was increased under insect-proof cages (Bosland, 1993). The bulk seed increase of 06C1323 became 'NuMex Trick-or-Treat' and was used in subsequent field plot trials.

Description and Performance

Replicated field plot trials in 2008–12 were conducted at the Leyendecker Plant Science Research Center, 5 km south of Las Cruces, NM. Data for fruit size and yield were from a randomized complete block design with four replications containing up to 30 plants each over 5 years. The means between the two cultivars were compared using Student's *t* test (*P* ≤ 0.05). All statistical analyses were performed in SAS (Version 9.3; SAS Institute, Cary, NC). The plants were grown using standard production practices commonly used in southern New Mexico (Bosland and Walker, 2014). Table 1 shows the fruit quality traits between 'Orange Habanero' and 'NuMex Trick-or-Treat'. To calculate means for fruit quality traits, plots were harvested once and 10 randomly selected fruit from each replication were used. In replicated trials, 'NuMex Trick-or-Treat' did not differ significantly from 'Orange Habanero' in plant height (40.0 cm) nor plant width (90.7 cm). The yield of 'NuMex Trick-or-Treat' averaged 7780 kg·ha⁻¹ (6940 lbs/acre), and was not significantly different from 'Orange Habanero' yield of 7704 kg·ha⁻¹ (6872 lbs/acre). Small differences in fruit width, fruit length, and wall thickness were observed between 'NuMex Trick-or-Treat' and 'Orange Habanero' (Table 1). The pods of both cultivars matured to similar orange colors; NuMex Trick-or-Treat (Munsell color rating: 5/14–2.5YR) and Orange Habanero (Munsell color rating: 6/14–2.5YR) (Fig. 1) (Munsell Book of Color, 1980).

Heat level was determined by an organoleptic test and by a reverse-phase high-performance liquid chromatography (HPLC) system with fluorescence detectors (Collins et al., 1995). Neither discernible heat was detected in 'NuMex Trick-or-Treat' by the organoleptic test nor by the HPLC method. The average heat level for the 'Orange Habanero' was ≈300,000 SHU on a dry weight basis (Table 1). The flavor and aroma of 'NuMex Trick-or-Treat' is equal to, or better than, the 'Orange Habanero' (personal observation).

(Orange Habanero X No-heat *C. chinense* accession NMCA 30036) → F₁ X Orange

Habanero → BC₁F₂ 02C2334-5 selfed → 03C1332-3 selfed → 04C1338-1 selfed →

05C607-2 selfed → 06C1323 bulk (NuMex Trick-or-Treat).

Fig. 2. 'NuMex Trick-or-Treat' pedigree.

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Table 1. Fruit characteristics for 'NuMex Trick-or-Treat' and 'Orange Habanero' compared over 5 years (2008–12).

	Fruit width ^z cm (inches)	Fruit length cm (inches)	Fruit wall thickness (mm)	Heat ^y (SHU)
NuMex Trick or Treat	3.10 (1.22)	3.92 (1.54)	2.19	0
Orange Habanero	2.64 (1.04)	4.18 (1.65)	1.94	301,452
P value of t test ^x	0.0001	0.0334	0.0369	

^xFruit length, fruit width, and wall thickness was the average of 10 fruits/replication.

^yScoville Heat Units (SHU), 1 µg·g⁻¹ capsaicinoid = 16 SHU per dry weight basis.

^xMean separation in columns by Student's *t* test at *P* ≤ 0.05.

Availability

'NuMex Trick-or-Treat' seed 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 www.chilepepperinstitute.org, cpi@nmsu.edu, or phone: (575) 646–3028.

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