NuMex NoBasco: A No-heat Tabasco-type Chile Pepper

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The New Mexico State University chile pepper breeding program has announced the release of the cultivar NuMex NoBasco, an open-pollinated, no-heat *Capsicum frutescens*. Compared with *C. annuum* or *C. chinense*, there are relatively few named cultivars of *C. frutescens*. The most notable *C. frutescens* cultivar is Tabasco, with its origins in Mexico; it was named after the Mexican state of Tabasco (Greenleaf, 1975). It is best known through its use in Tabasco hot sauce, which is McIlhenny Company's exclusive trademark for the hot sauce made from 'Tabasco' red ripe fruit. However, 'Tabasco' pepper can be used in products like pickled green-yellow immature fruit. A second notable *C. frutescens* cultivar is Greenleaf Tabasco. 'Greenleaf Tabasco' was bred to have resistance to *Tobacco etch virus* (TEV) (Greenleaf et al., 1970). 'Greenleaf Tabasco' originated from an inter-specific hybridization of *C. frutescens* with two *C. chinense* accessions, followed by backcrossing to 'Tabasco'.

The cultivar name, NuMex NoBasco, is a pun because the 'Tabasco' is hot, with a heat level of $\approx 30,000$ Scoville Heat Units (SHU), whereas 'NuMex NoBasco' has no heat (i.e., 0 SHU). 'NuMex NoBasco' has a similar fruit color, shape, and size as 'Tabasco' (Fig. 1).

In the United States, hot sauces are a \$1.3 billion market (Meyer, 2017). The specific type of chile pepper used to make the hot sauce provides a unique flavor profile and heat sensation (Guzman and Bosland, 2018). Low or no-heat chile peppers are indispensable to commercial salsa and hot sauce makers who have used them for years to reduce the heat in mass-produced salsas and hot sauces. To satisfy that need, the New Mexico State University chile pepper breeding program released 'NuMex Primavera', a low-heat jalapeno (Bosland and Votava, 1998), and 'NuMex Trick-or-Treat', a no-heat habanero (Bosland and Coon, 2015).

The growing popularity of the heatless habanero reflects the expanding consumer preference for diverse pepper flavor profiles. Fruit retain the fruity and floral flavor without the heat.

Origin

'NuMex NoBasco' originated from a hybridization between 'Tabasco' and a no-heat *C. frutescens* accession from Colombia (CATIE 9838). Immature CATIE 9838 fruit is greenish; it is red at maturity. 'Tabasco' has yellow immature fruit that mature to red. 'Tabasco' has the "S" gene for deciduous ripe fruit (Smith, 1951), whereas 'NuMex NoBasco' has the "s" allele. The "s" allele is a trait associated with domestication. Most types (e.g., jalapeno, bell pepper, New Mexican, Hungarian wax, etc.) have the "s" allele; therefore, harvesting with the "s" allele is common. A pedigree breeding method that included several backcrosses to 'Tabasco' followed by seven generations of single-plant-selfed selection produced New Mexico breeding line 16C903 (Fig. 2). During each generation, selection for horticultural traits that were similar to the phenotype of the 'Tabasco' was accomplished. New Mexico Breeding Line 16C903 was increased in an insect-proof greenhouse at the Fabian Garcia Science Center in Las Cruces, NM, and released as 'NuMex NoBasco'.

Replicated field plot trials in 2015–17 were conducted at the Leyendecker Plant Science Research Center, which is 5 km south of Las Cruces, NM. Data regarding fruit size and yield were obtained from a randomized complete block design with four replications containing five plants each over 3 years. The means between the cultivars observed were compared using Duncan's multiple range test at $P \leq 0.05$. All statistical analyses were performed using SAS (PROC FREQ; SAS version 14.1; SAS Institute, Cary, NC). The plants were grown using standard production practices commonly used in southern New Mexico (Bosland and Walker, 2014). Plant height of 'NuMex NoBasco' was significantly shorter than that of 'Tabasco' and CATIE 9838, whereas the plant width of 'NuMex NoBasco' was the same as that of CATIE 9838, and both were narrower than 'Tabasco' (Table 1). Fruit width and fruit length were the average of 10 fruit per replication with four replications per year over 3 years. Fruit of 'NuMex NoBasco' are ≈ 4 cm long by 1 cm wide with yellow (Munsell color rating, 5Y 8/6) immature fruit, and red mature fruit (Munsell color rating, 7.5R 3/10), with no heat (Table 1). 'Tabasco' fruit length and width are similar to those of 'NuMex NoBasco', with yellow (Munsell color rating, 10Y 8/6), and red mature fruit (Munsell color rating, 7.5R 3/10). CATIE 9838 fruit length is 3.9 cm, and the fruit width is 0.98 cm. CATIE 9838 immature fruit are green (Munsell color rating, 5GY 8/6) and mature fruit are red with a Munsell color rating of 7.5R 3/12 (Xrite Inc., 1980). 'NuMex NoBasco' fruit, like 'Tabasco' fruit, have the dominant upright trait when mature rather than the pendant fruit characteristic of CATIE 9838 (Wang and Bosland, 2006). At the Leyendecker Plant Science Research Center, total yield was all harvested fruit and the average of five plants per replication with four replications per year. The average yield of 'NuMex

Fig. 1. Immature and mature fruit of 'NuMex NoBasco' chile pepper fruit.

'Tabasco' X *C. frutescens* accession (CATIE 9838) → F₁ X 'Tabasco' → F₂ single plant selfed selection 02C2371-9 → 'Tabasco' X 02C2371-9 → 04C 74 (F₁) X 'Tabasco' → F₂ single plant selfed selection 07C356-3 → 07C356-3 X 'Tabasco' → F₂ single plant selfed selection (11C1525-1) → single plant selfed selection (13C125-1) → 16C903 ('NuMex NoBasco').

Fig. 2. 'NuMex NoBasco' chile pepper pedigree.

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Table 1. Fruit characteristics for ‘NuMex NoBasco’, ‘Tabasco’, and CATIE 9838 chile peppers compared over 3 years.

Accession	Total yield (kg) ^z	Sorted yield (kg) ^y	Fruit width (cm) ^x	Fruit length (cm) ^x	Plant ht (cm) ^w	Plant width (cm) ^w	Heat level (SHU) ^v
‘NuMex NoBasco’	2.6 a ^a	1.5 a	1.20 a	4.3 a	76.1 a	55.2 a	0
‘Tabasco’	2.4 a	1.7 a	1.16 a	4.1 a	92.3 b	59.3 b	30,000
CATIE 9838	4.1 b	2.4 b	0.98 b	3.9 b	98.5 b	51.3 a	0

^zTotal yield is all harvested fruit and the average of five plants per replication; there were four replications per year.

^ySorted yield is ripe fruit without blemishes or disease and the average of five plants per replication; there were four replications per year.

^xFruit width and fruit length were the average of 10 fruit per replication.

^wPlant width and height are the average of five plants per replication; there were four replications per year.

^vScoville Heat Units: 1 µg·g⁻¹ capsaicinoid = 16 SHU per dry weight basis.

^aMean separation in columns by Duncan’s multiple range test at $P \leq 0.05$. Means with the same letter are not different.

Nobasco’ and of ‘Tabasco’ were not significantly different, whereas CATIE 9838 had a higher yield.

The inheritance of the no-heat trait was studied and tested as a single recessive gene, as is found in *C. annuum* (e.g., bell peppers). A chi-square analysis was conducted to test for goodness-of-fit to theoretical ratios in the F₂ progeny (PROC FREQ; SAS version 14.1). The F₂ population fit an expected 3 (hot):1 (not hot) ratio ($\chi^2 = 0.2015$; $P = 0.653$). The results support the hypothesis that no heat fruit is inherited as a single recessive trait.

The heat level was determined by an organoleptic test and a reverse-phase high-performance liquid chromatography system with fluorescence detectors (Collins et al., 1995). No discernible heat was detected in ‘NuMex NoBasco’ or CATIE 9838 by the organoleptic test or the high-performance liquid chromatography method. The average heat level for ‘Tabasco’ was $\approx 30,000$ SHU on a dry weight basis (Table 1). The flavor and aroma of ‘NuMex NoBasco’ are equal to

or better than those of ‘Tabasco’ (personal observation).

Availability

‘NuMex NoBasco’ 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 (website), cpi@nmsu.edu (e-mail), or 575-646-3028 (phone).

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