'NuMex R. Vince Hernandez' Paprika-type Chile

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In New Mexico, paprika is the term describing New Mexico-type red chile cultivars that are high in extractable pigment (greater than 180) American Spice Trade Association (ASTA) units and low in heat (pungency) [less than 700 Scoville heat units (SHU)] (Bosland and Walker, 2014). Cultivars with thinner pericarp (fruit walls) are valued by the red chile industry in the southwest United States, because the vast majority of the crop is dehydrated and processed into flakes or powder, and the thinner pericarp allows for more efficient drying of the chile. The red chile industry monitors drying efficiency as “shrink,” which is a measure of fresh harvested red weight divided by the dried red weight. Lower shrink values indicate higher drying efficiency for a chile cultivar. The shrink value is impacted by the harvest date and the cultivar (Walker, 2009).

'New Mexico 6-4' was released in 1958 and quickly gained popularity for its excellent flavor and usefulness as a dual-purpose chile pepper cultivar. The dual purpose label indicates that high-quality green and, later in the season, red chile fruit can be harvested from the plants. At the time of release, 'New Mexico 6-4' exhibited a heat level range of 300–500 SHU; however, analysis in recent years indicates that the heat level has drifted higher. By 2012, 'New Mexico 6-4' displayed an average of 1786 SHU (Bosland, 2012; Coon et al., 2011). Chile peppers readily self-pollinate, and they also are easily cross-pollinated by

insects. Cross-pollination events, and possible seed intermingling, over the years likely contributed to variability in fruit quality currently seen in 'New Mexico 6-4'. Although New Mexico 6-4 was the first cultivar widely used for dehydration by red chile processors in the southwest United States, larger red chile processors have discontinued the use of the cultivar because of its high heat level and less efficient drying (higher relative shrink) compared with newer, proprietary paprika cultivars. 'LB-25' (Biad Chili Co., Leasburg, NM) is currently the predominant commercially available paprika cultivar grown in New Mexico. Although this cultivar exhibits high extractable pigment and low heat level, industry representatives have expressed the need for a paprika cultivar that provides higher dried red yield compared with 'LB-25'.

'NuMex R. Vince Hernandez' (Fig. 1) originated from a cross between two breeding lines, 189W05 and 25W05. The breeding line 189W05 was developed from a cross of 'Sonora' (Monsanto Vegetable Seeds, Woodland, CA), an open-pollinated cultivar commonly grown for paprika processing in 2005, and an unidentified chile pepper line sourced from Zimbabwe, Africa. Unfortunately, the pedigree and local variety name of the Zimbabwe line are unknown. Line 25W05 was derived from a 'New Mexico 6-4' single plant selection in a commercial field in Columbus, NM. In 2005, 189W05 (maternal parent) was crossed using controlled pollination in the greenhouse with 25W05 (paternal parent). F₁ and F₂ seed was planted in the greenhouse and self-pollinated seed was collected. F₃ seed was planted in the field at New Mexico State University's Leyendecker Plant Science Research Center during the 2007 season. Single plant selections were made following field evaluation for high yield and efficient fruit drying, plant vigor, excellent NuMex-type chile pepper flavor, and low heat being the key criteria. Selected plants were dug up from the field at the end of the season and potted in the greenhouse. Self-pollinated seed was collected from the single plant selections, and each line was planted in the field in 2008 for further evaluation. In 2008, a single plant selection from this population, 6W08-10, was noted as possessing excellent paprika characteristics. The

Fig. 1. Dried fruits of 'NuMex R. Vince Hernandez'.

(189W05 X 25W05-3) → 141W06 → 3W07-6 → 6W08-10 → 12W09-1 → 3W10 → 5W11 → 28W12 → 'NuMex R. Vince Hernandez'

Fig. 2. Pedigree of 'NuMex R. Vince Hernandez'.

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This cultivar is named in honor of Vince Hernandez, the field manager and chile breeder for Biad Chili Co. and a 1966 agronomy graduate from New Mexico State University. Hernandez has been a valued research collaborator with the red chile and paprika breeding program at NMSU, and contributed to the selection of the parent material of this new release.

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Table 1. Dried red fruit yield, shrink, extractable pigment, and heat level for 'NuMex Vince Hernandez' and 'LB-25' compared over 2 years in two locations.

Cultivar	Yield ^z (kg·ha ⁻¹)	Shrink ^y	Extractable pigment ^x (ASTA)	Heat ^w (SHU)
	Trial 1 (16 Oct. 2012 harvest date) ^v			
NuMex R. Vince Hernandez	3,164	2.90	233	474
LB-25	1,631	3.69	331	171
	+	NS	NS	NS
	Trial 2 (18 Oct. 2012 harvest date)			
NuMex R. Vince Hernandez	2,251	4.33	245	145
LB-25	2,071	4.37	209	526
	NS	NS	NS	NS
	Trial 3 (23 Oct. 2013 harvest date)			
NuMex R. Vince Hernandez	5,121	2.83	219	488
LB-25	3,433	3.70	285	284
	+	+	+	NS
	Trial 4 (20 Nov. 2013 harvest date)			
NuMex R. Vince Hernandez	6,202	2.42	308	NT ^u
LB-25	3,817	2.66	370	NT
	+	NS	NS	NT

^zYield is the dried red fruit yield less the weight of green fruit, diseased, or undesirable fruits.^yShrink is the weight of the freshly harvested red fruit divided by the dried red fruit weight (fresh red kg/dry red kg).^xExtractable pigment [American Spice Trade Association (ASTA)] was measured through the ASTA method 20.1.^wScoville heat units (SHU), 1 mg·kg⁻¹ capsaicinoid = 16 SHU per dry weight basis.^vFurrow irrigation was used for trials 1, 2, and 3; drip irrigation was used for trial 4. Trials 1, 3, and 4 were conducted at the Leyendecker Plant Science Research Center near Las Cruces, NM; trial 2 was conducted at the Agricultural Science Center in Los Lunas, NM.^uNot tested.NS = nonsignificant at $P = 0.05$; + = significant at $P = 0.05$ by Duncan's multiple range test.

plant was dug up and grown in the greenhouse to generate self-pollinated seed. The self-pollinated seed generated from 6W08-10 was planted in the field during the 2009 season. An additional round of single plant selections was made from this population, with 12W09-1 being the precursor to 'NuMex R. Vince Hernandez'. Self-pollinated seed from 12W09-1 was grown in the field using insect-excluding seed increase cages (Bosland, 1993) during the 2010 (3W10) and 2011 (5W11) seasons at the Leyendecker Plant Science Research Center (Fig. 2). Although 'NuMex R. Vince Hernandez' has not been screened for specific disease tolerance, sick and off-type plants were rogued from the populations during the selection process so that only vigorous, well-adapted selections were brought forward during the development process.

Evaluation Procedures

'NuMex R. Vince Hernandez' was evaluated in replicated field trials in two locations, the Leyendecker Plant Science Research Center, located ≈5 miles south of Las Cruces in southern New Mexico, and at the Los Lunas Plant Science Research Center, located ≈24 miles south of Albuquerque in central New Mexico. All of the test plots were grown in furrow-irrigated fields with the exception of one set of the 2013 Leyendecker plots that were grown using subsurface drip irrigation. LB-25, the current standard paprika cultivar in the southwest United States, was grown as comparison cultivar in both years and all locations. Trials were arranged in randomized complete block designs with three replications at both sites in 2012, six replications in the 2013 furrow-irrigated field, and four replications in the 2013 drip-irrigated field. Transplants were planted in single rows with 25 cm between plants and

102-cm row spacing at the Leyendecker locations, and 76-cm row spacing at the Los Lunas location. The fields were fertilized, irrigated, and maintained according to standard practices for paprika production in New Mexico (Walker, 2009). Plots were harvested at the end of the season before the first killing frost. All red fruit were harvested from the inner 6 m of the 9-m plots and a fresh red fruit weight was obtained. The red fruit were placed in dryers maintained at 50 °C until constant fruit weight was attained, and a dry red fruit weight was measured. A subsample of the dried red chile (with seeds included) from each plot was ground, and laboratory analyses were conducted to determine extractable pigment and heat level on the powders. Heat level was measured using the protocol developed at New Mexico State University that employs a reverse-phase high-performance liquid chromatography system with fluorescence detectors (Collins et al., 1995). Extractable pigment was determined using the ASTA method 20.1 (ASTA, 1985), which is a measure of total pigment content in a chile sample and is expressed in ASTA units.

'NuMex R. Vince Hernandez' provided significantly greater dry red yield compared with 'LB-25' in the Leyendecker replicated trials, and exhibited improved drying efficiency in the furrow-irrigated plots in 2013. Heat level was not significantly different from 'LB-25', and the average heat level for 'NuMex R. Vince Hernandez' was less than the maximum of 700 SHU accepted by the chile industry for a paprika-type chile pepper in each trial tested. Average extractable pigment for 'NuMex R. Vince Hernandez' was 233, 245, 219, and 308 ASTA in the respective trials. Although extractable pigment measurement was significantly lower than those of 'LB-25' in the Leyendecker, furrow-irrigated

2013 trial, all values were greater than 180 ASTA that is the minimum value indicative of higher paprika quality (Table 1).

Favorable flavor evaluation reported for 'NuMex R. Vince Hernandez' was determined by taste tests of the fresh fruit and ground powder by knowledgeable program personnel and visiting New Mexico Chile Commissioners.

Availability

'NuMex R. Vince Hernandez' is being offered for exclusive release. Contact Stephanie J. Walker, Department of Extension Plant Sciences, MSC 3AE, Box 30003, New Mexico State University, Las Cruces, NM 88003.

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