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‘NuMex Sandia Select’ New Mexican Chile Pepper

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Heirloom vegetables are becoming more appreciated by the public for their unique colors, shapes, and superior flavor unavailable in modern cultivars (Klee, 2010). The increased popularity of heirloom vegetables began in the late 20th century and has been attributed to the return to the organic, local, and “authentic” foods movement (Weaver, 2000). However, experimenting with and cultivating heirlooms has been a popular pastime for centuries. Even Thomas Jefferson grew heirlooms at his Monticello plantation. In his 1000-foot long garden terrace, Jefferson tended to a number of heirloom cultivars, taking meticulous notes on the growth and cultivation of each species in his *Garden Kalendar* (Hatch, 2012). Heirloom cultivars are ideal for home gardeners and can be used in the commercial processing industry to improve sales.

A potential problem with heirloom varieties is that the consumer and the processing industry needs and desires can change through time (McLaughlin, 2010). Some heirlooms have fallen from favor because they are not widely adapted or they fail to satisfy commercial production standards or mainstream tastes (Gettle et al., 2011). These factors limit the ability of the old cultivars to compete against newer introduced cultivars whose general or specific attributes have broader appeal. So even with their perceived benefits, heirloom cultivars can be improved. Selection for improvement within an heirloom cultivar can enhance the consumer and/or horticultural value of heirloom cultivars.

Origin

Dr. Roy Harper released the New Mexican-type chile pepper cultivar, Sandia A, in 1956 (Coon et al., 2008). In 1967 the New Mexico Crop Improvement Association met and decided to change the name to ‘Sandia’ (Harper and Nakayama, 1967). The cultivar, Sandia, originated from a hybridization between ‘New Mexico No. 9’ and ‘Anaheim’.

Today, ‘Sandia’ is considered a hot New Mexican pod-type cultivar with a heat level of ≈7000 Scoville Heat Units. New Mexico farmers commonly grow ‘Sandia’ and sell ‘Sandia’ at roadside stands or to chile pepper processors for dehydration to make red chile pepper powder. Because the original use of ‘Sandia’ was for dehydration, a thin fruit wall was appropriate (Walker, 2009). This feature hastens the dehydration of the pods on the plant in the field and thus lowers the cost of commercial dehydration. ‘Sandia’ does not make for a satisfactory green chile pepper cultivar because after roasting and removal of the outer skin (cuticle), the pod has little fruit wall (pericarp) remaining, resulting in a low pack-out for the chile pepper processor.

New Mexico green chile pepper growers and processors approached our breeding program and requested we create an improved ‘Sandia’ by selecting for a thicker-walled

Fig. 1. Fruits of ‘NuMex Sandia Select’.

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Table 1. Plant and fruit characteristics for 'NuMex Sandia Select' and the current commercially available Sandia compared over the years 2007–11.

	Plant width[z] (cm; inches)	Yield[y] (t·ha^{-1}; tons/acre)	Fruit length[x] (cm; inches)	Fruit width[x] (cm; inches)	Wall thickness[x] (mm)	Heat[w] (SHU)
NuMex Sandia Select	50.99 (20.09) a	15.13 (33.90) a	17.28 (7.96) a	4.10 (1.61) a	4.05 a	9482 a
Sandia	39.84 (15.70) b	10.84 (24.28) b	12.45 (4.91) b	2.72 (1.08) b	2.60 b	6510 b

[z]Plant width was the mean of 10 plants from each of five replications per year.
[y]Yield is the field green fruit yield less the weight of diseased or undesirable fruits from five replications per year.
[x]Fruit length, fruit width, and wall thickness were the mean of 10 fruits from each of five replications over 5 years.
[w]Scoville Heat Units (SHU) were calculated from the conversion of 1 mg·kg^{-1} capsaicinoid = 16 SHU per dry weight basis. The average SHU was obtained from 10 fruits from each of five replications over 5 years.
[v]S.E. = Standard Error for five means over years.
Significant at $P \leq 0.01$ by t test.

green pod with a relatively high heat level and increased yield. A similar request was given for 'New Mexico 6-4' and 'NuMex Big Jim', which culminated in the release of 'NuMex Heritage 6-4' and 'NuMex Heritage Big Jim' (Bosland, 2012; Bosland and Coon, 2013).

In 2001, ≈450 plants of commercially available 'Sandia' were grown at the Leyendecker Plant Science Research Center, 5 km south of Las Cruces, NM. Each chile pepper type, i.e., green, red, cayenne, and paprika, has unique requirements that must be met if it is to be accepted by the chile pepper industry. For example, to the more than 25 standard horticultural traits, green chile pepper must have a dark green color, a pointed tip, two locules, thick fruits walls, and a specific heat level. Using phenotypic selection, superior single plants were stripped of any set fruit and open flowers, caged, allowed to produce selfed seed, and re-planted in 2002 in 30-foot observation plots for further selection. The process of phenotypic recurrent selection with single plant selection continued until 2006, when eight advanced lines were selected and a larger seed increase for use in replicated trials was accomplished under isolation cages (Bosland, 1993). For 5 years in a randomized complete block design with five replications, the selected lines were tested for superior yield performance and horticultural traits deemed important for the green chile pepper processing industry. The current commercially available 'Sandia' was used as the control cultivar. By the fifth year of evaluation, accession New Mexico Breeding Line 06C1183-1 had established its superiority over the other accessions and was chosen to be released as 'NuMex Sandia Select' (Fig. 1).

Description and Performance

The plants were grown using standard growing practices commonly found in southern New Mexico (Bosland and Walker, 2005). 'NuMex Sandia Select' plants have a single, strong main stem and are uniformly branching, providing foliage cover for sunscald protection and support for an excellent fruit set. Plots were harvested when the second and/or third set were green mature. A once-over harvest was done. No difference in plant height of 61 cm (35 inches) was found between 'NuMex Sandia Select' and 'Sandia'. From each replication, 10 randomly selected fruit were used to calculate means for pod quality traits. 'NuMex Sandia Select' has significantly greater yield, up to 40% higher, than the original 'Sandia'. 'NuMex Sandia Select' produced green mature pods with a smooth, thicker wall that averaged 17.28 cm (7.96 inches) in length and 4.10 cm (1.61 inches) at their widest dimension (Table 1), and were significantly better than 'Sandia'. The green mature pods had Munsell color rating of 5 GY 4/6 and 5 GY 5/6 for 'NuMex Sandia Select' and 'Sandia', respectively (Munsell Book of Color, 1980). The calyx is easily removed by hand (personal observation).

The heat level (pungency), an important quality trait, was measured. Because the original 'Sandia' is known for its relatively high heat level, 'NuMex Sandia Select' was also chosen to have a relatively high heat level. The heat level was determined by a reverse-phase high-performance liquid chromatography system with fluorescence detectors (Collins et al., 1995). 'NuMex Sandia Select' with a heat level of 9000 Scoville Heat Units is considered a hot cultivar in the New Mexican pod type. A field-harvested sample of 'NuMex Sandia Select' green pods was delivered to a green chile pepper processor that uses a flame-roasted approach to skinning green chile peppers, and they reported that 'NuMex Sandia Select' roasted and skinned easily and uniformly, giving it highly desirable processing characteristics (Chris Biad, personal communication). In addition, two informal taste panels, one with New Mexico State University students and staff, and a second made of green chile processor executives and staff, were assembled to assess the organoleptic (aroma and flavor) qualities of roasted green fruits of the eight advanced lines. New Mexico Breeding Line 06C1183-1 ('NuMex Sandia Select') was rated the best in aroma and flavor.

The cultivar is released for green chile use, so red pod characteristics were not measured, but anecdotal evidence from a red chile pepper processor suggests red chile yield of 8624 kg·ha^{-1} (7700 pounds per acre) are reasonable (Biad Chili, personal communication).

Heirloom cultivars are often genetically heterogeneous, suggesting that single plant selection with pedigree breeding can lead to improvement. The cultivar, NuMex Sandia Select, illustrates the effectiveness of selection within an heirloom cultivar to create a new modern cultivar. There will always be a need to adapt new cultivars to current challenges, for example climate change, diseases, pests, etc. Selecting within an heirloom cultivar is an advantageous method to provide best-adapted cultivars for organic/sustainable farming needs. The new cultivar will be improved or refined to be more useful and better aligned to the region and industry needs, making them more widely available to farmers and gardeners.

Availability

'NuMex Sandia Select' is being offered by the Biad Chili Ltd. Co. to commercial growers. Seed can be obtained by contacting Biad Chili, 6060 S. Main Street, Mesilla Park, NM 88047, phone: (575) 525-0034. For requests of 5 pounds or less, the 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 <http://www.chilepepperinstitute.org>, hotchile@nmsu.edu, or phone: (575) 646-3028.

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