'NuMex' Sweet Onions

Guide H-256

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Sweet Onions

Onions are known for their pungent aroma and taste. Their distinctive flavor is the result of the production of volatile sulfur compounds that form when the flesh of the onion is cut or bruised. Many consumers find the strong flavor typically exhibited by onions overpowering, especially when used in a raw form. The desire for onions with a mild flavor has fueled the market for sweet, low-pungency onions in the United States.

Sweet onions first became a force in the market largely due to the efforts of and the publicity generated by the Vidalia onion industry in Georgia. In the early 1930s, Mose Coleman, an onion grower in Vidalia County, Georgia, recognized that the onions he had harvested did not have the characteristic pungent bite normally found in onions (Boyhan and Torrance, 2002). Although the local consumers did not initially embrace his product, he eventually won market acceptance and received a premium price for the sweet onions.

Although statistics are not available for overall sweet onion production in the U.S., it's estimated that approximately 10 percent of the onions grown in New Mexico are marketed as 'sweet' (Johnson, 2005).

New Mexico competes with several other growing areas that produce their own branded, sweet onion. Other brands grown in the U.S. include 'Walla Walla' from Washington, 'Maui' from Hawaii, 'Texas Sweets', and California's 'Sweet Imperials'. 'Nu-Mex Sweet' and 'Carzalia' are trademarks for sweet onions grown in New Mexico. The 'Carzalia' brand name is the property of W.R. Johnson & Sons, a farming operation in south central New Mexico. 'Nu-Mex Sweet' is the trademark-protected name that belongs to the New Mexico Dry Onion Commission and can be used for selected sweet onion varieties released by the New Mexico State University (NMSU) onion breeding program and grown in New Mexico.

In support of the industry in New Mexico, several sweet onion varieties have been released by NMSU's onion breeding program. These 'NuMex' varieties were selected for genetically expressed low pungency as well as high productivity and disease tolerance. The varieties are all fresh market onions, either short-day or intermediate-day, and adapted for growing conditions in southern New Mexico. Varieties of 'NuMex' sweet onion are now available so that, through careful scheduling of seeding and transplanting, sweet onions can be harvested continuously from late May through August. Planting and harvesting windows for the 'NuMex' sweet onion varieties are summarized in table 1 (Corgan and Holland, 1993; Cramer, 2000; Wall and Corgan, 1998; Wall and Corgan, 1999; Wall and Corgan, 2002).

Pungency Development

Onion pungency is affected by both genetic and environmental factors. Nutrient management of an onion crop, especially sulfur fertility, affects pungency. Low sulfur soils have been cited as a specific factor that distinguishes areas of sweet onion production. Granberry et al. (1987) found that onions develop an increased level of pungency in response to the application of sulfur fertilizer. Research conducted by Randle (1992) confirmed that additional sulfur can increase pungency, but the effect of sulfur nutrition on onion pungency is greatly impacted by the specific onion variety. Apparently, the

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development of onion pungency varies depending on other growth, environmental and genetic factors. Genetics appears to be the major contributing factor to onion pungency. Pungency is the result of additive genetic inheritance, with significant environmental effects (Simon, 1995). The high genetic component means that a breeding program with selection for low-pungency is an effective method for producing low-pungency onion varieties.

Pungency is only manifested when an onion is cut or bruised. Cellular storage containers called vacuoles within onion cells contain the enzyme allinase. Odorless flavor precursor compounds (*S*-alk(en)yl cysteine sulfoxides) are present in cellular cytoplasm. Damage to the onion's cells ruptures the storage vacuoles and causes the release of allinase. When the enzyme contacts the flavor precursors, a chemical reaction quickly occurs that results in the formation of volatile sulfur compounds. These highly volatile compounds produce the characteristic pungent odor and taste of onions.

Unfortunately, volatile sulfur compounds are unstable and difficult to measure directly, even with the use of sophisticated laboratory instruments. Various methods have been employed to quantify onion pungency, including direct measurement of the sulfur compounds (Kopsell et al., 2002). These methods have often provided inconsistent results. A predictable and uniform method for determining onion pungency involves quantification of pyruvic acid, a byproduct of the reaction between allinase and *S*-alk(en)yl cysteine sulfoxides. Pyruvic acid is a common compound found in plant cells, but by comparing the baseline pyruvate level in an onion sample to the amount of pyruvate in an onion sample after the cells have been ruptured, the amount of the pungent, sulfur-containing compounds can be estimated. The pyruvic acid method for determining onion pungency agrees with analytical taste tests by a trained panel of onion tasters (Wall and Corgan, 1992). Typically, onions with less than 5.0 micromol pyruvic acid per milliliter of juice are considered to be sweet. In addition to being objective, the pyruvate test is relatively inexpensive. This method has been used in the sweet onion breeding program at New Mexico State University to successfully select for low-pungency onions.

'NuMex' Sweet Onion Varieties

Sweet onion varieties released by the NMSU breeding program include those that mature early in the southern New Mexico harvest season, such as 'NuMex Sweetpak', and those that mature late, such as 'NuMex Arthur'. 'NuMex Sweetpak' can be harvested in late May, while 'NuMex Arthur' bulbs can be harvested as late as early August. Brief descriptors of the 'NuMex' sweet onion cultivars follow.

'NuMex Sweetpak' is a yellow, open-pollinated, short-day onion for fall planting in southern New Mexico. This variety is the earliest maturing 'NuMex' sweet variety and can be harvested in late May. Bolting resistance is fair. Planting later than September 30 in southern New Mexico aids in prevention of bolting for this variety. The globe to flat globe shaped bulbs are firm. The thin scale is a light brown color. Large bulbs can be produced through appropriate management. The percentage of single-centers is high, and pink root resistance is good.

'NuMex Starlite' is a yellow, open-pollinated, short-day onion for fall seeding in southern New Mexico. The bulbs are firm with light brown scale color. The bulbs are slightly top-shaped. Seeded fields are ready for harvest in early June, while transplanted fields reach maturity in mid- to-late June. Resistance to pink root is good, and bolting resistance is excellent. The percentage of single-centered bulbs is moderate.

'NuMex Dulce' is a yellow, open-pollinated, short-day onion for fall seeding or spring transplanting in southern New Mexico. The variety has excellent yield and can be managed to produce very large bulbs. The bulbs exhibit light brown scale color. The bulbs are top-shaped, with only average bulb depth. Seeded fields reach maturity in mid-June, while transplanted fields are ready for harvest in mid- to late- June. The variety possesses good resistance to pink root. Bolting resistance is very good. The percentage of single-centered bulbs is very good. Bulb firmness is poor. This variety performs well as a transplant.

'NuMex Freedom' is a yellow, open-pollinated, intermediate-day onion for spring seeding or transplanting in southern New Mexico. The variety matures in late June. The globe-shaped bulbs are fairly firm and have thin, light brown scale. Pink root resistance and bolting resistance are excellent. The percentage of single-centered bulbs is moderate. 'NuMex Freedom' produces high marketable yield when direct seeded in the fall. The variety can also be spring seeded but produces a smaller bulb.

'NuMex Arthur' is a yellow, open-pollinated, intermediate-day onion for spring seeding or transplanting in southern New Mexico. This variety matures from mid-July to early August depending on location and management. The globe-shaped bulbs have thin scale with light brown color. Pink root resistance and bolting resistance are excellent. 'NuMex Arthur' is an excellent, late-season sweet onion for the fresh market.

Conclusion

The climate in southern New Mexico has proven to be ideal for the production of low-pungency, fresh market onions. With new varieties specifically developed for this area by the NMSU's onion breeding program, sweet onions can now be harvested continuously from the middle of May through August. The growing popularity of sweet onions with consumers provides an ideal marketing opportunity, particularly if brand identity and consistent high quality ensure a demand for the product. Continued growth in the sweet onion industry in the state is possible through targeted marketing, publicity and stringent quality oversight for sweet onions produced in New Mexico.

Table 1. 'NuMex' Sweet Onion Variety Planting and Harvesting Dates for southern New Mexico.[1]

Cultivar	Planting Dates	Harvest Dates
'NuMex Sweetpak'	Direct Seed: Sep 25–Oct 5	May 20–Jun 5
'NuMex Starlite'	Direct Seed: Sep 15–Oct 1	Jun 1–Jun 10
	Transplant: Feb 1–Feb 5	Jun 5–Jun 15
'NuMex Dulce'	Direct Seed: Sep 25–Oct 5	Jun 5–Jun 15
	Transplant:Feb 1–Feb 5	Jun 15–Jun 25
'NuMex Freedom'	Direct Seed: Oct 1–Oct 5	Jun 22–Jun 30
	Transplant: Feb 1–Feb 5	Jul 4–Jul 14
'NuMex Arthur'	Direct Seed: Feb 1–Feb 5	Jul 15–Aug 1
Transplant:	Feb 1–Feb 10	Jul 1–Jul 15

[1] Actual planting and harvest dates will vary depending on location, as well as on current climatic conditions.

References

Boyhan, G.E. and R.L. Torrance. 2002. Vidalia onions-sweet onion production in southeastern Georgia. *HortTechnology* 12(2):196-202.

Corgan, J. and M. Holland. 1993. 'NuMex Starlite' Onion. *HortScience* 28(1): 66-67.

Cramer, C.S. Cooperative Extension Service *New Mexico Onion Varieties.* New Mexico State University College of Agriculture and Home Economics. Circular 567. July 2000.

Granberry, D.M., D. Smittle, W. McLaurin, and R.L. Shewfelt. 1987. The effects of calcium sulfate on leaf and bulb tissue, sulfur content and on pungency of the Vidalia onion. *Proc. Natl. Onion Res. Conf.* 10-11 Dec. 1987. p. 27-32.

Johnson, J. 2005. President W.R. Johnson and Sons. Carzalia, NM. Verbal communication.

Kopsell, D.E., W. M. Randle, and N.E. Schmidt. 2002. Incubation time, cultivar, and storage duration affect onion lachrymatory factor quantification. *HortScience* 37(3):567-570.

Randle, W.M. 1992. Onion germplasm interacts with sulfur fertility for plant sulfur utilization and bulb pungency. *Euphytica* 59: 151-156.

Simon, P.W. 1995. Genetic analysis of pungency and soluble solids in long-storage onions. *Euphytica* 82: 1-8.

Wall, M.M. and J.N. Corgan. 1992. Relationship between pyruvate analysis and flavor perception for onion pungency determination. *HortScience* 27(9): 1029-1030.

Wall, M. and J. Corgan. 1998. 'NuMex Dulce' Onion. *HortScience* 33(4): 762-763.

Wall, M. and J. Corgan. 1999. 'NuMex Sweetpak' Onion. *HortScience* 34(7): 1303-1304.

Wall, M. and J. Corgan. 2002. 'NuMex Arthur' Onion. *HortScience* 37(4): 707-708.

Wall, M. and J. Corgan. 2002. 'NuMex Freedom' Onion. *HortScience* 37(4): 705-706.

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