

Cultivar and Germplasm Release

RELEASE OF TROPICAL PUMPKIN 'TAÍNA DORADA'^{1,2}

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J. Agric. Univ. P.R. 97(1-2):97-100 (2013)

Cucurbita moschata Duchesne 'Taína Dorada' is an open-pollinated tropical pumpkin cultivar developed and released by the Agricultural Experiment Station of the University of Puerto Rico, Mayagüez Campus (UPRM) in 2012. Tropical pumpkin is an important part of the Puerto Rican diet. The most typical use is as a diced vegetable added to the sauce of beans (*Phaseolus vulgaris* L.) which are then eaten with rice. Currently, the most widely grown cultivar on the island is 'Soler'. Since fruits of 'Soler' tend to be quite large, often greater than 8 kg (Wessel-Beaver, 2005), individual fruits are generally loaded onto trucks for sale to farmers' markets and supermarkets, rather than packaged into boxes or bags. However, many supermarkets prefer smaller fruit packaged five to six fruits per 23-kg sack. This preference for a cultivar with smaller fruit was the impetus for the development of 'Taína Dorada.'

Origin

In 2000 at the Lajas Substation, an experiment was conducted comparing the open-pollinated long-vine cultivar 'Soler' with semi-bush F_1 hybrids. The parents of the semi-bush hybrids were derived from crosses between 'Bush Butternut' x 'La Primera' and 'Bush Butternut' x 'La Segunda', followed by selfing and selection (Carle et al., 2000). At the end of this experiment seeds from 30 open-pollinated fruits were bulked to form a population (C_0) for further selection. A certain degree of cross pollination between 'Soler' and the semi-bush hybrids was assumed to have occurred. The resulting base population (cycle 0 or C_0) was planted in isolation at the Juana Díaz Substation in the fall of 2000 to begin half-sib recurrent selection. Prior to anthesis, some roguing to eliminate non-bush plants was done. Approximately 100 fruits were chosen on the basis of fruit shape (globe to slightly flattened) and weight (4 to 6 kg). Fruits were cut open, and forty fruits with the deepest orange color and greatest flesh thickness were selected. The resulting 40 half-sib families were tested at Juana Díaz for yield and fruit characteristics (spheroid to oblate spheroid shape, thick flesh, dark orange flesh color) in a randomized complete block design with two replications. The 10 best families were intermated in isolation in a March 2001 planting. Seed from this intermating was used to form the next cycle (C_1) of half-sib recurrent

¹Manuscript submitted to Editorial Board 14 December 2012.

²The author wishes to thank Obed Román, Luisa Flores, and Juan Toro for their technical support, and to Sofia Macchiavelli who helped obtain some of the data presented here as part of a high school science fair project. This research was supported in part by USDA Hatch funding and USDA-CSREES (now NIFA) Tropical/Subtropical Agriculture Special Grant Program Award No. 2005-34135-15883, 2006-34135-17545, 2008-34135-19505, and 2010-34135-21022.

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selection. In August 2001 C_1 was planted in isolation in Juana Díaz. Forty half-sib families were produced and evaluated for yield and fruit characteristics in a replicated trial in Juana Díaz in January 2002 with the same procedures as in C_0 . The 10 best families were intermated in isolation in June 2002. Harvested seed was bulked to form the third cycle of selection (C_2). As in C_0 and C_1 , C_2 was planted in isolation at Juana Díaz in October 2002; the progeny trial was conducted in February 2003, and superior families were intermated. A bulk of seed from this last intermating formed the breeder's seed of what was designated as "PRShortvine" in experimental trials, and what is now being released as 'Taína Dorada.'

Cultivar Description

Internode length in plants of 'Taína Dorada' is much reduced compared to that of the traditional long-vined standard cultivar 'Soler.' During its first six weeks of development, 'Taína Dorada' has generally one main vine (sometimes two), rather than multiple vines as is the case with 'Soler.' Thus, during this early stage 'Taína Dorada' has a bush habit of growth. The dominant gene, *Bu*, controls bush growth habit in *Cucurbita pepo* and *C. maxima* (Paris and Brown, 2005). 'Bush Butternut', one of the parents in the background of 'Taína Dorada', derives its bush habit from *C. pepo*. Between six to eight weeks after germination the principal vine continues to elongate, the internode length increases, and secondary vines may begin to appear; thus plants take on more of a "semi-bush" appearance. At fruit maturity, the main vine can reach 5 m or more in length. The degree of vining appears to be somewhat related to day length, with longer vines occurring during the summer months (long days).

'Taína Dorada' has silver-grey areas in the axils of the leaf veins, a trait controlled by a single dominant gene, *M* (for *Mottled-leaves*) (Coyne, 1970). Leaves are somewhat more rounded (less indented) than those of 'Soler.'

The shape of fruits of 'Taína Dorada' is spheroid (round) to oblate spheroid. The degree of flattening can be slight to quite noticeable. The ratio of fruit diameter to fruit length averaged 1.3 in three field trials, compared to 1.7 for 'Soler,' which has a much flatter fruit shape ($p < 0.5$) (Wessel-Beaver et al., 2006). Fruit shape varies among plants of both 'Taína Dorada' and 'Soler' because they are open-pollinated cultivars with some degree of remaining genetic heterogeneity for fruit shape (and other traits).

During development, the fruit skin (rind) of 'Taína Dorada' is predominantly green in color, with broken white spots. As fruits mature, the green skin color changes to a light orange, with cream-colored spots. Fruits of 'Taína Dorada' have a noticeably thicker skin than the very fine-skinned 'Soler.' The rind is thick enough to require removal before cooking with beans. For pumpkin used for processing in pies or custards, the skin can easily be removed and discarded after cooking. This requires some adjustment on the part of 'Soler' consumers who are usually accustomed to eating this cultivar without removing its thin skin.

Fruit weight and size are less than that of 'Soler'. In five trials (Wessel-Beaver et al., 2006) average fruit weight of 'Taína Dorada' varied from 2.9 kg to 5.5 kg whereas in the same trials fruit weight for 'Soler' varied from 3.7 to 8.0 kg. In all trials, fruit weight of 'Taína Dorada' was less ($p < 0.05$) than that of 'Soler'.

Flesh (mesocarp) thickness in 'Taína Dorada' (average of 4.7 cm) is not different ($p > 0.05$) from that of 'Soler.' However, the interior fruit cavity of 'Taína Dorada' accounts for less of the total fruit diameter (56%) than that in 'Soler' (64%), thus making 'Taína Dorada' fruits relatively heavy despite their small size.

Flesh color in 'Taína Dorada' is orange-yellow (average hue angle = 65.8 in four trials) whereas 'Soler' tends to have a slightly more yellow color (average hue angle = 68.0 in four trials) ($p < 0.05$) (Wessel-Beaver et al., 2006).

Adaptation and Yield

Field trials of 'Taína Dorada' were conducted at the Isabela, Juana Díaz and Lajas substations between 2003 and 2005 (Wessel-Beaver et al., 2006). Soils at these three

locations are from different orders (Oxisols, Mollisols and Vertisols, respectively). Trials were conducted under various cultural practices including with and without raised beds, direct seeding and transplanting, and with and without plastic mulch. Various within- and between-row plant spacings were tested, with planting density ranging from 2922 to 5928 plants per hectare. All trials were conducted with drip irrigation. 'Taína Dorada' (PRShortvine) yielded from 15,341 kg/ha to 36,774 kg/ha in the five different trials. Yields tended to be higher under greater planting densities (within-row spacing of 0.9 m by between-row spacing of 1.8 m). In these trials, yield of 'Taína Dorada' was not significantly different ($p > 0.05$) from that of the standard variety 'Soler.' 'Taína Dorada' produces 1.5 to 2 times as many fruits as 'Soler' because of its smaller fruit size, potentially adding to harvest costs.

'Taína Dorada' has been successfully grown on commercial farms in Guánica and Santa Isabel, Puerto Rico. Growers have sometimes reported somewhat smaller yields than with 'Soler', but have been satisfied with fruit quality. Commercial yields have been as high as 30,000 kg/ha.

Seed production of 'Taína Dorada' is estimated to be 236 kg/ha, not different from that of 'Soler' (Wessel-Beaver et al., 2006). Because this cultivar remains genetically heterogeneous, 200 or more plants should be used for seed multiplication to assure a representative sample.

Insect and Disease Susceptibility

'Taína Dorada' was evaluated for silverleaf disorder in six trials in Isabela, Juana Díaz and Lajas at six weeks after planting in fields with natural populations of silverleaf whitefly (*Bemisia argentifolii*) (Wessel-Beaver et al., 2006). There was no difference ($p > 0.05$) in the average severity rating of 'Taína Dorada' versus 'Soler' in three of the trials. In two trials severity was less in 'Taína Dorada'; in the other trial severity was greater in 'Taína Dorada.' Among the six trials, the severity rating of 'Taína Dorada' averaged 1.4 on a 0 to 3 scale (where 0 = no symptoms; 3 = all leaves with greater than 75% of leaf area silvered). If adequate measures are taken to control whiteflies, silverleaf should not present any problems to growers of this cultivar.

In trials in Lajas and Juana Díaz, 'Taína Dorada' and 'Soler' were equally susceptible to melonworm (*Diaphania hyalinata*) ($p > 0.05$) (Wessel-Beaver et al., 2006). This insect is a serious pest for all tropical pumpkin cultivars. Crop monitoring is always needed, and control measures must be taken as soon as larvae appear.

Like 'Soler', 'Taína Dorada' is mildly to moderately susceptible to downy mildew (*Pseudoperonospora cubensis*), depending on conditions. Defoliation caused by this and other diseases can have a greater impact on 'Taína Dorada' than on 'Soler' because the former develops fewer secondary vines on account of its semi-bush habit.

'Taína Dorada' is more susceptible to potyviruses Papaya ringspot virus (PRSV) (McPhail-Medina, 2010) and Zucchini yellow mosaic virus (ZYMV) (Sierra-Rivera, 2012) than is 'Soler'. In a 2012 field trial at the UPRM Alzamora Laboratory Farm in Mayagüez, field plots of 'Taína Dorada' inoculated with PRSV had an average symptom severity of 3.8 on a scale of 0 to 5 (0 = no symptoms; 3 = most leaves with strong mosaic and some blistering; 5 = severe symptoms on all leaves, including leaf deformity) compared to 'Soler' with symptom severity of 2.1 ($p < 0.05$). In Puerto Rico, PRSV and ZYMV are the most common virus diseases in cucurbits (Paz-Carrasco and Wessel-Beaver, 2002).

Fruit Quality

The consistency of 'Taína Dorada' is often described by consumers as "pudding-like" compared to 'Soler', which is sometimes described as "watery." Tests show that total dry matter is more than twice as high ($p < 0.05$) in 'Taína Dorada' (11.7 g/100 g fresh weight)

than in 'Soler' (4.1 g/100 g). 'Taína Dorada' is also superior to 'Soler' in sugars. Brix averages 10.75 in 'Taína Dorada,' compared to only 5.35 in 'Soler' ($p < 0.05$). The high percentage dry matter and sweet flavor of 'Taína Dorada' are the cultivar's most notable and valuable traits for consumers.

Uses

'Taína Dorada' is adapted to a variety of conditions in Puerto Rico and can be planted wherever 'Soler' has been successfully grown. On average, five to six fruits of 'Taína Dorada' can be packed into a standard 23 kg (50 lb) sack, thus making this cultivar convenient for supermarkets that prefer to purchase their produce in boxes or bags. Fruits can be sold whole or cut in half and wrapped. The smaller fruit size may make 'Taína Dorada' less appropriate for farmers' markets (*plazas de mercado*). 'Taína Dorada' has eating quality like that of *C. maxima* and *C. moschata* winter squash cultivars which are used for direct consumption or processing. Preliminary studies (unpublished) indicate that 'Taína Dorada' fruits can be diced and packaged (minimally processed) and stored at 4° C for about two weeks with little loss of quality.

Availability of Seed

If importation regulations of the country of the recipient researcher permit sending seed by mail, small samples of 'Taína Dorada' for testing are available from the author (Department of Crops and Agroenvironmental Sciences, UPR-RUM, PO Box 9000, Mayagüez, PR 00681-9000, USA). Costs of procuring necessary phytosanitary permits will be charged to the recipient. For commercial-sized lots, contact the Deputy Director, Puerto Rico Agricultural Experiment Station, Jardín Botánico Sur, 1193 Guayacán, San Juan, PR 00926, USA.

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