‘TAM Dulcito’, a New, Multiple Virus-resistant Sweet Jalapeño Pepper

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The Texas Agricultural Experiment Station (TAES) at Weslaco announces the release of ‘TAM Dulcito’, a multiple virus-resistant, nonpungent pepper (*Capsicum annuum* L.). The project to breed virus-resistant peppers at the TAES began in 1971. Several cultivars of virus-resistant jalapeños have been released over the last 20 years (Villalon, 1983; Villalon et al., 1992, 1994). The production of hot and sweet peppers in Texas has fluctuated from 1200 to 7000 ha over the last 30 years. Currently, close to 2500 ha are cultivated statewide (Smith and Anciso, 2005). One of the most persistent problems on pepper production in south Texas has been virus infection. The two most serious virus pathogens are *Tobacco etch virus* (TEV) and *Pepper mottle virus* (PepMoV), both transmitted by aphids, primarily the cotton aphid (*Aphis gossypii* Glover) and the green peach aphid (*Myzus persicae* Sulzer). Historically, most jalapeño cultivars grown in south Texas have been susceptible to local strains of both TEV and PepMoV. Yield reductions from infected plants have been as high as 45%, particularly when fruit is intended for the fresh market (Greenleaf, 1986). The best solution to the problem is the development of resistant cultivars with high-quality fruit. Multiple sources of single resistance genes

against these potyviruses have been documented in various germplasm lines (Cook, 1960; Greenleaf, 1956; Kyle and Palloix, 1997; Zitter and Cook, 1973).

Origin

‘TAM Dulcito’ originated from an F₁₅ selection out of the sweet jalapeño line 79053, an F₂ line with resistance to Texas isolates of TEV, *Potato Virus Y* (PVY), and PepMoV (Fig. 1). The pedigree includes three sources of potyvirus resistance: ‘Avelar’, PI 264281, and AC 2207 (Cook, 1960; Greenleaf, 1986; Zitter and Cook, 1973), as well as several jalapeño lines. Field selections were conducted for 15 generations. Progeny of the initial virus-resistant F₂ single plant selection were placed in an isolation block and selected based on fruit quality and yield, bulking superior plants. This process was continued until the F₇ generation, when a single plant selection was manually selfed. Progeny of this plant were then grown in an isolation block where another superior single plant selection was selfed. This process was repeated and superior selections were bulked for two more generations. This uniform F₁₁ line was then subjected to four generations of selfing in the greenhouse and bulking the plants to increase seed. At each generation, seedlings were mechanically inoculated in succession with Texas isolates of TEV and PepMoV before transplanting to the field to verify resistance (Villalon, 1981). Susceptible control varieties were included to ensure viral pathogenicity. The final selection was at the F₁₅ generation and possessed uniform plant and fruit traits.

Description

‘TAM Dulcito’ is adapted to the high temperatures and virus disease pressures of south Texas. The concentrated set of large, crack-free fruit on compact (36 to 42 cm) plants makes it ideally suited to once over harvests and high-density plantings. Comparisons for field performance, yield, and fruit

quality were conducted under commercial and experimental field conditions in 1999 and 2000 at the TAES center at Weslaco (silty, clay loam soil type) and also in a commercial field in Edinburg, TX (sandy soil). Typical commercial production practices such as establishment from transplants, on drip-irrigated raised beds, and chemical pest control were followed. Fruit size and yield data were based on a randomized complete block design with four replications containing eight plants each. Thirty fruit per plot from healthy plants were used to calculate averages for quality traits.

In the fall season, ‘TAM Dulcito’ had significantly larger fruit and thicker flesh than ‘Mitla’ and similar yield per plant. In the spring season, fruit size and yield were significantly greater than ‘Grande’ (Table 1; Fig. 2). In both seasons, ‘TAM Dulcito’ matured 6 d before ‘Mitla’ at Weslaco. In the Fall 2000 season, yields and fruit quality were compared among ‘TAM Dulcito’ and the commercial cultivars ‘Mitla’, ‘Grande’, and ‘Tula’ as well as two TAES releases, ‘TAM Mild Jalapeño 1’ and ‘TAM Mild Jalapeño 2’ (Table 2). Yields of ‘TAM Dulcito’ (635 g/plant) were significantly greater than those of the popular cultivars ‘Grande’ (444 g/plant) and ‘Mitla’ (502 g/plant). Fruit of ‘TAM Dulcito’ were smaller than those of ‘Tula’ but equal in size to ‘Grande’ fruit. In addition, ‘TAM Dulcito’ fruit produced very little anthocyanin compared with fruit of ‘Grande’ and ‘Mitla’ (data not shown). This purple-black pigment is undesirable for jalapeño peppers and reduces the value of the crop. Total capsaicinoid concentrations of mature fruits from ‘TAM Dulcito’ plants grown in Uvalde and College Station in Spring 2001 were measured by high-performance liquid chromatography (Hoffman et al., 1983). Fruits from a hot jalapeño cultivar ‘Grande’, grown in College Station, were also analyzed for comparison. Total capsaicin, on a dry weight basis, was converted to Scoville Heat Units (SHU) following the method of Collins et al. (1995). ‘TAM Dulcito’ fruit from both locations had no detectable levels of capsaicin. By comparison, the hot jalapeño ‘Grande’ had a capsaicin concentration of 1332 mg·kg⁻¹ (19,980 SHU).

In separate experiments, seedlings of both ‘TAM Dulcito’ and a susceptible control, ‘Mitla’, inoculated with local isolates of TEV, PVY, or PepMoV, were transplanted to 10-L pots in the greenhouse and into field plots (TEV and PepMoV) to observe effects on plant growth and fruit quality. In both greenhouse and field experiments, TEV-inoculated plants of ‘Mitla’ had small, misshapen fruit, and chlorotic leaves, whereas inoculated plants of ‘TAM Dulcito’ had normal fruit and no chlorosis. None of the plants appeared to be reduced in height. PepMoV-inoculated plants of ‘Mitla’ exhibited severe leaf distortion, plant stunting, and reduced yield with misshapen fruit. None of the fruit from inoculated ‘Mitla’ plants were of commercial quality. ‘TAM Dulcito’ plants inoculated with PepMoV exhibited

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Fig. 1. Pedigree of 'TAM Dulcito'.

Table 1. Performance of TAM Dulcito and other jalapeño cultivars at Weslaco.

Cultivar	Fruit length (cm)	Flesh thickness (mm)	Wt/fruit (g)	Yield per plant (g)
Fall 1999				
TAM MJ II ^a	7.2 a ^y	4.6 a	31 a	412 b
TAM Dulcito	7.1 a	4.6 a	32 a	442 a
Mitla	7.3 a	4.1 b	23 b	430 ab
TAM MJ I ^a	6.5 b	4.1 b	20 b	308 c
Spring 2000				
TAM MJ II	8.1 a	4.5 ab	34 a	350 c
TAM Dulcito	7.0 b	4.7 a	34 a	407 a
Grande	7.1 b	4.5 ab	30 b	372 b
TAM MJ I	6.6 c	4.3 b	24 c	294 d

^aTAM Mild Jalapeño 2.

^yMeans within a season followed by the same letter are not significantly different by least significant difference at $P \leq 0.05$.

^aTAM Mild Jalapeño 1.

Fig. 2. Fruit of 'TAM Dulcito' compared with 'Grande'.

Table 2. Performance of TAM Dulcito and other jalapeño cultivars at Edinburg, TX.

Cultivar	Fruit length (cm)	Wt/fruit (g)	Yield per plant (g)	% Culls ^a
TAM Dulcito	7.4 a ^y	31 b	637 a	10 bc
Mitla	7.0 b	24 c	502 b	19 a
Grande	7.5 a	31 b	444 c	13 b
Tula	7.5 a	36 a	371 d	6 c
TAM MJ I	6.5 c	21 c	315 e	12 b

^aCulls pertains to severely misshapen, small, damaged, or rotten fruit not suitable for sale.

^yMeans followed by the same letter are not significantly different by least significant difference at $P \leq 0.05$.

mild chlorosis on older leaves but no distortion or misshapen fruit. No symptoms were observed on 'TAM Dulcito' or 'Mitla' after inoculation with PVY in the greenhouse. Enzyme-linked immunosorbent assay tests were conducted on leaf samples from inoculated greenhouse plants of both 'TAM

Dulcito' and 'Mitla' to determine the presence of TEV, PepMoV, and PVY. Leaves from 'Mitla' tested positive for TEV and PepMoV with absorbance readings of 1.70 and 2.21, respectively, but negative for PVY (0.02). Leaves from 'TAM Dulcito' tested negative for TEV (0.04) and PVY (0.02) and

weakly positive for PepMoV (0.44). Leaves of a susceptible control, 'Capistrano' bell pepper, tested positive for TEV (4.00) and PepMoV (2.37).

The large, nonpungent fruit of 'TAM Dulcito' makes it well suited for many processed products. These would include mild salsas and rings for markets, which prefer less pungent foods, or in cases in which synthetic capsaicin is added to create distinct but uniform heat levels. The multiple virus resistance and adaptation to high temperatures will be valuable attributes in regions where these stresses exist. 'TAM Dulcito' could be a useful parent to develop other virus-resistant jalapeño cultivars with varying degrees of pungency or other attributes. The seed of this open-pollinated cultivar will be much less expensive than comparable hybrid cultivars as a result of the lower production costs.

Availability

Breeder's seed will be maintained by the Texas Agricultural Experiment Station at Weslaco. Application for plant variety protection is being filed for 'TAM Dulcito'. This variety may be licensed through the Texas Agricultural Experiment Station for commercial seed production.

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