'Processor 278' Tomato

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Successful tomato production (*Lycopersicon esculentum* Mill.) in the subtropical climates of southern Texas and northern Mexico requires that cultivars be adapted to hot, humid weather. Annual production is split between two seasons with cross-adapted cultivars. The spring crop is planted in January and February and harvested in May, June, and July; the fall crop is planted in July and August and harvested in November and December. With this cropping scheme, weather patterns favor a diversity of pathogenic organisms that incite disease epiphytically. Additionally, elevated temperature and humidity mandates the development of cultivars that produce viable pollen and dehiscent anthers under supraoptimal temperature regimes. The purpose of this breeding program was to develop a subtropically to tropically adapted cultivar with broad-spectrum disease resistance, heat tolerance, and improved processing quality. The name 'Processor 278' is based on intended cultivar use and assigned breeding line numbers.

Origin

'Processor 278' was a single plant selection derived from 5737M, a southern blight-resistant breeding line developed by Leeper et al. (1993). Processor 278 was tested as P- or Tx 278 (Fig. 1).

Description

'Processor 278' plants are small and determinate (<75 cm in diameter), about two-thirds

the size of 'Chico III' plants (Leeper, 1969). Plant canopy is compact with average to moderately dense foliage. Leaf margins tend to curl downward toward the midrib, and sometimes the veins on the underside of the leaf have a purple tint. Because it is compact and has a high harvest index, 'Processor 278' is suitable for high-density planting. It is often grown in double rows on 203-cm beds with 23 cm between plants and 36 cm between rows on the same bed. 'Processor 278' is resistant to southern blight (*Sclerotium rolfsii* Sacc.), fusarium wilt race 1 [*Fusarium oxysporum* f. *lycopersici* (Sacc.) Snyder and Hansen], and gray leaf spot (*Stemphylium solani* Weber) (Jones et al., 1991; McColloch et al., 1968). Additionally, most of the fruit are held off the ground, and disease blemishes caused by soil contact are reduced. 'Processor 278' crack resistance equals that of 'Chico III', and plants are adapted for fruit set at high relative humidity (RH) (75% to 95%) and temperature (34 to 36°C). In the late spring and early summer pollination phase, RH in southern Texas averages 80% at pollen shed, and temperature generally ranges from a minimum average of 23°C to a maximum average of 34°C (Leeper and Cox, 1986). Fall temperature tends to be 7 to 10°C lower at pollination.

'Processor 278' fruit are firmer and more resistant to puffiness than 'Chico III'. Plants set about four to six fruit per inflorescence and have a more concentrated set that occurs a few days earlier than that of 'Chico III'. Average 'Processor 278' fruit mass (54.5 g) is larger than that of 'Chico III' (49.0 g) in spring and fall, but smaller than that of 'Pacesetter 502' (60.6 g), 'Processor 40' (62.7 g) (Leeper and Cox, 1986), or 'Moran 3032' (58.0 g). Most of the fruit have three locules, but about one-third has either two or four. Fruit color is medium to dark red and fruit have 6.0- to 7.0-mm-thick walls (Fig. 1). Unlike the 5737M progenitor (Leeper et al., 1992), 'Processor 278' fruit are nearly cylindrical and smooth with blunt stem and blossom ends. Fruit commonly are 55 to 70 mm long with a maximum diameter of 50 to 55 mm (Fig. 1). Fruit are attached to jointless pedicels that separate easily from the fruit and leave a 7.0- to 8.0-mm stem scar (Fig. 1).

In eight sites across years and seasons (four spring and four fall trials), 'Processor 278' outyielded 'Chico III' by ≈ 3 t·ha⁻¹ (Table 1). In the four spring trials, 'Chico III' was superior to 'Processor 278', but 'Processor 278' was better adapted to spring production. In all cases, the yield differences between 'Processor 278' and 'Chico III' were indicative of trends rather than statistical significance; for both seasons combined, differences between 'Processor 278' and 'Pacesetter 502' and 'Processor 40' (Leeper and Cox, 1986) and 'Moran 3032' were clearly significant (Table 1). These trials were conducted on calcareous soils on which resistance to southern blight is unimportant; results derived from acid soil infested with this pathogen likely would differ. Preliminary yield trials in Queensland, Australia, indicate that 'Processor 278' is more widely adapted than initially expected (K. Carlin, personal communication). Additionally, 'Processor 278' seemed more uniform than the other test cultivars and was adapted to machine harvest. 'Processor 278' was signifi-

Fig. 1. 'Processor 278' fruit; average length 55 to 70 mm, average diameter 50 to 55 mm.

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Table 1. 'Processor 278' yield compared to that of standard cultivars for spring and fall trials.^z

Cultivar	Yield (t·ha ⁻¹ , mean ±SE)		
	Spring ^y	Autumn ^x	Combined
Processor 278	26.7 ± 4.00	33.9 ± 9.79	30.3 ± 7.90
Chico III	28.5 ± 7.86	27.6 ± 11.68	28.1 ± 9.23
Pacesetter 502 ^w	28.8	16.4 ± 3.17	20.6 ± 6.14
Processor 40 ^v	17.3 ± 2.69	24.6 ± 2.83	20.9 ± 4.76
Moran 3032 ^u	7.87 ± 3.19	14.7	10.1 ± 3.62

^zThe results for 'Processor 278' and 'Chico III' were based on eight site-year environments.^ySpring trials were planted in March and harvested in early July.^xFall trials were planted in August and harvested in December.^wResults are based on one spring trial and two fall trials.^vResults are based on two spring and two fall trials.^uResults are based on two spring trials and one fall trial.

Table 2. Comparison of canned juice and whole-fruit traits for 'Processor 278' and 'Chico III'.

Trait ^z	Mean ±SE	
	Processor 278	Chico III
<i>Canned juice traits</i>		
Color difference meter ^y	91.2 ± 2.78	81.6 ± 5.98
°Brix at 20C ^x	5.39 ± 0.12	5.32 ± 0.65
Viscosity (cps) ^w	553 ± 204	525 ± 181
pH	4.23 ± 0.04	4.41 ± 0.18
Percent acidity	0.52 ± 0.06	0.46 ± 0.08
<i>Whole-fruit traits</i>		
Wholeness ^v	19.67 ± 0.58	19.33 ± 0.58
Color ^u	28.0 ± 0.06	27.0 ± 1.58
Total score ^t	93.67 ± 2.52	93.00 ± 2.00

^zResults based on three replicates from the spring trials of 303 no. 4 cans evaluated in the summer.^yHunter Lab Scan Color Meter, Hunter Labs, Reston, Va. Color difference is based on a measure of the ratio of redness (a) to yellowness (b), estimated as (a*/b* 100). Values ≥80.0 indicate fancy color grade.^wEstimate of percent sugar.^vMeasured with a flow meter in centipoise (cps), where 1.0 cps = 100 dyne-sec-cm⁻².^uRefers to freedom from broken locules; 20 is the highest possible score.^tDetermined by matching samples to U.S. Dept. of Agriculture color standards; 30 = highest possible score.^sA composite sum of wholeness and color, plus drained weight and absence of defects, which have maximum possible scores of 20 and 30, respectively. Highest possible composite score is 100.

cantly better than 'Chico III' with regard to whole-fruit color, pH, and canned juice color differences (Table 2). In most cases, 'Processor 278' processing traits and yield had lower standard errors than 'Chico III'. This result indicates that 'Processor 278' is more stable across environments.

Availability

'Processor 278' is a public release from Texas A&M Univ. Breeder seed was deposited with the Foundation Seed Service, Texas A&M Univ., College Station, TX 77843. Breeder seed also has been deposited in the U.S. Dept. of Agriculture tomato collection (PI 560329) held in Geneva, N.Y. Small seed samples are available from G.F.O.

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