'Arcadia' and 'Goulburn': Determinate Fresh-market Tomatoes for Arid Production Areas

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Inland areas of southeastern Australia feature hot, dry summers that favor horticultural production and provide ideal conditions for fruit ripening and uninterrupted harvest. About 15,000 t of tomatoes (*Lycopersicon esculentum* Mill.) are produced annually in these areas for fresh-market consumption.

High temperatures in the field can cause fruit softening and, thus, reduced quality during subsequent postharvest operations and marketing. This characteristic has proven to be a major problem with many commercial tomato cultivars screened for production in inland Australia.

'Arcadia' and 'Goulburn' were selected to meet market quality requirements and to maintain fruit firmness under field conditions. 'Arcadia' and 'Goulburn' produced high commercial yields and were significantly firmer than standard commercial cultivars in replicated field trials conducted over three seasons. Both cultivars were well received when commercially released, and 'Arcadia' currently makes up >75% of the tomatoes planted in the region.

Origin

'Arcadia' and 'Goulburn' are inbred lines developed through a breeding program conducted by the Victorian Dept. of Agriculture (VDA). 'Arcadia' was derived by crossing the local breeding line K7101 with 'K7' (VDA). K7 101 was produced by crossing [(Burnley Gem) × 'ES58') × 'Armor'] with 'A422'.

Parents of 'Goulburn' were 'VF298' and breeding line K7411. 'VF298' originated from across of 'UC134' × 'VF105' by Jack Hannah at the Univ. of California, Davis. K7411 was a product of the cross ('UC82B' × 'H1610') × ('Armor' × 'A422'). 'H1610' and 'A422' were obtained from Heinz (Melbourne, Australia), whereas 'Armor' was bred by VDA.

Description

'Arcadia' and 'Goulburn' are true-breeding. Fruit have jointed pedicels and are multilocular. They have a uniform light-green base color

and ripen to a scarlet red (IL12) (Maerz and Paul, 1950). They also have small calyx and blossom-end scars compared with those of 'Floradade' and separate easily from the vine.

'Arcadia' is a strongly determinate bush-type and is suitable only for ground production. Leaf cover is good, and the small plant is easy to manage and harvest. 'Arcadia' fruit mature early and, in replicated trials (Table 1), the average time from transplanting to first picking was 95 days compared with 106 days for 'Floradade'. 'Arcadia' fruit are small to medium (Table 1), have smooth skin, and are oblate to round (Fig. 1).

'Goulburn' bushes also are determinate and are best suited for ground production, but they may grow to 1.2 m high in a trellis system. Foliage cover is heavy and fruit are medium, smooth, and round (Fig. 2). Time from transplanting to first pick averaged 99 days for 'Goulburn'.

'Arcadia' and 'Goulburn' fruit are firm. In our judgment, both cultivars have thick locule walls and good internal color. They are resistant to verticillium wilt (*Verticillium albo-atrum* Rienke and Berth.) race 1, and fusarium [*Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) Snyder and Hans] race 1. Both cultivars also have shown excellent field resistance to radial and concentric skin cracking and to fasciation (catface).

Performance

Agronomic characteristics of F₂ progenies were assessed in replicated field experiments over three growing seasons (1985, 1986, and 1987). Yield, fruit size, and firmness were compared with those of standard commercial cultivars grown in the region (Table 1). Fruit were harvested three times at 2-week intervals. Firmness was measured by the methods of Sumeghy et al. (1983) on fruit picked at breaker maturity stage and stored for 6 days at 20°C. Data on fruit size distribution (Table 1) were subjected to an ordinal data analysis (McCullagh, 1980), which showed 'Arcadia' and 'Floradade' to be significantly smaller than 'Goulburn', which was smaller than 'C33' (*P* 0.05). Based on mean fruit weight, 'Arcadia' was lighter than 'Goulburn' or 'C33', whereas 'Goulburn' was lighter relative only to 'C33'.

'Arcadia' and 'Goulburn' fruit have excellent holding characteristics and have emerged in good condition after storage at 15°C for 4 weeks (unpublished data). The measured firmness and longevity of these cultivars means

Table 1. Field performance of 'Arcadia' and 'Goulburn' tomatoes vs. that of standard commercial cultivars. Results are means from replicated trials at Tatura, Australia, in 1985, 1986, and 1987 and at Undera, Australia, in 1986.

Cultivar	Marketable yield (t·ha ⁻¹)	Size distribution ^a (% by wt)				Fruit wt (g)	Firmness (mm) ^b
		1	2	3	4		
Goulburn	80.1	30.7	32.0	28.2	9.0	127	1.3
Arcadia	77.7	41.6	36.4	20.5	1.5	110	1.3
Floradade	74.3	45.0	27.9	20.7	6.3	115	1.6
C33	69.6	27.3	23.8	33.3	15.6	145	1.9
^{LSB} 0.05 (error df = 9)	13.6					15	0.2

^aSize classifications were 1 is 45 to 58 mm 2 is 59 to 64 mm; 3 is 65 to 73 mm; and 4 is >73 mm in diameter.

^bFirmness was measured as millimeters compression as described by Sumeghy et al. (1983).

Fig. 1. 'Arcadia' tomatoes.

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Fig. 2. 'Goulburn' tomatoes.

that fruit recovery is high in the field and that fruit can be picked ripe. Vine-ripened fruit have strong marketing advantages, including

improved flavor (Bisogni et al., 1976), and 'Arcadia' particularly has been commercially successful when marketed this way.

Availability

'Arcadia' and 'Goldburn' seeds are available commercially from Fairbanks Selected Seed Co., P.O. Box 35, Footscray Market, Victoria 3011, Australia. Small quantities of seed for experimental purposes can be obtained from W.J.A.

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