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Promising Commercial Highbush Blueberry Varieties for South-Eastern Australia

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Abstract

Six blueberry varieties with commercial potential have been identified from a selection program which began in 1970.

Two of the varieties are early-midseason, two midseason and two are late varieties. Three of the varieties; 'Blue Rose,' 'Brigitta Blue' and 'Denise Blue' are already planted widely in south-east Australia and are the basis of the Victorian highbush industry.

Introduction

In Australia there are few commercial blueberry plantations over 6 years old, however production is rapidly gaining momentum. Since 1981/82 fresh fruit production has doubled annually to reach approximately 60 tonnes in 1985/86. This figure includes both low and high chill varieties but does not include production for the pick your own trade. Production will continue to rise at its current rate until at least the early 1990's. The majority of production is from local highbush selections, although U.S. varieties especially 'Bluecrop' are widely planted.

The local selections were made from seeds imported into Australia in 1970 by R. Rowe and D. Jones. The first local selections were initially made by D. Jones and these were then evaluated by R. Bell from 1975-1979 and reduced during that time to 15 selections. The seeds originated from open pollinated U.S. varieties and were sent to Australia by S. Johnson at Michigan State University. Parentage of each selection is given in Table 1.

Unfortunately the rapid establishment of the new blueberry industry has meant that many varieties (both the local selections and also standard U.S. varieties) were planted before being adequately evaluated. This has caused several difficulties both in production and marketing. Firstly, growers often have too many varieties, particularly mid-season, and secondly, a number of varieties have proved commercially unsatisfactory. The preponderance of mid-season varieties hinders marketing because 50% of the crop is harvested during the first two weeks of January. In Australia as in New Zealand (3) this is the worst period for marketing horticultural produce because there is a post Christmas fall in prices. The need to rationalize plantings to attenuate the peak of production and to discard unsatisfactory cultivars made detailed varietal evaluation an urgent priority.

This paper compares the performance of 15 local selections with seven U.S. varieties (five highbush and two rabbiteyes). In addition the blueberry varieties which currently show the best commercial potential for southern Australia are briefly discussed.

Methods

The Horticultural Research Institute (HRI) (37° 54'S, 145° 18'E) receives an average (1958-72) 760 hrs chilling below 7.2°C per year. This is marginal for highbush blueberries as they require between 650-850 hrs p.a. (1). Soils at the Institute are podzolic sandy clay loams with a pH of around 5.0. Topsoil is shallow (~10cm) and overlays a compacted clay of low permeability. Soils

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can be waterlogged in winter and spring.

Four plants of each of the 15 seedling selections (Table 1) and 44 U.S. highbush and rabbiteye varieties (Table 2) were planted in a bird proof cage at HRI in January 1981. Three branches on each bush were selected and tagged before bud break and then assessed weekly for the following attributes:— flower bud opening, vegetative bud opening, number of floral and vegetative buds, number of flowers per cluster and number of fruit set per cluster. Fruit were harvested every 7-10 days, weighed and the weight of 100 berries recorded.

The bird netting has been found to allow unimpeded bee movement in and out of the cage (Goodman and Clayton-Greene, unpublished data). Qualitative characteristics of vigour, shape and ease of picking (i.e. were berries easy to locate) were assessed for bushes. Berries were assessed for colour, shape, scar (size and whether dry or wet) taste, tearing and ease of detachment without pedicel.

Except for fruit set the results are from three seasons 1983/1984, 1984/85, 1985/86.

Table 1. Average fruit set of 15 local blueberry selections and seven standard U.S. varieties. All parents of local selections were open pollinated.

Variety	Parentage	Fruit Set % 1983/84	Fruit Set % 1984/85
11A	Late Blue	12	63
15A	Late Blue	56	79
16	Late Blue	80	76
17	Late Blue	51	74
19	Late Blue	33	22
20	Berkeley	71	84
21	Late Blue	80	78
22	Berkeley	69	80
36	Blue Haven	68	77
38	Blue Haven	21	61
40	Blue Haven	91	76
47	Blue Haven	67	72
55	S-388	100	54
74	Northland	63	31
83	S-52H	66	67
Earliblue		59	53
Elliott		73	99
Jersey		87	77
Bluecrop		66	88
Rubel		62	66
Delite		54	79
Tifblue		57	64

Table 2. List of U.S. varieties evaluated at HRI Knoxfield.

Highbush	Rabbiteye	Tetraploid
Atlantic	Beckyblue	Flordablue
Berkeley	Bluebelle	Sharpe blue
Bluechip	Bluegem	Avonblue
Bluecrop	Briteblue	
Blueray	Centurion	
Bluehaven	Climax	
Bluejay	Delite	
Bluetta	New Murphy	
Burlington	Powder blue	
Cabot	Premier	
Coville	Tifblue	
Collins	Woodard	
Croatan		
Darrow		
Earliblue		
Elliott		
Herbert		
Ivanhoe		
Jersey		
Lateblue		
Murphy		
Northland		
Patriot		
Rancocas		
Rubel		
Spartan		
Stanley		
Weymouth		

Results

Flowering for most of the local selections commences together with 'Bluecrop' in the first week of September. Selections 21, 36, 38 commence a week later and selections 15A and 17 flower two weeks after 'Bluecrop.'

Most of the Australian selections have adequate fruit set (75%) indicat-

Table 3. Qualitative characteristics of Australian blueberry selections grown at HRI compared with seven U.S. varieties. Selections are listed in order of maturity.

	Bush			Berry					
Variety	Vigour	Shape	Picking	Season	Scar	Color	Flavor	Size	Remarks
Earliblue	8	7	84	10	9	6	7	6	Size declines as bush ages
74	6	4	5	9	8	6	7	6	Tears;
19	2	2	2	8	7	8	8	7	Size declines rapidly during season; berries drop;
40 (Jenny)	9	9	9	7	4	4	7	4	Does not drop, sweet;
16	6	7	8	7	9	6	6	5	
47 (Denise)	5	5	10	7	10	4	9	10	Goes mealy quickly when mature, may be biennial;
Rubel	4	7	6	6	6	5	6	3	Small and dark berries;
Bluecrop	5	7	10	6	9	9	6	9	Flops badly in cropping, stores well;
55 (Annie)	7	8	7	5	7	7	7	8	
83 (Rose)	9	8	7	5	7	8	7	8	Acid unless fully ripe, tight clusters can be soft;
38	5	4	6	5	4	4	3	4	Damp scar;
11A (Brigitta)	8	10	10	4	9	9	8	9	Stores well, excellent variety;
36	4	4	9	4	2	6	2	10	No flavour at all;
Jersey	5	4	6	4	8	6	6	5	
20	7	6	4	4	2	6	2	7	Mealy texture;
22	7	6	5	4	6	6	2	7	Poor yields, poor texture;
15A	7	3	8	4	4	65	7	8	Wet scar, floppy habit;
21 (Caroline)	7	9	9	3	9	10	10	8	Very aromatic, sweet;
17	7	9	9	2	8	3	7	7	Soft, dark colour;
Elliott	9	9	9	2	9	10	7	5	Very tart unless fully mature;
Tifblue	10	5	6	1	10	10	6	4	Gritty texture;
Delite	10	8	6	1	10	2	10	8	May be biennial.

a. For bush characters 10 = most vigorous, most upright and easiest to pick whilst 1 = low vigour, floppy shape and difficult to pick.
b. For berry characters 10 = early season, dry scar, light colour, good flavour and large size.

ing satisfactory pollination (Table 1). Only selection 19 was consistently poor. The poor fruit set of 11A and 38 in 1983/84 was not repeated in 1984/85 and selection 11A records good fruit set from commercial plantings. Selection 38 is not widely planted commercially.

A number of selections can be eliminated as commercial possibilities due to their unsatisfactory qualitative characteristics (Table 3). These include 15a, 17, 19, 20, 22, 36, 38 and 74. Features such as a wet scar, tearing of the skin around scar when picking, berry softness, poor flavour and tex-

ture, and a spreading growth habit were each regarded as of sufficient importance to affect commercial viability. The above selections all displayed at least one of these attributes and are unacceptable.

Berry size is important both for ease of picking and also marketing. Many selections displayed inadequate size (Table 4) these include 16, 19, 20, 22, 38, 40 and 74. Of the U.S. varieties discussed in this paper only 'Bluecrop' and 'Delite' produced large berries, although those from 'Elliott' were acceptable. 'Tifblue' although small by highbush standards was typical for rabbiteye varieties.

Although 40 has a damp scar and small berry size it has a high yield and sweet berries which will remain on the bush for a long time after maturity. It also has a season over the Christmas-New Year holiday period which render it suitable as a pick your own variety.

Yield totals, both annual and cumulative (Table 5), are similar to those obtained in Michigan (2), but are lower than those reported from New Zealand (3). Several of the Australian selections (20, 40, 55) have cumulative totals comparable to those of Bluecrop. Total yield would have been higher for 11A, 21, 47 but the test bushes were the only sources of urgently required propagation material. Both 11A and 47 which are widely planted commercially have produced yields similar to 'Bluecrop' in commercial plantations.

'Earliblue' is the earliest maturing cultivar (Fig. 1) at HRI and 'Delite' the latest. 'Elliott' is the latest highbush variety. Most of the Australian selections are mid-season although 16, 19, 74 are only 5-7 days later than 'Earliblue' and 17 & 21 are only a few days earlier than 'Elliott.' Selection 47 showed considerable variation in maturity between seasons being up to 5 days either side of 'Bluecrop' in different years.

Table 4. The average weight of berries from three seasons at first pick and the average for the first three picks.

Variety	Average Berry Weight (gm) for 3 Years	
	Ave. 1st harvest	Ave. wt. 1st 3 harvests
11A (Brigitta)	1.5	1.5
15A	1.8	1.4
16	1.3	1.2
17	1.7	1.5
19	1.4	1.3
20	1.6	1.4
21 (Caroline)	2.0	1.5
22	1.4	1.3
36	2.2	2.2
38	1.2	1.1
40 (Jenny)	1.2	1.2
47 (Denise)	2.1	1.9
55 (Annie)	1.6	1.4
74	1.2	1.1
83 (Rose)	1.6	1.5
Bluecrop	2.3	2.0
Earliblue	1.1	1.1
Elliott	1.6	1.3
Jersey	1.0	0.9
Rubel	0.6	0.6
Delite	1.9	1.6
Tifblue	1.3	1.2

Discussion and Conclusions

The results indicate that only 6 of the Australian selections (11A, 21, 40, 47, 55 and 83) have commercial potential. These six selections were named by R. Bell as, 11A—'Brigitta Blue,' 21—'Caroline Blue,' 40—'Jenny Blue,' 47—'Denise Blue,' 55—'Annie Blue' and 83—'Blue Rose,' although the vernacular usually deletes the word blue. They can now be accorded varietal status.

'Brigitta' (11A) has proved to be the best variety in all characteristics and has generally performed well wherever it has been planted. It is an upright vigorous bush with large pale blue berries which have an excellent appearance and flavour. Its fruit hangs and stores well. Fruit is easy to find and can

Table 5. Annual and cumulative yields of Australian selections and several U.S. varieties from HRI Knoxfield.

Variety	Annual Yield Totals (KG)/Plant				
	1982/83	1983/84	1984/85	1985/86	Total
11A*	0.17	0.84	0.70	1.03	2.74
15A	0.73	1.09	0.79	1.22	3.83
16	0.56	0.62	1.37	1.47	4.02
17	0.42	0.59	0.59	0.71	2.31
19	0.28	0.29	0.18	0.28	0.98
20	0.81	1.03	1.43	2.25	5.52
21*	0.39	0.92	0.86	0.67	2.84
22	0.53	0.52	1.28	1.46	3.79
36	0.33	0.75	0.67	1.01	2.76
38	0.08	0.43	0.38	0.08	0.97
40	0.90	1.04	1.69	3.12	6.75
47*	0.31	0.55	0.45	0.38	1.69
55	0.94	0.82	1.21	2.21	5.18
74	0.37	1.42	0.63	0.98	3.40
83	1.01	0.81	0.67	1.29	3.78
Bluecrop*	0.95	1.08	1.94	2.16	6.13
Earliblue	0.17	0.55	0.67	0.76	2.15
Elliott	0.51	0.69	1.05	1.99	4.24
Jersey	0.23	0.22	0.53	0.30	1.28
Rubel	0.28	0.58	0.30	0.25	1.41
Delite	0.06	0.54	0.48	0.33	1.41
Tifblue	0.34	1.22	1.45	2.30	5.31

*These plants have low yields due to utilisation as sources of propagation material.

typically be completely removed with only 2 harvests. It has a small dry scar.

'Caroline' (21) has not been widely planted but it should prove a successful late-season berry. It is vigorous and produces large pale-blue berries which are sweet and very aromatic. It is easy to pick and the berries hang well. It has a small dry scar.

'Jenny' (4) is a high yielding vigorous variety with dark, sweet berries that will hang on the bushes for a long time without deteriorating. The fruit is easy to find. Its yield, hanging quality, seasonal timing (Christmas - New Year Holiday) and sweetness make this an excellent prospect for P.Y.O (Pick your own) sales. It will not be a major commercial fresh market berry apart from certain areas in which small fruit size is required and damp scars do not matter (e.g. processing).

'Denise' (47) is widely planted and produces a large round medium and excellent flavour. The berries have an excellent dry scar, loose clusters, detach readily and are easy to find. Vigour is only moderate. 'Denise' is likely to be gradually replaced by 'Bluecrop' however, because of the latter's superior horticultural characteristics. Faults with 'Denise' include lack of vigour and a tendency to overcrop, an excessively floppy habit when in crop and a red colouration around the scar. It goes mealy within 4-5 days of maturity.

'Annie' (55) is not planted widely and is unlikely to become commercially important as it is a mid-season variety and has a season similar to 'Rose' and 'Bluecrop' both of which are better. It is vigorous and produces large medium to dark blue berries with

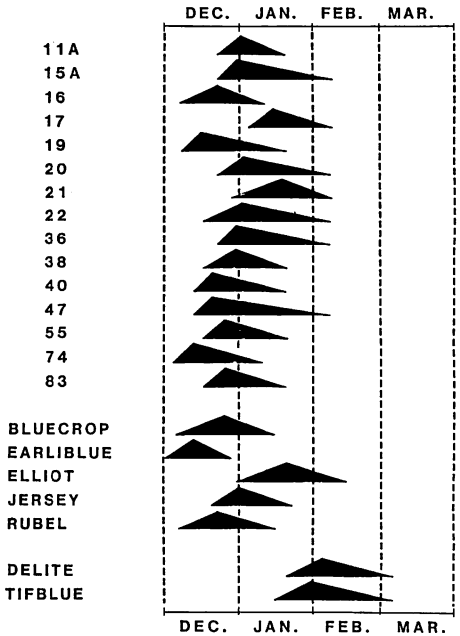

Figure 1. Seasonal ripening patterns of 15 local and 7 U.S. Blueberry varieties at HRI Knoxfield. Peak of triangle corresponds to 50% of total yield.

a good scar but not a particularly strong flavour. It is not as acidic as 'Rose.'

'Rose' (83) is the highest yielding and perhaps the most widely planted variety in south-east Australia. It is very vigorous, and produces medium-large pale blue berries. Fruit is easy to find and it has a fairly dry scar. Storage quality is not as good as 'Brigitta.' 'Rose' has two faults; tight clusters and it is very tart unless fully mature. The tight clusters will make mechanical harvesting difficult and cause immature fruit to detach when picking and give rise to misshapen fruit.

Of the U.S. cultivers evaluated at HRI only 'Earliblue,' 'Bluecrop,' 'Elliott' and possibly 'Spartan' and 'Bluejay' show a commercial potential. 'Earliblue' solely because of its earliness and 'Elliott' because it is late. More information is required about 'Spartan' and 'Bluejay.' At HRI many Spartan plants have succumbed to canker.

The industry is now consolidating on fewer highbush varieties with a greater emphasis on obtaining a wider seasonal spread of production. These varieties include 'Earliblue,' 'Bluecrop,' 'Blue Rose,' 'Brigitta,' 'Caroline,' 'Elliott,' 'Denise,' 'Spartan' and 'Blue Jay.'

Both 'Delite' and 'Tifblue' are being commercially evaluated as late season varieties and provide the possibility to extend the season in certain districts to mid-late March. There is some indication that 'Delite' may have a biennial bearing tendency and this needs to be examined more closely and over a wide range of habitats. No other rabbiteyes show much commercial potential in Victoria as their season clashes with highbush varieties and the berries are of smaller size and less cost effective to produce.

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