'8S6923' (Aurora Golden Gala™) Apple

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Additional index words. cultivar description, fruit breeding, *Malus ×domestica*

'8S6923' is a midseason, yellow dessert apple (*Malus ×domestica* Borkh.) with exceptional texture and keeping quality (Fig. 1). The fruit flesh is extremely crisp and juicy, firm and sweet. It retains crispness and juiciness for 6 months in air storage at 1 °C. The shelf life of fruit after storage is excellent. The tree is highly precocious and productive. The growth habit of '8S6923' is spreading with ample spur development and moderate vigor. It is not subject to alternate bearing or preharvest drop.

'8S6923' has been tested under contract by several orchardists in British Columbia, as well as by institutional cooperators in the Canadian provinces of Ontario, Nova Scotia, and Quebec. '8S6923' is also being tested by a nursery consortium in France.

The fruit will be sold under the name Aurora Golden Gala. The name was chosen in a nationwide internet-based *Name The Apple* contest sponsored by Agriculture and Agri-Food Canada's Communication team. The winning entry was submitted by Daphne Biggs of Ottawa, Ont.

Origin

'8S6923' resulted from a cross between the seed parent 'Splendour' and the pollen parent 'Gala' made at the Pacific Agri-Food Research Centre (PARC), Summerland, BC, by D. Lane and R. MacDonald in 1981 (Fig. 2). Seedlings from this cross were budded in place onto M.26 EMLA rootstock in the field in 1984. '8S6923' was selected on the basis of fruit quality and tree habit, assigned the breeder's number 8S-69-23, and propagated for second test on M.26 EMLA and M.9 EMLA beginning in 1990. The second test trees were planted in randomized, replicated trials with standard cultivars in Spring 1992 and evaluated from the time of first fruiting for yield, fruit size, fruit quality, storage and sensory quality over 10 years with consistent results. In 1996, the selection was forwarded to elite stage testing under the breeder's test

Received for publication 3 Apr. 2004. Accepted for publication 23 June 2004. We thank Warren Walters for his help with various aspects of nursery and field maintenance and data collection, and Mark Neufeld, Keith Johnstone and the PARC farm crew for ongoing assistance with plot maintenance. We also thank our volunteer taste panelists, and the past and present staff of the Okanagan Plant Improvement Company. We are grateful to Ann de St. Remy, Audrey Nadalin, Cathy Shearer, and other members of Research Branch Communications for their work with the apple naming contest.

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number 8S-69-23 by H. Quamme through the Okanagan Plant Improvement Company. The selection was described at that time (Quamme et al., 1998).

Description

The following description of the flowers, fruit, tree and leaves uses color designations of the Royal Horticultural Society of London (1966). Measurements are the average of 10 plant parts unless otherwise specified.

Flowers

Flowering season. Midseason, slightly earlier than 'Royal Gala'.

Petal color. Unopened bud RHS 70A/155D. At bloom, color on upper side 70B/155D, on lower side 70A/70D (155D when faded).

Size. Medium, corolla diameter at anthesis

about 52 mm. Petals of king bloom average 16 × 24 mm, including claw (mean of 40 petals from 20 flowers).

Fruit

Shape. Globose to globose conical; weakly ribbed and sometimes slightly elliptical in cross-section; slightly variable. In side view symmetrical or asymmetrical.

Size. Medium, smaller than 'Golden Delicious' and similar to 'Royal Gala.' Length 77 mm, diameter 83 mm (mean of 20). Harvest-time lab sample weights over 6 harvest years ranged from 265 g to 288 g.

Color. Ground color at full maturity 8C, after storage 10B. In areas with cold nights before harvest, sometimes having ≤10% blush of color 34A. Flesh color cream to light yellow, 11D.

Skin. Tender, thin to medium thickness; glossy and smooth at harvest, becoming duller and slightly waxy in long term air storage at 1 °C. Russet absent or very low in PARC orchards, but some test sites report stem end russet in the first crop year. Bloom absent.

Pedicle. Length ranging from 21 to 33 mm. Thick to medium thick, clubbed, occasionally hipped. Sometimes stems of adjacent flower adnate.

Calyx. Sepals persistent, dry, erect and separate at base, very slightly recurved; sepal shape lanceolate to acuminate. Eye closed to half open, small to medium in size.

Fig. 1. Fruit of '8S6923' (Aurora Golden Gala).

Fig. 2. Pedigree of '8S6923'.

Fig. 3. Intensity of selected attributes (each rated on a 0 to 9 scale) of '8S6923' fruit relative to commercial cultivars. Twelve trained judges drawn from a larger pool rated the fruit in each panel. The values are means weighted inversely to the error mean square of the analysis of variance for that taste panel. The number of panels and years that the cultivar was tested appears in parentheses. Abbreviations: R. Gala = 'Royal Gala', Golden Del. = 'Golden Delicious'.

Table 1. Shelf life test data for '8S6923' (Aurora Golden Gala) in different years. The fruit were removed from 1 °C air storage, and the firmness measured (Day 0). After 1 week at 20 °C, the firmness was measured again. Taste panels were run on Day 7.

Harvest year	Harvest date (day of year)	Harvest firmness ^a (kg)	Days in storage	Day 0 date (day of year)	Day 0 firmness ^a (kg)	Day 7 firmness ^b (kg)
1995	268	7.6	120	23	7.1	6.6
1996	276	7.5	123	34	6.8	6.9
1997	288	6.8	104	27	6.7	6.3
1998	265	7.3	120	20	6.6	6.9
1998	265	7.5	133	33	6.3	6.4
2001	277	7.1	117	29	7.4	7.5
2002	274	7.4	113	22	6.9	7.4

^aMean of 10 fruit.

^bMean of five fruit. The same fruit were tasted in hedonic panels on Day 7.

Table 2. Average fruit weight (AFW = weight of all fruit on tree ÷ number of fruit), trunk cross-sectional area (TCSA), cumulative yield and cumulative yield efficiency (CYE = cumulative yield divided by TCSA) of '8S6923' and other cultivars in the same plots from three randomized, replicated trials on different rootstocks at Summerland.^a

Cultivar	No. of trees	AFW (g)	TCSA (cm ²)	Cumulative yield (kg/tree)	CYE (kg·cm ⁻²)
Trial 1: Rootstock M.26 EMLA, 7 years after planting (5 years of data for average fruit weight)					
8S6923	4	192 b	13.1 a	63.6 a	4.80 a
Braeburn	4	238 a	9.8 a	37.1 b	3.79 a
Golden Delicious	4	243 a	14.3 a	42.4 b	3.27 a
Trial 2: Rootstock M.9 EMLA, 6 years after planting (5 cropping years)					
8S6923	6	223 ab	18.0 a	83.9 a	5.20 a
Golden Delicious	6	251 a	11.9 a	57.4 b	4.87 a
Silken	6	197 b	19.5 a	76.8 ab	4.26 a
Trial 3: Rootstock Budagovsky 9, 5 years after planting (3 cropping years)					
8S6923	8	211	12.8 a	28.5 a	2.26 a
McIntosh	8	201	9.5 b	13.0 b	1.38 b
Royal Gala	8	207	12.0 a	28.0 a	2.36 a
Silken	8	212	12.4 a	31.1 a	2.51 a

^aMean separation within a column and within a trial by Fisher's *t* test, $P \leq 0.05$

Core. Median in position, size small to medium. Calyx tube urn-shaped, core lines clasping, stamens in median position. Locules open, symmetrical or axile, smooth, nontufted. Full complement of seeds, nontufted, acute in shape.

Texture. Very crisp and breaking, very juicy, medium-grained, maintains breaking texture and juiciness in storage. Cut flesh browns fairly quickly.

Firmness at harvest. Over 6 years, ranged from 6.6 to 7.6 kg.

Soluble solids. At harvest, 13.0% to 15.1%. After 6 to 8 weeks of air storage, 14.2% to 16.4%.

Acidity at harvest. 0.58 to 0.75 mg/100 mL, as malic acid.

Flavor. Sweet, mild, fresh, delicate, with honey and tropical notes.

Maturity season. In Summerland, usually harvested in the first few days of October, or about 20 to 25 d after 'Gala'.

Keeping quality. Blind hedonic sensory

evaluations were run between 55 and 76 d after harvest, according to Hampson et al. (2000), over 6 harvest years against commercial cultivars. In these tests, the appearance, texture and flavor of Aurora Golden Gala were liked as much or more than 'Fuji', 'Golden Delicious' and 'McIntosh'. In separate blind panels, 12 trained judges evaluated the degree or intensity of various attributes (Fig. 3) relative to standards. Attribute intensity was rated between 27 and 85 d after '8S6923' was harvested, depending on the year. Aurora Golden Gala retains texture and excellent eating quality at least 6 months at 1 °C, but the skin becomes slightly waxy after 4 or 5 months. Shelf life was tested by removing fruit from air storage 117 to 167 d after harvest, leaving it at 20 °C for 1 week, measuring firmness (Table 1) and then subjecting the fruit to hedonic sensory panels as previously described (Hampson et al., 2000). Over 6 years of such tests, the appearance, texture and flavor of Aurora Golden Gala were liked as well as or significantly more than 'Fuji', 'Royal Gala', 'Braeburn', and 'Golden Delicious'.

Use. Dessert apple, appropriate for medium to long term storage.

Tree

Vigor. Moderate, similar to 'Gala' or 'Golden Delicious'. Trunk-cross sectional area of trees on different rootstocks is shown in Table 2.

Shape. Spreading with abundant spurs, well suited to high density planting.

Bearing habit. Bears chiefly on spurs and short shoots, but will also bear on 1-year-old wood. Very little bare wood. Heavy fruit set is typical, both in terms of number of fruits per cluster and number of clusters. Pre-harvest fruit drop is negligible ($\leq 1\%$). Very precocious and not subject to alternate bearing.

Branch angle. Varies from 45 to 90°, mostly 60 to 90°.

Productivity. Highly productive and will overbear without proper thinning. Yield is greater than 'Golden Delicious' or 'McIntosh' and similar to 'Royal Gala' in research plots of trees propagated on a variety of rootstocks (Table 2). Yield efficiency was similar to 'Golden Delicious' or 'Royal Gala'.

Thinning. Requires prompt thinning to prevent overbearing and achieve proper fruit size and flavor. Thin to single king fruits 15 to 20 cm apart.

Branch appearance. Bark on 1-year-old dormant shoots dark brown (RHS 200A). Upper half of dormant 1-year-old shoots has weak to medium pubescence; lenticels white, medium sized, intermediate density. On older shoots, lenticels rougher, oval, white to pale tan, becoming more corky and elongated with age.

Hardiness. Trees have survived winter temperatures as low as -20 °C at Summerland. Early winter hardiness of 1-year-old twigs was assessed in controlled freeze tests run over two different years, according to procedures previously published (Quamme, 1976). '8S6923' was similar to 'Golden Delicious' and significantly less hardy than 'Spartan'

Table 3. Mean temperature of incipient damage (TID, the warmest temperature at which damage occurred to bark or xylem) for twigs in controlled-freeze tests in 2 years.^a All trees were of the same age, all were propagated on M.9 EMLA and were in the same field.

Cultivar	No. of trees	TID, 1999 (°C)	TID, 2000 (°C)
8S6923	4	-23.1	-22.1
Golden Delicious	4	-25.1	-23.3
Spartan	4	-29.8	-28.3

^aTID for 8S6923 was not significantly different from 'Golden Delicious' and significantly greater (warmer) than 'Spartan' in both years, according to Dunnett's test.

(Table 3). Based on these results, we rate it as moderately winter tender.

Disease resistance. Disease resistance of '8S6923' is comparable to its parents. It is susceptible to apple scab [*Venturia inaequalis* (Cke.) Wint.]. Powdery mildew [*Podosphaera leucotricha* (Ell. & Ev.) Salm.] incidence was lower on '8S6923' than on 'Gala' in unsprayed plots. In plots under conventional management, the incidence of powdery mildew has been negligible, and notably lower than on 'Jonagold', 'Gala' or 'Ginger Gold'. No natural outbreaks of fire blight (incited by *Erwinia amylovora* [Burr.] Winslow) affected '8S6923' during its 20 years in the fields at PARC. Resistance was assessed in different experiments over several years by needle inoculation of shoot tips with mixed virulent local strains of fire blight bacteria, and subsequently measuring the percent of shoot length blighted. Results are shown in Table 4.

Leaves

Size. Blade size ≈67 × 94 mm, length: width ratio 1.4

Table 4. Mean percent shoot blight (number of measurements in parentheses) after needle-inoculation with fire blight bacteria in three trials.^a

Cultivar	Trial 1	Trial 2	Trial 3
8S6923	77 a (8)	80 a (16)	57 ab (19)
Royal Gala	84 a (9)	ND ^b	79 a (24)
McIntosh	100 a (8)	ND	33 b (24)
Starkrimson Delicious	ND	57 b (19)	ND

^aTrial 1 (1999) and Trial 2 (2000) used potted 2-year-old trees on M.9, grown in the greenhouse under optimum conditions for disease development. Trial 3 used 4-year-old trees on M.27 and was done in the field at Agassiz, BC in 2001. Means followed by a different letter within a column are significantly different (Dunnett's test, $P \leq 0.05$, using named cultivars as controls)

^bNot done.

Petiole. Length ≈26 mm.

Margins and tips. apex cuspidate; margins serrate

Color. Adaxial side 147A, medium glossy; anthocyanin coloration of veins medium, RHS 59A.

Cultural Notes

'8S6923' sets annual heavy crops and must be thinned properly for satisfactory fruit size and taste. If trees are over cropped, the fruit are hard to pick and therefore more likely to be finger-bruised at harvest. Trees are very precocious and will set fruit in the nursery if allowed to do so. On older trees, spur renewal pruning is recommended. Occasionally, adjacent fruitlets will fuse together. These can be seen at thinning time and should be removed. '8S6923' (Aurora Golden Gala) is not recommended for areas that cannot attain adequate fruit size on 'Gala', nor for areas where 'Gala' or 'Golden Delicious' suffer winter injury.

Some stem end russet may occur on fruit from the first crop or fruit on 1-year-old wood. Older trees have had clean fruit. The response in humid regions or those with cold, wet springs has not been established.

The fruit can be harvested in one or two picks. Research to determine the best harvest index is in progress. When harvested at starch 4 to 6 on the Blanpied and Silsby (1992) generic starch chart, the fruit has been stored successfully for up to 7 months in air. No controlled-atmosphere storage research has been done. If picked fully to overmature (iodine staining completely absent), the fruit may develop stem end splits on the tree or in storage. Small spots of superficial scald may appear on some apples if they are highly exposed to the cooling coils in air storage. This

can be prevented by covering the fruit with a box of a nonsusceptible variety such as 'Gala'; preliminary observations at PARC show that covering the boxes of fruit with tarpaulins will also prevent the disorder. Fruit that receive no calcium sprays during the growing season may develop internal browning in long term air storage (≥8), similar to 'Fuji'. The incidence is higher when fruit size is very large.

Availability

'8S6923' was tested at the Centre for Plant Health in Sidney, BC using woody and herbaceous host bioindicators, as well as serological and molecular methods. No viruses, virus-like agents, viroids, or phytoplasmas were detected. '8S6923' is protected under Canadian Plant Breeders' Rights legislation (PBR Certificate # 1652), and is being protected in the European Community and the United States. Commercialization rights have been granted to the okanagan Plant Improvement Company (PICO, Box 6000, Summerland, BC, Canada, V0H 1Z0). Information on the availability of trees or propagation wood, and inquiries regarding nursery licensing or acquisition of trees outside of Canada should be addressed to PICO. Trademark protection is being sought for the name Aurora Golden Gala, under which the fruit will be sold in North America.

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