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'Kent' and 'Honeoye' Were Highest Yielding Best-Adapted Strawberry Cultivars in Colorado Trial

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Abstract

Seven strawberry cultivars were compared during 1985-1987 in a saline western Colorado soil pH 8.0. Two relatively new cultivars, 'Kent' and 'Honeoye,' were the highest yielding and also had very good fruit quality. 'Kent' had the additional advantage of above-average frost tolerance based on a damaging freeze April 27, 1986, 'Honeoye' was highly resistant to pH-induced chlorosis. These two cultivars were superior to those recommended from earlier trials.

Introduction

Although there has been considerable interest in growing strawberries in Colorado, the late spring frosts and availability of harvest labor have limited expansion of the acreage. Some mid to late season cultivars tested in an earlier yield trial produced quite well (2), but no late spring frosts occurred those years. The seven cultivars tested in this yield trial were selected for evaluation because of their mid to late season flowering characteristics and their reported traits of either sustained large fruit size and high yield or relative hardiness (1, 3, 4).

Materials and Methods

The experimental plot was located at the Orchard Mesa Research Center on a Genola clay loam, pH 8.0. the soil was fumigated on November 15, 1984 with shank-injected Vorlex at a rate of 132 liters per hectare (35 gallons per acre). Phosphate fertilizer was incorporated prior to planting. The 5.5 m (18-ft) plots with plants 30 cm (12 in) apart were planted in late April 1985. Rows were planted on 30-cm (12-in) wide ridges about 10 cm (4 in) high and 101 cm (40 in) on center, which equals a plant density of 32,308 plants per acre). The ridge facilitated burying of the drip irrigation lines. Matted rows were allowed to develop. Plots were arranged in a randomized complete-block design with four replications.

Cultivar performance was based on fruit yield and occurrence of iron chlorosis in both 1986 and 1987 and powdery mildew in 1987. Bloom period and extent of frost injury after exposure to -4°C (25°F) on April 27, 1986 were recorded. Most cv were harvested 9-11 times during a 3-week period. Yield data for 1986 and 1987 were anlayzed by two-way analysis of variance with mean separation by Duncan's Multiple Range Test.

The planting was drip irrigated three times per week based on Class A pan evaporation with a crop coefficient of 0.8. Total irrigation plus effective rainfall was 127 cm (50 in) in 1985, 125 cm (49 in) in 1986 and 96 cm (38 in) in 1987, when a renovation dry-down period was used. Standard fertilization included nitrogen and phosphate through the drip system. Fe 138 iron chelate was needed on cultivars Benton and Cardinal in August 1986 to keep plants alive and was applied as a slurry to the portion of the soil surface wetted by the drip tubing. Standard weed control and winter straw-mulching practices were used. One fungicidal spray was required in 1986 on the cultivars 'Arking' and 'Cardinal' for powder mildew control. No insecticides were needed during the trial.

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Results and Discussion

All seven cultivars achieved a good stand in 1985. None had severe iron chlorosis, as did cultivars tested in this soil in 1983-1984 (2). Some chlorosis appeared by harvest time of 1986, but growth following renovation showed minimal symptoms on all but 'Benton' and 'Cardinal.' By the 1987 harvest season chlorosis was more widely evident (see Table 1), but again the July-September regrowth of foliage showed only minor symptoms.

Each season the straw mulch was left in place until March 24-26 to delay bloom. The seven cultivars in this trial were mid and late season strawberries, the earliest being 'Honeoye.' An extremely warm early spring in 1986 resulted in open blooms on all cultivars except 'Shuksan' between April 19 and 25 (Table 2). In 1987 the bloom period was 8-10 days later. the early bloom in 1986 was accompanied by a -4°C (25°F) freeze on April 27. Only open flowers were evaluated for freeze injury and the fraction of total buds which had reached this stage varied widely (Table 2). The combined effects of bloom date and flower cold hardiness (percent of open flowers killed) can be inferred by comparing fruit yields for the two seasons (Table 1). 'Honeoye,' with the most advanced bloom, was the most damaged. Of the three cultivars with fairly good survival, 'Benton' probably had the hardiest blossoms, 'Shuksan' had the slowest blossom development, and 'Kent' probably fared well due to a combination of flower hardiness and lateness. Controlled freezing tests would be required to confirm these observations.

A June 16, 1987 evaluation of powdery mildew (Table 1) showed that 'ArKing' and 'Cardinal' were very susceptible. In a climate where many strawberry cultivars can be grown without fungicides, this is a notable drawback. 'Guardian' was also susceptible.

The analysis of yield data found significant differences among the seven varieties and also between years, due to the freeze damage to buds in 1986. Interaction between cultivar and year was also significant, (Table 1 footnote). In 1986 'Honeoye' was the lowest yielding cv, but in 1987 its yield was second only to 'Kent' (Table 1). While 'Shuksan' and 'Guardian,' the best two cultivars from prior trials in western Colorado (2), both performed well, neither was comparable to the newer cultivars 'Kent' and 'Honeoye.' 'Guardian' and 'Shuksan' both have high vegetative vigor and in the past have produced more in their first crop than their second. The 30 cm (12 in) spacing in this trial, versus 60 cm (24 in) between plants in the previous trial

Table 1. Comparison of 7 strawberry cultivars, planted in April 1985, for chlorosis and powdery mildew susceptibility and fruit yield.

Cultivar	Chlorosis rating[z]	Mildew rating[z]	Fruit yield kg/ha[y]	
			1986	1987
Kent	2.4 c[x]	3.0 ab[x]	14,307 a[x]	27,826 a[x]
Honeoye	4.0 a	3.8 a	3,765 d	21,002 b
ArKing	3.0 b	1.0 d	5,426 cd	18,346 bc
Cardinal	2.3 c	1.3 d	5,406 cd	17,847 bc
Shuksan	3.9 a	2.5 bc	8,571 bc	15,709 cd
Guardian	3.6 a	1.8 cd	4,252 d	15,455 cd
Benton	2.8 c	3.0 ab	10,674 ab	12,996 d

[z]Ratings of 4 = insignificant, 3 = slight, 2 = moderate and 1 = severe. The ratings for chlorosis combine both 1986 and 1987 values. Mildew ratings are for 1987.

[y]Yield in kg/ha x 0.88 = lb/ac.

[z]Mean separation within columns by Duncan's Multiple Range Test, 5% level. The Analysis of Variance was significant at the 1% level for cultivar differences for chlorosis, mildew, and fruit yield. For yield there was also 1% level significance for years and interaction.

Table 2. Relative bloom time and freeze injury of open flowers for 7 strawberry cultivars.

Open cultivar	Date when many primary flower buds were open		Effect of April 27, 1986 freeze	
	1986	1987	Fraction of flower buds open	Percent flowers killed
Kent	4/22	5/2	1/2	30
Honeoye	4/19	4/28	all	84
ArKing	4/24	5/3	1/4	66
Cardinal	4/23	5/2	3/4	71
Shuksan	4/29	5/6	1/10	50
Guardian	4/25	5/2	1/4	42
Benton	4/22	4/30	3/4	35

(2), may have further accelerated interplant competition. The 1986 freeze damage left this analysis unresolved, as well as the question of whether these cultivars perform better on flat beds (1982-1984) or 10 cm (4 in) raised beds as in this trial. 'Guardian' is more prone to yield loss due to freeze injury than is 'Shuksan.'

'Kent' and 'Honeoye' not only yielded better than 'Shuksan' and 'Guardian,' but an informal evaluation found their fruit to have superior flavor, size, and shape. 'Kent' appears to be very well adapted to Colorado conditions, especially in terms of cropping consistency in frost-prone areas. Its 1987 yield potential of 27,800 kg/hectare (24,600 lbs per acre) as extrapolated from the plots was exceptional. 'Kent's' adaptation to high pH calcareous soils is not as good as the other three above-mentioned cultivars, although chlorosis symptoms only appeared during the fruit enlargement phase. The best way to extend the harvest season when using 'Kent' as the main variety is to grow the earlier cultivar 'Honeoye,' although frost protection would be advisable. 'Honeoye' is at least as resistant to iron chlorosis as 'Shuksan,' the previously top-rated cultivar for that trait. 'Kent' and 'Honeoye' are apparently widely adapted, since they have also yielded very well in the upper midwest and northeastern U.S. (1, 3).

While 'ArKing' and 'Cardinal' outyielded 'Shuksan' and 'Guardian' and 'ArKing' holds its fruit size well, they have problems with powdery mildew and chlorosis (Table 1) and fruit quality. 'Benton' has good bud hardiness and fruit quality but is chlorosis susceptible and doesn't produce well. On balance, 'ArKing,' 'Cardinal' and 'Benton' aren't an improvement over 'Shuksan' and 'Guardian,' while 'Kent' and 'Honeoye' are. Strawberry production potential in western Colorado appears favorable. Spring frosts, control of field bindweed, and access to labor remain the primary challenges.

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