



## A Comparison of 10 Fall Bearing Raspberry Cultivars for Northern Utah

*Rick Heflebower, Britney Hunter, Shawn Olsen, Brent Black, Diane Alston, and Thor Lindstrom*  
Utah State University Extension

### Introduction

Raspberry plants have a perennial root system with biennial canes. In other words the root system may live for many years, while the individual shoots live for only 2 years. During the first year of growth the canes (primocanes) are typically vegetative, while in the second year, the same canes (now floricanes) flower and bear fruit. Even though the individual canes live for only 2 years, the crown is sending up new canes each year, hence the plant itself is perennial.

Some raspberries have the ability to bear on canes during the first year of growth. These are known as “primocane bearers” or may also be referred to as “fall bearing varieties.” The “fall bearing” name is used because by the time the primocane fruiting varieties grow, flower, and set fruit it is usually later into the fall season. This bulletin deals only with fall bearing varieties. If you would like to learn more about general raspberry culture please refer to the fact sheet “Growing Raspberries in Utah.”

With fall bearing cultivars, the new canes emerge from the roots in late spring, begin flowering in July and set fruit in August. For this reason, fall bearing cultivars may be better able to withstand extreme cold winters, but are best suited to areas that experience longer growing seasons. Summer bearing varieties set their crop earlier in the summer (usually by July) but require the survival of overwintering canes. Since winter damage is not a major concern with the fall cropping system, the important characteristics to consider in selecting a fall-bearing cultivar are earliness, yield, fruit quality, and resistance to common insects and diseases. In response to increasing local interest in berry production, a

research project to evaluate fall-bearing cultivars was carried out at the USU Kaysville Farm.

### Kaysville Cultivar Trial

Ten fall-bearing raspberry cultivars were planted in 2006. Each cultivar was grown in a plot measuring 12 feet long with 10 feet between rows, and 8 feet between plots within the row. Each plot was planted with six nursery-produced plants spaced 2 feet apart within the row, and alleyways were planted to grass. Irrigation was provided using both drip and overhead. Plant nutrient needs were supplied by applying 120 lbs of 16-16-16 (NPK) per acre in mid April and again in early June (banded in the row). Only the primocanes were cropped, as all the canes in each plot were pruned to ground level at the end of each season. Canes were supported with a temporary trellis system consisting of a single twine on each side of the row, supported by T-shaped rebar posts (Figure 1).



**Figure 1.** Trellis system for fall raspberries, consisting of baling twine and a t-post made of rebar.

In the 2008-2010 growing seasons, plots were evaluated for yield, fruit size, and production season. Ripe fruit in each plot was harvested three times per week from late July until the first fall freeze, and fruits were weighed and sized.

*Consumer preference* - To compare fruit quality and consumer preference among cultivars, several evaluations were carried out. On 10 October 2008, an amateur taste panel of 10 individuals was convened and instructed to taste each of the 10 cultivars and provide ratings for firmness, appearance, flavor and overall preference. During the 2011 growing season, yield and production season were no longer being evaluated, and all of the marketable fruit from the planting was diverted for commercial sale, including at a local farmer's market. Harvested fruit was scored once each week for incidence of sunburn, and available fruit taken to the farmer's market was used to conduct a consumer

preference survey. The survey was open to any market attendee. One clamshell container of each cultivar was placed at the front of the table, with a small coin bank placed directly behind each clamshell (Figure 2). Participants were then provided with 10 pennies and instructed to taste berries from each container and then "vote" for their preferred cultivar by placing pennies into the corresponding coin bank. These preference surveys were carried out on 8 Sept. 2011 and 22 Sept. 2011, with 29 and 63 participants, respectively.

The planting was not treated with insecticides, in order to compare insect damage. Approximately weekly during June to August in each 2009-11, the number of canes with wilted tips and raspberry horntail larvae present were determined for each fall-bearing cultivar. Suspect canes were cut open and the presence, size, and location of horntail larvae and parasitoid wasps was determined (Figure 3).



**Figure 2.** Consumer preference evaluations by farmers market attendees.



**Figure 3.** Raspberry horntail adult just prior to emergence from the floricane.

## Results

### Yield

While the start of fruit harvest was similar across years, the length of the fruiting season, and rate at which the season progressed, differed significantly. Among cultivars, 'Joan J' consistently had the highest yields followed by 'Polana'. The cultivars 'Anne' and 'Himbo Top' consistently had the lowest yields (Figure 4). Because cultivar yield was inconsistent between years, a

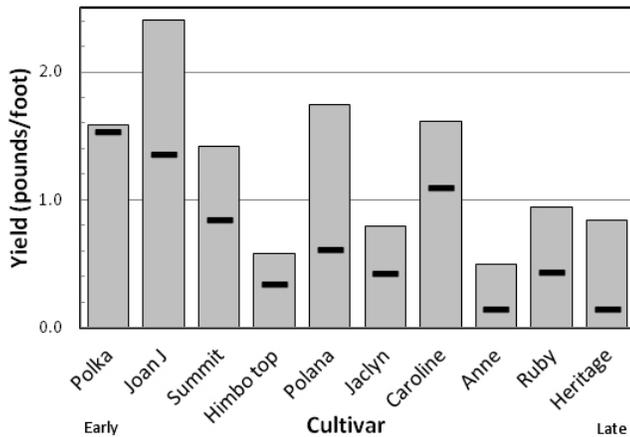
yield reliability index was calculated. Figure 4 shows average yield and yield reliability index of the 10 cultivars, where cultivars are listed in order of earliness. 'Himbo Top', 'Jaclyn' and 'Anne' were all consistently low yielding. Of particular interest is the comparison between the two earliest cultivars, 'Polka' and 'Joan J'. Averaged over the 3 years, yields for 'Joan J' were much higher than for 'Polka' at 2.4 and 1.6 lbs per foot. However, yields for 'Polka' were much more consistent

from year to year, resulting in very similar reliability index for both cultivars.

The cultivars with the largest fruit size included ‘Anne’ and ‘Ruby’ (Table 1); however, crop load likely affected fruit size. Because ‘Anne’ consistently had the lowest number of fruits (yield), more of the plant’s energy could be provided to each fruit.

**Table 1.** Average fruit size (g/fruit)

	Mean
Anne	2.94
Ruby	2.73
Joan J	2.71
Caroline	2.67
Polka	2.62
Himbo Top	2.55
Jaclyn	2.41
Polana	2.24
Heritage	2.12
Summit	1.51



**Figure 4.** Average yield and yield reliability index of 10 fall-bearing raspberry varieties at the USU Kaysville Research Farm from 2008-2010. Yield reliability index (75%) is shown by the dash marks, and represents the minimum yields that could be expected in 75% of the years. Varieties are listed from earliest to latest. Yields are reported as pounds of fruit per row foot

### Consumer Preference

Although the methods, and number of participants in consumer preference evaluations differed between years, the results were almost identical (Table 2). The top ranking cultivars overall were ‘Anne’ and ‘Polka’ in both studies. However, ‘Polka’ ranked slightly better in firmness and appearance while ‘Anne’ ranked better in flavor and overall preference (Table 2). The preference of ‘Anne’ may be due to its unusual color (pale yellow)

**Table 2.** Fruit quality and consumer preferences ratings of 10 fall-bearing raspberries. Varieties are listed according to overall preference by the taste panel.

Cultivar	Taste panel ratings 2008 (1-5)				Consumer rating 2011 (% of votes)	
	Firmness	Appearance	Flavor	Preference	8-Sept.	22-Sept.
Anne	4.0	4.1	4.1	4.4	34.8	21.3
Polka	4.2	4.9	3.9	4.2	22.7	18.4
Heritage	4.1	4.0	3.8	3.4	9.4	11.0
Joan J	3.8	4.3	3.2	3.0	9.4	10.3
Jaclyn	2.9	3.3	3.1	2.9	7.0	7.7
Himbo Top	3.3	3.4	2.6	2.7	4.3	5.5
Polana	3.2	3.7	3.0	2.7	3.9	5.7
Summit	3.2	3.0	2.6	2.6	2.0	5.2
Ruby	3.9	4.0	2.8	2.4	n.a.	7.7
Caroline	3.8	4.6	2.8	2.3	6.6	7.2

and large berry size. The least preferred cultivars were inconsistent between studies. While the consumer preference data strongly favors certain cultivars, less popular varieties should not be overlooked. ‘Joan J’ was the fourth favorite of study participants, while it had the highest average yield over 3 years.

### Sunburn

The frequency of sunburn varied dramatically among cultivars. ‘Polana’, ‘Joan J’ and ‘Jaclyn’ showed the lowest incidence of sunburn, whereas ‘Ruby’ and ‘Heritage’ were among the highest. Sunburn was the most common cause of fruit being unmarketable.

### Horntail Susceptibility

The average number of raspberry horntail larvae ranged from approx. 0.4 to 1 per foot of row across the 10 fall-bearing cultivars, and was not significantly different among cultivars (Table 3). There was an influence of year on horntail infestation; numbers of larvae dropped by over 50% in 2010 and 2011 as compared to 2009, the first year of the study (Table 4). These results support the benefit of frequent removal of horntail larvae through cane pruning, such as was done with our sampling protocol. Also, horntails were more abundant in nearby summer-bearing cultivars, which suggests that pruning back fall-bearing canes in the spring before adults emerge from overwintering cells may lessen horntail infestations.

Parasitism of horntail larvae was detected from late June through mid August (Table 5). Parasitism peaked in late July at nearly 70%, and averaged 40%. Two primary parasitoid wasp species have been found: 1) an ichneumon wasp, a solitary ecto-parasitoid whose larva feeds externally on horntail larvae, and 2) a pteromalid wasp, a gregarious ecto-parasitoid whose larvae feed in groups of 3-20 larvae per horntail host.

### Summary

Comprehensive detail is provided below for each cultivar based on the information gathered in this study. Cultivars are listed in order of earliness (based on the mean date over three years at which the cultivars cumulative yield reached 20% of the season total).

**Table 3.** Susceptibility to common problems

	Sunburn (%)	Horntail injury*
Ruby	14.4 a	0.7
Heritage	13.9 a	0.9
Himbo Top	11.9 ab	0.8
Caroline	11.9 ab	0.6
Anne	11.3 abc	1.0
Polka	9.3 abcd	0.6
Summit	8.3 bcd	0.6
Joan J	6.3 cd	0.7
Polana	6.0 d	0.4
Jaclyn	5.8 d	0.6

**Table 4.** Variability in horntail injury among years

Year	Horntail injury*
2009	1.12 a
2010	0.42 b
2011	0.5 b

\*Number of raspberry horntail larvae per row-ft

**Table 5.** Mean percentage parasitism of horntail larvae in fall-bearing raspberries 2009-2011.

Date	% Horntail
Jun 24	9
Jul 1	23
Jul 15	25
Jul 22	58
Jul 29	69
Aug 5	42
Aug 13	32

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## Cultivar Descriptions

**‘Polka’** – ‘Polka’ was very popular in consumer preference trials, and also reliably produced good yield (Figure 4). ‘Polka’ produced average size berries moderately resistant to sunburn, and had average susceptibility to raspberry horntail injury.

**‘Joan J’** – ‘Joan J’ was popular in consumer preference trials and produced high yields. However, ‘Joan J’ yields were not as consistent compared to ‘Polka’ (Figure 4). ‘Joan J’ produced large berries resistant to sunburn, and had average susceptibility to raspberry horntail injury.

**‘Summit’** – ‘Summit’ produced average yields, but was not preferred in consumer preference trials due to soft texture, small fruit size, and undesirable appearance. However, ‘Summit’ showed moderate resistance to sunburn and raspberry horntail injury.

**‘Himbo Top’** – ‘Himbo Top’ produced low yields, and the flavor was not preferred in consumer preference trials. ‘Himbo Top’ produced average size berries with a moderately high percentage of sunburn injury. The cultivar showed high susceptibility to raspberry horntail injury.

**‘Polana’** – ‘Polana’ was high yielding, but yield was inconsistent (Figure 4). Fruits of ‘Polana’ were not preferred in consumer preference trials. However, ‘Polana’ also had a very low percentage of sunburn injury and showed resistance to raspberry horntail injury.

**‘Jaclyn’** – ‘Jaclyn’ was a low yielding cultivar with average size berries, however the fruits were relatively popular in consumer preference trials. ‘Jaclyn’ also had the lowest percentage of sunburn injury in this study. Raspberry horntail injury was moderately high in ‘Jaclyn.’

**‘Caroline’** – ‘Caroline’ berries were among the largest in this study, and simultaneously produced good yields. The flavor of ‘Caroline’ was not preferred in consumer preference studies, while firmness and appearance were rated highly. Caroline berries tend to be more tart than other cultivars, which may explain the lower consumer flavor ratings. The cultivar had a moderately high percentage of sunburn injury, and a relatively low amount of raspberry horntail injury.

**‘Anne’** – While there is a strong consumer market for ‘Anne,’ the cultivar provides inadequate yield for commercial production. The lower yields were primarily

due to late ripening with yields limited by fall frost. ‘Anne’ has a large fruit size with good flavor, firmness, and appearance. ‘Anne’ is a pale yellow variety moderately susceptible to sunburn.

**‘Ruby’** – ‘Ruby’s’ berries were among the largest, and produced average yields despite it being one of the latest fruiting cultivars in this study. The flavor of ‘Ruby’ was not preferred in consumer preference trials, while the firmness and appearance were rated highly. ‘Ruby’ had the highest percentage of sunburn injury, and a moderately high amount of raspberry horntail injury.

**‘Heritage’** – ‘Heritage’ produced low, inconsistent yields due to its late season. ‘Heritage’ produced small berries that were among the top three in consumer preference trials. ‘Heritage’ had a high percentage of sunburn injury, and a high amount of horntail injury. Although ‘Heritage’ is one of the oldest fall raspberry varieties, our results indicate that newer varieties offer improvements in size, flavor, earliness and resistance to sunburn.

## Related Information Links

Raspberry cane insects:  
<http://utahpests.usu.edu/htm/utah-pests-news/fall2011/raspberry-damage/>

Pruning the Orchard (including raspberries and blackberries):  
[http://extension.usu.edu/files/publications/publication/HG\\_363.pdf](http://extension.usu.edu/files/publications/publication/HG_363.pdf)

Raspberry cane insects and their control:  
<http://utahpests.usu.edu/htm/utah-pests-news/summer07raspberry-insects/>

Raspberry Horntail [insect]:  
<http://utahpests.usu.edu/ipm/htm/fruits/fruit-insect-disease/raspberry-hornail09>

Iron Chlorosis in Berries:  
[http://extension.usu.edu/files/publications/publication/Horticulture\\_Fruit\\_2009-02pr.pdf](http://extension.usu.edu/files/publications/publication/Horticulture_Fruit_2009-02pr.pdf)

Caneberry Irrigation:  
[http://extension.usu.edu/files/publications/publication/Horticulture\\_Fruit\\_2008-04pr.pdf](http://extension.usu.edu/files/publications/publication/Horticulture_Fruit_2008-04pr.pdf)

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