Horticulture

EXTENSION
UtahStateUniversity
extension.usu.edu

January 2015 Horticulture/Fruit/2015-02pr

A Comparison of 16 Summer-Bearing Raspberry Cultivars for Northern Utah

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

Introduction

Summer-bearing raspberry plants have a perennial root system with biennial canes, meaning 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) typically only produce leaves, 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 produces new canes each year, making the plant perennial.

In temperate climates of northern Utah, an advantage of summer-bearing (floricane fruiting) cultivars is that they bloom and bear fruit during midsummer. This allows plants to reach their full yield potential before the first fall freeze. However, fruit susceptibility to sunburn during the hot summer months dictates that cooler regions, such as the northern Wasatch Front, Cache Valley and Bear Lake, are best suited to summer-bearing cultivars. Another disadvantage of summer-bearing types is the susceptibility of floricanes to winter cold injury (Figure 1).

Important characteristics to consider in selecting summer-bearing cultivars are winter hardiness (Figure 1), yield, fruit quality including sunburn resistance, and resistance to common insects and diseases. In response to increasing local interest in raspberry production, a research project was initiated to evaluate important characteristics of summer-bearing cultivars. To learn more about general raspberry culture, please refer to the USU factsheet titled “Raspberry Management for Utah.”

Figure 1.Winter injury to floricanes.

Kaysville Cultivar Trial

Sixteen summer-bearing raspberry cultivars were planted in 2006 at the Utah State University Agricultural Research Farm in Kaysville, Utah. Each cultivar was assigned a plot and 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 met with fertilizer applications of 120 lb/acre of 16-16-16 N-P-K applied in mid-April and early June, banded in the raspberry row. Canes were supported with a permanent T-shaped trellis.

In the 2008-2010 growing seasons, plots were evaluated for yield, fruit size, and length of production season. To compare fruit quality and consumer preference among cultivars, several evaluations were conducted. On 16 July 2009 and 22 July 2010, 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 fruit from the planting was diverted for commercial sale, including a local farmers market. Visitors to the farmers market participated in a consumer preference survey. One clamshell container of each cultivar was placed at the front of a table with a small coin bank placed directly behind each clamshell (Figure 2). Participants were 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 21 July and 14 August 2011.

Plots were not sprayed with insecticides in order to evaluate insect damage. Approximately weekly during June to August in 2009-2011, the number of canes with wilted tips and horntail larvae present was determined for each cultivar. Suspect canes were cut open and the presence, size, and location of horntail larvae (Figure 3) and parasitoid wasps (beneficial wasps attacking the raspberry horntail larvae) was determined (Figure 4).

Results

Yield

The degree of winter cane injury differed dramatically from year to year. In the spring of 2008, no canes had visible winter injury, whereas injury was severe in Spring 2007 and Spring 2011, showing dramatic differences among cultivars. The cultivars 'Royalty', 'Cascade Bounty', and 'Moutere' showed the least amount of winter injury, while 'Coho', 'Lauren', 'Titan' and 'Tulameen' all showed winter injury in most years (Table 1). Not surprisingly, yields were strongly affected by floricane survival, where the cultivars with the greatest winter survival typically produced the highest yields (Table 2). 'Royalty', 'Cascade Bounty', 'Georgia', 'Reveille' and 'Chemainus' had the highest yields, while 'Lauren', 'Coho' and 'Tulameen' had the lowest. Average yields of 'Cascade Dawn' and 'Cascade Delight' were affected by being planted a year later than the other cultivars, which reduced 2008 production.

Fruiting season was evaluated based on the date at which 20% of the total season crop was harvested. Fruiting season differed significantly among years and among cultivars (Table 3). In general, the earliest cultivars were 'Reveille', 'Canby' and 'Moutere'. The latest maturing cultivars were 'Saanich', 'Royalty' and 'Coho'. Fruit size was largest for 'Cascade Delight', 'Tulameen' and 'Cowichan', and smallest for 'Lauren', 'Canby', 'Saanich', 'Reveille', and 'Moutere' (Table 4).

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

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

Table 1. Winter survival of summer-bearing raspberry cultivars at the USU Kaysville Research Farm. Values are percent floricane survival.

	2007	2008	2009	2010	2011	Mean
Royalty	100	100	100	100	90	98
Cascade Bounty	93	100	100	96	90	96
Moutere	88	100	100	99	88	95
Reveille	99	100	99	99	73	94
Cowichan	97	100	100	99	74	94
Georgia	100	100	100	96	68	93
Cascade Dawn		100	99	98	68	91
Cascade Delight		100	99	98	64	90
Saanich	82	100	94	98	68	88
Canby	53	100	94	97	75	84
Chemainus	90	100	92	99	22	81
Willamette	64	100	84	78	59	77
Tulameen	88	100	87	82	16	75
Titan	25	100	99	90	40	71
Lauren	49	100	81	42	20	58
Coho	23	100	80	50	30	57

Table 2. Yield of summer bearing raspberries, expressed as pounds of fruit per row foot (lbs/ft).

Cultivar	2008	2009	2010	Mean
Royalty	0.97	1.83	1.49	1.43
Cascade Bounty	0.57	1.80	1.38	1.25
Georgia	0.76	1.64	1.22	1.21
Reveille	0.53	1.92	1.16	1.20
Chemainus	0.35	1.92	1.20	1.16
Cowichan	0.47	1.62	1.05	1.04
Canby	0.35	1.55	1.12	1.00
Saanich	0.28	1.50	1.14	0.97
Cascade Delight	0.26	1.49	1.15	0.97
Moutere	0.29	1.44	0.99	0.91
Titan	0.27	1.58	0.70	0.85
Willamette	0.19	1.14	0.84	0.72
Tulameen	0.12	1.21	0.75	0.69
Cascade Dawn	0.07	0.97	0.92	0.65
Coho	0.03	0.79	0.61	0.48
Lauren	0.09	0.51	0.27	0.29
Mean	0.35	1.43	1.00	

Table 3. Fruiting season, based on the average date at which 20% of the total season's yield was harvested.

Cultivar	2008	2009	2010	Mean
Reveille	7-Jul	30-Jun	12-Jul	6-Jul
Canby	14-Jul	4-Jul	12-Jul	10-Jul
Moutere	15-Jul	5-Jul	13-Jul	11-Jul
Lauren	13-Jul	7-Jul	14-Jul	11-Jul
Cascade Dawn	14-Jul	8-Jul	14-Jul	12-Jul
Titan	15-Jul	7-Jul	15-Jul	12-Jul
Willamette	14-Jul	9-Jul	15-Jul	12-Jul
Georgia	19-Jul	6-Jul	14-Jul	13-Jul
Cowichan	15-Jul	8-Jul	17-Jul	13-Jul
Chemainus	19-Jul	9-Jul	15-Jul	14-Jul
Cascade Delight	16-Jul	12-Jul	18-Jul	15-Jul
Cascade Bounty	17-Jul	12-Jul	20-Jul	16-Jul
Tulameen	20-Jul	15-Jul	20-Jul	18-Jul
Saanich	24-Jul	13-Jul	19-Jul	19-Jul
Royalty	22-Jul	15-Jul	21-Jul	19-Jul
Coho	18-Jul	18-Jul	25-Jul	20-Jul
Mean	16-Jul	9-Jul	16-Jul	

Consumer Preference

Flavor preferences differed widely among participants and studies. The 10-member panel rated 'Cascade Delight', 'Tulameen', 'Cascade Bounty' and 'Georgia' as the favorites, and the farmers' market customers rated 'Saanich', 'Canby' and 'Cascade Dawn' as top picks (Table 5). In both studies, participants least preferred 'Royalty', 'Moutere', 'Titan' and 'Chemainus'. It should be noted that several cultivars, including 'Tulameen' and 'Lauren', did not fruit significantly in 2011 due to the severity of winter damage. Therefore, fruit was unavailable for evaluation at the farmers market.

Table 4. Fruit size at peak harvest. (g/fruit)

Cultivar	2008	2009	2010	Mean
Cascade Delight	2.9	2.4	2.4	2.6
Tulameen	2.6	1.7	2.4	2.2
Cowichan	2.1	2.0	2.3	2.2
Royalty	2.4	1.5	2.2	2.0
Titan	1.9	1.9	2.2	2.0
Willamette	2.0	2.2	1.8	2.0
Georgia	2.3	1.8	1.8	2.0
Chemainus	2.2	1.8	1.9	2.0
Cascade Bounty	1.6	1.6	2.2	1.8
Coho	2.4	1.4	1.6	1.8
Cascade Dawn	1.6	1.9	1.8	1.8
Moutere	2.0	1.6	1.7	1.8
Reveille	2.1	1.8	1.4	1.8
Saanich	1.9	1.4	1.8	1.7
Canby	2.0	1.7	1.4	1.7
Lauren	1.7	2.1	1.3	1.7

Table 5. A comparison of berry taste preferences of summer-bearing raspberry cultivars from the USU Kaysville research farm. The taste panel consisted of 10 individuals that rated overall preference based on fruit firmness, flavor and appearance. The farmers market survey in 2011 was based on the number of votes for preference cast by participants with each participant given 10 votes. Rank is for votes cast on 21 July.

	Taste panel preference Rank (1 to 6, low to high)			Farmers market survey % of Votes Cast		
Cultivar	16-Jul-09	22-Jul-10	Average	21-Jul-11	14-Aug-11	Rank
Cascade Delight	4.0	3.9	4.0	8.7%	6.4%	6
Tulameen	3.8	3.9	3.8			
Cascade Bounty	2.9	3.8	3.3	6.4%	4.0%	7
Georgia	3.1	3.6	3.3	6.3%	9.0%	8
Canby	3.1	3.4	3.3	11.5%		2
Willamette	3.0	3.3	3.2	8.8%	4.5%	5
Cowichan	2.5	3.7	3.1	9.8%	11.0%	4
Reveille	3.1	3.0	3.0	5.8%		9
Saanich	2.9	3.0	3.0	13.5%	11.9%	1
Coho	2.8	3.1	2.9		11.6%	4
Cascade Dawn	2.7	3.1	2.9	10.2%	13.8%	3
Lauren	2.7	3.1	2.9			
Titan	2.8	2.8	2.8	4.8%		11
Chemainus	2.3	3.1	2.2	5.1%	17.2%	10
Royalty	2.3	2.9	2.6	4.3%	6.2%	12
Moutere	2.4	2.8	2.6	4.1%	4.5%	13

Horntail Susceptibility

There was a wide range in susceptibility of summer-bearing cultivars to the raspberry horntail (Table 6). 'Royalty' and 'Moutere' had the fewest infested canes. The most susceptible cultivars had 0.6 or more infested canes per foot of row, and included 'Georgia', 'Cascade Bounty', 'Titan', 'Willamette', and 'Saanich'. 'Canby', a popular summer-bearing cultivar in Utah, showed intermediate susceptibility to horntail; however, it was significantly more susceptible than 'Royalty' and 'Moutere'. Susceptibility to winter injury of some cultivars may make them more attractive to attack by raspberry horntail (Tables 1 and 6).

Parasitism of horntail larvae was detected from late June through mid-August of 2009-2011. Parasitism peaked in late July at nearly 70%, and averaged 40% overall. Two primary parasitoid wasp species were found: 1) an ichneumon wasp, a solitary ecto-parasitoid whose larva feeds externally on a horntail larva, and 2) a pteromalid wasp, a gregarious ecto-parasitoid whose larvae feed in groups of 3-20 larvae on a single horntail larva (Figure 4). Despite high infestation rates of raspberry horntail in the most susceptible raspberry cultivars, these two parasitic wasps contributed to substantial reduction in survival of raspberry horntail.

Table 6. Infestation of summer raspberry canes with raspberry horntail (number per foot of row) at Kaysville, Utah, in 2009-2011.

Royalty	0.04 a*
Moutere	0.13 a
Cascade Dawn	0.21 ab
Cowichan	0.26 abc
Coho	0.26 abc
Cascade Delight	0.29 abc
Lauren	0.31 abc
Tulameen	0.37 abc
Reveille	0.47 abc
Chemainus	0.49 abc
Canby	0.54 bc
Georgia	0.60 c
Cascade Bounty	0.63 cd
Titan	0.68 cd
Willamette	0.85 cd
Saanich	0.99 d

*Cultivar means were compared with analysis of variance. Means followed by the same letter are not significantly different at $P \leq 0.05$.

Summary

Following is an overview of the performance of each cultivar, and recommendation for its planting in northern Utah.

Figure 4. Parasitic wasp pupae and a collapsed horntail larva.

Recommended:

Canby had average yields and may have produced better if not for winter cane injury. Canby was favored in consumer taste trials, but was moderately susceptible to raspberry horntail.

Cascade Bounty was high yielding and had low winter cane injury. The conical shaped and firm fruits are adapted to machine harvest. Taste reviews of 'Cascade Bounty' varied highly. Highly susceptible to raspberry horntail.

Cowichan had average yields with good cane survival, and ranked well in taste trials. Firm fruits may be suited to machine harvest. Fairly resistant to raspberry horntail.

Georgia was a high yielding cultivar with good cane survival. 'Georgia' is a recent Maryland release that is not yet widely available. Taste rankings were average. Susceptible to raspberry horntail.

Reveille was the earliest fruiting cultivar in this study and had high cane survival and yields. Consumer ratings were neutral. Moderately susceptible to horntail injury.

Royalty is a purple-fruited cultivar with rather large fruit. It had the highest yield, excellent winter survival and resistance to raspberry horntail. The cultivar was among the lowest ranked in taste trials, likely due to the unique flavor reminiscent of the black raspberry parent.

Worth a Try:

Cascade Delight had average yields and fairly low winter cane injury. Berries were large, and plant fruited into late summer. Flavor was popular among farmers' market customers. Moderately susceptible to horntail.

Cascade Dawn had low yields, but relatively good winter cane survival. Popular among farmers market taste trial participants. Has a mild flavor with berries that do not release until fully ripe. Suitable for fresh market, but not for machine harvest. Lower susceptibility to raspberry horntail.

Chemainus had good yields with moderate winter cane injury. Taste reviews varied widely. Suitable for both fresh and machine harvest. Moderately susceptible to horntail.

Saanich had average yields, but was susceptible to winter cane injury in some years. The firm, glossy fruit ranked number one among farmers' market participants. Highly susceptible to horntail.

Willamette was a lower yielding cultivar due to winter cane injury. Plants produce medium sized, deep red fruits in mid-season with average ranking in taste trials. Highly susceptible to raspberry horntail, but resistant to Raspberry Bushy Dwarf virus.

Not Recommended:

Lauren was the lowest yielding cultivar due to severe winter cane injury. 'Lauren' ranked average with the 2010 taste panel, but was not included in the 2011 farmers' market trial. Moderately susceptible to horntail.

Moutere produced average yields, but was least favored in taste trials. Raspberry horntail resistant.

Titan was lower yielding due to winter cane injury. Fruits are quite large, conical in shape and produce over a long season, but were not favored in consumer taste trials. Highly susceptible to horntail.

Tulameen was low yielding due to winter cane injury, but the large fruits ranked well among taste panel participants. Ripened mid to late season and may overlap with fall fruiting cultivars in some years. Moderately susceptible to horntail.

Coho was among the lowest yielding in this study, likely due to high instance of winter cane injury. The bright red fruits were popular among farmers' market taste trial participants. Moderately susceptible to horntail.

Related information links:

Red Raspberry Production in Utah: http://extension.usu.edu/files/factsheets/hg161.pdf

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

Pruning the Orchard: http://extension.usu.edu/files/publications/publication/HG_363.pdf

Raspberry cane insects and their control: http://utahpests.usu.edu/htm/utah-pests-news/summer07/raspberry-insects/

Raspberry Horntail [insect]: http://utahpests.usu.edu/ipm/htm/fruits/fruit-insect-disease/raspberry-horntail09

Iron Chlorosis in Berries: 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

This work was supported by grants from the Western Sustainable Agriculture Research and Education program (W-SARE), the Utah Department of Agriculture and Food, and by the Utah Agricultural Experiment Station and Utah State University Cooperative Extension.