Title: Selectivity of Valent Herbicides in Red Raspberries

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Two red raspberry trials were conducted this year with Valent products: one in baby raspberries, and a second one in established raspberries. Both trials tested the same products at the same rates, although they were applied to fields approximately ten miles apart (established raspberry plots near Burlington and baby raspberry plots near Mount Vernon) and at different times of year (established raspberry plots treated in March, baby raspberry plots treated in June).

Materials and Methods:

Baby Raspberries. Plots were established at WSU Mount Vernon NWREC. Six bare-root plants of 'Meeker' red raspberry were transplanted in a single row down the center of each 10 by 10 ft plot June 11, 2007. Herbicides were broadcast applied June 12. No raspberry foliage was present at the time, although a single dormant primocane from each crown extended three to twelve inches above the soil. Injury to freshly-emerging primocanes was noted June 27 (2 weeks after treatment, WAT), but, because no foliar injury from these treatments was discernable by 4 WAT, additional injury data was not collected. Weed control was rated June 27 and August 28 (11 WAT). The primary weed species in this trial was shepherd's-purse (*Capsella bursa-pastoris*), with lesser populations of henbit (*Lamium amplexicaule*), pale smartweed (*Polygonum lapathifolium*), ladysthumb (*Polygonum persicaria*), common lambsquarters (*Chenopodium album*), common chickweed (*Stellaria media*), and hedge mustard (*Sisymbrium officinale*). Surviving raspberry crowns were counted and the longest primocane from each crown was measured August 16. Plots will be maintained through this winter, primocanes will be cut to the ground, and additional herbicide applications will be made to determine effects on second-year raspberry crowns.

Established Raspberries. Plots were established in healthy, third-year 'Cowichan' raspberries at Sakuma Brothers Farms near Burlington, WA. Each plot was 20 feet long by 5 feet wide and contained a single row of raspberries. Herbicide applications were made either as a directed spray to the base of the canes or sprinkled among the canes (granular Casoron). Early applications (PRE to most primocanes) were made March 28, 2007. The cooperator applied Aim (carfentrazone, 0.01 lbs ai/a) to all rows in the block April 3, so PRE treatments had about a week of contact time on some primocanes prior to cane burning. Injury to primocanes and floricanes was noted May 3 and June 22. Berries were picked by hand two times, July 6-9 and July 16, and total berry weight per plot was recorded; 50-berry weights were also recorded. Primocane counts will be recorded when raspberries are in winter dormancy. The experiment is a randomized complete block with three replicates.

As this was a vigorous young raspberry planting, few weeds were present (non-treated plots showed >95% free of weeds) so no weed control data was obtained in this trial. In addition, no treatments caused significant injury to floricanes or significantly reduced raspberry yield or fruit size. Consequently, results are limited to effects of these products on primocane re-growth. These plots will be maintained through early dormancy to obtain final primocane counts

resulting from these treatments.

Results:

Baby Raspberries. None of the tested products caused significant injury to raspberry, with primocane injury ratings ranging from 0 to 3% at 2 WAT (Table 1). Weed control at 2 WAT was excellent for all treatments, but by 11 WAT, control from V-1 had declined to 58% and control from V-2 was at 79%. Tank-mixtures of these products with Chateau at 11.8 oz/a, however, continued to provide excellent weed control (94 and 99% for V-1 and V-2, respectively). The control in these two treatments was probably mostly coming from the Chateau, however, as weed control in plots treated with Chateau at 5.9 and 11.8 oz/a was 99 and 100%, respectively. Even the light rate of Chateau (3 oz/a) was providing very good weed control at 11 WAT (90 and 96% with and without coc, respectively) or when mixed with Matrix at 2 oz/a (56% for Matrix alone and 96% for the Chateau combination).

There were no significant effects of these herbicides on raspberry crown count or on raspberry primocane height by mid-August (9 WAT), indicating that crop safety of these herbicides at these rates on baby raspberry was excellent. There was a trend toward shorter primocanes at the higher rates of Chateau, however (55, 48, and 43 cm for the increasing rates of Chateau in this trial, respectively, 43 and 45 cm for V-1 alone and in tank mixture with Chateau, respectively, and 44 and 45 cm for V-2 alone and in tank mixture).

Table 1. Primocane injury and weed control following application of several herbicides in newly-transplanted baby red raspberry.

Treatment[a]	Rate	Timing	Primocane injury[b]	Weed control[c]		Stand count[d]	Primocane height[d]
				Jun 27	Aug 28		
	product/a		%	%	%	no./plot	Cm
Chateau	3 oz	PRE	0 b	98 abc	90 ab	6.0	55
Chateau	5.9 oz	PRE	0 b	100 ab	99 a	6.0	48
Chateau	11.8 oz	PRE	0 b	100 ab	100 a	5.8	43
Chateau + coc	3 oz	PRE	0 b	99 ab	96 a	5.8	54
Matrix + coc	2 oz	PRE	0 b	97 abc	56 d	5.8	51
Chateau +	3 oz +	PRE +	0 b	100 ab	96 a	5.8	57
Matrix + coc	2 oz + 1 qt	PRE + PRE					
V-1	10.7 oz	PRE	1 b	95 cd	58 d	5.8	43
Chateau +	11.8 oz +	PRE +	3 b	100 ab	94 a	6.0	45
V-1	10.7 oz	PRE					
V-2	5.9 oz	PRE	0 b	96 bc	79 bc	6.0	44
Chateau +	11.8 oz +	PRE +	0 b	100 a	99 a	5.8	45
V-2	5.9 oz	PRE					
Non-treated	---	---	0 b	100 a	96 a	5.5	60

Means followed by the same letter are not significantly different ($P < 0.05$).
[a]Raspberries were transplanted June 11; herbicides were applied June 12.
[b]Primocane injury estimated June 27 (2 WAT); no visible injury by 4 WAT.
[c]Weed control estimated June 27 (2 WAT) and August 28 (11 WAT).
[d]Stand count and primocane height measured August 16 (9 WAT).

Established Raspberries. Chateau applied PRE at 5.9 or 11.8 oz/a slowed primocane re-growth by 20 or 32%, respectively, by 5 WAT, but raspberry plants had fully recovered by 12 WAT and were similar in growth as raspberries in non-treated plots (Table 2). Neither Matrix nor Chateau + Matrix caused significant injury at tested rates. V-1 at 10.7 oz/a, however, caused 48 and 15% injury at 5 and 12 WAT, respectively. An additive effect was noted when V-1 was mixed with Chateau (82 and 30% injury at 5 and 12 WAT, respectively). V-2 caused no observable slowing of primocane re-growth when applied at 5.9 oz/a. When V-2 was applied with Chateau, injury was similar to Chateau at 11.8 oz/a alone, indicating that the majority of injury from this tank mixture was due to Chateau.

Table 2. Primocane and floricane injury, weed control, and berry yield following application of several herbicides in established red raspberry.

Treatment[a]	Rate	Timing	Primocane injury[b]		Berry yield[c]	Fruit size
	product/a		%	%	kg/m	g/berry
Chateau	3 oz	PRE	7 efg	2 d	2.33	3.4
Chateau	5.9 oz	PRE	20 def	0 d	2.84	3.4
Chateau	11.8 oz	PRE	32 bcd	2 d	2.56	3.4
Chateau + coc	3 oz	PRE	7 efg	2 d	2.51	3.6
Matrix + coc	2 oz	PRE	3 fg	0 d	2.63	3.4
Chateau +	3 oz +	PRE +	3 fg	0 d	2.52	3.5
Matrix + coc	2 oz + 1 qt	PRE + PRE				
V-1	10.7 oz	PRE	48 b	15 b	3.04	3.9
Chateau +	11.8 oz +	PRE +	82 a	30 a	2.88	3.6
V-1	10.7 oz	PRE				
V-2	5.9 oz	PRE	0 g	2 d	2.49	3.3
Chateau +	11.8 oz +	PRE +	40 bc	2 d	2.49	3.4
V-2	5.9 oz	PRE				
Casoron 4G	100 lbs	PRE	88 a	15 b	2.61	3.6
Non-treated	---	---	0 g	0 d	2.59	3.5

Means followed by the same letter are not significantly different ($P < 0.05$).
[a]Herbicides were applied March 28-29 (PRE) and April 30 (POST).
[b]Primocane injury estimated May 3 (5 WAPRET and 1 WAPOST) and June 22 (12 WAPRET and 8 WAPOST).
[c]Berries harvested twice by hand (July 6-9 and July 16).

Discussion:

The differential injury to raspberries from the same rate of V-1 in these two studies is interesting, particularly considering that it was the established 'Cowichan' that showed substantial injury from application of this product (48% at about 5 WAT) in contrast to the newly-planted 'Meeker' (1% at 2 WAT and 0% by 4 WAT). Because the established raspberries had already begun to emerge at the time of the PRE application, when V-1 was applied to primocane foliage (about six days prior to the whole field being treated with Aim, which would have killed practically all emerged primocanes), it was apparently active enough to cause substantial delay in the second crop of primocanes. When applied to 'Meeker' raspberries at one day after transplanting, no new growth was present for several days after herbicide application, so inhibition of primocane growth was virtually nonexistent.

Chateau seems to be safe for raspberries up to 11.8 oz/a, with a caveat. The roughly 20 to 30% slowing of primocane re-growth after application of 5.9 or 11.8 oz/a in the established raspberry trial is probably due to essentially two cane burnings conducted in those plots (the first from Chateau and the second from Aim six days later). In other words, this effect might not have been so pronounced had Chateau been applied truly PRE to all new growth, or had these plots not received application of another herbicide. We had evaluated Chateau as a primocane suppression material in 2002, but felt that it didn't kill sprayed primocanes at a high enough level to warrant registration for that use (2.2 oz/a with no added surfactant gave 58% primocane control at about one month after application). But perhaps Chateau was acting in the same manner as the V-1 in this trial; if so, it is the POST activity of Chateau that is accounting for the slowing of re-growth. In either case, Chateau at rates up to 11.8 oz/a did not appear to significantly injure raspberry establishment in the baby raspberry trial. Keep in mind that primocane length was non-statistically shortened with increasing rates, however, so there may be some consequences to very high application rates of Chateau. Since the 5.9 oz rate was still providing excellent weed control (99%) at 11 WAT, however, it does not appear that the 11.8 oz rate will be warranted (presumably that rate was just for crop safety analysis in this trial).

We'll maintain both trials though early raspberry dormancy to get final primocane counts resulting from these treatments, and will keep the baby raspberry trial going for another year to monitor second-year effects after a second herbicide application.