Yield Compensation of Red Raspberry following Primary Bud Removal

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Most raspberry (*Rubus idaeus* L.) cultivars produce a single fruiting lateral at each node (Jennings, 1988), but there may be secondary and tertiary buds present at a node, depending on genotype. Some raspberry genotypes do not have any secondary buds, while others have secondary buds at almost every node (Keep, 1969). Development of secondary and tertiary buds is usually suppressed by the primary bud. When the primary bud is damaged, other buds may grow and produce a crop.

A common cause of damage to the primary bud is cold injury. Primary buds are less cold tolerant than secondary buds, especially in spring (unpublished data). Other causes of damage to the primary bud are insects and mechanical injury. Raspberries are capable of compensating for the loss of primary buds. 'Meeker' produced 68% of a normal crop when 50% of the buds were removed (Waister and Barritt, 1980). Keep (1969) removed all primary buds for three cultivars and inbred derivatives; the potential crop of disbudded canes was 0% to 139% of the nontreated controls.

The objective of this research was to compare the extent of compensation among five Pacific Northwest raspberry cultivars to primary bud removal.

Two individual hills for each of five raspberry cultivars, 'Chilcotin', 'Comox', 'Chilliwick', 'Meeker', and 'Willamette', were pruned to four canes per hill and topped at 1.5 m. All primary buds were removed on two canes per hill on 2 Feb. 1991 and 25 Feb. 1992.

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Each year, the number of fruiting nodes was determined for each cane, and total weight and number of fruit were determined from about weekly harvests. Average fruit weight, number of fruit per fruiting lateral, yield per fruiting lateral, and date of 50% harvest were calculated from these variables. In 1992, the number of nodes per cane was also determined. From this and the number of fruiting laterals, the percentage of budbreak was calculated. In 1992, the date of 5% harvest, date of 95% harvest, and length of harvest season (the number of days from 5% to 95% harvest) were calculated from the cumulative yield.

Data were analyzed as paired data comparing disbudded canes to control canes using each hill as a single observation. Data from each year were combined, and the effect of the disbudding treatment was tested by using a *t* test. The effect of year and cultivar were tested by analysis of variance of a 2 × 5 factorial with year and cultivar as factors.

All variables, except fruit weight, responded similarly for disbudded canes and control canes (Table 1). In both years, average fruit weight was greater for canes that had been disbudded. Additionally, in 1992, disbudding did not change the percentage of budbreak (Table 1), date of 5% harvest, date of 95% harvest, or length of harvest season (data not shown).

There were statistically significant ($P \leq 0.05$) cultivar effects for difference between

disbudded and control canes for only one of the 11 variables. Thus, for the five Pacific Northwest raspberry cultivars we used, there were no major differences in their response to primary bud removal. The only variable that exhibited a significant cultivar effect was percentage of nodes breaking bud in 1992 ($P = 0.02$). 'Willamette' had a 17% decrease in budbreak for disbudded canes, and 'Meeker' and 'Chilcotin' had 7% and 2% decreases, respectively. 'Comox' and 'Chilliwick' had 5% and 7% higher budbreak, respectively, in disbudded canes compared to controls.

It is not clear if the compensation was a result of expression of previously differentiated primordia in secondary buds or additional differentiation after disbudding. In England, primary buds were present by 3 Dec., while secondary bud primordia were observed beginning the third week in January (Keep, 1969). Secondary buds may not have completed differentiation in this study by the time the canes were disbudded. Removal of buds later in winter and a comparison of yields, number of fruit, and number of drupelets per fruit from secondary buds would provide information on how plastic raspberry plants are and which components are changing as raspberries are compensating.

Although mechanical bud removal did not reduce yield, cold may damage more than simply the primary bud. These additional damages, not loss of the primary buds, may cause observed yield reductions.

Literature Cited

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Table 1. Effect of disbudding on 1991 and 1992 harvest characteristics of red raspberry at Puyallup, Wash.

Cane type	Yield		No. fruit		Fruit wt (g)	No. fruiting laterals (no./cane)	Date of 50% harvest (Julian)	Percent budbreak (1992)
	g/cane	g/lateral	No./cane	No./lateral				
Control	377	24.4	150	9.6	2.43	16.3	187	81
Disbudded	381	26.0	137	9.3	2.66	15.7	187	78
Difference	4 ^{ns}	1.6 ^{ns}	-13 ^{ns}	-0.3 ^{ns}	0.23*	-0.6 ^{ns}	0 ^{ns}	-3 ^{ns}

^{ns}, *Nonsignificant or significant using a *t* test of paired data, $P \leq 0.05$.