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Grape Notes

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Time of Girdle Experiments – Princess, Summer Royal, Thompson Seedless

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Girdling increases carbohydrates (sugars and starches) and plant hormones in vine parts above the girdle and until the girdle heals. Depending on when the girdle is applied, this concentration of carbohydrates and increased hormone activity can improve berry size, advance, or delay fruit maturity, improve berry set, and increase yield.

Princess and Summer Royal are two new USDA cultivars. Like Thompson Seedless, they set by stenospermocarpy and contain only rudiments of seeds. Unlike Thompson, however, Princess and Summer Royal can set poorly resulting in excessive numbers of unmarketable, straggly clusters. Princess is also plagued with flower cluster necrosis, and in severe cases 50% of the flowers abscise soon after bloom (see Photo).

The objective of this research is to determine the most appropriate time to girdle Princess and Summer Royal emphasizing overcoming poor berry set and increasing yields for both varieties. Additionally, with Princess we are interested in determining the influence of time of girdling on the incidence of flower cluster necrosis. We also revisit girdling of Thompson Seedless and use it as a standard of comparison.

Girdle timing was evaluated on Princess, Summer Royal, and Thompson Seedless in 2005 in Tulare Co. Girdle timings and the parameters measured follow:

Girdle Timing Treatments	Parameters Measured
Bloom starts; Full bloom; Shatter starts; Berry set; Berry set + 7 days; Berry set + 14 days; Veraison starts; Veraison 50%; Control – no girdle.	Girdle healing rate; Yield; Total clusters harvested; Cluster weight; Berries per cluster; Berry weight; Maturity (brix); Color development; Bud Fruitfullness.

All experiments were designed as a randomized complete block with four blocks, nine treatments, and two vine plots. Statistical analysis was by ANOVA and treatment means were separated using least significant difference (l.s.d.) at 5% level of significance.

Vine trunks were girdled with a 3/16 inch girdle knife. The wound was observed each week following the girdle and healing evaluated by measuring callus development. Girdle wounds were 100% bridged by callus (healed) by the fifth week following the girdle, regardless of the time of the girdle. Girdles applied at veraison or near veraison callused more quickly the first few weeks after the girdle was applied and this is illustrated in Figure 1 for Princess. There was very little difference between varieties in the time required for the girdle to heal.

Princess: Girdling Princess during the bloom period had the greatest impact on improving yield with nearly a 40% increase compared to the ungirdled control. Girdling Princess in early bloom increased yields primarily by reducing flower cluster necrosis. Girdling at full bloom both reduced flower cluster necrosis but also improved berry set (see Photo). Girdling a week after full bloom (shatter begins) increased yield by improving berry weight. Yields were not increased compared to the ungirdled control when Princess was girdled at berry set or later.

It was apparent that the early bloom and full bloom girdle reduced the number of clusters affected with flower cluster necrosis. This suggests that the disorder is associated with poor carbohydrate nutrition of the flower, and this is overcome by the bloom time girdle. Excessively vigorous Princess vineyards suffer the most from flower cluster necrosis as carbohydrates are drawn to support shoot growth at the expense of flowers.

Berry weight was greatest when the girdle was applied at the beginning of shatter or a week later at berry set. The response dropped off quickly when vines were girdled later than berry set, Table 1. Girdling research in 2004 at Kearney showed that a full bloom girdle increased berry weight equally as well as the berry set girdle. But, in this 2005 research near Tulare the full bloom girdle did not increase berry weight. This shows that results are going to vary from year to year and site to site.

Based on this study, the best girdling time for Princess depends on the vineyards past history of early flower cluster necrosis. Vineyards with a history should be girdled during full bloom to reduce necrosis and maximize yield. Berry size, however, will be similar to ungirdled control. Vineyards with no history of necrosis should be girdled about a week after full boom when shatter first begins and no later than early berry set. In our trial, the full bloom girdle maximized berry set and correspondingly increased yield.

Summer Royal: Girdling Summer Royal at early bloom or a week later at full bloom increased berry set and early bloom was more effective than full bloom. Berry weight was greatest when vines were girdled during the period from full bloom to berry set. Girdles applied one week after berry set or later did not impact berry weight. The bloom time girdle increased total yield by 24%. This increase was the combined effect of increased set (berries/cluster) and heavier (larger) berries, Table 2. Unlike Princess, Summer Royal was not afflicted with flower cluster necrosis; therefore, the bloom time girdles did not increase the number of clusters at harvest.

Fruit maturity was advanced with vines girdled just prior to veraison or at 1% veraison. Delaying the girdle to 50% veraison resulted in no advancement in ^{o}brix. Girdles applied during the period from early bloom through berry set delayed sugar maturity. Concomitantly, fruit color was delayed, Table 3. The delay in maturity and color is estimated at two weeks compared to the ungirdled control.

Based on this 2005 study, the best time to girdle Summer Royal was during the period from full bloom to early shatter (1 week past full bloom). This timing improved berry set and increased berry weight.

Thompson Seedless: Thompson Seedless table grapes have always been girdled at berry set for larger berries, and some vineyards are girdled even later, a week or more after berry set, because of labor constraints. Our 2005 research with Thompson Seedless showed the largest improvement in berry weight occurred from a girdle applied during the period from full bloom to berry set. Girdles applied later than berry set or earlier than full bloom were not effective, Table 4. This research suggests that grower faced with labor constraints should begin girdling crews earlier rather than later and finish the job by early berry set.

Growers have always been concerned that girdling Thompson Seedless earlier than berry set would reduce shatter and result in tight clusters. This did not occur in our 2005 research. None of the girdle times significantly affected set, Table 5, although values for berry set were highest for the early bloom and full bloom girdles. Girdling at the beginning of shatter, one week past full bloom, unquestionably, did not increase berry set.

Our data suggest that vines should be girdled no later than berry set to maximize berry size. A week after berry set is too late. We also found that girdling a week or two earlier than berry set effectively increased berry weight, and did not result in tight clusters. Growers should experiment to determine specific response in their vineyards. Girdle response will no doubt vary from site to site and from year to year.

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Table 1. Yield and fruit characteristics in response to time of girdling Princess.

Girdle Timing	Yield (lbs/vine)	Maturity (brix)	Berry Wt. (g)	Set (berries/cluster)	# Clusters per vine
Control	33	13.1	4.4	52	54
Early Bloom	49	13.9	4.5	58	85
Full Bloom	51	12.4	4.6	72	71
Shatter Begins	42	15.6	6.4	48	62
Berry Set	29	17.2	5.8	41	56
B. Set + 7 days	25	18.1	5.1	41	55
B. Set + 14 days	21	17.8	5.0	36	53
Veraison (1% soft)	20	17.9	5.1	34	52
Veraison (50% soft)	28	17.1	5.3	46	51
L.S.D.	9	1.2	0.7	16	17

Table 2. Yield and fruit characteristics in response to time of girdling Summer Royal.

Girdle Timing	Yield (lbs/vine)	Berry Wt. (g)	Set (berries/cluster)	# Clusters per vine
Control	45	4.0	162	28
Early Bloom	56	4.4	220	29
Full Bloom	50	4.9	189	26
Shatter Begins	50	5.3	148	26
Berry Set	48	5.1	151	26
B. Set + 7 days	54	4.6	145	33
B. Set + 14 days	33	4.3	147	23
Veraison (1% soft)	36	4.4	151	26
Veraison (50% soft)	47	4.0	170	29
$L.S.D._{.05}$	10 (0.1)	0.6	22	ns

Table 3. Maturity in response to time of girdling Summer Royal.

Girdle Treatment	Sugar (Brix)	Light Color (lbs/vine)
Control	16.3	0.7
Early Bloom	13.7	8.7
Full Bloom	14.1	5.6
Shatter Begins	14.2	6.1
Berry Set	14.6	9.4
B. Set + 7 days	15.6	3.9
B. Set + 14 days	20.7	0
Veraison (1% soft)	18.8	0
Veraison (50% soft)	16.3	0
L.S.D	1.4	7.8

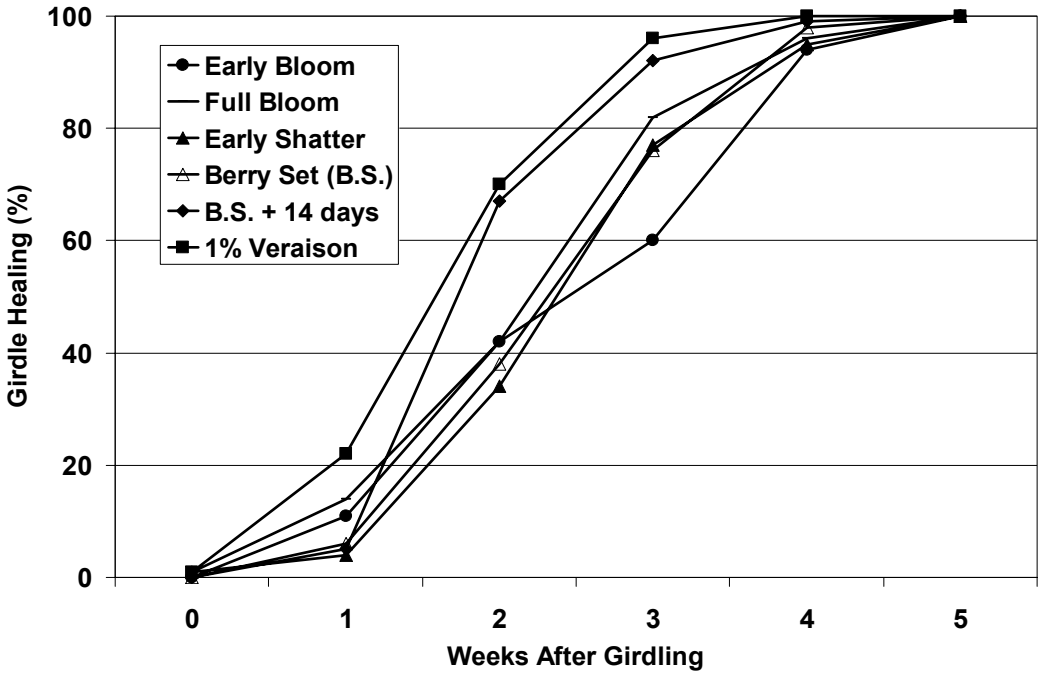
Table 4. Yield and fruit characteristics in response to time of girdling Thompson Seedless.

Girdle Timing	Yield (lbs/vine)	Maturity (brix)	Berry Wt. (g)	# Clusters per vine
Control	56	15.9	4.5	48
Early Bloom	59	16.2	4.7	46
Full Bloom	73	15.0	5.5	55
Shatter Begins	55	16.5	5.2	42
Berry Set	40	16.4	5.0	37
B. Set + 7 days	64	16.7	4.6	50
B. Set + 14 days	56	16.2	4.3	52
Veraison (1% soft)	57	16.9	4.2	52
Veraison (50% soft)	43	18.1	4.4	40
L.S.D	13	1.4	0.5	ns

Table 5. Berry set in response to time of girdling Thompson Seedless.

Girdle Timing	Berries per cluster	Berries per cm of lateral
Control	120	1.8
Early Bloom	127	2.0
Full Bloom	134	2.3
Shatter Begins	108	2.0
Berry Set	100	1.9
B. Set + 7 days	126	2.1
B. Set + 14 days	113	1.9
Veraison (1% soft)	115	1.9
Veraison (50% soft)	112	1.9
L.S.D	ns	ns

Fig. 1. Healing in response to girdle time - Princess.



Flower Cluster Necrosis: Princess

Bloom Girdle Improves Set: Princess

Girdle Full Bloom

No Girdle