University of California Cooperative Extension • Tulare County

UCCE

Grape Notes

Volume 2, Issue 2 **April 2005**

Research Sheds Light on Bud Fruitfulness and Berry Set

Bill Peacock, Mike Michigan, and Leslie Peacock*

Bud Fruitfulness

During May and June, light exposure and moderate temperatures promote fruitfulness of developing buds. In low crop years, we can often attribute the lack of flower clusters to cloudy and cool climate during this period the previous year. High vigor vines with canopy hay stacked atop a restricted trellis also negatively affects bud fruitfulness by restricting light in the interior canopy.

Dividing the canopy just before bloom improves the light environment for developing buds and, subsequently, bud fruitfulness. This is accomplished using moveable wires, or shoots can be divided and secured to outside wires with ties. We demonstrated this with research on Thompson Seedless, Crimson Seedless, Fantasy Seedless and other table grape varieties.

In a Crimson Seedless trial, we divided the canopy prior to bloom and increased cane fruitfulness the following year by 14%, cluster weight by 25%, and berry weight by 7%, Table 1. This was a young, third crop, vigorous cane pruned vineyard. The trellis was a 5-foot open gable. The canopy was divided using moveable foliage wires that were moved outward before bloom. Flowers were counted in the spring the following years. The result of canopy division was an increase in the number of flower clusters per vine. At harvest, the following year, it was found that division also increased cluster weight and berry weight indicating bigger flower clusters.

We have also learned that shoot thinning can increase fruitfulness the following year, probably by improving carbohydrate nutrition of retained shoots. This was demonstrated with Thompson Seedless at Kearney. Vines were pruned and canes tied using the within row alternate bearing system (WRAB DOV). With this system shoots to become next year's fruiting canes are on one side of the trunk (renewal) and fruiting canes are on the other (fruiting). Renewal shoots/canes developed under high light in all shoot-thinning treatments, eliminating light as a variable. We compared shoot thinning the head of the vine in mid-April with a control, no shoot thinning. Shoot thinning consisted of removing unnecessary and poorly positioned shoots from the head of the vine, mostly from the center and upper areas of the head. About 50% of the shoots were removed from the head of the trunk. In two out of four years, shoot thinning increased cane fruitfulness as measured by flower clusters counts the following spring, Table 2. Shoot thinning apparently improves carbohydrate nutrition of new buds in years when carbohydrate production is limited because of low temperature and light levels. This suggest, that carbohydrate is directly relates to fruitfulness; whereas, light and temperature issues are indirectly involved in the production of carbohydrates.

Berry Set

A berry is considered set when it reaches a diameter between $1/16^{th}$ and $1/8^{th}$ inch diameter. Berries are set about two weeks after full bloom in the San Joaquin Valley. The percentage of flowers in a cluster that develop into berries ranges from 20% to 30%.

Temperature and sunlight drive photosynthesis and the production of carbohydrates. Consequently, temperature and light levels that maximize photosynthesis also maximize fruit set for a given variety. Temperatures in the 80's ^{o}F are ideal for berry set. Set is reduced when temperatures climb into the 90+ ^{o}F range during bloom and this is a blessing for growers of Thompson Seedless and other tight clustered varieties. Tight clusters increase the labor costs to loosen them. In cool climate wine grape districts, set can be dramatically reduced

along with yield when bloom time temperatures drop to the 60's.

Vineyard management that influences carbohydrate production and movement (flux) can also affect berry set. Vine girdling, shoot tipping, and even deficit irrigation prior to bloom can increase berry set. Girdling response is a result of disrupting flow of carbohydrates below the girdle, until it heals, which increases nourishment of flowers. Shoot tipping temporarily affects the sink source flux of carbohydrates to the advantage of flower clusters and berry set. This has been demonstrated on a number of table grape varieties (Fantasy Seedless, Crimson Seedless, Summer Royal and Princess).

Summer Royal is a new USDA variety. It is subject to poor berry set resulting in straggly clusters. The responses of shoot tipping or girdling in early bloom, or a combination of both were evaluated on six-year-old vines in 2004, Table 3. Vines were girdled in early bloom and compared to vines girdled at berry set. Berry weight was increased 25%, regardless of the time the girdle was applied. However, girdling at early bloom also increased berry set and, consequently, cluster weight. Shoot tipping in early bloom also increased berry set and total yield, but berry weight was unaffected. The combination of both girdle and shoot tipping in early bloom doubled both berry set and yield, but clusters were tight and berry size was no different from the control.

Princess, another USDA variety, is also subject to poor set in some years. This variety is fickle, however, and can have straggly clusters alongside excessively tight clusters. We evaluated the same girdling and shoot tipping treatments on Princess that we did on Summer Royal, Table 4. Girdling increased berry weight about 16%, with no difference in timing. Girdling in early bloom also increased berry set along with total yield and was the best treatment. Shoot tipping increased berry set but reduced berry weight and so yield remained the same as the control. The combination of shoot tipping and bloom girdle increased berry set the most of all treatments, 56%. Berry size was not increased, however, because of the large number of berries in the cluster, and many clusters were excessively tight.

In summary, bud fruitfulness and berry set are associated with carbohydrate nutrition. Canopy division prior to bloom improves bud fruitfulness of Crimson Seedless and other varieties. Shoot thinning the head of Thompson Seedless pre bloom increases cane fruitfulness in years when carbohydrate production is limited because of low temperature and light levels. Girdling and shoot tipping in early bloom improves berry set and yield by diverting more carbohydrates to flowers (Princess, Summer Royal, and Fantasy Seedless).

- Bill Peacock and Mike Michigan are with UCCE in Tulare County and Leslie Peacock is a UC Davis student in environmental science.

Table 1. Canopy division prior to bloom improves yield of Crimson Seedless trellised with a 5' open gable.

Treatments**	Yield (Boxes/Ac)	Clusters (#/vine)	Cluster Wt. (lbs.)	Berry Wt. (g)
Control	989	49	0.8	5.8
Shoots Positioned	1382	56	1.0	6.2
L.S.D.	122	4.5	0.1	0.09

**Canopy division commenced the year prior to collection of this data.

Table 2. Shoot thinning head of Thompson Seedless vines improves bud fruitfulness in years when climate is not optimum for flower cluster differentation.

	Flower Clusters Per Vine Counted in Early April			
Treatments **	2001 (#/vine)	2002 (#/vine)	2003 (#/vine)	2004 (#/vine)
Control	36	73	37	56
Shoot Thinned	51	77	53	54
L.S.D.	9	n.s.	10	n.s.

**Shoot thinning began in 2000

Table 3. Cultural practices affect berry set, berry size, and yield of Summer Royal table grapes.

Treatment	Yield (Boxes/Ac)	Berry Wt. (g)	Cluster Wt. (lbs.)	Berry Set (#/Cluster)
Control:	544	5.1	0.64	57
Shoot tip - Early Bloom:	826	4.7	0.73	70
Girdle - early bloom:	903	6.1	0.89	67
Girdle + Sh. Tip - early bloom:	1088	4.9	1.33	121
Girdle - berry set:	586	6.7	0.68	45
L.S.D.	260	1.2	0.19	23

Table 4. Cultural practices affect berry set, berry size, and yield of Princess table grapes

Treatment	Yield (Boxes/Ac)	Berry Wt. (g)	Cluster Wt. (lbs.)	Berry Set (#/Cluster)
Control:	1003	5.8	0.7	53
Shoot tip - Early Bloom:	979	5.2	0.7	60
Girdle - early bloom:	1444	6.6	1.0	68
Girdle + Sh. Tip - early bloom:	1338	5.0	1.0	82
Girdle - berry set:	1027	6.8	1.0	65
L.S.D.	291	0.7	0.16	11

University of California
Cooperative Extension
Tulare County
4437B S Laspina St
Tulare, CA 93274-9537

FIRST-CLASS MAIL
US Postage Paid
Visalia, CA 93277
Permit No 240

Grape Notes

April 2005

Bill Peacock
Farm Advisor