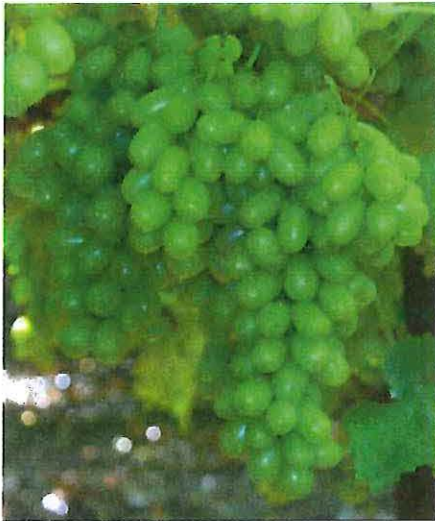


Cultural Practices for Princess

*Nick Dookoozlian, Department of Viticulture and Enology, University of California, Davis
Jennifer Hashim-Buckey, UCCE Viticulture Farm Advisor*



Princess is a mid- to late-mid season white seedless table grape developed by David Ramming and Ron Tarailo of the USDA-ARS in Fresno, CA. Formerly known and tested as USDA selection C45-59, this cultivar was released in the spring of 1999 as "Melissa". Due to trademark conflict, the name of the cultivar was renamed "Princess". Princess resulted from the cross of Crimson Seedless and B40-208, an unreleased USDA selection producing white, seedless berries with muscat flavor. The cultivar produces large, greenish white berries that ripen in early to mid-August. The harvest period is just ahead of, or about the same time as Thompson Seedless. Clusters are conical with small to medium shoulders, and generally less compact than Thompson Seedless. Berry shape

is generally cylindrical or similar to table Thompson Seedless, although berry size may be greater with cultural practices. The berries are firm and have a slight floral or muscat character when fully mature. The commercial appeal of Princess rests on its large berry size, late maturity and excellent eating quality. There are approximately 2,200 acres of Princess in commercial production in California.

Site Selection and Planting

Princess is highly vigorous on most soils suitable for table grape production in the San Joaquin Valley. Rootstock selection should be based on site-specific soil pest or soil chemistry problems. Although information on rootstocks is limited, recent research indicates that grafting to high vigor rootstocks such as Freedom and Ramsey may exacerbate problems of poor fruit set and early bunch stem necrosis (explanation below). For these reasons, the use of low vigor rootstocks may be preferable to the use of high vigor stocks. Vines are extremely vigorous when planted in deep, fertile soils. Excessive nitrogen fertilization and irrigation should be avoided. Vines are typically spaced 7' to 8' between vines and 12' between rows

Training and Trellising Systems

Princess should be head trained and cane pruned for adequate yields. Some growers are also utilizing quadrilateral cordon training with a combination of spur and cane pruning, particularly when the open gable is used. Up to 12 canes per vine, depending on vine vigor and trellis system, are typically retained at pruning on mature vines. When quadrilateral cordon training is utilized, 36 to 40, 2 to 3-bud spurs are retained per vine.

Due to the cultivar's high vigor, a large expansive trellis such as the open gable is generally preferred compared to the standard "T" system. A major advantage of the gable trellis system is that more fruiting wood can be retained per vine compared to the standard system.

Productivity and Crop Load Management

Information on commercial production is limited due to the relatively short production history. Yields typically range between 800 and 1,200 boxes (22 lb.) per acre. Mean cluster weight is typically one pound or slightly less, suggesting 50 clusters per vine or more are necessary to reach 1000 boxes per acre. Since the cultivar is moderately fruitful, cluster thinning may only be necessary in years of high bud fruitfulness and thinning should occur only after fruit set has occurred. Due to the moderate length of the cluster, cluster tipping is normally not necessary.

A potential problem with this variety is that natural berry set is highly variable among sites. In some vineyards, natural fruit set is excessive, limiting berry growth and resulting in tight bunches. In these cases, gibberellic acid bloom sprays are needed to reduce fruit set. In other vineyards fruit set is poor and yields are reduced as a result. In these cases methods to increase fruit set, such as shoot tipping, deficit irrigation or girdling at bloom may be warranted. Poor set is common in third and fourth leaf vineyards of high vigor. It appears that site-specific experience is necessary for the selection of optimum bloom treatments. Gibberellic acid sprays are not recommended for the first two crop years, allowing the natural shatter at the site to be adequately evaluated.

In vineyards with consistently poor fruit set, shoot tipping immediately prior to bloom may be used to increase fruit set. The shoot apex or tip is removed (2-2.5" of each shoot) a few days before the initiation of bloom when the first few open flowers are observed. While this treatment is highly effective for increasing fruit set it often produces tight, compact clusters. Additional cost for berry thinning and shoulder removal may result. Shoot tipping also limits the use and effectiveness of girdling and chemical berry sizing treatments.

Lastly, because of this variability in fruit set, it is generally recommended all crop load adjustments or cluster thinning be performed after fruit set, even in fruitful years. Based on a mean cluster weight of approximately one pound, acceptable crop loads range between 45 and 55 clusters per vine.

Girdling and Gibberellic Acid

Berry thinning. Once gibberellin bloom sprays are deemed necessary, 0.5 to 1.5 grams of gibberellic acid per acre applied at full bloom is sufficient to reduce fruit set and increase berry length and weight. It is wise to begin with low rates (0.5 to 0.75 grams per acre) the first year and gauge treatment efficacy before using higher amounts. Rates greater than 1.5 grams per acre may result in excessive thinning and unacceptable reductions in yield the following year.

Berry sizing. Trunk girdles applied at berry set (4-5 mm berry diameter) increase the berry weight and yield of Princess 15% to 20%, but also delay fruit maturity. Girdles applied at berry softening or veraison advance fruit maturity, but have no effect on berry size. Effective rates of gibberellin for berry sizing between 10 to 20 grams per acre with applications normally timed at fruit set + 2 weeks to minimize negative effects on return fruitfulness. Research has shown that return fruitfulness is extremely sensitive to gibberellin and in most cases rates as low as 10 grams per acre applied two weeks following fruit set reduce both cluster size and number the following year. Rates above 20 grams per acre will result in acceptable reductions in yield.

Canopy Management

Canopy management practices, including shoot thinning, sterile shoot removal, leaf removal around the clusters and summer pruning, should be performed as with Thompson Seedless. It is important to remove leaves in direct contact with clusters following fruit set in order to reduce the potential berry surface scarring. However, care must be taken to avoid excessive and/or direct sunlight exposure of clusters that results in ambering or browning of the berry surface.

Special Problems and Considerations

In addition to the propensity for poor fruit set as described above, Princess is also susceptible to early bunch stem necrosis or inflorescence necrosis. This is a physiological disorder that results in the cluster stem shriveling and drying just prior to or shortly after bloom. In some cases the entire cluster is affected, while in others only the main rachis stem or isolated shoulders are affected.

Affected tissues initially turn purple or black, and then become brown, necrotic as they dry. Fruit set is reduced as a result, and affected clusters that remain on the vine appear straggly with large open areas (excessive shatter). Most studies indicate the disorder is regulated by environmental conditions near bloom. It is



most commonly observed on table grape in the San Joaquin Valley when daytime temperatures drop below normal during the bloom period. The exact cause is unknown. Some studies have indicated that the damage results from a temporary accumulation of ammonia in the rachis tissue, while others tie the problem to inadequate carbohydrate availability during bloom. At present, little can be done to correct or control the severity of the disorder. Similar to poor fruit set, this disorder is most severe on third or fourth leaf vines.

Cultural Practices for Autumn King

*Jennifer Hashim-Buckey, UCCE Viticulture Farm Advisor and
David Ramming, USDA-ARS Research Horticulturist*

Autumn King (US Plant Patent 16,284*) is a late-season white seedless table grape developed by David Ramming and Ronald Tarailo of the USDA-ARS in Parlier, California. The cultivar, formerly known as C10, was released in 2006 and resulted from the cross of USDA selections A61-20 x B99-131. The parentage of Autumn King is complex and includes Agadia, Blackrose, Calmeria, Cardinal, Divizich Early, Italia, Maraville, Muscat Hamburg, Muscat of Alexandria, Perlette, Sultanina and Tafafihi Ahmur. The cultivar produces medium-sized (0.5 kg./1.1 lb.), conical to cylindrical-shaped clusters that are medium to well filled. The natural berry size of Autumn King is quite large and without gibberellin or girdling, berry weight can average 8-9 grams or more. Berries are cylindrical to ovoid in shape, and have medium to firm flesh and skin. The berries contain 2-3 aborted seeds which are inconspicuous when eaten and the flavor is described as sweet and neutral. Autumn King ripens mid-September to late-October, or about eight weeks after Thompson Seedless, and the appeal of Autumn King will certainly rest on its large natural berry size and late harvest.

Site Selection and Planting

Autumn King is moderate-to-highly vigorous when planted on its own roots. Rootstock selection should be based on site-specific soil pest or soil chemistry problems. Common rootstock choices for Autumn King have included Freedom and 1103-P, but rootstock effects on fruit yield, quality and vine performance have not yet been evaluated. It is likely that grafting to these and other rootstocks common for table grape production in the San Joaquin Valley will increase vine vigor.

Training and Trellising Systems

Autumn King should be head-trained and cane-pruned for maximum productivity and fruit quality. Depending on vine vigor and trellis system, 5-8 canes that are 12 to 15 buds long are retained at pruning. Up to 4, 2-bud renewal spurs must be left to generate canes for the following year. Head trained, cane pruned Autumn King vines may be trellised to the standard California "T", but the open gable "Y" system is preferred.

Productivity and Crop Load Management

Information on commercial production potential has yet to be established given its brief production history. However, experimental observation and data indicate that mature Autumn King will yield 700-800 10 kg (22 lb.) boxes per acre for head-trained, cane-pruned vines grown on a gable system. Initial cluster counts during the spring ranged from 50-80 per vine and crop load may need to be adjusted by thinning to about 40 clusters following berry set so as not to impede fruit growth. Due to its moderate cluster length, cluster tipping is not normally necessary.

Girdling and Gibberellic Acid

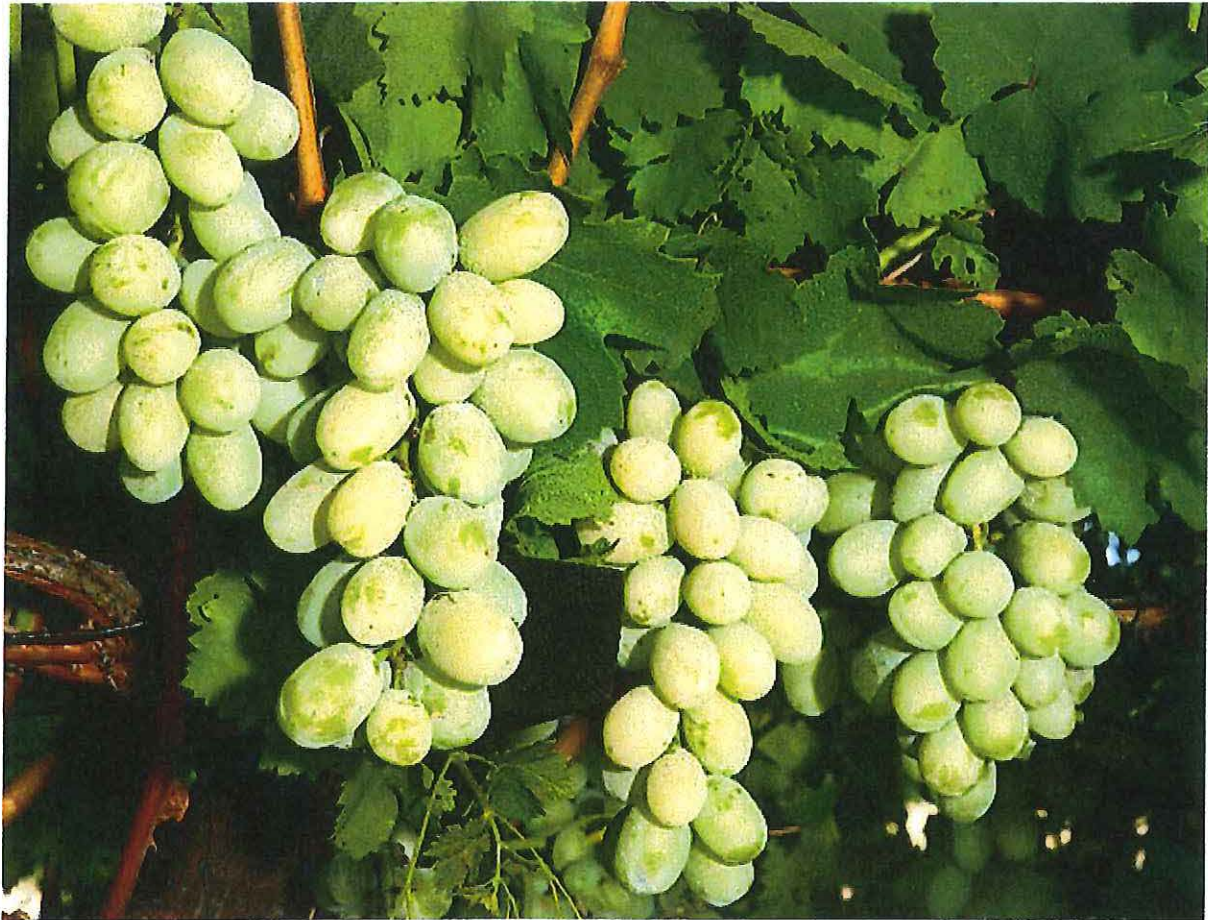
The natural berry size of Autumn King is very large (≈ 10 grams, 24 mm berry diameter, 29 mm berry length), possibly limiting the need for cultural inputs to increase berry size. The application of a girdle at berry set to increase berry size is not recommended, however a bloom-time girdle (70% bloom) may be necessary in areas where vines are extremely vigorous and poor berry set is observed. Gibberellic acid (GA) thinning sprays are generally not necessary due to the cultivars naturally loose architecture. **Autumn King is extremely sensitive to applications of GA at berry set which have reduced return fruitfulness below acceptable levels and is not recommended at this time.**

Canopy Management

Canopy management practices, including shoot thinning, sterile shoot removal, leaf removal around the clusters and summer pruning, should be performed as with Thompson Seedless and Princess. It is important to remove leaves in direct contact with clusters following fruit set in order to reduce the potential of berry surface bruising. However, care must be taken to avoid excessive and/or direct sunlight exposure of clusters that results in yellowing of the berry surface. In general, fruit should be well shaded until just before harvest. The fruit of Autumn King is harvested very late, making it susceptible to heavy rains and frost and may necessitate the use of plastic vine covers in northern table grape production areas.

* Autumn King is exclusively licensed to the California Table Grape Commission and inquiries regarding availability of Autumn King should be addressed to the commission at 392 W. Fallbrook, Suite 101, Fresno, CA 93711-6150.

For more information contact: Jennifer Hashim-Buckey, email: jmhashim@ucdavis.edu.



Autumn King produces naturally large grapes with a sweet neutral flavor. Photo by Stephen Ausmus.

December 2007 – January 2008

Cultural Practices for Sweet Scarlet

*Jennifer Hashim-Buckey, UCCE Viticulture Farm Advisor and
David Ramming, USDA-ARS Research Horticulturist*



Sweet Scarlet (US Plant Patent 15,891*) is a mid-season red seedless table grape with a light, fruity muscat flavor developed by David Ramming and Ronald Tarailo of the USDA-ARS in Parlier, California. The cultivar, formerly known as A2 and A61-16, was released in 2004 and resulted from the cross of two red seedless USDA selections C33-30 X C103-41. The parentage of Sweet Scarlet is complex and includes Blackrose, Maraville, Tafafihi Ahmur, Divizich Early, Fresno Seedless,

Italia, Calmeria, Muscat of Alexandria, Agadia, Muscat Hamburg, Perlette, Flame Seedless, Autumn Seedless and Sultanina. The cultivar produces very large (approximately 1.6 kg./3.5 lb. untipped), medium to well filled, conical-shaped clusters with large shoulders. Natural berries are oval in shape and weigh approximately 3.6 grams, though berry weight and size is increased when clusters are tipped, vines are girdled and fruit is treated with gibberellic acid. The skin is medium in thickness and the flesh is firm. Sweet Scarlet ripens mid-to-late August, or about the same time as Ruby Seedless and fills the harvest window between Flame Seedless and Crimson Seedless. Only a few hundred acres of this cultivar have been planted to date.

Site Selection and Planting

Sweet Scarlet is moderately vigorous when planted on its own roots. Rootstock selection should be based on site-specific soil pest or soil chemistry problems. Although rootstock effects on vine performance have not yet been evaluated, it is likely that grafting to Freedom, Ramsey (Salt Creek) and other rootstocks common for table grape production will increase vine vigor and require greater attention to canopy management.

Training and Trellising Systems

Quadrilateral cordon training and spur pruning is preferred for maximum productivity and fruit size and quality. Depending on vine vigor and in-row spacing, 36 to 40, 2-bud spurs are normally retained on quadrilateral cordon trained vines. Quadrilateral cordon

trained vines may be trellised to either the standard California "T" or open gable systems, but the gable system is preferred. Bilateral cordon training is not recommended due to inadequate productivity. Cane pruning may offer an advantage over spur pruning in terms of yield but is not recommended due to the production of overly compact clusters with variable berry size resulting in reduced berry size and poorer color development.

Productivity and Crop Load Management

Based on limited experience, Sweet Scarlet yields are observed to be quite variable ranging between 700 to 1,400 (22 lb.) boxes per acre for vines trellised on an open gable system. Optimum crop load varies among vineyards, depending upon vine vigor, berry set and tipping practices. Cluster counts prior to bloom often range between 30 and 40 per vine. Untipped clusters may weigh over 4 pounds at harvest, making them difficult to harvest and pack. Cluster tipping is therefore used to reduce cluster size and decrease crop load. It is essential that large, conical clusters be tipped to the top 4 shoulders after fruit set (8-10 mm in berry diameter) in order to reduce crop load, and allow berries to reach optimal size and acceptable color. Cylindrical "carrot" clusters, or those without defined shoulders may be tipped to clipper length, or about 6-7". Clusters tipped in this fashion typically weigh about 2 lb. at harvest. Based on this estimate, vines with 30 clusters per vine would produce about 2.7 packed boxes of fruit per vine or 1,240 10 kg. (22 lb.) boxes per acre (based on an 8 foot x 12 foot spacing).

Girdling and Gibberellic Acid

Berry thinning. Sweet Scarlet does not respond to gibberellic acid thinning sprays at bloom. Rates as low as 1-2 ppm do not consistently reduce berry set and will cause excessive post-harvest shatter.

Berry sizing. Preliminary research conducted indicates that girdling vines at fruit set (5-6 mm in berry diameter) combined with a treatment of gibberellic acid at the rate of 20 ppm, applied following fruit set (7-8 mm in berry diameter) will significantly increase berry size. Rates above 40 ppm have been observed to reduce yield the following year and increase post-harvest shatter.

Color Development

Experience has shown that to achieve adequate fruit coloration, Sweet Scarlet requires Ethrel (ethephon) at the 1 pint/acre rate at the onset of color break as well as leafing in the fruit zone and trimming or hedging row middles to improve cluster exposure to sunlight during ripening.

Canopy Management

Shoot thinning should be performed on vines when shoot length reaches 8 to 10". Shoot positioning should be performed on the open gable or other divided canopy systems. It is critical that clusters be exposed to adequate, indirect sunlight during the ripening period (after veraison) for maximum coloration. The removal of interior basal leaves, tendrils and lateral shoots in the fruit zone is generally recommended. Leaf removal should be performed near berry set, and after fruit softening. Shoot trimming or

hedging in the row middle is typically performed to maintain canopy shape and improve cluster exposure to sunlight, as well as reduce humidity within the fruiting region. Early senescence of leaves has been observed on the canopy interior, but no detrimental effects have been reported.

** Sweet Scarlet is exclusively licensed to the California Table Grape Commission and inquiries regarding availability of Sweet Scarlet should be addressed to the commission at 392 W. Fallbrook, Suite 101, Fresno, CA 93711-6150.*



Sweet Scarlet grapes, Arvin, CA, 7/24/2007. Photo by Jennifer Hashim-Buckey.

May-June 2008

Cultural Practices for Scarlet Royal

*Jennifer Hashim-Buckey, UCCE Viticulture Farm Advisor and
David Ramming, USDA-ARS Research Horticulturist*



Scarlet Royal (US Plant Patent 16,229*) is a mid-season red seedless table grape developed by David Ramming and Ronald Tarailo of the USDA-ARS in Parlier, California. The cultivar, formerly known as B1, was released in 2006 and resulted from the cross of two red seedless USDA selections C33-30 x C51-63. The parentage of Scarlet Royal includes Blackrose, Calmeria, Cardinal, Crimson Seedless, Divizich Early, Italia, Maraville, Muscat of Alexandria, Sultanina and Tafafihi Ahmur. The cultivar produces large (0.8 kg./1.8 lb.), conical-shaped clusters that are medium to well filled. Berries are oval in shape and its appearance is similar to Crimson Seedless. Natural Scarlet Royal berries weigh about 5-7 grams, though berry weight and size is slightly increased when fruit is treated with gibberellic acid. The flesh is firm and meaty and the skin is medium to thick. The flavor is described as sweet and neutral. Scarlet Royal ripens mid-to-late August, filling the harvest

window between Flame Seedless and Crimson Seedless.

Site Selection and Planting

Scarlet Royal is moderately vigorous when planted on its own roots. Rootstock selection should be based on site-specific soil pest or soil chemistry problems. Common rootstock choices for Scarlet Royal have included Freedom and 1103-P, but rootstock effects on fruit yield, quality and vine performance have not yet been evaluated. It is likely that grafting to these and other rootstocks common for table grape production in the San Joaquin Valley will increase vine vigor.

Training and Trellising Systems

Quadrilateral cordon training and spur pruning are suggested for Scarlet Royal vines. Depending on vine vigor and in-row spacing, 32-40 2-bud spurs should be retained during pruning. Quadrilateral cordon trained vines may be trellised to the standard California "T" or the open gable "Y" system.

Productivity and Crop Load Management

Information on commercial production potential has yet to be established given its brief production history. However, experimental observation and data indicate that mature Scarlet Royal will yield 1100-1300 10 kg (22 lb.) boxes per acre for quadrilateral cordon, spur-pruned vines grown on a gable system. Cluster counts prior to bloom ranged from 50-70 per vine and crop load should be adjusted by thinning to about 40-45 well shaped clusters following berry set so as not to impede fruit growth. In addition to cluster thinning, it may be necessary in some years to thin berries due to their naturally large size.

Girdling and Gibberellic Acid

Very limited information has been developed on cultural practices to reduce set and improve the size of Scarlet Royal grapes. Girdling at berry set to increase berry size is not recommended on Scarlet Royal vines as previous work has shown that girdling may cause significant sunburn damage to fruit and may increase astringency in the berry skins. Initial work on bloom time applications of gibberellic acid (GA) indicate that rates of 2-2.5 ppm applied at 40%-60% bloom may not be completely effective for loosening the cluster. When determining optimal rates and timing, its best to observe untreated fruit during the first fruiting year and then begin with lower rates (2 ppm) and evaluate treatment effects before using higher rates. GA at the rate of 20 ppm applied at fruit set appears to be effective for increasing berry size. However, a 40 ppm rate has been shown to reduce return fruitfulness (the following year). In most cases the reduction may not be of economic importance due to the cultivar's highly productive nature. More work is needed to determine GA rates that will provide consistent effects on cluster thinning and increased berry size.

Color Development

Scarlet Royal grapes color well when grown under a full canopy and do not appear to have the problems of other red seedless cultivars, like Crimson Seedless and Flame Seedless, if crop load is properly managed. Ethrel (ethephon) is generally not recommended, as treated fruit may develop an undesirable purple color in comparison to the deep crimson hue of untreated fruit. Observations indicate that minimal basal leaf removal and other common canopy management practices are sufficient to enhance coloration.

Canopy Management

Shoot thinning should be performed on vines when shoot length reaches 8-10 inches. Shoot positioning should be performed on open gable or other divided canopy systems. Minor leaf pulling in the fruit zone is generally recommended to facilitate air flow and foliar spray penetration, and facilitate color development. Shoot trimming or hedging in the row middles just prior to harvest is typically performed to maintain canopy shape and reduce humidity within the fruiting region.

Special Problems and Considerations

Scarlet Royal is susceptible to undesirable skin astringency, or bitter flavors if fruit is held too long on the vine and allowed to become over ripe (>23% soluble solids). Harvest must not be delayed. It is recommended that harvest begin when berries are well colored near the capstem and the fruit is sweet ($\geq 17\%$ soluble solids) and well balanced and continue harvest until soluble solids reach 22% to ensure high quality, palatable fruit.

** Scarlet Royal is exclusively licensed to the California Table Grape Commission and inquiries regarding availability of Scarlet Royal should be addressed to the commission at 392 W. Fallbrook, Suite 101, Fresno, CA 93711-6150.*



Scarlet Royal grapes on 1.5 year-old vines. Arvin, California. Photo taken 7/24/2007.