

# COLOR ENHANCEMENT OF APPLE FRUIT\_

By Paul Vossen

## Color's Importance

The importance of color in apples can not be overstated. Even in green varieties like Granny Smith, a deep green color and sour taste is usually preferred by the majority of green apple buyers. This is evident even though Granny Smith will become much sweeter and somewhat yellow-green in color when fully ripe. Some growers do, however, sell these in niche markets as "Late-Harvest" Grannys.

Fuji is another example of a variety that sold very well as a yellow-orange fruit as long as it was the only one on the market. As soon as full-colored red fruit from Washington state became available in volume, the prices for California fruit dropped dramatically. This is one of the historical reasons why red varieties have not been grown in the hot interior valley districts.

The original Red Delicious, when mature, has a yellow background color attractively overlaid with red stripes. Since the 1920's when the first sport mutations were discovered, several hundred new full-colored red sports have been introduced. Along with the improved red color also comes earlier coloring, so that the fruit appears ready for harvest long before it is actually mature. When mature, it turns a more dull purple-red color. Consequently, there is a strong tendency to pick Delicious sports well in advance of optimum edible maturity. Some growers, however, have found a niche market for mature fruit with good flavor.

Growing fruit with excellent finish at a reasonable cost has a major profit potential for apples in California. Prices paid are directly proportional to the appearance of the fruit. The pigments in apples are activated by high light intensity and cool temperatures. Several methods have been devised to increase light intensity to the fruit and/or lower temperatures in the orchard prior to harvest to improve the color of red fruited varieties.

## Tree Design

The basic design of the tree should allow as much fruit as possible to be touched by as much light as possible without movement of the fruit exposing the more shaded surface to sunburn. In high heat and sunlight areas where temperatures routinely exceed 95°F, long fruit bearing branches must be stiffened by heading cuts to keep the fruit from rotating as it increases in size and weight. This will limit sunburn. Pruning methods that shade lower fruit will reduce sunburn damage but will also reduce light intensity and red coloring.

In order to get maximum sunlight and better colored fruit into the lower portions of apple trees, the trees should be properly spaced and trained so approximately 20% of the orchard floor is unshaded. The trees need to be trained with a weak central leader or very open center system to avoid shading the lower scaffold branches.

## **Reflective Ground Covers**

Recent research in California has demonstrated that 25% to 35% more (well colored and much higher value) fruit can be harvested during the first picking. Reflective materials (from 60-80 inches wide) placed on the orchard floor middles will deepen and enhance more uniform color development. There are several product types, such as metalized surface plastics, white plastics and foil materials. Costs range from \$160 to \$200 per acre. These materials are normally placed on the ground four to six weeks prior to harvest.

## **Shade Cloth**

Shade cloth can reduce temperatures by 4-12°F and increases the ratio of diffuse to direct sunlight on the fruit. This system can enhance color and reduce sunburn, but it is expensive, both because it requires a trellis system to hold up the shading material as well as the capability to apply it prior to harvest. Later, it must be removed for normal seasonal tree growth. Excessive shading will cause problems with flower bloom initiation early in the season and may affect yields.

## **Overhead Cooling with Water**

The application of low volumes of water cools the fruit through evaporative cooling of the surrounding air. When water is applied, it evaporates from the fruit surface and cools the fruit. In addition, it hydrocools the fruit by carrying heat away in runoff. Such a cooling system requires very clean water to prevent residues from being left on the fruit surface and careful management to produce the desired cooling effect without increasing fireblight, apple scab or root rotting diseases. Application rates of 40-70 gallons per minute per acre are usually needed to cool fruit on the hottest days.

## **White Wash Spray Coverings**

White washing fruit trees is not known to enhance red fruit color development. Commercially prepared whitening agents with up to 12 applications are slightly effective in reducing sunburn damage, but not cost effectively. The whitewash material is also very difficult to remove in the packing process.

## **Bagging Fruit**

This method is extremely expensive (\$6,000/acre) but can potentially increase profits because of the specialty nature of the fruit. It can also be used to control insect and disease pests. Each fruit is covered with a double bag early in the season as fruit begins to enlarge. Approximately 3 weeks prior to harvest the outer bag is removed, exposing a transparent colored bag which protects the fruit but allows light penetration and excellent color development. This inner bag is removed just before harvest.