MANAGING THE THERMAL CHARACTER OF THE CANOPY TO OBTAIN GOOD YIELD AND QUALITY FRUIT

In high value fruit farming, managing the interception of sunlight and shade in the canopy and managing the water input to the plants are very important considerations. Sunlight interception and shade can be managed by shaping the canopy and controlling the leaf mass. Water input can be managed by controlling the water in the in the root zone based on an estimation of the water needed by the plant. With the right tools canopy and water input can be very manageable.

Canopy Thermography (the thermal characterization and assessment of the canopy) offers a new tool for managing canopy and water input for the production of quality fruit and good yield.

Canopies intercept some of the energy in sunlight so that chlorophyll can produce sugars and other organic compounds from carbon dioxide and the input water. The canopy is also important in cooling the plant by three different means so that it does not overheat or cook in the sun. (see Figure 1.)

1. Chlorophyll strongly scatters and reflects sunlight/energy that isn't used in photosynthesis. In the near-IR part of the spectrum where sunlight is very energetic, this is important.
2. The shape and density of the canopy provides various amounts of shade to the leaves and the fruit in the canopy.
3. The canopy transpires (the evaporation of water from the aerial parts of plants, especially leaves but also stems) and thus cools the canopy. This process also significantly cools the plant. It also facilitates the movement of water up into the leaves to replace the deficit caused by transpiration

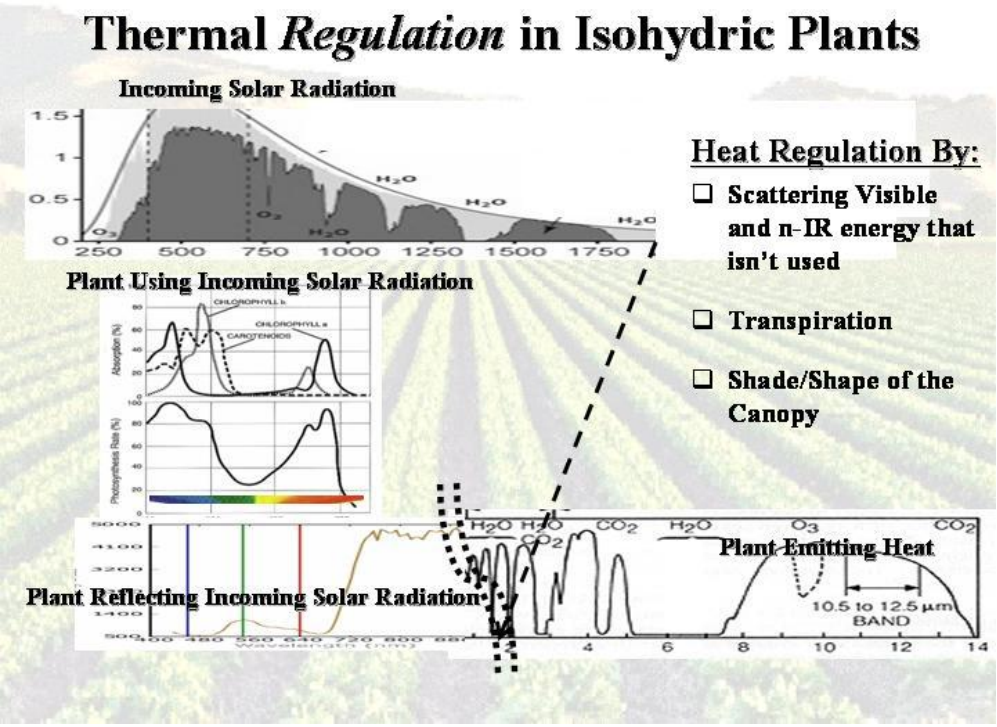

Figure 1. Thermal Regulation by Plants

The relationship of photosynthesis and water input can be seen in the canopy temperature.

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Although plants don't regulate their temperature, the degree of temperature control afforded by scattering, shade, and transpiration is critical to the plant's health and to the quality and yield of the product. We have observed that there appears to be a temperature range that fruiting plants 'enjoy' and that when they are stressed it is immediately evident in their elevated canopy temperatures.
For example; whether the ambient temperature is 70° or 105°, healthy grapevine canopies will range between 87° to 91°. And when they are stressed it is immediately evident in their elevated canopy temperatures.

The commercial value of knowing the character of the canopy temperatures from remotely sensed real-time imagery of large acreages is that detrimental stresses can be quickly isolated and identified and then remediated before significant damage is done. I also think that irrigation can be regulated by measuring the canopy temperatures across a block and then applying irrigation when the canopy temperatures approach a *water-now-temperature* threshold.

Crop-Vu is working to further understand canopy temperature and to facilitate affordable management practices involving irrigation scheduling to help the plant maintain a healthy thermal character.

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