The writing this week is a continuation of what was submitted last week.

The quality of light (wavelength spectrum composition) a plant receives differentially affects plant physiology. The spectrum of light most relevant for plant growth and development includes ultra violet-B (280-320 nm), ultra violet-A/B (300-400 nm), PAR [400-700 nm including blue (400-500 nm), green (500-600 nm), and red (600-700 nm)] and far-red (700-800 nm) (Taiz et al., 2015). As light passes through a canopy, the light quality changes and the quantity of ultra violet (UV), blue, green, and red decreases and the quantity of far-red increases in the light spectra (Awad et al. 2001). The proportional changes in light quality induces changes in pigment-based photoreceptors and as the ratio of red:far-red impacts phytochromes and the quantity of UV and blue light impacts phytochromes, cryptochromes, and phototropins (Devlin et al. 2007). Baraldi et al. (1994) demonstrated that the ratio of red:far-red in peach trees changes throughout the season with the ratio at approximately 1.1 throughout the entire canopy early in the season, but as the canopy developed, the ratio changed to approximately 0.5 at the top and 0.3 at the bottom of the canopy. Light conditions with increased far-red light, or a decreased red:far-red ratio, invoke a shade avoidance response with plant morphological changes such as: shoot elongation, increased apical dominance, and reduced leaf width (Combes et al. 2000; Baraldi et al. 1994).

Phytochrome is photoconvertible from an active form (Pfr) in the presence of red light to an inactive form (Pr) in far-red light. The ratio of Pfr to total phytochrome (Ptot) as represented by the phytochrome photoequilibrium has been shown to be a good indicator for plant responses to changes in light quality (Baraldi et al. 1998; Raparini et al. 1999; Smith 2000). Under similar fluence rates (total number of photons), Baraldi et al. (1998) demonstrated that peach plants exposed to blue plus far-red light as compared to red plus far-red light had a lower phytochrome photoequilibrium (0.13 and 0.49, respectively) and correspondingly shorter shoot and internode lengths. Furthering this research, under a constant photosynthetic active radiation and phytochrome photoequilibrium, Raparini et al. (1999) demonstrated that increased blue light on peach trees decreased height, internode length, leaf expansion, leaf thickness and stomatal density. These two studies demonstrate that the ratio of red:far-red and blue light receptors are integral for morphological changes in peach trees.

Fruit tree light environments have been modified *in situ* using photoselective colored nets (including shade cloth) and bagging fruit bearing portions plants using colored bags (citations). Net treatments are installed over the entire tree and physiological changes whereas bagging treatments are applied to individual fruits. Net treatments are likely the product of interactions between both vegetative and reproductive tissue, whereas bagging treatments only change the microclimate of the fruit and any surrounding tissue that receives reflected, refracted, or altered wavelengths.

Lobos et al. (2012) found that all netting reduced the quantity of spectral irradiance from 300 to 600 nm for various shading levels and the quality of the light under black netting was similar to full sunlight after dividing the measured by the total irradiance. Under the same conditions, they found that white netting slightly altered spectral irradiance with reduced UV, reduced photosynthetic active radiation, and increased infrared radiation (700-1,000 nm) as compared to full sunlight. Red netting exhibited similar spectral irradiance patterns as the white netting but differed along the spectrum. When comparing red and white netting, at 350 nm white decreased irradiance two times more than red; at 450 nm red decreased three times more irradiance than white; at 550 nm red decreased irradiance four times more than white; at 650 nm white continued to decrease irradiance, but red increased irradiance; and at 750 nm red increased irradiance more than twice white. Bastias et al. (2012) found similar results when measuring red and white netting irradiance measurements 450 to 750 nm.

Bastias et al. (2011) found that pearl, grey, red, and blue colored netting reduced irradiance across the spectrum of 400 nm to 800 nm as compared to full sunlight. They found that hail nets (nets with stronger, but less numerous fibers) remained above 70% light transmission. Pearl colored hail nets slightly increased transmission from 400-420 nm but remained around 87% transmission across the spectrum and red colored hail nets remained at 75% transmission up to 600 nm and increased to 90% transmission through 800 nm. Grey shade nets (nets with an increased density of fibers) slightly increased from approximately 42 to 44% transmission across the spectrum. Red shade nets decreased from 55% to 45% from 400 to 550 nm and rapidly increased to about 80% from 640-800 nm. Blue shade nets increased parabolically from 51% transmission at 400 nm to 70% at 480 and leveled off around 46% at 600 nm through 740 nm. At 740 nm the blue shade net increased to end around 70% at 800 nm. In general, netting reduced the spectral irradiance across the entire spectrum as compared to full sunlight, but blue, red and white netting altered the relative proportion of transmitted wavelengths. Blue netting increased the proportion of irradiance at lower wavelengths. Red netting increased the proportion of irradiance at higher wavelengths and white netting generally followed the same patterns as red netting.

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