The writing for this week includes an article for a consumer-oriented publication, VSCNews <http://vscnews.com>. The publication is dedicated mostly for growers of vegetables and specialty crops. The second portion of the writing includes the beginning of a literature review for a research project that I hope to complete as part of my Ph.D. research.

Currently 695 words. 750-850 words max.

Title: Bags protect developing peaches, improve fruit appearance, and extend shelf life

Peach growers have rediscovered a tool to add to their integrated pest and disease management toolbox - paper bags. These paper bags are special; they are easy to install and remove, they are durable enough to withstand wind and rain throughout the season, and if our data are consistent with previous observations, they are affordable for many operations. Globally, bagging increases yield and reduces damage for multiple crop-pest complexes. Producers in the United States, Spain, Japan, and China are currently using the practice of fruit bagging for many different crops including peach, apple, pear and loquat (Sharma 2014). Bagging has been shown to protect pomegranates from injury caused by the anar butterfly (Bagle 2011) to reduce Anthracnose and stem end rot in mangos mango (Hofman 1997). This strategy has does effect fruit quality characteristics, including percent of soluble solids and acidity.

A team of experts from Florida, Georgia, and South Carolina are investigating the horticultural and economic impact of incorporating bagging as a pest management strategy for peach growers in the southeast. Preliminary data collected by this team of research scientists indicates bagging can protect peaches against insect feeding and pathogenic fungi. After fruitlets are thinned to an appropriate density and receive an approved protective anti-fungal spray, young peaches are bagged. The bag is placed over the fruitlet when it is approximately one inch long. The bag is designed to fit snugly over the branch. The sides of the bag are folded in an accordion-like fashion, and the bag is finally secured with a metal twist tie that is built into the bag. Approximately seven to ten days before harvest, the bag is removed to allow the skin to tan and become red color and ten days later the fruit is manually harvested. After the metal twist tie is removed, the bag can be recycled depending on the recycling requirements.

In Florida, bagging can begin as early as February but will occur later for cultivars that require more chill hours. Producers in Georgia and South Carolina typically bag fruit in March and April, respectively. In Florida, members of our research team installed an average of 2.5 bags per minute and removed 48 bags per minute (). Depending on the size of the operation, bagging can require an extensive labor force and the choice to bag may depend on the grower’s market. Depending on the quantity purchased, bags cost around one penny per bag (). For an acre of Florida peach trees planted to a density of 117 per acre that that yielded 150 fruit/tree, the cost of bagging would equal $1,592, based on bag price plus $12/hr labor, in addition to the estimated 123 man-hours of total labor needed for bagging installation and removal (). Additional research is needed to determine if bagged peaches can be sold at a price premium or current management practices could change, such as a reduced spray schedule, to offset the price of bagging.

For organic or conventional producers who experience a significant loss in yield due to pests and diseases, bagging may provide the tool needed to improve fruit quality and increase yield. Bags are currently commercially available and any producer in the southeast interested in testing this technology can contact the authors of this article for more information.

Key Florida findings in 2018

In a statistical comparison of bagged peaches to unbagged our initial year of data showed:

* Fruit size and yield were not affected by bagging
* Bagged peaches had a longer shelf life and less brown rot
* Bagged peaches had fewer scab-like lesions (inclusive of all black spots on the skin)

Funding: This article was developed in part with funding from the USDA-OREI Project Number 2016-51300-25726.

References

Bagle, B.G. 2011. Studies on varietal reaction, extent of damage and management of anar butterfly, *Deudorix isocrates* in pomegranate. Acta Hortic. 890:557-559.

Hofman, P.J., L.G. Smith, D.C. Joyce, G.L. Johnson, and G.F. Meiburg. 1997. Bagging of mango (*Mangifera indica* cv. ‘Keitt’) fruit influences fruit quality and mineral composition. Postharvest Biol. Technol. 12:83-91.

Sharma, R.R., S.V.R. Reddy, and M.J. Jhalegar. 2014. Pre-harvest fruit bagging: A useful approach for plant protection and improved post-harvest fruit quality. J. Hortic. Sci. Biotech. 89:101-113.

**Peach colored bag literature review (HortScience**

Horticulturists have been altering the light quality and quantity of peach trees since the beginning of intensive cultivation because light can have a profound effect on peach tree growth and fruit quality. Innovations such as orchard design, tree spacing, and pruning allow machinery to traverse the orchard and ensure maximal incident solar photosynthetic active radiation (PAR) within the tree canopy as well as on a land area basis (Bastias and Corelli-Grappadelli, 2012; Minas et al., 2018). Maximizing PAR ensures that the photosynthetic components in the chloroplasts are capturing optimal levels of light to assimilate C from the atmosphere. Changes in PAR can result in an increase in vegetative and fruit dry matter and as such has been the primary focus of research efforts on light and plant physiology.

On a sunny day, the PAR contacting the leaves on the perimeter of the canopy is approximately 2,000 micromol m-2 s-1, but PAR at the bottom of a dense canopy may be only 10 micromol m-2 s-1 (Taiz et al. 2015). The quantity of light intercepted by the leaves is determined by the transmittance and reflectance characteristics of each tree species and leaf shape (Awad et al., 2001; Combes et al., 2000). Intercepted light is captured by photosynthetic pigments (Chlorophyll A, Chlorophyll B, Carotenoids, and other accessory pigments), and pigment activity is directly related to the PAR quantity. A reduction in PAR has been shown to decrease canopy temperature and alter photosynthetic capacities of blueberry (Lobos et al., 2012); increase shoot growth and the shoot to root ratio in citrus (Li and Syvertsen, 2006); and reduce total soluble solids, delay maturity, and reduce the red blush of peach fruits (Marini et al., 1991). An increase in PAR can increase canopy air temperature and relative humidity (Layne et al., 2001), improve apple and peach skin color (Glenn and Puterka, 2007; Ju et al., 1999, Layne et al., 2001), increase apple fruit weight (Glenn and Puterka, 2007), and increase sweet cherry firmness and total soluble solids (Whiting et al., 2008).

References

Awad, M.A., P.S. Wagenmakers, and A. de Jager. 2001. Effects of light on flavonoid and chlorogenic acid levels in the skin of ‘Jonagold’ apples. Sci. Hortic. 88(4):289-298.

Bastías, R.M. and L. Corelli-Grappadelli. 2012. Light quality management in fruit orchards: physiological and technological aspects. Chil. J. Agric. Res. 72(4):574-581.

Combes D., H. Sinoquet, and C. Varlet-Grancher. 2000. Preliminary measurement and simulation of the spatial distribution of the morphogenetically active radiation (MAR) within an Isolated Tree Canopy. Ann. For. Sci. 57(5):497-511.

Glenn, D.M., and G.J. Puterka. 2007. The use of plastic films and sprayable reflective particle films to increase light penetration in apple canopies and improve apple color and weight. HortScience. 42(1):91-96.

Ju, Z., Y. Duan, and Z. Ju. 1999. Effects of covering the orchard floor with reflecting films on pigment accumulation and fruit coloration in `Fuji’ apples. Sci. Hortic. 82(1):47-56.

Li, K.T. and J. Syvertsen. 2006. Young tree growth and leaf function of citrus seedlings under colored shade netting. HortScience. 41(4):1022-1022.

Layne, D.R., Z. Jiang, and J.W. Rushing. 2001. Tree fruit reflective film improves red skin coloration and advances maturity in peach. HortTechnology 11(2):234-42.

Lobos, G.A., J.B. Retamales, J.F. Hancock, J.A. Flore, N. Cobo, and A. del Pozo. 2012. Spectral irradiance, gas exchange characteristics, and leaf traits of *Vaccinium corymbosum* L. ‘Elliott’ grown under photo-selective nets. Environ. Exp. Bot. 75:142-149.

Marini, R.P., D. Sowers, and M.C. Marini. 1991. Peach fruit quality is affected by shade during final swell of fruit growth. J. Am. Soc. Hortic. Sci. 116(3):383-389.

Minas, I.S., G. Tanou, and A. Molassiotis. 2018. Environmental and orchard bases of peach fruit quality. Sci. Hortic. 235:307-322.

Taiz, L., E. Zeigler, I.A. Moller, and A. Murphy. 2015. Photosynthesis: Physiological and ecological considerations. In: Sinauer. D (Ed). Plant Physiology and Development. Sinauer Associates, Inc., Sunderland, MA.

Whiting, M.D., C. Rodriguez, and J. Toye. 2008. Preliminary testing of a reflective ground cover: Sweet cherry growth, yield and fruit quality. Acta Hortic. 795:557–560.