

Influence of photo-selective shade nettings to improve fruit quality at harvest and during postharvest storage

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ABSTRACT

Increasing summer temperatures, wind and hail damage can affect avocado quality at the pack house and during marketing. Exposure to higher temperatures and solar radiation can cause sunburn damage to the fruit surface. Higher temperatures during growth result in morphological, anatomical, physiological and biochemical changes in plant tissues. Fruits exposed to higher temperatures were reported to show variability in postharvest responses such as slow ripening patterns and greater fruit firmness and can affect the present ready-to-eat programme.

Nets are commonly used to protect agricultural crops from either excessive solar radiation, or environmental hazards or pests. Commercially used nets help to provide shading and protection against pests; these nets do not alter the light spectral composition. The photo-selective nets include coloured nets (red, yellow, green and blue) as well as neutral-colour nets (pearl, white and grey). Present research aims to investigate the effect of photo-selective coloured shade nets (red leno and pearl leno) on tree growth, leaf area, leaf chlorophyll (non-destructive measurement), flowering, fruit set, fruit drop, fruit size (diameter), marketable yield, sunburn and wind damage, incidence of diseases and pests on cv. Hass. The structure of the nets was erected during the 2014 growing season and data will be collected during 2015 and 2016 growing seasons.

INTRODUCTION

Photo-selective shade netting is reported to affect the radiation, air temperature and RH, fruit surface and soil temperature. Photo-selective coloured shade nets were shown to increase radiation use efficiency, yields (both at the plant and ecosystem level), growth and plant flowering (timing and amounts). It is also evident that coloured nets can be used to influence the light ratio changes red to far-red that can be easily detected by phytochromes, and the amount of radiation available to activate the blue/ultraviolet-A photoreceptors, blue light involved in phototropic responses mediated by phototropins, and radiation at other wavelengths that can influence plant growth and development (Stamps, 2009).

The effects on air movement and PAR under the nets depend on nets' porosity and knitting pattern. In a study conducted in southern Italy using white, red, blue and grey netting with shading factors from 20.4% to 26.9%, the number of flowers and inflores-

cences per shoot were lower in the net than in open field treatments (Basile *et al.*, 2008). According to Shahak *et al.* (2004), after two years under netting, flowering of 'Hermosa' peaches was increased by five (white - 12% shading; blue, pearl, red and yellow - 30% shading) of six net treatments compared with the open field control. However, the 30% grey netting did not affect flowering, compared with the control.

Coloured netting also affected the rate of fruit maturation in grapes. Light-scattering nets (pearl, white) increased the rate of fruit maturation in a number of cultivars and black and red nets delayed the maturation of 'Red Globe'. However, with blue netting, maturation was advanced for 'Superior', but delayed for 'Perlette' grapes. For peaches, the 30% red net had the greatest effect on the quality of fruit set with three of the other net treatments also benefiting set quality. It was reported that fruit size was larger under the nets, except under the blue-coloured net. However, these larger fruit had lower total soluble



solids and firmness. Radiation quality can have effects on both plants and the microorganisms associated with them. According to Elad *et al.* (2007), for example, although pepper yields were increased under coloured shade nets, powdery mildew (*Leveillula taurica*) leaf coverage and leaf shedding resulting from disease were more severe in the shade and had to be controlled by spraying (Elad *et al.*, 2007). Ben-Yakir *et al.* (2008) reported that although white flies preferred landing on yellow net compared with black netting, fewer adult white flies were caught on yellow sticky traps inside the yellow-netted chambers than under black nets.

It is reported that exposure of fruits to 30°C affected fruit ripening, including colour development, softening, rate of respiration and ethylene production. Higher temperatures during growth and maturation can affect fruit firmness by affecting the cell wall composition, cell number and cell turgor properties. The mineral accumulation also can be affected by higher temperatures or direct sunlight which could be related to water movement through the fruit. Although avocados are not grown under netting in South Africa, this project aims to focus on using colour nets to create a suitable microclimate to produce healthy plants in order to obtain good quality fruits at harvest that will have higher consumer acceptance at the export markets. The objectives for the coming season is to investigate the effect of photo-selective coloured shade nets on tree canopy morphology, leaf chlorophyll (non-destructive measurement), flowering, fruit set, fruit drop, fruit size (diameter), marketable yield, wind damage, sun scald, incidence of diseases and pests on cv. Hass.

OUTCOME

Effect of different photo-selective shaded netting; colours red leno or pearl leno with 20% shading and Knittex net (commercial shade net with 20% shading, control) were erected at Lombard's farm in December 2014.

EXPERIMENTAL DESIGN

Randomised Complete Block Design with four treatments (nets) replicated within each of the five block replications (blocking was done according to slope and the soil differences were assumed to be uni-

form). An experimental unit will include 5 x 4 = 20 trees and 6 centre trees will act as data trees per treatment. The irrigation and fertiliser application will be carried out according to standard orchard management practices, which will be adapted to SAAGA's recommendations.

Data gathering will be done during the 2015 growing season.

For Hass cultivar and shaded netting of a particular colour (three replicates), approximately 10 plants per cultivar will be investigated on plant growth, canopy morphology, leaf chlorophyll (non-destructive measurement), flowering, fruit set, fruit drop, fruit size (diameter), marketable yield, wind damage, sun scald, incidence of diseases and pests, and fruit quality parameters. The effect of two photo-selective shade netting with 20% shading will be compared with the 20% white Knittex netting and the open field cultivation (commercial).

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