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Effect of Coloured Shade Nets on Growth and Quality of Horticultural Crops

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Abstract

Shade nets provide a specific microenvironment to the crops at various stages. For maintaining quantitative and qualitative characteristics of fruits, vegetables, flowers and foliage plants, it is important to manipulate the quantity, quality, duration and direction of light which is coming towards the crop. In fruit crops, coloured netting produced a positive influence on yield and grafting. In Ornamental plants, morphological parameters are much affected by the differential effects of coloured shade nets whereas in vegetable crops, leaf characteristics are variably influenced by red and green coloured shade nets. Rather than green and black shade nets, other colours such as red, white, blue, etc. were gaining importance in the present market. The coloured shade net approach was evaluated during the past decade in numerous ornamentals, fruit crops and vegetables which improved the growth and quality of the crops specifically.

Introduction

Shade nets are commonly used for growing plants under specific micro-environment to get filtered sunlight and physical protection. They decrease light quantity and alter light quality to a varying extent and optimize other environmental conditions such as temperature and humidity. Protective shade nets are structures enclosed by agro-nets or any other woven material to allow the environmental requirements such as sunlight, moisture and air to pass through the gaps. It creates an appropriate micro climate conductive to the plant growth. Coloured nets represent new agro-technological concept, which not only exhibit special optical properties that allow the control of light, but also have the advantage of influencing the microclimate to which the plant is exposed and offer physical protection against excessive radiation, insect pests and environmental changes. Use of these nets optimizes desirable physiological responses, resulting in substantial effect on shoot elongation, branching and flowering in horticultural crops.

Different Coloured Shade Nets

Shade nets of different colours are available; the common colours being used are red, white, black, blue, grey and yellow. Green colour is prevalent in markets but nowadays black nets proved to be best.

Green and Black Shade Net

Green and black nets behave like filters and deprive the plants of much of the sunlight required for photosynthesis, resulting in retarded growth. It reduces the quantity of light as well as the quality of the spectrum.

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White Shade Net

White nets reduce only the quantity of light and do not affect the quality of the light spectrum. Plant growth is more rapid in white nets than with green and black shade nets.

Red Shade Net

Red light is essential for photosynthesis. It increases the accumulation of starch in many plant species by the inhibition of translocation of photo-assimilates to other tissue.

Flowers and Ornamentals

Lisianthus usually yield more flowering stems per plant under grey shade net. Numerous seasonal cut-flowers (e.g., *Lisianthus, Trachelium, Lupinus*, sun flowers, etc.) were grown under 50% shade nets. Cut flowers developed longer and wider stems under the red shade net and even more under the yellow net, while shorter under the blue, compared with the equivalent black shade net. The colored shade nets additionally affected timing of anthesis and quality of cut flowers. The extent of the responses varied amongst the different species/ cultivars tested. Growing cut foliage plants under shade nets influence their morphological parameters. Under black, blue, grey and red netting of 70% shade, leaf mass of *Philodendron xanadu* was unaffected but the number of leaves was highest under the red and lowest under the blue netting. Red shade net usage in *Philodendron xanadu* improved the morphological parameters and green shade net enhanced the root characters and foliage quality (Naveena *et al*., 2019). Generally flowers are low volume high value crops, in which growers always focus on protected technology for quality output.

Vegetable Crops

Leaf area is a useful parameter of growth as it interprets the capacity of a crop for producing dry matter in terms of the utilization of intercepted radiation and amount of photosynthesis synthesized. Leaf area in *Spinacia oleracea* was affected by coloured shade nets due to change in light characteristics. In summer season, leaf area was lower in open condition and higher in coloured shade nets (Red and white colour). During rainy season leaf area was more in green nets. In Tomato (*Lycopersicon esculentum*), under four different coloured shade-nets (pearl, red, blue and black) with 40% relative shading, maximum leaf area index (LAI) found in red colour nets. Shade-grown leaves generally have higher total chlorophyll and carotenoids content. Pericarp thickness tends to be improved in the tomatoes grown under pearl net. The highest concentration of lycopene was detected in tomatoes grown in plastic houses integrated with red colour nets. Shade application of coloured nets to sweet pepper (*Capsicum annuum* L.) plants was effective in substantially improving vegetative growth parameters (leaf area index and leaf pigments) under excessive solar radiation during the summer period (Ilic *et al*., 2017).

Fruit Crops

In Granny Smith apple variety, better fruit quality was obtained using coloured shade nets namely black, blue and grey as well as it reduced the risk of sunburn in apple. Average yield of fruits improved gradually under colour netting in "Golden Delicious" variety (Mupambia *et al*., 2018). Researchers also involved in identifying colour netting effect in jamun grafting and strawberry cultivation.

Conclusion

Coloured shade net approach has a positive potential in improving the quality of horticultural crops. Shade nets claimed to be a low cost protected cultivation structure, which may play an important role during Covid-19 crisis especially for the growers. However, the effects are varied and plant responses vary among different plant species. Therefore, more research is needed to clarify the effects of coloured shade nets based on their photo-selectivity and a complete description of environmental conditions is needed to standardize the optimum growing conditions.

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