



COLOURED SHADE NETS: AN EMERGING TECHNOLOGY IN PROTECTED CULTIVATION

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Abstract

Protected cultivation technologies are gaining importance in modern agriculture due to their ability to create favourable growing environments for crops. Among these technologies, coloured shade nets have emerged as an effective tool for regulating light intensity, temperature and humidity around plants. These nets not only reduce excessive solar radiation but also modify the spectral composition of sunlight, which influences plant growth and development. Different colours of shade nets selectively filter wavelengths of light and thereby affect physiological processes such as photosynthesis, flowering and vegetative growth. Shade net houses are widely used for nursery production, floriculture, vegetable cultivation and hardening of tissue culture plants. Proper selection of shade percentage and net colour can significantly improve crop productivity and quality.

Keywords: Shade net house, protected cultivation, coloured nets, microclimate, horticulture.

Introduction

Light is one of the most important environmental factors influencing plant growth and development. Plants respond to variations in light intensity and quality by

modifying their physiological processes, growth patterns and overall morphology. These responses are controlled by special pigments called phytochromes, which absorb light mainly in the red and blue regions of the spectrum. When the spectral composition of light changes, plants activate a series of photomorphogenic responses that influence stem elongation, leaf formation, flowering and productivity.

In recent years, protected cultivation technologies have been increasingly adopted to reduce the negative effects of environmental stress on crops. Among these technologies, coloured shade nets have gained considerable attention. These nets not only reduce excessive sunlight but also modify the quality of light reaching plants. As a result, they help create a favourable microclimate that improves plant growth and crop yield (Shahak *et al*, 2008).

Shade Net House

A shade net house is a protective structure constructed using materials such as galvanized iron pipes, angle iron frames, wooden poles or bamboo supports. The structure is covered with specially manufactured plastic nets made from polyethylene threads that are treated with ultraviolet stabilizers.

This treatment improves the strength and durability of the nets under prolonged exposure to sunlight. Shade net houses provide a partially controlled environment for crop production. They reduce the intensity of solar radiation and lower the temperature within the structure, particularly during hot

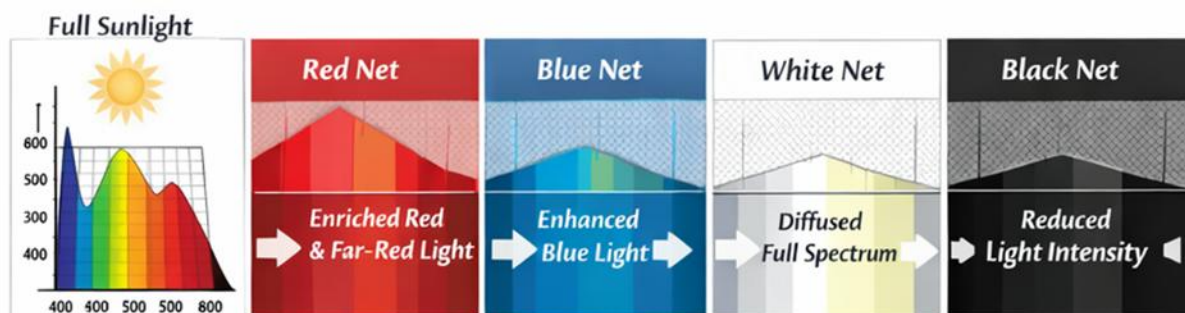
daytime conditions. By moderating factors such as light intensity, temperature and humidity, shade net houses create favourable conditions for plant growth. These structures allow farmers to cultivate crops throughout the year, including during off-season periods (ICAR, 2017).

Shade Net House Structure



Spectrum Modification by Coloured Nets

Effect of Coloured Shade Nets on Light Spectrum



Applications of Shade Nets

Shade nets are widely used in various agricultural and horticultural activities. Their versatility makes them suitable for many production systems.

Major applications include:

- Nursery seedling production
- Floriculture and ornamental plant cultivation
- Vegetable production under protected conditions
- Hardening of tissue culture plants
- Providing shade in livestock shelters
- Covering fish ponds to reduce excessive sunlight
- Drying of agricultural produce such as spices and medicinal plants
- Acting as windbreaks in open fields
- Terrace gardening and urban horticulture
- Protection of vermicomposting units

Characteristics of an Ideal Shade Net

A good shade net should possess certain qualities to ensure effective crop protection and durability.

- High strength and durability
- Resistance to environmental stresses
- UV stabilization for longer life
- Availability in different sizes and shading percentages
- Proper shade factor to protect crops while allowing sufficient light for photosynthesis (Jensen *et al.* 1995)

Types of Coloured Shade Nets

Red Shade Net

Red shade nets increase the proportion of red and far-red light reaching plants. These wavelengths influence the phytochrome system and may stimulate flowering and vegetative growth.

Blue Shade Net

Blue shade nets enhance blue wavelengths of light that regulate stomatal opening, leaf development and phototropic responses. Plants grown under blue nets often show compact growth.

White Shade Net

White shade nets help diffuse sunlight evenly within the crop canopy. They reduce heat stress while maintaining adequate light penetration.

Aluminet Shade Net

Aluminet screens are reflective shade materials that improve temperature regulation and light diffusion inside protected structures.

Black Shade Net

Black shade nets are the most widely used conventional nets. They reduce the

intensity of sunlight and protect plants from excessive radiation.

Environmental Effects of Shade Nets

Radiation

Shade nets reduce the amount of solar radiation reaching the crop surface. The level of reduction depends on the shading percentage.

Light Diffusion

Diffused light allows deeper penetration into the crop canopy and improves photosynthesis.

Photo Selectivity

Coloured nets modify the spectral composition of sunlight reaching plants, influencing plant growth responses (Shahak *et al.*, 2010).

Temperature

Shade nets help maintain lower temperatures compared with open field conditions.

Relative Humidity

Humidity inside shade net structures is usually slightly higher because water vapour released through plant transpiration accumulates within the protected area.

Table 1: Common Colours of Shade Nets and Their Effects

Shade net colour	Main effect on light	Influence on plants
Red	Enriches red and far-red light	Promotes flowering and vegetative growth
Blue	Enhances blue wavelengths	Improves vegetative growth and plant compactness

White	Diffuses sunlight	Uniform light distribution and moderate temperature
Black	Reduces light intensity	Protects plants from excessive heat and radiation

Source: Eran Shahak *et al.* (2004) and ICAR (2017)

Conclusion

Coloured shade nets have become an important component of modern protected cultivation systems. By regulating light intensity, modifying spectral composition and moderating temperature conditions, these nets create favourable environments for plant growth. Their use in nurseries, floriculture and vegetable production can significantly improve crop yield and quality. With increasing adoption of protected cultivation technologies, coloured shade nets will continue to play a key role in sustainable horticultural production.

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