

**Original Research Paper**

## Assessment of physiological and quality traits of peace lily (*Spathiphyllum wallisii*) under coloured shade nets

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### ABSTRACT

Studies were carried out to evaluate the physiological and quality traits of peace lily (*Spathiphyllum wallisii*) under different shade net (50% shading) and control (tree shade). The results showed that, the plants grown under black coloured shade nets recorded maximum total chlorophyll content in leaves (79.02 SPAD units) and photosynthetic rate ( $1.64 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ), while, white shade net recorded early flowering. The number of flowers produced plant<sup>-1</sup> (2.00), flower stalk length (43.23 cm), flower stalk diameter (3.58 mm), spathe length (15.10 cm), spathe width (6.09 cm) and vase life (2.44 days) were maximum in plants grown under black coloured shade net. The peace lily grown under black coloured shade net recorded overall better performance with respect to root and foliage quality parameters, therefore, black shade nets can be recommended for commercial cultivation of peace lily.

**Keywords:** Coloured shade nets, physiology, quality, *Spathiphyllum*

### INTRODUCTION

Landscaping is becoming an important element to beautify the surroundings and also enhance the mental and physical conditions of people. Nowadays, there is a huge demand for indoor ornamental and air purifying house plants. These house plants can effectively purify the indoor air by absorbing volatile organic compounds such as formaldehyde, benzene, toluene, ethylene and xylene. *Spathiphyllum*, family Araceae, has emerged as one of the most popular foliage-plant bearing beautiful dark green foliage with white coloured flowers. NASA has recognized that, the peace lily plant has the capacity to alleviate the effects of formaldehyde, carbon monoxide and benzene compounds in indoor air (Chen et al., 2003). Coloured shade nets approach has been already used in growing certain vegetables, ornamentals and fruit crops. The responses of various ornamental plants to changes in light quality are the internode elongation in chrysanthemum cultivated under blue shade nets, and increased petiole length and leaf area were recorded in Anthurium grown under black shade cloths (Lima et al., 2010). The scientific knowledge on use of coloured shade nets in cultivation of ornamental foliage potted plants is scarce, which warrants the need to study the use of coloured shade nets in cultivation of ornamental plants. Hence, the present study was

carried out to evaluate the physiological and quality traits of ornamental foliage peace lily grown under different coloured shade nets.

### MATERIALS AND METHODS

The experiment was laid out in a completely randomized design with four coloured shade nets viz., black, white, red and green and control (tree shade) replicated four times with 10 plants per replication during 2021-22. The potting media was prepared by mixing of soil and FYM in 1:1 ratio and filled in 12" polybags. The peace lily plants were transplanted into polybags at four leaves stage. The physiological parameters like total chlorophyll content in leaves was measured by using SPAD chlorophyll meter (Minolta SPAD 502 type meter) by averaging 5-10 readings plant<sup>-1</sup>. The photosynthetic rate ( $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ), transpiration rate ( $\mu\text{mol H}_2\text{O m}^{-2} \text{ s}^{-1}$ ) and stomatal conductance ( $\mu\text{mol m}^{-2} \text{ s}^{-1}$ ) were measured with the help of LCi-SD Portable photosynthesis system at different growth stages. Days taken for appearance of first flower were counted, starting from days after transplanting to the day of appearance of first flower bud. Floral parameters such as flower stalk length (cm), spathe length (cm) and width (cm) were recorded. The plant foliage colour was measured with the help of Royal Horticultural Society (RHS) colour



chart. Vase life of foliage and flowers were measured by placing the petiole of mature leaves and stalks of flowers in a conical flask containing tap water and were maintained until wilting. Root parameters viz., number of roots plant<sup>-1</sup>, root spread (cm), length of longest root (cm) and root dry weight (g) were measured by uprooting the plants at the final stage of the experiment.

## RESULTS AND DISCUSSION

### Physiological parameters

The influence of coloured shade nets on total leaf chlorophyll content was found significant. The maximum total leaf chlorophyll content was recorded in plants grown under black coloured shade net (Fig. 1), compared to other coloured shade nets. Although, the plants were not directly exposed to the sun, they produced additional chlorophyll content to capture the diffuse radiation in order to produce more carbohydrates required for their growth and development (Ilic et al., 2015). Stamps & Chandler (2008) also reported similar results in *Pittosporum tobira* 'Variegata' grown under black coloured shade net.

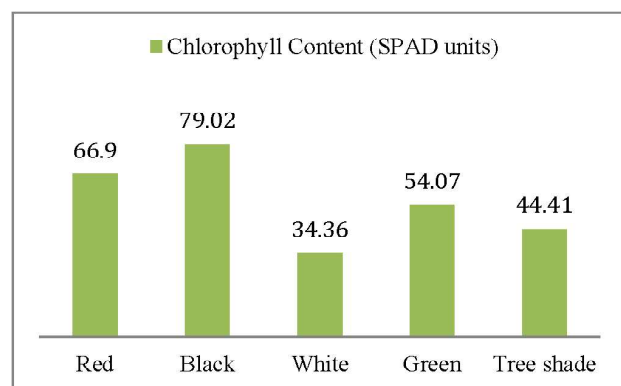


Fig. 1: Effect of coloured shade nets on total leaf chlorophyll content in peace lily

The photosynthetic rate was found to be high ( $1.64 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ) in the plants grown under black coloured shade net, which was on par ( $1.53 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ) with the plants grown under red coloured shade net (Table 1). It was evident that the canopy development in terms of plant height (48.65 cm), number of leaves (27.90), and leaf area ( $4301.73 \text{ cm}^2$ ) were recorded higher in plants grown under black coloured shade net, which results in maximum photosynthetic rate as compared to other coloured shade nets, as also reported by Gaurav et al. (2016) in cordyline grown under black coloured shade net.

The transpiration rate ( $0.58 \mu\text{mol H}_2\text{O m}^{-2} \text{ s}^{-1}$ ) and stomatal conductance ( $0.10 \mu\text{mol m}^{-2} \text{ s}^{-1}$ ) were recorded minimum in the plants grown under black coloured shade net, whereas, the transpiration rate ( $1.95 \mu\text{mol H}_2\text{O m}^{-2} \text{ s}^{-1}$ ) and stomatal conductance ( $0.33 \mu\text{mol m}^{-2} \text{ s}^{-1}$ ) were recorded maximum in plants grown under white coloured shade nets (Table 1). Li et al. (2017) observed the higher transpiration rate and stomatal conductance in snapdragon plants grown under white and red coloured shade cloths than plants grown under coloured black shade cloth.

### Foliage quality parameters

Leaf colour intensity was measured by using Royal Horticultural Society colour chart which showed the variation in foliage colour of all the plants grown under different coloured shade nets belongs to green group (Table 2). The leaves of plants grown under black coloured shade net had registered 141B dark green foliage group followed by the plants grown under red coloured shade net (141C medium green). The leaves of plants grown under white shade net had recorded 142B light green foliage colour. Naveena et al. (2019) also stated that the leaves (cladophylls) of *A. springeri* grown under black shade net

Table 1 : Effect of coloured shade nets on physiological parameters in peace lily

Coloured shade nets	Photosynthetic rate ( $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ )	Transpiration rate ( $\mu\text{mol H}_2\text{O m}^{-2} \text{ s}^{-1}$ )	Stomatal conductance ( $\mu\text{mol m}^{-2} \text{ s}^{-1}$ )
Red	1.53	0.96	0.25
Black	1.64	0.58	0.10
White	1.25	1.95	0.33
Green	1.47	0.75	0.21
Tree shade (control)	1.30	0.65	0.15
SEm±	0.06	0.04	0.01
CD at 5%	0.17	0.12	0.04

conditions, had registered the Green group 139 Dark yellowish green foliage.

**Table 2 : Effect of different coloured shade nets on foliage quality of peace lily**

Coloured shade nets	Leaf colour (RHS colour chart)	Vase life (days)
Red	141C (medium green)	28.55
Black	141B (dark green)	29.63
White	142B (light green)	23.63
Green	140C (light green)	25.95
Tree shade (control)	142B (light green)	25.25
SEm±	—	0.33
CD at 5%	—	1.01

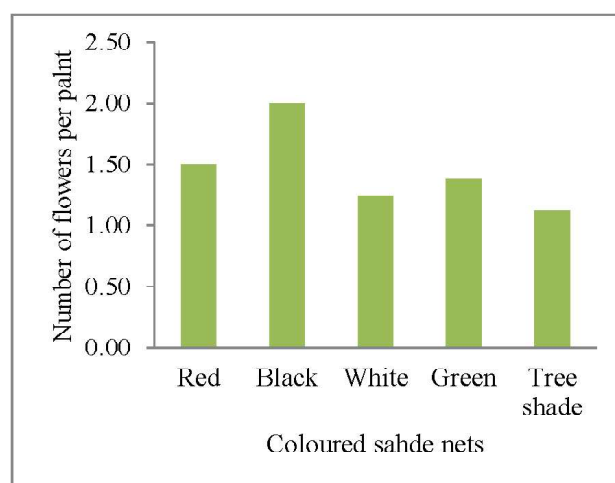
### Floral parameters

Peace lily grown under different coloured shade nets had differed significantly with respect to number of days to first flower appearance (Table 3), being early flowering (57.63 days) recorded under white coloured shade net than under other coloured shade nets, which, might be due to absorption of high light intensity which had increased the leaf temperature and leads to earlier accumulation of heat units thereby induced the early flowering in peace lily. The plants grown under black coloured shade net had exhibited the delayed (98.63 days) flower initiation. Zhao et al. (2012) reported delayed flower initiation in *Poenia lactiflora* grown under shade condition.

Significant differences were recorded among different coloured shade nets with respect to number of flowers

produced plant<sup>-1</sup> in peace lily (Fig. 2). Number of flowers produced plant<sup>-1</sup> were more (2.0) in plants grown under black coloured shade net, which might be due to an increase in chlorophyll content (79.02 SPAD units) and photosynthetic rate (1.64  $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ) in plants grown under black coloured shade net absorb low light intensity (24.0 klux) that results accumulation of more photo-assimilates in turn results in a greater number of flowers per plant.

Flower stalk length (43.23 cm) and flower stem diameter (3.58 cm) were recorded high in plants grown under black shade net. Nomura et al. (2009) obtained the best results in terms of flower stalk length and flower stem diameter in *Anthurium andraeanum* 'Apalai' grown under black screens.



**Fig. 2:** Effect of different coloured shade nets on number of flowers per plant in peace lily

**Table 3 : Effect of coloured shade nets on floral parameters in peace lily**

Coloured shade nets	Flower appearance (days)	Flower stalk length (cm)	Flower stalk diameter (mm)	Spathe length (cm)	Spathe width (cm)	Vase life (days)
Red	84.63	30.00	3.19	11.75	4.30	2.25
Black	98.63	43.23	3.58	15.10	6.09	2.44
White	57.63	24.56	2.31	7.13	2.28	1.50
Green	78.25	29.33	2.87	10.15	3.16	2.00
Tree shade (control)	67.38	28.31	2.77	8.35	3.61	1.81
SEm±	3.03	0.70	0.11	0.27	0.10	0.19
CD at 5%	9.22	2.12	0.34	0.82	0.31	0.57

**Table 4 : Effect of coloured shade nets on root parameters of peace lily**

Coloured shade nets	No. of roots/plant	Root spread (cm)		Length of longest root (cm)	Dry weight of the root (g)
		N-S	E-W		
Red	35.10	16.08	13.43	56.75	3.58
Black	49.20	18.42	14.70	64.25	3.91
White	18.95	12.50	9.58	37.80	0.99
Green	22.60	15.95	12.37	44.60	2.06
Tree shade (control)	20.30	15.14	11.49	41.25	1.37
SEm±	0.62	0.20	0.40	1.12	0.07
CD at 5%	1.88	0.60	1.22	3.40	0.22

Maximum spathe length and width were recorded in plants grown under black shade net. This indicates that differences in luminosity not only affect the morphology and physiology of plants but also have an important impact on productivity, particularly the plant development requires appropriate light intensity. Nomura et al. (2009) reported that the maximum length and width of spathe in anthurium flowers produced by the plants grown under black coloured shade net. The vase life (29.63 days) of foliage was recorded maximum in plants grown under black shade net. This might be due to better protection of foliage from high light intensity and thereby improved quality of cut foliage of peace lily grown under black shade net. These results are in accordance with the findings of Myrthong & Sudhadevi (2016) who stated that the plants grown under black coloured shade net had showed the maximum vase life of foliage in *Nephrolepis exaltata* and in *Asparagus densiflorus*.

#### Root parameters

The number of roots produced plant<sup>-1</sup> and root spread were found maximum in plants grown under black coloured shade net, which might be due to creation of congenial environment and supply of more photo-assimilates to roots helps in rapid cell division and cell elongation activities and it leads to the production of more number of roots plant<sup>-1</sup> as well as better spreading of root system. The longest root and dry weights were recorded high in plants grown under black coloured shade net (Table 4). Silva et al. (2017) reported that the positive effect low light condition received by the plants grown under black screens facilitate an increase in dry mass of roots and rhizomes in *Heliconia*.

#### CONCLUSION

The present investigation could be concluded that plants grown under black coloured shade net had out performed with respect to physiological, floral, root and quality parameters and replaced the generally used green coloured shade net. Black coloured shade net was found superior and viable practice in improving the growth and quality of ornamental potted peace lily plants and may be recommend to nursery for pot plant production.

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