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Studies on effect of photoselective shade nets on growth of fern species

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Abstract
An experiment entitled "Studies on effect of photoselective shade nets on growth of fern species" was carried out at College of Horticulture, Venkataramannagudem, Andhra Pradesh during 2022-23 with three replications in Factorial Completely Randomized Design. In this study factor I which includes photo-selective nets such as red, black, white, green, tree shade and factor II includes fern species *viz*., *Nephrolepis biserrata* and *Nephrolepis exaltata*. The performance of fern species was studied for a period of 150 days. The vegetative parameter such as plant height, plant spread, number of fronds per plant, length of the frond and width of the frond were recorded maximum in plants grown under black photo-selective shade nets. Among fern species, the vegetative parameters were recorded maximum in *Nephrolepis biserrata* followed by *Nephrolepis exaltata*.

Keywords: Photoselective shade nets, ferns, frond, vegetative parameters

Introduction
In last few decades floriculture in India has seen a phenomenal growth. It is one of the ancient farming method that now has become a major agri-business in more than 140 countries. Due to increasing expansion of cities and changing life style of people day by day, landscaping has become an important element to beautify the surroundings and also to enhance physical and mental conditions of people. Cut greens impart freshness and colour variety to the floral designs and hence, constitute an important component of floricultural industry, largely used as fillers in bouquets and in flower arrangements (Pacifici *et al.*, 2007; Reid and Jiang, 2012) [4, 6]. Ferns are extremely handsome because of the elegance of their foliage and hence widely useful for different purposes in the garden. Many species of fern are being commercially used as cut greens. Ferns are shade loving and require high humidity. Photo-selective shade netting is an advanced tool that can be used for a wide variety of purposes by horticulturists (Stamps 2009) [11]. These nets are designed to screen various spectral bands of the solar radiation, and/or transform direct light into scattered light. The responses of various ornamental plants to changes in light quality includes extension of the internodes of chrysanthemums cultivated under blue nets and maximum petiole length and leaf area in Anthurium grown under black shading cloths (Lima *et al*., 2010) [2]. The systematic knowledge regarding use of photo-selective shade nets for cultivation of ornamental potted plants is very confined which demands need for scientific study on use of photo-selective shade nets in cultivation of ornamental plants.

Materials and Methods
The present experiment was laid out in a factorial completely randomized block design (FCRD) with two factors at Department of Floriculture and Landscape Architecture, College of Horticulture, Venkataramannagudem during the year 2022-23. The five different photo-selective shade nets (red, black, white, green and tree shade) were selected as factor I and two fern species (*Nephrolepis biserrata* and *Nephrolepis exaltata*) as factor II with three replications. The potting media was prepared by mixing soil and FYM in 1:1 ratio. The prepared media was filled into polybags of 12 inches and plants of four frond stage were transplanted in polybags on 20th November, 2022. Total plants per replication were ten. Observations for plant height, plant spread, number of fronds per plant, length of the frond and width of the frond were recorded at 30, 60, 90, 120 and 150 DAP.

Results and Discussion

Plant Height (cm)

The data pertaining to plant height is presented in Table 1. Among the photo-selective shade nets, the plants grown under black photo-selective shade net recorded the maximum plant height (S_2) (52.28 cm) followed by red shade net (S_1) (42.68 cm), while the minimum plant height was recorded in plants grown under (S_3) (28.29 cm). Of the two fern species, *Nephrolepis biserrata* (F_1) (40.69 cm) was superior over *Nephrolepis exaltata* (F_2) (37.55 cm). The combination of black shade net + *Nephrolepis biserrata* (S_2F_1) (56.36 cm) recorded maximum height and lowest height was noticed in white shade net + *Nephrolepis exaltata* (S_3F_2) (28.55 cm).

The results of the present work indicated that plants grown under black shade net had maximum plant height. Under black shade net, prevailing of lower temperature and high relative humidity were found to favouring a high rate of cell division at shoot apical meristem which in turn could be responsible for an increase in plant height. An increase in plant height might be also due to better transport and low photo-destruction of auxins under lower light intensities recorded in black shade net causing rapid cell elongation below the apical meristem. These results are in agreement with those earlier reported by Poojashree *et al*. (2022) [5] who stated that plant height was maximum under black coloured shade net in peace lily. The significant differences were observed between two fern species with respect to plant height. The plant height was maximum in *Nephrolepis biserrata* than in *Nephrolepis exaltata* might be due to its inherent genotypic difference. Similar results were reported by Suryapriya *et al*. (2015) [12] in ferns.

Plant spread (EW) (cm)

The data on plant spread (EW) is presented in Table 1. The plants grown under black shade net (S_2) (49.44 cm) recorded the maximum plant spread, followed by red shade net (S_1) (46.90 cm) whereas minimum plant spread was recorded in plants grown under white shade net (S_3) (35.27 cm). As regards with fern species, *Nephrolepis biserrata* (F_1) (43.93 cm) recorded maximum plant spread compared to *Nephrolepis exaltata* (F_2) (41.31 cm). Among the treatment combinations, the combination of black shade net + *Nephrolepis biserrata* (S_2F_1) (50.54 cm) noticed the maximum plant spread and minimum plant spread was noticed in white shade net + *Nephrolepis exaltata* (S_3F_2) (34.25 cm).

Plant spread (NS) (cm)

The data pertaining to plant spread (NS) is represented in Table 1. The plants raised under black photo-selective shade net (S_1) (50.26 cm) recorded the highest plant spread, followed by red shade net (S_1) (44.08 cm) whereas minimum plant spread was recorded in plants grown under white shade net (S_3) (34.42 cm). The performance of *Nephrolepis biserrata* (F_1) (42.80 cm) was superior over *Nephrolepis exaltata* (F_2) (41.20 cm). Among treatment combinations, black shade net + *Nephrolepis biserrata* recorded the maximum plant spread (S_2F_1) (51.20 cm), while minimum was recorded in white shade net + *Nephrolepis exaltata* (S_3F_2) (33.92 cm).

Significant variation was found among different photo-selective shade nets, fern species and their interactions with respect to plant spread in both the directions. Plant spread determines the compactness of the plant and its suitability to various growing conditions. This increase in plant spread beneath the black shade net could be attributed to the fact that, an increase in plant height, production of more number of fronds per plant, frond length and frond width. The results are in accordance with the findings of Stamps and Chandler (2008) [10] in Aspidistra; Myrthong and Sudhadevi (2016) [13] in *Nephrolepis exaltata* and *Asparagus densiflorus*. The maximum plant spread was noticed in fern species *Nephrolepis biserrata* than *Nephrolepis exaltata*. This variability in plant spread among species could be mainly due to genetic nature of species, growing environmental conditions and cultural practices followed during the period of study. This was in accordance with the reports of Safeena *et al*. (2019) [8] in *Asparagus sp*.

Table 1: Effect of photo-selective shade nets on plant height and plant spread in fern species

Photo-selective shade nets (S)	Plant height (cm)			Plant spread (cm) (EW)			Plant spread (cm) (NS)		
	Ferns (F)		Mean of S	Ferns (F)		Mean of S	Ferns (F)		Mean of S
	F_1: *N. biserrata*	F_2: *N. exaltata*		F_1: *N. biserrata*	F_2: *N. exaltata*		F_1: *N. biserrata*	F_2: *N. exaltata*	
S_1: Red	44.03	41.34	42.68	47.70	46.10	46.90	44.65	43.52	44.08
S_2: Black	56.36	48.21	52.28	50.54	48.34	49.44	51.20	49.32	50.26
S_3: White	29.42	28.55	28.98	36.29	34.25	35.27	34.92	33.92	34.42
S_4: Green	40.86	38.28	39.57	44.17	41.43	42.80	43.35	43.05	43.20
S_5: Tree shade	32.80	31.36	32.08	40.96	36.46	38.71	39.86	36.20	38.03
Mean of F	40.69	37.55	*39.12*	43.93	41.31	*42.62*	42.80	41.20	*42.00*
Factors	SEm±	CD at 5%		SEm±	CD at 5%		SEm±	CD at 5%	
S	0.43	1.26		0.32	0.94		0.36	1.06	
F	0.27	0.80		0.20	0.60		0.23	0.67	
S x F	0.60	1.78		0.45	1.33		0.51	1.51	

Number of fronds per plant

There were significant differences among the values of number of fronds per plant due to photo-selective shade nets, fern species as well as their interaction (Table 2). The differences in number of fronds per plant, among photo-selective shade net was recorded maximum in plants grown under black shade net (S_2) (39.43), followed by red shade net (S_1) (30.44) and minimum number of fronds was observed in plants grown under white shade net (S_3) (21.63). Regarding fern species, *Nephrolepis biserrata* (F_1) (30.68) recorded highest number of fronds per plant than *Nephrolepis exaltata* (F_2) (26.66). The maximum number of fronds among interactions, was recorded in combination black photo-selective shade net + *Nephrolepis biserrata* (S_2F_1) (43.67) whereas minimum number of fronds per plant was recorded in by white shade net + *Nephrolepis exaltata* (S_3F_2) (19.98).

It is evident from the above data that the number of fronds per plant were maximum in plants grown under black shade nets.

Since black shade net consists of favourable environment which could have led to the improving cell division activity in shoot apical meristem region by supplying more carbohydrates, which in turn have supported superior growth and development of the plants. Similar results were observed by Stamps and Chandler (2005) [10] in *Aspidistra elatior* and Poojashree *et al*. (2022) [5] in peace lily plants grown under black shade net. The difference in number of fronds per plants were noticed maximum in *Nephrolepis biserrata* than in *Nephrolepis exaltata*. This variation between the species might due to interaction of genotypic character with congenial growing environment results in a meritorious phenotypic expression with respect to this trait. Similar variations among species were noticed by Suryapriya *et al*. (2015) [12] and Safeena *et al*. (2019) [8] in ferns.

Length of the frond (cm)

The data pertaining to length of the frond is presented in the Table 2. It was noticed that plants grown under black shade net (S_2) (44.14 cm) produced the longest fronds, followed by red shade net (S_1) (39.84 cm) whereas, shortest fronds was produced under white shade net (S_3) (27.92 cm). Among fern species, maximum width of the frond was observed with *Nephrolepis biserrata* (F_1) (37.34 cm) than *Nephrolepis exaltata* (F_2) (34.99 cm). The maximum length of frond among interactions, was recorded in combination black photo-selective shade net + *Nephrolepis biserrata* (S_2F_1) (45.21 cm) whereas, minimum length of the frond was recorded by white shade net + *Nephrolepis exaltata* (S_3F_2) (25.02 cm).

Width of the frond (mm)

The data pertaining to width of the frond is presented in the Table 2. The maximum width of frond, among photo-selective shade nets was observed in plants grown under black shade net (S_2) (95.43 mm) followed by red shade net (S_1) (82.12 mm) and minimum width of frond was observed in plants grown under white shade net (S_3) (68.29 mm). As regards with fern species maximum width of frond was recorded in *Nephrolepis biserrata* (F_1) (82.03 mm) than *Nephrolepis exaltata* (F_2) (76.93 mm). The combination of black photo-selective shade net + *Nephrolepis biserrata* (S_2F_1) (104.94 mm) recorded the maximum width of frond, and minimum width of frond was observed in white shade net + *Nephrolepis exaltata* (S_3F_2) (67.02 mm).

The data on length and width of fronds revealed that these characters were significantly varying at all growth stages among the photo-selective shade nets. Significantly the longest and widest fronds were produced in plants grown under black shade net. It could be due to presence of congenial micro-environmental conditions *i.e.*, low temperature and high relative humidity leads to more photosynthetic activity and lesser respiratory activity which improves the carbohydrate storage in stipes of fronds resulting in greater meristematic activity and consequent increase in frond length and width. This outcome is in agreement with the findings of Poojashree *et al*. (2022) [5] in peace lily and Retamales *et al*. (2008) [7] in bush blueberry cultivars. With respect to fern species, the maximum length and width of frond was recorded in *Nephrolepis biserrata* than *Nephrolepis exaltata*. The difference in frond length and width between the two species is a varietal trait as it is governed by their genetic makeup. The similar variations were observed by Gilman (1999) [1] and Oloyede and Odu (2011) [3] in ferns.

Table 2: Effect of photo-selective shade nets on number of fronds per plant, length of the frond and width of the frond in fern species

Photo-selective shade nets (S)	Number of fronds per plant			Length of the frond (cm)			Width of the frond (mm)		
	Ferns (F)		Mean of S	Ferns (F)		Mean of S	Ferns (F)		Mean of S
	F_1: *N. biserrata*	F_2: *N. exaltata*		F_1: *N. biserrata*	F_2: *N. exaltata*		F_1: *N. biserrata*	F_2: *N. exaltata*	
S_1: Red	33.36	27.53	30.44	40.44	39.25	39.84	87.98	81.96	84.97
S_2: Black	43.67	35.19	39.43	45.21	43.08	44.14	104.94	85.93	95.43
S_3: White	23.27	19.98	21.63	30.82	25.02	27.92	69.56	67.02	68.29
S_4: Green	28.12	26.18	27.15	37.66	36.61	37.14	77.73	77.47	77.60
S_5: Tree shade	25.00	24.42	24.71	32.54	30.97	31.76	73.99	73.91	73.95
Mean of F	30.68	26.66	*28.67*	37.34	34.99	*36.16*	82.03	76.93	*79.48*
Factors	SEm±	CD at 5%		SEm±	CD at 5%		SEm±	CD at 5%	
S	0.55	1.61		0.28	0.83		0.49	1.45	
F	0.35	1.02		0.18	0.53		0.31	0.92	
S x F	0.77	2.28		0.40	1.18		0.70	2.05	

Conclusion

From the above investigation it can be concluded that among different photo-selective shade nets, in terms of vegetative parameters such as plant height, number of fronds per plant, length of the frond and width of the frond was recorded maximum under black photo-selective shade net. Among fern species, *Nephrolepis biserrata* performance was better than *Nephrolepis exaltata*.

References

1. Gilman EF, Klein RW, Hansen, G. *Adiantum* spp. Maidenhair Fern. In: FPS13, one of a series of the Environmental Horticulture Department, Institute of Food and Agricultural Sciences, University of Florida, Florida, USA; c1999. p. 1-3.
2. Lima JD, Nomura ES, Fuzitani EJ, Da Silva SHMG. Physiological variables in anthurium cultivated under different shading screen. Scientia Agraria. 2010;11(3):193-200.
3. Oloyede FA, Odu EA. Taxonomic evaluation of homosporous leptosporangiate ferns (Pteridophytes) in Southwestern Nigeria. International Journal Current Research. 2011;2(2):9-17.
4. Pacifici S, Ferrante A, Mensuali-Sodi A, Serra G. Postharvest physiology and technology of cut eucalyptus branches: A review. Journal of Agromedicine. 2007;137:124-131.
5. Poojashree NR, Suseela T, Dorajee Rao AVD, Subbaramamma P, Sujatha RV. Studies on effect of coloured shade nets on growth of Peace lily (*Spathiphyllum wallisii*). The Pharma Innovation. 2022;11(8):1213-1219.

6. Reid MS, Jiang CZ. Postharvest biology and technology of cut flowers and potted plants. Horticultural reviews. 2012;40:1-54.
7. Retamales JB, Montecino JM, Lobos GA, Rojas LA. Colored shading nets increase yields and profitability of highbush blueberries. Acta Horticulturae. 2008;770:193-97.
8. Safeena SA, Thangam M, Singh NP. Conservation and evaluation of different cut foliage species comprising pteridophytes (ferns and fern allies) of west coast regions of India. Journal of the Indian Society of Coastal Agricultural Research. 2019;37(1):7-13.
9. Sharma SP, Jana BK, Bose TK. Investigation on growth and development of house plants. In: National Seminar on Commercial Floriculture; c1992. p. 16-17.
10. Stamps RH, Rock DK, Chandler AL. Vase life comparison of ornamental Asparagus species and cultivars. Proceedings of the Florida State Horticultural Society. 2005;118:365-367
11. Stamps RH. Use of colored shade netting in horticulture. HortScience. 2009;44(2):239-241.
12. Suryapriya I, Arulmozhiyan R, Sankari A, Anand M. Evaluation of cut-foliage plants for Eastern Ghats. Journal of Horticultural Sciences. 2015;10(1):24-29.
13. Myrthong AL, Sudhadevi PK. Performance evaluation of Nephrolepis exaltata and Asparagus densiflorus under different coloured shade nets. Int J Appl Pure Sci Agri. 2016;2:113-117.