J. Hortic. Sci.
Vol. 18(2) : 497-501, 2023

https://doi.org/10.24154/jhs.v18i2.1453

Short Communication

Differential performance of *Dianella tasmanica and Pleomele reflexa* under coloured shade nets

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ABSTRACT

Cut greens are emerging as an important constituent of the floricultural industry as they add freshness and colour to floral designs. An experiment was conducted to evaluate the effect of different coloured shade nets (black, blue, green, red, white and no shade) at 50% shade intensity on growth and quality parameters of *Dianella tasmanica* and *Pleomele reflexa.* Both species significantly responded to the change in colour of shade nets. In *D. tasmanica*, maximum plant height (85.66 cm), stem diameter (8.63 mm) and leaf length (68.33 cm) were recorded under red shade net, while, plant spread (63.03 cm) and leaf breadth (4.06 cm) under black shade net, however, leaf thickness (0.57 cm) and vase life (24.33 days) under white shade net. In *P. reflexa*, maximum plant height (63.66 cm), stem diameter (9.76 mm), leaf length (17.50 cm), leaf thickness (0.93 cm) and SPAD index (60.10) were recorded under red shade net, whereas, plant spread (36.34 cm) and leaf breadth (3.00 cm) under black shade net, and vase life (25.66 days) under white shade net. Thus, red coloured shade nets could be preferred commercially for better performance of *D. tasmanica* and *P. reflexa*.

Keywords: Coloured shade net, cut stem, *Dianella tasmanica*, *Pleomele reflexa*, vase life

INTRODUCTION

Cultivation of ornamental plants is considered to be the advanced form of agriculture. Cut greens/foliage impart freshness and colour to the floral designs. They are largely used as fillers or accents in bouquet making and flower arrangement and hence, constitute an important component of floricultural industry (Reid & Jiang, 2012). The plants with dark green, green or variegated broad leaves with long shelf life are used in floriculture industry as cut foliages. The production of foliage plants in both national and international market plays a lead role in income generation (Abou El-Ghait et al., 2012). The species *Dianella tasmanica* (Tasmanian Flax-lily) and *Pleomele reflexa* (Song of India) are popular ornamental plants, both in home landscaping and as cut greens. They can be used as a specimen plant, accent, or pruned to create a border and considered as houseplants as they prefer bright, filtered light without direct sun exposure and could tolerate infrequent watering.

Most of the foliage plants are native to tropical and sub-tropical regions and hence their cultivation requires moderate temperature and high humidity. These conditions can be met throughout the year by using shade nets. The shade nets are lightweight knitted polyethylene fabric that protect plants from extreme climatic conditions *viz.*, scorching sun or chilling breezes. The colored shade nets characteristic of changing the spectral quality of radiation, thus allowing manipulation of growth and development of plants. Plants respond to changes in the spectrum of electromagnetic radiation through alterations in morphology and physiological functions that result in adaptation to different environmental conditions. They can protect the plants from hail and excessive radiation, and help in the absorption of various spectral lights, which are good for quality production (Perez et al., 2006). The coloured shade net approach has been evaluated in ornamentals (Nissim-Levi et al., 2008). Keeping this in view, an experiment was conducted to study the effect of coloured shade nets on plant growth and leaf production in commercially important cut foliage species, *D. tasmanica* and *P. reflexa.*

A pot experiment was conducted at the research farm of the Department of Floriculture and Landscaping, Punjab Agricultural University, Ludhiana during 2017. The 8" pots were filled with potting mixture comprising of soil and well rotten FYM in the ratio of 2:1. Six months old plants of *D. tasmanica* and *P. reflexa* were planted under 5 coloured shade nets *viz*., black, blue, green, red and white with 50% shade levels and control (without shade net), in completely randomized design, replicated thrice with five pots in each replication. After establishment of plants, pots were irrigated on alternate days and nitrogen in the form of urea was applied at the rate of 1 g/pot at monthly intervals.

Observations on plant height, plant spread, number of cut stems, chlorophyll content and vase life were recorded after one year during March 2018 The relative leaf chlorophyll content was determined with a portable chlorophyll meter (Minolta SPAD 502) as SPAD index. Vase life was recorded by keeping stems in vases containing distilled water. The vase life studies were conducted under ambient conditions (maximum and minimum temperature 26.8 ^{f}C and 12.5 ^{f}C, respectively and relative humidity 62.15%). Vase life was considered to be terminated when cut stems showed signs of wilting or root initials. The data were statistically analyzed with the help of software statistix 10 programme.

In *D. tasmanica*, plant height and stem diameter were recorded maximum under red shade net (85.66 cm and 8.63 mm, respectively), which was significantly at par other coloured shade nets except for green shade net and control (Table 1). Similar results were observed in *P. reflexa* (Table 2), however, minimum plant height was recorded in the plants grown under open conditions. The increase in plant height under shade nets could be attributed to lower light intensity under shade nets as compared to control that led to better auxin transport causing cell elongation below the apical meristem. The plants under low light intensity have more apical dominant than grown under high light intensity (Godi et al., 2018). Increase in plant height under red shade net may be attributed to the reduced R: FR ratio and deficiency of blue light (Myrthong & Sudhdevi, 2016). Similar results were also obtained by Gaurav et al. (2016a) in *Draceana* and Myrthong and Sudhdevi (2016) in *Nephrolepis*.

Table 1 : Effect of coloured shade nets on different parameters in *Dianella tasmanica*

Shade net	Plant height (cm)	Plant spread (cm)	Stem diameter (mm)	No. of cut stems	Leaf length (cm)	Leaf breadth (cm)	Leaf thickness (mm)	Chlorophyll content (SPAD index)	Vase life (days)
Black	81.00	63.03	8.28	8.00	64.66	4.06	0.56	45.13	22.66
Blue	84.00	59.27	7.70	7.33	65.66	3.60	0.54	31.23	23.66
Green	69.33	51.92	7.16	6.00	43.33	3.20	0.53	43.43	23.00
Red	85.66	54.06	8.63	9.33	68.33	3.60	0.51	33.46	19.00
White	84.66	51.18	7.86	7.33	65.66	3.80	0.57	42.76	24.33
Control	55.00	46.83	7.32	5.33	36.66	2.76	0.49	36.46	24.00
C.D. (P=0.05)	14.94	4.32	NS	NS	6.65	0.31	0.08	NS	3.31

Table 2 : Effect of coloured shade nets on different parameters in *Pleomele reflexa*

Shade net	Plant height (cm)	Plant spread (cm)	Stem diameter (mm)	No. of cut stems	Leaf length (cm)	Leaf breadth (cm)	Leaf thickness (mm)	Chlorophyll content (SPAD index)	Vase life (days)
Black	62.00	36.34	7.36	5.32	18.06	3.00	0.78	41.96	24.33
Blue	61.00	29.45	8.20	4.66	15.50	2.73	0.80	49.06	24.00
Green	58.66	32.33	8.50	7.66	16.66	2.96	0.65	46.23	24.66
Red	63.66	31.51	9.76	4.93	17.50	2.86	0.93	60.10	23.00
White	61.00	30.29	6.80	5.67	15.60	2.90	0.86	45.06	25.66
Control	45.66	27.93	6.56	6.33	14.53	2.63	0.69	38.63	25.00
C.D. (P=0.05)	11.78	6.87	2.03	NS	1.19	0.30	0.13	16.81	1.33

In *D. tasmanica*, plant spread was recorded maximum under black shade net (63.03 cm), which was significantly at par with blue shade net (Table 1). Similar results were recorded for *P. reflexa*, while, minimum values were recorded under open field conditions (Table 2). Myrthong and Sudhdevi (2016) also reported higher plant spread in *Nephrolepis exaltata* and *Asparagus* cultivated under red and black coloured nets. The effect on physiological processes is displayed through morphological parameters *viz.*, plant height, spread etc. (Naveena & Thamaraiselvi, 2020).

In *D. tasmanica*, maximum cut stems (9.33/plant/year) were produced under red coloured shade net, whereas, minimum was produced under open field conditions (5.33/plant/year) (Table 1). Gaurav et al. (2016a) also reported that *Dracaena* plants grown under red shade-nets produced more number of leaves. Naveena et al. (2019b) affirmed that although leaf mass of *Philodendron xanadu* was not influenced under black, blue, grey or red netting but the number of leaves were more under red netting and least under blue netting. In contrast, in *P. reflexa*, the number of cut stem did not vary significantly under different shade nets. The variation in number of cut stems could be explained as a cascade of mechanism between light intensity, photosynthesis and growth hormones which results in varied growth in terms of height, spread or nodes.

Longest leaves (68.33 cm) were produced in *D. tasmanica* under red shade net, which was significantly at par with all other coloured shade nets except for green and open field conditions (Table 1). Similar results were recorded for *P. reflexa* (Table 2). Oren et al. (2003) also reported that the red net markedly enhanced vegetative growth rate and vigour of *Pittosporum variegatum*. In *D. tasmanica,* black coloured shade net recorded maximum leaf breadth (4.06 cm), whereas, it was recorded minimum (2.76 cm) under open field conditions (Table 1). Similar results were recorded for *P. reflexa* (Table 2). All shade nets in both species led to more leaf breadth than open field as shade nets altered the microclimate making it better in terms of reduced temperature, relative humidity, wind speed and light intensity (Medany et al., 2009).

In *D. tasmanica*, leaf thickness was recorded maximum (0.93 mm) in red coloured shade net which was statistically at par with white shade net (Table 1), however, in *P. reflexa*, it was recorded maximum under white shade (Table 2). The utilization of coloured shade nets provide more optimal growth conditions than open field that led to more growth and enhanced vegetative parameters (Zare et al., 2019).

The intensity of leaf colour is closely correlated with the quality of the cut foliage. A close correlation exists between SPAD values and chlorophyll content in plants. *D. tasmanica*, chlorophyll content was found non-significant under different coloured shade nets (Table 1). In *P. reflexa*, it was recorded significantly maximum under red coloured shade nets and minimum under control (Table 2). Gaurav et al. (2016a) also reported that *Dracaena* plants grown under red and white shade-nets exhibited better leaf chlorophyll content. The better performance of plants in terms of SPAD index under shade nets could be accounted to their indirect exposure to sun that led to increased production of chlorophyll to capture the diffuse radiation. This could be an adaptation to produce carbohydrates required for their growth and development.

Vase life was recorded maximum in the cut stems harvested from the plants grown under white coloured shade net (24.33 days), however, it was statistically at par with all the treatments except for red coloured shade net (Table 1). Similar results were recorded in *P. reflexa* (Table 2). The improved vase life of cut foliage grown under white shade nets could be attributed to better protection of leaves from high light intensity. Improved vase life under white shade nets have been reported in fronds of *Nephrolepis cordifolia* (Khyber et al., 2019). Most of the cut stems under all treatments strike roots in the water during their vase life ranging from 19 to 24 days in *D. tasmanica* and 23 to 25 days in *P. reflexa*. The rooting was considered as one of the criteria to terminate vase life. Naveena et al. (2019a) also reported improved vase life of foliage plants (*Asparagus* and *Nephrolepis*) grown under different shade nets.

After twelve months of planting, lamina colour of all plants in *D. tasmanica*, showed yellow green-group (yellow green group, 147A) except the plants grown under red shade net (green group, 137B (Table 3), however, in *P. reflexa,* showed same group of colour (yellow green group, 147A) except the plants under blue shade nets (green group, 146A).

Table 3 : Effect of coloured shade nets on foliage colour in *Dianella tasmanica* and *Pleomele reflexa*

Shade net	*Dianella tasmanica*		*Dracaena reflexa*	
	Lamina	Margin	Lamina	Margin
Black	Yellow green group, 147A	Yellow group, 4D	Yellow green group, 147A	Yellow group, 3D
Blue	Yellow green group, 147A	Yellow group, 4D	Green group, 146A	Yellow group, 4C
Green	Yellow green group, 147A	Yellow group, 4D	Yellow green group, 147A	Yellow group, 2D
Red	Green group, 137B	Yellow group, 4D	Yellow green group, 146A	Yellow group, 4C
White	Yellow green group, 147A	Yellow group, 4D	Yellow green group, 147A	Yellow group, 3D
Control	Yellow green group, 146A	Yellow group, 1D	Yellow green group, 146A	Yellow group, 4B

The results showed significant variation for different parameters in both the species under varied colour of shade nets. Differential response of different foliage plants varied with the colour of shade net. Gaurav et al. (2016b) also recommended red or white coloured shade nets to replace commercially prevalent green shade nets for cut green production in Cordyline.

Keeping an insight into commercially significant parameters of both cut foliage species, it could be inferred that *Dianella tasmanica* should be grown under red shade net, whereas, green shade net was found to be superior for commercial cultivation of *Pleomele reflexa*.

REFERENCES

Abou El-Ghait, E. M., Gomaa, A. O., Yousse, A. S. M., & Mohamed, Y. F. (2012). Effect of some postharvest treatments on vase life and quality of chrysanthemum (*Dendranthema grandiflorum* Kitam) cut flowers. *Research Journal of Agriculture and Biological Sciences, 8*, 261-271.

Gaurav, A. K., Raju, D. V. S., Janakiram, T., Singh, B., Jain, R., and Gopala, K. S. (2016a). Effect of coloured shade net on production of *Dracaena fragrans*. *Indian Journal of Horticulture, 73*(1), 94-98. doi: 10.5958/0974-0112.2016.00025.6

Gaurav, A. K., Raju, D. V. S., Janakiram, T., Singh, B., Jain, R., & Gopala, K. S. (2016b). Effect of coloured shade net on production and quality of cordyline. *Indian Journal of Agricultural Sciences, 86*(7), 865-869. doi: 10.56093/ijas.v86i7.59736

Godi, V., Manohar, K. R., & Kumari, V. R. (2018). Effect of different coloured shade nets with varying shade intensities on growth parameters of tomato (*Solanum lycopersicum* L.) var. Arka Rakshak. *International Journal of Pure and Applied Bioscience, 6*(1), 142-146. doi: http://dx.doi.org/10.18782/2320-7051.5898

Khyber, A., Singh, P., & Jhanji, S. (2019). Effect of coloured shade nets on growth and frond production in sword fern (*Nephrolepis cordifolia*) *Agricultural Research Journal, 56*(4), 766. doi: 10.5958/2395-146X.2019.00119.4

Medany, M. A., Hadsanein, M. K., & Farag, A. A. (2009). Effect of black and white nets as alternative covers to sweet pepper production under greenhouses in Egypt. *Acta Horticulturae, 807*, 121-126. doi: 10.17660/ActaHortic.2009.807.14

Myrthong, A. L., & Sudhadevi, P. K. (2016). Performance evaluation of *Nephrolepis exaltata* and *Asparagus densiflorus* under different coloured shade nets. *International Journal of Applied and Pure Sciences and Agriculture, 2,* 113-117.

Naveena, N., & Thamaraiselvi, S. P. (2020). Effect of coloured shade nets on growth and quality of horticultural crops. *Biotica Research Today, 2*(8), 800-801.

Naveena, N., Thamaraiselvi, S. P., Rajadurai, K. R., & Sivakumar, R. (2019a). Effect of coloured shade nets on physiology and quality of cut foliage plants. *Journal of Pharmacognosy and Phytochemistry, 8*(4), 1141-1144.

Naveena, N., Thamaraiselvi, S. P., Rajadurai, K. R., & Sivakumar, R. (2019b). Studies on growth and quality of *Philodendron xanadu* plants under different coloured shade nets. *International Journal of Chemical Studies, 7*(1), 319-322.

Nissim-Levi, A., Farkash, L., Hamburger, D., Ovadia, R., Forrer, I., Kagan, S., & Oren, S. M. (2008). Light-scattering shade net increases branching and flowering in ornamental pot plants. *Journal of Horticultural Science and Biotechnology*, *83*(1), 9-14. doi: 10.1080/14620316.2008.11512340

Oren, S. M., Shahak, Y., Spiegel, E., Gussakovsky, E., Giller, Yu., Ratner, K., Nissim-Levi, A., Ovadia, R., Bachar, A., Gal, Z., & Pardo, L. (2003). Improvement of the yield and quality of green decorative branches by colored shade nets. *DapeyMeyda, 17*, 48-52.

Perez, M., Plaza, B. M., Jimenez, S., Lao, M. T., Barbero, J., & Bosch, J. L. (2006). The radiation spectrum through ornamental net houses and its impact on the climate generated. *Acta Horticulturae, 719,* 631-636. doi: 10.17660/ActaHortic.2006.719.73

Reid, M. S. & Jiang, C. Z. (2012). Postharvest biology and technology of cut flowers and potted plants. *Horticultural Reviews*, *40*, 1–54. doi: 10.1002/9781118351871.ch1

Zare, S. K. A., Sedaghathoor, S., Dahkaei, P. M. & Hashemabadi, D. (2019). The effect of light variations by photoselective shade nets on pigments, antioxidant capacity, and growth of two ornamental plant species: marigold (*Calendula officinalis* L.) and violet (*Viola tricolor*). *Cogent Food and Agriculture, 5*, 16504-16515. doi: 10.1080/23311932.2019.1650415

(Received : 02.05..2022; Revised : 10.07.2023; Accepted : 12.07.2023)