Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5898

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (1):** 142-146 (2018)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Effect of Different Coloured Shade Nets with Varying Shade Intensities on Growth Parameters of Tomato (*Solanum lycopersicum* L.) *var.* Arka Rakshak

Vinod Godi*, Krishna Manohar, R., and Vasantha Kumari, R

Precision Farming Development Centre, Division of Horticulture, UAS, GKVK, Bangalore

*Corresponding Author E-mail: balesh072@gmail.com

Received: 16.10.2017 | Revised: 24.11.2017 | Accepted: 29.11.2017

ABSTRACT

An experiment was carried out to study the growth parameters of tomato (Solanum lycopersicum L.) as influenced by different coloured shade nets with varying shade intensities at the PFDC, Division of Horticulture, GKVK, UAS, Bengaluru during 2013-14. The experiment was laid out with fifteen treatments replicated thrice. The spacing followed was 60 cm x 45 cm. The results revealed that treatment T_{12}(C_4P_3: Black colour shade net + 75 per cent shade) recorded highest plant height (211.51, 159,128.35 and 79.57 cm. at 30, 60, 90 and 120 DAT respectively) whereas the lowest plant height (56.69, 97.22,109.5 and 136.74 cm at 30, 60, 90 and 120 DAT respectively) was recorded under treatment T_7 (T_7- C_3P_1: Red colour shade net + 35 per cent shade). Similarly treatment T_9 (T_9 - C_3P_3: Red colour shade net + 75 per cent shade) recorded highest number of branches (19.20,12.75,9.21and 6.50 at30,60,90 and 120 DAT respectively), whereas treatment T_{10} (T_{10}- C_4P_1: Black colour shade net + 35 per cent shade) recorded lowest number of branches (3.70,6.20, 9.00 and 15.29 cm at 30, 60, 90 and 120 DATrespectively). The highest leaf area (86.81 cm^2) and maximum dry matter accumulation (254.7g) were recorded in treatment T_9(T_9 - C_3P_3: Red colour shade net + 75 per cent shade) while lowest leaf area (71.07cm^2) and minimum dry matter accumulation (180.7g) were recorded in treatment T_1(T_1- C_1P_1: Green colour shade net + 35 per cent shade). From the study it can be concluded that red coloured shade net of 75 per cent shade intensity would be ideal for cultivation of tomato crops variety Arka Rakshak under protected conditions of shade net.

Key words: *Tomato, Coloured Shade Nets, Shade Intensities, Growth Parameters*

INTRODUCTION

Tomato (*Solanum lycopersicum*L.) belongs to the family *Solanaceae*. It is one of the most important vegetable crops that can be consumed as fresh and used in the processing industry. Tomato is being cultivated throughout the world and more extensively in USA, USSR, Italy, China, Turkey and India. The tomato plants typically grow to 1-3 m height and have weak stem that often sprawls over the ground and twines over other plants. It is native of South America, but is now grown worldwide for its edible fruits with thousands of cultivars having been selected with varying fruit types and for optimum growth in differing growth conditions.

Cite this article: Godi, V., Manohar, K.R. and Kumari, V.R, Effect of Different Coloured Shade Nets with Varying Shade Intensities on Growth Parameters of Tomato (*Solanum lycopersicum* L.) *var.* Arka Rakshak, *Int. J. Pure App. Biosci.* **6(1):** 142-146 (2018). doi: http://dx.doi.org/10.18782/2320-7051.5898

Tomato has several medicinal values as it promotes gastric secretion, blood purification, intestinal antiseptic, cures cancer of the mouth and sore throat, apart from improving quality of the prepared foods. It is highly nutritious with good amount of vitamins. It is a good appetizer having pleasing taste[3]. Tomato juice contains *lycopene*, one of the most powerful antioxidant and vitamin C which are most beneficial to human beings. The crop grown under open conditions will not fulfil the export standards, so the search for new avenues has led to development of Hi-Tech precision agricultural systems. Growing of tomato under cover has been reported to give good quality produce with higher productivity in several countries. Recently, few entrepreneurs have started its cultivation under protected structures like shade net houses, to get higher productivity and quality, adopting the hybrids supplied by the private companies. Shade nets are made of 100 per cent polyethylene inter-woven thread with specialised UV treatment having different shade percentages. It provides partially controlled atmosphere and environment by reducing light intensity and effective heat during day time to crops grown under it. To create optimum climatic conditions, selection of the correct percentage of shade factor plays an important role to enhance plant's productivity to its optimum. The photo selective, light-dispersive shade nets provide a new, multi-benefit tool for crop protection. Changing the light intensity and radiation spectrum has a large impact on the total production system. Coloured shade netting 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 to[2] and offer physical protection against excessive radiation, insect pests and environmental changes[5].Presently shade nets are available in different colours i.e. white, black, red, blue, yellow and green and in combinations. However, there is a need to study the performance of coloured capsicum under shade net house conditions.

MATERIAL AND METHODS

The experiment was conducted under different coloured shade nets with varying shade intensities at the PFDC, Department of Horticulture, GKVK, UAS, Bengaluru during 2013-14. The experimental station is located at an altitude of 930 m above mean sea level between a latitude of $12^{o}58^{l}$ North and a longitude of $77^{o}35^{l}$ East. The experiment was laid out in a split plot design with three replications. The total number of treatments was fifteen. The dimensions of each flat roofed shade net house was 16 m length (East-West) and 12 m breadth (North-South) with a size of 192 m^2.The seedlings of IIHR Bengaluru has developed tomato F1 hybrid Arka Rakshak were planted in two rows on 0.9 m wide bed having 45 cm path between two beds (mulched with 30 µ thick black mulch) and the spacing maintained was 60 cm x 45 cm. Irrigation and fertigation were done as per the recommendations. Plants were trained along a plastic thread tied to galvonised iron wire stretched over head along the bed.

The observations were recorded on growth parameters like height of the plant (cm), number of branches, leaf area (cm^2) and dry matter accumulation per plant (g) during the crop growth.

RESULTS AND DISCUSSION

All the growth parameters differed significantly due to different coloured shade nets with varying shade intensities. The highest plant height (211.51, 159.00, 128.35 and 79.57cm) at 30, 60, 90 and 120 DAT respectivelywas obtained under black colour shade net(C_4), 75 per cent shade intensity (P_3) .This may be due to increased auxin transport leading to cell elongation below the zone of apical meristem as plants grown in low light levels were found to be more apical dominant than those grown in high light environment, resulting in taller plants under shade. This finding is in agreement with Rylski and Spigelman[4] in capsicum. The number of branches (19.20, 12.75, 9.21 and 6.50)at 30, 60, 90 and 120 DAT respectivelywas found to be higher under red colour shade net (C_3), 75

per cent shade intensity (P_3). This could be attributed to the favourable light intensity leading to production of growth hormones like gibberellins resulting in more number of nodes with shorter internodes. Similar results were obtained by Oren-Shamir *et al*[2], in *Pittosporium variegatum*. The leaf area (86.81 cm^2) was found to be higher under red colour shade net (C_3), 75 per cent shade intensity (P_3).This could be because of the higher level of PAR (Photosynthetically Active Radiation) transmitted which lead to increased photosynthesis and also due to the cytokinines influencing the nutrients mobilization from other parts of the plant to the leaves, which produced more number of leaves. This finding is in agreement with Rylski and Spigelman[4] in capsicum. Dry matter accumulation per plant (254.7 g) was higher under red colour shade net (C_3), 75 per cent shade intensity (P_3) respectively. This could be due to the quality of light transmitted, which resulted in more photosynthetic area and hence better accumulation of food deposits in plant parts. This is in confirmation with studies conducted by Leite *et al*[1], in *Phalenopsis*. Among different coloured shade nets with varying shade intensities , grown under 75 per cent black colour shade net recorded the highest plant height while grown under 75 per cent red colour shade net recorded maximum number of branches, leaf area and dry matter accumulation per plant.

Table 1: Plant height as influencedby colour of the shadenet and shade intensityat different stages of crop growth in tomato *var.* Arka Rakshak

Treatments	Plant height (cm)			
	30 DAT	60 DAT	90 DAT	120 DAT
Shade net colour (C)				
C_1 - Green & black interwoven	65.61	105.18	123.6	166.6
C_2 - Blue	73.64	114.67	149.4	190.0
C_3 - Red	59.54	101.08	114.1	146.2
C_4 - Black	75.35	115.17	156.4	208.1
C_5 – White	68.64	110.53	144.0	179.7
S.Em±	0.217	0.353	0.649	0.767
C.D at 5 %	0.708	1.151	2.11	2.502
Shade intensity (P)				
P_1- 35 per cent	65.63	104.19	134.1	166.52
P_2- 50 per cent	68.63	108.46	137.2	170.31
P_3- 75 percent	71.40	115.34	141.2	181.62
S.Em±	0.048	0.167	0.060	0.149
C.D at 5 %	0.141	0.493	0.178	0.440
Interaction(C x P)				
C_1P_1	63.86	100.00	121.3	156.18
C_1P_2	65.97	105.12	123.1	161.20
C_1P_3	67.00	110.42	126.2	167.48
C_2P_1	69.41	110.02	146.47	183.48
C_2P_2	73.35	116.00	147.7	183.87
C_2P_3	78.17	118.00	154.23	185.67
C_3P_1	56.69	97.22	109.5	136.74
C_3P_2	59.88	101.18	114.8	139.57
C_3P_3	62.06	104.84	118.0	149.29
C_4P_1	71.28	107.15	153.5	183.08
C_4P_2	70.22	110.02	156.8	192.21
C_4P_3	79.57	128.35	159.0	211.51
C_5P_1	66.95	106.54	139.6	173.13
C_5P_2	68.76	109.96	143.8	174.69
C_5P_3	75.20	115.09	148.7	194.16
F test (p= 0.05)	*	*	*	*
S. Em±	0.107	0.374	0.135	0.334
C.D at 5%	0.315	1.103	0.399	0.985

DAT-Days After Transplanting

Table 2: Number of branches per plant as influenced by colour of the shade net and shade intensity at different stagesof crop growth in tomato *var.*Arka Rakshak

Treatments	Number of branches			
	30 DAT	60 DAT	90 DAT	120 DAT
Shade net colour (C)				
C_1 - Green & black interwoven	4.62	7.58	9.9	16.73
C_2 - Blue	5.05	7.97	10.2	17.02
C_3 - Red	**6.10**	**8.77**	**11.9**	**18.55**
C_4 - Black	3.99	6.62	9.3	16.05
C_5 – White	4.99	8.35	10.9	18.12
S.Em±	0.044	0.047	0.056	0.059
C.D at 5 %	0.145	0.155	0.182	0.193
Shade intensity (P)				
P_1- 35 per cent	4.55	7.43	9.86	16.75
P_2- 50 per cent	4.99	7.86	10.42	17.33
P_3- 75 percent	5.31	8.28	11.04	17.82
S.Em±	0.010	0.011	0.016	0.014
C.D at 5 %	0.031	0.034	0.047	0.043
Interaction(C x P)				
C_1P_1	4.20	7.25	9.25	16.25
C_1P_2	4.70	7.52	9.87	16.94
C_1P_3	4.95	7.98	10.62	17.02
C_2P_1	4.78	7.59	9.59	16.52
C_2P_2	5.02	8.04	10.27	17.14
C_2P_3	5.36	8.29	10.82	17.42
C_3P_1	5.79	8.15	11.07	18.05
C_3P_2	5.49	8.85	11.25	18.41
C_3P_3	6.50	9.21	12.75	19.20
C_4P_1	3.70	6.20	9.00	15.29
C_4P_2	4.01	6.57	9.25	16.07
C_4P_3	4.25	7.09	9.77	16.79
C_5P_1	4.28	7.98	10.41	17.63
C_5P_2	5.21	8.23	10.95	18.07
C_5P_3	6.00	8.95	11.78	18.66
F test (p= 0.05)	*	*	*	*
S. Em±	0.024	0.025	0.036	0.032
C.D at 5%	0.070	0.075	0.105	0.095

DAT-Days After Transplanting

Table 3: Leaf area and dry matter accumulation per plant as influenced by colour of the shadenet and shade intensityatdifferent stages of crop growth in tomato *var.* Arka Rakshak

Treatments	Leaf area (cm^2)	Dry matter accumulation per plant (g)
Shade net colour (C)		
C_1 - Green & black interwoven	72.41	188.6
C_2 - Blue	74.38	192.9
C_3 - Red	81.65	229.4
C_4 - Black	74.43	191.0
C_5 – White	80.1	216.1
S.Em±	0.137	0.62
C.D at 5 %	0.448	2.022
Shade intensity (P)		
P_1- 35 per cent	74.18	192.7
P_2- 50 per cent	75.9	202.4
P_3- 75 percent	79.7	215.7
S.Em±	0.048	0.201
C.D at 5 %	0.141	0.592
Interaction(C x P)		
C_1P_1	71.07	180.7
C_1P_2	72.2	188.8
C_1P_3	73.97	196.2
C_2P_1	72.47	185.7
C_2P_2	74.33	192.9
C_2P_3	76.35	200.1
C_3P_1	78.19	208.9
C_3P_2	79.94	224.7
C_3P_3	86.81	254.7
C_4P_1	72.25	183.8
C_4P_2	74.62	191.4
C_4P_3	76.41	197.8
C_5P_1	76.94	204.4
C_5P_2	78.42	214.1
C_5P_3	84.94	229.8
F test (p= 0.05)	*	*
S. Em±	0.107	0.449
C.D at 5%	0.315	1.325

REFERENCES

1. Leite, C.A., Ito, R.M., Lee, G.T.S., Ganelevin, R. And Fagnani, M.A., Light spectrum management using colored nets to control the growth and blooming of *Phalaenopsis*. *Acta Horticulturae*, **770:** 177-184 (2008).
2. Oren-Shamir, M., Gussakovsky, E.E., Shpiegel, E., Nissim-Levi, A., Ratner, K., Ovadia, R., Giller, Y.U.E. And Shahak, Y., Coloured shade nets can improve the yield and quality of green decorative branches of *Pittosporum variegatum*. *Journal of Horticultural Science & Biotechnology*, **76:** 353-361 (2001).
3. Ram, H. H., Text book. Vegetable breeding principles and practices, Kalyani publishers, 171-187 (1991).
4. Rylski, I. And Spigelman, M., Effect of shading on plant development, yield and fruit quality of sweet pepper grown under conditions of high temperature and radiation. *Scientia Horticulturae*, **29(1-2):** 31-35 (1986).
5. Shahak, Y., Gussakovsky, E.E., Gal, E. And Ganelevin, R.A, Color nets: crop protection and light-quality manipulation in one technology. *Acta Horticulturae*, **659:** 143-151 (2004).