

## Comparative Performance of Cauliflower hybrids Under Protected and Open Field Condition

U.S. Surve<sup>1</sup>, S.N. Mundhe<sup>1</sup>, A.D. Tumbare<sup>1</sup> and B.B. Gadge<sup>1</sup>

**ABSTRACT:** The present investigation was conducted at Department of Agronomy, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (M.S.) to study the response of cauliflower hybrids to different shadenet colours and open field condition during summer 2014. The red coloured shadenet with 75 per cent shading intensity found more suitable to obtain significantly maximum growth, yield attributes and curd yield of cauliflower (20.18 q unit<sup>-1</sup> of shadenet) followed by green colour (18.44q unit<sup>-1</sup> of shadenet). The open field condition recorded significantly minimum growth, yield attributes and curd yield of cauliflower (6.04 q unit<sup>-1</sup> of 756 m<sup>2</sup>) as compared to different coloured shadenets. The hybrid Basanti-956 was found significantly superior over NS-133 in respect of growth, yield attributes and curd yield of cauliflower (16.48 q unit<sup>-1</sup> of shadenet). The red coloured shadenet registered significantly maximum absorbed photosynthetically active radiations and at par with green and green + white coloured shadenets at all crop growth stages.

**Keywords:** Cauliflower, Coloured shadenet, hybrids, Curd yield.

### INTRODUCTION

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is one of the cole crop belong to the family *Brassicaceae* (Syn. *Cruciferae*). Cauliflower crop mostly cultivated in winter season in open field condition. Looking to the productivity of cauliflower under open field condition, there is need to improve productivity of cauliflower to meet out the growing demand of population. At present the green shadenet houses were used for growing of vegetables to improve quality of produce, however in the worldwide different coloured shadenets are used to enhance the productivity and quality of vegetables. Hence, the efforts have been made to increase the productivity and quality of cauliflower under different coloured shadenet houses.

### MATERIAL AND METHODS

An experiment was conducted at Mahatma Phule Krishi Vidyapeeth, Rahuri during summer season of 2014. The soil used in shadenet house was red sandy clay in texture and well drained. The EC and P<sup>H</sup> of the experimental site was 0.32 dS m<sup>-1</sup> and 7.10, respectively. Available N, P and K were observed

as 280.32, 32.55 and 362.25 kg ha<sup>-1</sup>, respectively. The shadenet house was flat top type having the height of 3.25 m. The shadenet house had an area of 2800 m<sup>2</sup> (70 m × 40 m), out of which 756 m<sup>2</sup> (36 m × 21 m) was used for conduct of this experiment. Four beds of 18.0 m × 1.2 m size were prepared in each coloured shadenet (18.0 m × 6.0 m). The two drip lines were arranged on each bed along the crop row and drippers were placed to each plant at the spacing of 45 cm. The shadenet house was provided foggers to protect the crop from excessive heat and to control the humidity.

The experiment consisted of six coloured shadenets with open field and two hybrids *viz.*, Basanti-956 and NS-133. These treatments were replicated three times in factorial randomized block design. The net plot size was 3.0 m × 3.0 m with 30 cm × 15 cm spacing between the rows and plants. A basal recommended dose of nitrogen, phosphorus and potash was applied through urea, single super phosphate and potash. The farmyard manure @ 2 kg meter<sup>-2</sup> was applied at 15 days before preparation of Broad Bed Furrows in shadenet house. Raised beds of 45 cm in height, 18 m in length and 1.20 m in width

<sup>1</sup> Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri - 413 722 (India)

**Table 1**  
Growth attributes of cauliflower as influenced by different treatments

Treatment	Growth attributes			
	Stalk length (cm)	Plant spread (cm)	No of leaves plant <sup>-1</sup> (cm)	Dry matter (g) plant <sup>-1</sup>
<i>Coloured shadenets - 75 % shading intensity (C)</i>				
C <sub>1</sub> -White	21.32	57.83	18.13	102.33
C <sub>2</sub> -Blue	19.18	55.22	17.07	98.50
C <sub>3</sub> -Green + White	21.65	59.83	21.00	106.00
C <sub>4</sub> -Green	21.70	60.00	21.08	108.33
C <sub>5</sub> -Red	21.73	60.50	21.17	109.17
C <sub>6</sub> -Black	18.13	53.00	16.77	95.83
C <sub>7</sub> -Open field	14.67	39.33	13.65	77.93
S.E.m (±)	0.35	0.48	0.34	0.45
CD at 5 %	1.02	1.40	0.98	1.32
<i>Hybrids (V)</i>				
H <sub>1</sub> -Basanti-956	20.53	56.29	19.26	101.61
H <sub>2</sub> -NS-133	19.01	53.92	17.56	97.84
SEm (±)	0.19	0.26	0.18	0.24
CD at 5 %	0.55	0.75	0.52	0.70
<i>Interaction (C × V)</i>				
S.E.m (±)	0.49	0.68	0.47	0.64
CD at 5 %	NS	NS	NS	NS
<i>General mean</i>	19.77	55.10	18.41	99.73

were prepared along the shadenet house with walking space of 30 cm between the beds. In shadenet house irrigation was applied through drip at every alternate day based on pan evaporation data starting from sowing up to last picking whereas in open field irrigation was applied at every 75 mm CPE with 7.5 cm depth.

## RESULTS AND DISCUSSION

### Growth Attributes

It could be seen from the Table 1. Among the coloured shadenets, the red coloured shadenet exhibited significantly higher growth attributes *viz.*, Stalk length (21.73 cm), Plant spread (60.50 cm), No of leaves (21.17) and dry matter plant<sup>-1</sup> (109.17g) and at par with green and green + white coloured shadenet in respect of stalk length, plant spread, No. of leaves plant<sup>-1</sup> and dry matter plant<sup>-1</sup>. This might be due to the shading effect of red coloured shadenet that could be offering better microclimate of air temperature, relative humidity and light intensity which leads to increase in growth characters. The crop grown on open field registered significantly minimum growth attributes *viz.*, stalk length (14.67 cm), plant spread (39.33 cm), No. of leaves (13.65)

and dry matter plant<sup>-1</sup> (77.93 g) than all types of coloured shadenets, because of low relative humidity and high temperature leads to heat stress and reduces stalk length, plant spread No of leaves plant<sup>-1</sup>, and ultimately dry matter plant<sup>-1</sup>. These results are in confirmity with Swagatika Srichandan *et al.* (2006), Medany *et al.* (2009), Yan Qinyan *et al.* (2011) and Rajasekaret *al.* (2013).

Among the hybrids, Basanti-956 recorded significantly higher stalk length (20.53 cm), plant spread (56.29 cm), No. of leaves (19.26) and dry matter plant<sup>-1</sup> (101.61 g). This might be due to Basanti-956 hybrids suitably adjusting the soil and microclimatic conditions of shadenet house and its faster growing habit compared to NS-133.

### Yield Studies

It could be seen from the Table 2. Among the coloured shadenets, the red coloured shadenet exhibited significantly higher yield attributes *viz.*, curd length (8.70 cm), curd diameter (17.50 cm) and curd weight plant<sup>-1</sup> (654.33 g) and followed by green and green + white coloured shadenet. This might be due to the red colour have more reflection and scattering of light resulting in to higher absorption of photosynthetically active radiations, photosynthesis and dry matter accumulation ultimately increases the yield attributes of cauliflower plants. The crop grown on open field registered significantly minimum yield attributes *viz.*, curd length (5.28 cm), curd diameter (9.33 cm) and curd weight plant<sup>-1</sup> (383 g) than all types of coloured shadenets. It might be due to high temperature photosynthates partitioning and distribution for the final sink were reduced resulting in poor quality and lower yield attributes in cauliflower. Similar results were reported by Shahak *et al.* (2009) Medany *et al.* (2009), Zoran *et al.* (2011) and Rajasekar *et al.* (2013).

The red coloured shadenet exhibited significantly higher curd yield (2018.52 kg unit<sup>-1</sup> of shadenet) followed by green and green + white coloured shadenets. The curd yield obtained under red coloured shadenet was 233.75 per cent higher than open field condition. The curd yield obtained under different coloured shadenets was significantly more than open field condition. This was attributed to the fact that, red colour might have scattered more light resulted into availability of more diffused radiation causing higher absorbtion of PAR resulting in more photosynthetic rate. The crop grown on open field

**Table 2**  
Yield attributes and curd yield of cauliflower as influenced by different treatments

Treatment	Yield attributes					
	Curd length (cm)	Curd diameter (cm)	Curd weight plant <sup>-1</sup> (g)	Curd yield unit <sup>-1</sup> of shade net-756 m <sup>2</sup> (g)	% increase over open field	
<i>Coloured shadenet- 75 % shading intensity (C)</i>						
C <sub>1</sub> -White	8.06	16.67	575.29	1761.48	191.25	
C <sub>2</sub> -Blue	7.88	15.75	520.17	1648.08	172.75	
C <sub>3</sub> -Green + White	8.22	16.83	611.00	1791.72	196.75	
C <sub>4</sub> -Green	8.35	17.17	623.67	1844.64	205.00	
C <sub>5</sub> -Red	8.70	17.50	654.33	2018.52	233.75	
C <sub>6</sub> -Black	7.40	15.00	481.00	1428.84	136.50	
C <sub>7</sub> -Open field	5.28	9.33	383.00	604.8	-	
S.E.m (±)	0.31	0.48	5.82	12.50	-	
CD at 5 %	0.89	1.40	16.91	35.40	-	
<i>Hybrids (V)</i>						
H <sub>1</sub> -Basanti-956	50.10	8.05	16.21	566.55	1648.08	8.45
H <sub>2</sub> -NS-133	43.05	7.35	14.71	533.01	1519	-
S.E.m (±)	0.40	0.16	0.26	3.11	5.80	-
CD at 5%	1.16	0.48	0.75	9.04	18.60	-
<i>Interaction (C × V)</i>						
S.E.m (±)	1.06	0.43	0.68	8.22	14.50	-
CD at 5 %	NS	NS	NS	NS	45.37	-
<i>General mean</i>	46.57	7.70	15.46	549.78	1585.44	

registered significantly minimum curd yield (604.8 kg unit<sup>-1</sup> of shadenet). This might be due to higher light intensity causes heat stress leads to dropping of flowers resulted in reduction in number of curds plant<sup>-1</sup>. Secondly, it also increases soil temperature which affects the moisture and nutrient availability to crop reflected in decreasing growth and yield attributes of crop. Similar result were reported by Shahak *et al.* (2009), Medany *et al.* (2009), Zoran *et al.* (2011) and Rajasekar *et al.* (2013).

Among the hybrids, Basanti-956 recorded significantly higher yield attributes *viz.*, curd length (8.05 cm), curd girth (16.21 cm) and curd weight plant<sup>-1</sup> (566.55 g) over the NS-133 hybrids. This might be due to Basanti-956 hybrids recorded higher photosynthetic rate and it suitably adjusting microclimatic environment of shadenet house which help to increase the growth and yield attributes of crop.

The hybrids, Basanti-956 recorded significantly higher curd yield (1648.08 kg unit<sup>-1</sup> of shadenet) over the NS-133 hybrids. The curd yield of Basanti-956 hybrids was 4.68 per cent higher over the NS-133 hybrids. This might be due all the growth and yield attributes were significantly higher in Basanti-956 which reflected on curd yield of cauliflower.

**Table 3**  
Periodical absorbed photosynthetically active radiation incauliflower as influenced by different treatments.

Treatment	Absorbed photosynthetically active radiation (mmol m <sup>-2</sup> s <sup>-1</sup> )				
	15DAT	30DAT	45DAT	60DAT	At harvest
<i>Coloured shadenets - 75% shading intensity (C)</i>					
C <sub>1</sub> -White	199	224	230	213.33	203.83
C <sub>2</sub> -Blue	190.8	200	204.17	200.83	195.33
C <sub>3</sub> -Green + White	230.2	257.83	261.17	257.17	249.33
C <sub>4</sub> -Green	232.5	259.17	262.5	259.17	251.67
C <sub>5</sub> -Red	238.0	263	267.67	263.83	255.00
C <sub>6</sub> -Black	147.7	154.17	159.83	164.83	159.83
C <sub>7</sub> -Open field	134.3	140	142.17	137.67	125.00
S.E.m (+)	2.82	8.22	7.52	4.21	3.82
CD at 5 %	8.18	23.90	21.85	12.24	11.12
<i>Hybrids (V)</i>					
H <sub>1</sub> -Basanti-956	212.19	232.95	240.38	231.10	217
H <sub>2</sub> -NS-133	174.52	195.10	196.05	196.57	194.43
S.E.m (+)	1.50	4.39	4.02	2.25	2.04
CD at 5 %	4.37	12.78	11.68	6.54	5.94
<i>Interaction (C × V)</i>					
S.E.m (±)	4.98	11.63	10.63	5.95	5.41
CD at 5 %	NS	NS	NS	NS	NS
<i>General mean</i>	193.4	214.02	218.21	213.83	205.71

### Absorbed Photosynthetically Active Radiation (APAR)

It could be seen from the Table 3. Among the coloured shadenets, the red coloured shadenet registered significantly higher absorbed photosynthetically active radiation (238, 263, 267.67, 263.83 and 255  $\mu\text{mol m}^{-2}\text{s}^{-1}$  at 15, 30, 45, 60 DAT and at harvest respectively and at par with green and green + white coloured shadenet at all crop growth stages. This might be due to complete transmission of light to the absorbing surface of cauliflower, it has more selectivity for light flux required for photosynthesis.

The open field condition recorded highest absorbed photosynthetically active radiation at all crop growth stages as compared to shading effect of different shadenet colour because of high light intensity increases APAR value. These result are in confirmity with the finding of Sica and Picuno (2008), Zoran *et. al.* (2011) and Arthurs *et al.* (2013).

Among the hybrids, significantly higher absorbed photosynthetically active radiation was observed in Basanti-956 hybrids at all growth stages as compared to NS-133 hybrids. This might be due to the more crop canopy in Basanti-956 hybrids compared to NS-133 hybrids which intercept maximum photosynthetic active radiation.

### REFERENCES

- Arthurs S.P., Stamps R.H. and Giglia F.F. (2013), Environmental Modification Inside Photoselective Shadehouses. *Hort. Sci.* **48**(8): 975-979.
- Medany, A.M., Hassanein, M.K. and Farag, A.A. (2009), Effect of black and white nets as alternative cover in sweet pepper production under green house in Egypt. *Acta Hort.* **807**: 121-126.
- Rajasekar, M., Arumugam, T., Ramesh, S. (2013), Influence of weather and growing environment on vegetable growth and yield. *J. Horti.* **5**(10): 160-167.
- Shahak, Y., Ratner, K., Zur, N., Offir, Y., Matan, E., Yehezkel, H., Messika, Y, Posalski, I. and Ben-Yakir, D. (2009), Photoselective netting: An emerging approach in protected agriculture. *Acta Hort.* **807**: 79-84.
- Sica, S. and Picuno, P. (2008), Spectro radiometrical characterization of plastic nets for protected cultivation. *Acta Hort.* **801**: 245-252.
- Swagatika Srichandan, Panda, S.C., Sahu, G.S., Mahapatra, P. and Mishra, R. (2006), Effect of shadenet on growth and yield of cauliflower. *Orissa J. Hort.* **34**(1): 28-31.
- Yan Qinyan, Song Shiwei and Dong Fei. (2011), Effect of colour shading net on the growth and photosynthetic characteristics of flowering Chinese cabbage. *J. of Huazhang Agril. Uni.* **30**(1): 44-48.
- Zoran, I., Lidija M., Mihal, D. and Nikolaos, K. (2011). The effect of colour shade nets on the greenhouse climate and pepper yield. Proc. 46<sup>th</sup> Croatian and 6<sup>th</sup> Intl. Symp. on Agriculture. Opatija, Croatia. pp. 529-532.

○○○