



Effect of different shadenet house on yield of okra crop

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Abstract

The experiment conducted in the field of the Department of Farm Structures, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India for the winter season of 2016-2017. The initial condition of experimental site was fairly uniform and levelled. For conducting experiment, the field is subdivided into four plots of 48 m² (i.e. 8m x 6m), where three shadenet house has been constructed and one as open field for treatment. Three shadenet houses are of different types namely Greenshadenet house (GSH), White shadenet house (WSH), Green and white strips shadenet house (GWSH), Open field (OF). The green and white strips shadenet house found more appropriate to obtain significantly maximum growth of okra as compared to the white shadenet house, green shadenet house and open field. The green and white strips shadenet house found more suitable to obtain suggestively maximum growth, yield parameters and fruit yield of okra. The important yield contributing characters viz., number of fruits plant⁻¹ (31.25), fruit length (11.82 cm), and fruit weight per plant (481.44 g) were significantly higher under green and white strips shadenet house. The green and white strips shadenet house required minimum number of days (44.25) to first flower initiation. The fruit yield of okra was significantly higher under green and white strips shadenet house (237.55 q/ha). Based on benefit-cost ratio it is economically viable for the farmers to adopt green and white strips shadenet house with mulching for okra which shows B: C ratio as 1.98.

Keywords: okra, coloured shadenet house, yield, height, weight, length

1. Introduction

“Okra” (*Abelmoschus sculentus* L.) is an herbaceous annual vegetable plant typically recognized as ‘Bhindi’ or ‘Ladies finger’. It is cultivated throughout tropical and subtropical regions and also in the warmer part of the temperate zone. Bhindi is one of the most important vegetables from agricultural point of view. In India, production of okra during year 2013-14 was 6346.4 Thousand MT. West Bengal is the highest producing state of okra in India having 14% of production. Average 23 thousand hectares area was under total okra cultivation had total production of 241.50 MT with an average productivity of 10.5 MT/ha in Maharashtra during 2013-14 (India Horticulture Database 2015-16) [3]. The high economic worth of okra crops justified the variation to the producers, improved quality and/or extends the growing season. Producer of okra crops often used diverse mulching types to conquer weed or conservation of moisture near the root of the crop. Mulches affect the soil environment. However, the mulches change the plants environment according to the properties of mulches and the level of the physical contact between the mulches materials and the soil (Dalorima *et al.*, 2014) [2]. The shadenet houses used for growing vegetables to improve quality of produce; but the area of okra crop under shadenet is very less. Okra crop is mostly cultivated in summer and kharif season in open field condition (Gadge B. *et al.*, 2016) [3]. Considering to the productivity of okra under open field condition, there is serious need to improve productivity of okra to encounter the growing demand of population. Likewise, different colours of shadenet having different photo chromatic

effects, hence efforts have been made to know the effect of different coloured shadenets on growth, yield, and quality of okra by planning. In order to study the impact of various shadenet houses under mulch on production of okra present study was undertaken.

2. Materials and Methods

The experiment was conducted during winter season of 2016-2017 at the field of the Department of Farm Structures of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra India. The experimental site was fairly uniform and leveled.

2.1 Location, climate and weather condition

Akola is situated in Western Vidarbha region of Maharashtra state and comes under sub-tropical zone. It was situated at an altitude of 307.415 m above mean sea level at the intersection of 20°40' north latitude and 77°02' east longitude. The average annual precipitation is 760 mm, out of which approximately 86 percent is received from June to September. The climate of the area was semi-arid, characterized by three distinct seasons; mainly summer being hot and dry from March to May, the warm and rainy monsoon from June to October and winter with mild cold from November to February. The mean annual maximum and minimum temperature are 48.23°C and 22.05°C in summer and 32.88°C and 14.35°C in winter respectively. For conducting experiment, the field is subdivided into four plots of 48 m² (8m x 6m) and the three shadenet house has been constructed and one

plot kept as an open field for treatment. Three shadenet houses are of different types namely

1. Green shadenet house (GSH)
2. White shadenet house (WSH)
3. Green and white strips shadenet house (GWSH)
4. Open field.(OF)

2.3 Observations observed

The following observations were observed during study in the shadenet house and open-field condition.

Yield Parameter

1. Number of fruits plant⁻¹
2. Weight (g) of fruit plant⁻¹
3. Weight (g) of fruit plot⁻¹
4. Weight (g) and length (cm) of individual of fruit
5. Number of days for 1st flowering
6. Number of days for 1st harvest

3. Results and Discussion

3.1 Yield Parameters

Number of days for first flowering

The days to first flowering in okra was influenced due to different treatments and are presented in Table 1 and the mean number of days required to flower initiation was observed 44.45

Effect of mulching in shadenet house and on first flowering

The start of first flower in okra was influenced significantly due to different shadenet house and mulch. The green and white strips shadenet house observed significantly the minimum number of days to first flower initiation as compared to the green shadenet house and white shadenet house. Among the shadenet house green shadenet house reported the maximum number of days to first flower initiation. The green and white strips shadenet house observed minimum number of days to first flower initiation; it might be due to differing optical properties of the covering material. Since the scattered light penetrates better into dense canopies, green and white shadenet might have favoured better scattering of light resulting into more availability of photosynthetically active radiation favouring conversion of photosynthates into higher growth attributes which leads to early flower initiation. The crop grown in open field condition registered significantly maximum number of days to first flower initiation; it might be due to unfavorable climatic conditions and heat stress. These results are in accordance with (Zoran *et al.* (2011) [11].

Table 1: Number of days for first flowering as influenced by different shadenet house and mulch

Treatment	Number of days for first flowering
GSH	48.00
WSH	46.00
GWSH	44.25
OF	52.00
F TEST	Sig
SE (m)	0.43
CD @ 1%	1.84
C.V.	1.80

From Table 1, it is revealed that under mulching in shadenet house the GWSH found significantly minimum days to first

flower initiation as compare to the GSH, WSH, and OF. Open field found maximum days to flower initiation.

Length of fruit

The data pertaining to the mean length of fruit as influenced by different shadenet house and mulch is presented in Table 2.

Effect of mulching in shadenet house on length of fruit

The length of fruits in okra was influenced significantly due to different shadenet house and mulch at all crop growth. The green and white strips shadenet house observed significantly highest length of fruits as compare to the green shadenet house and white shadenet house at last picking. Among the different shadenet house, green shadenet house observed lowest length of fruit. This might be because of shading effect of green and white strips shadenet house that could be offering better microclimate of air temperature, relative humidity and light intensity which leads to increase in growth characters. The crop grown under open field condition observed lowest length of fruit as compared to different shadenet house. This might be due growth, development, productivity and post-harvest quality of any crop largely depend on the interaction between the plant genetics and the environmental conditions under which they are grown, the mean weekly temperature during summer season was higher in open field than in the shadenet house which leads to decreases growth attributes in okra. Similar results were also reported by (Mercado *et al.* 1997, Medany *et al.* 2009 and Rajasekar *et al.* 2013)^[5,4,8].

Table 2: Mean length of fruits as influenced by different shadenet house and mulch

Treatment	Mean length of fruits in cm
GSH	9.71
WSH	11.13
GWSH	11.82
OF	9.14
F TEST	Sig
SE (m)	0.30
CD @ 1%	1.31
C.V.	5.81

From Table 2, it is seen that difference in mean length of fruit found in shadenet house and open field with mulching were significantly. Significantly lowest fruit length was obtained in open field (9.14) as compared to the shadenet house. Numerically highest length was found in GWSH (11.82) followed by WSH (11.13), GSH (9.71) and in open field (9.14).

Number of fruits per plant

The data representing the following Table 3 shows the number fruits per plant.

Effect of shadenet house and mulch on number of fruits per plant

The numbers of fruits per plant were influenced significantly due to different shadenet house and mulch. The green and white strips shadenet house observed significantly highest number of fruits (35) per plant as compare to the green shadenet house (30.5) and white shadenet house (32) at last picking. This might be due to the green and white strips shadenet house and white shadenet house have more reflection and scattering of light resulting in to

higher absorption of photo synthetically active radiations, photosynthesis and dry matter accumulation ultimately increases the number of fruits per plant whereas in green shadenet house, lowest number of fruits per plant was recorded. The open field condition observed lowest number of fruits (28.5) per plant as compared to the different shadenet house. It might be due to high temperature is the major regulator of development processes. Higher temperatures have more adverse influence on net photosynthesis leading to decreased production of photosynthesis above a certain temperature. Temperature can be controlled and regulated under protected conditions and better growth of plants might be expected under protected condition as compare to open field. Similar results were reported by (Shahak *et al.* 2009, Medany *et al.* 2009 and Rajasekar *et al.* 2013) ^[10,4,8].

Table 3: Number of fruits per plant as influenced by different shadenet house and mulch

Treatment	Number of fruits per plant
GSH	22.75
WSH	27.50
GWSH	31.25
OF	18.25
F TEST	Sig.
SE (m)	0.93
CD @ 1%	4.01
C.V.	7.43

From Table 3, it is revealed that in shadenet house and open field with mulching highest number of fruits (31.25) were found in the GWSH and lowest numbers of fruits (18.25) were found in of. Numbers of fruits found in GWSH were at par with that of WSH. The result showed the clear effect of mulching in shadenet house on fruit ability of okra crop, as number of fruits found in open field was lower than that in all mulching with shadenet house.

Number of days for first harvesting

The days to first harvesting in okra was influenced due to different treatments and are presented in Table 4 and the mean number of days required to first harvesting was observed 48.25

Effect of mulching in shadenet house on first harvesting

The days to first harvesting in okra was influenced significantly due to different shadenet house and mulch. The green and white strips shadenet house observed significantly minimum number of days for first harvesting as compare to the green shadenet house and white shadenet house. Among the shadenet house green shadenet house reported the maximum number of days to first harvesting. Open field reported the maximum number of days to first harvesting as compare to the shadenet house.

Table 4: Number of days for first harvesting as influenced by different shadenet house and mulch

Treatment	Number of days for first harvesting
GSH	53.25
WSH	51.75
GWSH	48.25
OF	55.75
F TEST	Sig.
SE (m)	0.25
CD @ 1%	1.08
C.V.	0.96

From Table 4, it is revealed that under mulching in shadenet house the GWSH observed significantly minimum days to first harvesting as compare to the GSH, WSH, and OF. Open field observed maximum days to first harvesting.

Weight of fruit per plant (g)

The mean fruit weight per plant was observed 481.44 g.

Effect of shadenet house and mulch

The Weight Fruit per plant was influenced significantly due to different shadenet house and mulch. The green and white strips shadenet house observed significantly maximum fruit weight (481.44 g) per plant as compare to the green shadenet house (359.18 g) and white shadenet house (398.01 g). Among the shadenet house, green shadenet house observed minimum fruit weight (359.18 g) per plant. This might be due to the significant improvement in plant height, number of branches, and number of fruits per plant under green and white strips shadenet house and white shadenet house reflected in increased weight per plant. The minimum weight of fruit per plant was observed under open field condition (224.27 g) as compared to different shadenet house, it might be due to light intensity was higher in open field condition than shadenet house which affect the growth and yield attributes of crop. Similar results were reported by (Shahak *et al.* 2009, Medany *et al.* 2009 and Rajasekar *et al.* 2013) ^[10,4,8].

Table 5: Weight of fruit per plant (g) as influenced by different shadenet house and mulch

Treatment	Weight of fruit per plant (in gm)
GSH	359.18
WSH	398.01
GWSH	481.44
OF	224.27
F TEST	Sig.
SE (m)	9.63
CD @ 1%	41.59
C.V.	5.26

From Table 5, it is revealed that in shadenet house and open field with mulching highest Weight of fruits were observed in the GWSH and lowest numbers of fruits Weight of fruits were observed in OF. Weights of fruits observed in GWSH was superior and GSH were at par with that of WSH. The result showed the clear effect of mulching in shadenet house on fruit ability of okra crop, as Weight of fruits observed in open field was lower than that in all mulching with shadenet house.

Fruit yield (q/ha)

As the okra crop is vegetable crop, its harvesting was done from time to time by picking of fruits. The complete harvesting was obtained by 8 pickings. The data pertaining to average yield of okra as influenced by mulching in shadenet house is presented in Table 7.

Effect of mulching in shadenet house on fruit yield (q/ha)

The fruit yield of okra different shadenet house and open field. The green and white strips shadenet house observed highest fruit yield (237.75 q/ha) as compare to the white shadenet house (196.55 q/ha) and green shadenet house (177.38 q/ha). Among the shadenet house, green shadenet house observed lowest fruit

yield (177.38 q/ha). This was attributed to the fact that, green and white strips shadenet house might have scattered more light resulted into availability of more diffused radiation causing higher absorption of photosynthetically active radiation resulting in more photosynthetic rate, whereas green shadenet house acts as opaque material causing less reflection of all light spectra thereby reducing the active photosynthetically active radiation, photosynthetic rate and dry matter accumulation and ultimately reflected on reduction in fruit yield. The lowest fruit yield was observed under open field condition (110.75 q/ha) as compared to different

shadenet house, this might be due to higher light intensity causes heat stress leads to dropping of flowers resulted in reduction in number of fruits per plant. Secondly, it also increases soil temperature which affects the moisture and nutrient availability to crop reflected in decreasing growth and yield attributes of crop as well as reduces the number of fruit pickings. The fruit yield obtained under all shadenet house was maximum than open field condition. This indicates that okra crop responded better under protected cultivation. Similar result were reported by (Shahak *et al.* 2009, Medany *et al.* 2009, Zoran *et al.* 2011 and Rajasekar *et al.* 2013) [10, 4, 11, 8].

Table 6: Yield of okra as influenced by mulching in shadenet house and open field

Treatment	Fruit yield (q/ha)
GSH	177.38
WSH	196.55
GWSH	237.75
OF	110.75
F TEST	Sig.
SE (m)	8.31
CD @ 1%	35.93
C.V.	9.21

From Table 6, it is observed that the treatment GWSH observed significantly higher yield of okra (237.75 q/ha) and the treatments GSH found at par with treatments WSH followed by treatment OF. The lowest yield of okra was observed in treatment (OF). The higher growth and yields in the treatments of mulching in shadenet

house may be due to favourable moisture maintained in the root zone, its availability to plants, avoiding leaching of soluble fertilizers applied, no weed growth under mulching in shadenet house (which avoids the competition in uptake of nutrients applied) and favourable environment maintained in the shadenet house.

Table 7: Cost economics of the study

Treatment	Yield of okra (q/1000m ²) (1)	Gross return (q/1000m ²) (2)	Total cost (q/1000m ²) (3)	Net return (q/1000m ²) (4)	BC ratio (2)/(3)
GSH	17.74	53212.5	36086.65	17125.85	1.47
WSH	19.66	58965	36130.15	22834.85	1.63
GWSH	23.78	71325	36086.65	35238.35	1.98
OF	11.08	16612.5	13287.37	3325.13	1.25

The market rate okra (For shadenet house Rs 3000/q and for open field Rs.1500/q)

From the Table 7 it is seen that the maximum gross return of Rs. 71,325 per ha were obtained in GWSH followed by Rs. 58965, Rs. 53212.5, Rs. 16612.5 for WSH, GSH and open field respectively. However, the total cost in Rs/ha was maximum in WSH (Rs.36130.15) followed by Rs. 36086.65 for GWSH and GSH, Rs. 18198.75 per ha for the open field. The maximum B: C ratio was observed in treatment GWSH (1.98) followed by 1.63, 1.47 and 1.25 for the WSH, GSH and open field respectively. From the above results it can be conclude that GWSH with mulch was found best among all the treatments for okra.

4. Conclusions

The important yield contributing characters *viz.*, number of fruits plant-I (31.25), fruit length (11.82 cm), and fruit weight per plant (481.44 g) were significantly higher under green and white strips shadenet house. The green and white strips shadenet house required minimum number of days (44.25) to first flower initiation and the green and white strips shadenet house required minimum number of days (48.25) for first harvesting compare to the white shadenet house and green shadenet house and open field. The fruit yield of okra was significantly higher under green and

White strips shadenet house (237.55 q/ha) and it was higher than open field condition. The white shadenet house (196.55 q/ha) found second best treatment for achieving the higher yield of okra. Among the shadenet house, green shadenet house was (177.38 q/ha) observed minimum growth and yield attributes as well as fruit yield of okra. The open field condition was observed significantly minimum growth, yield attributes and fruit yield of okra (110.75 q/ha) compared to different shadenet house. Maximum and significantly higher fruit yield of okra was obtained under green and white strips shadenet house was (23.78q per 1000m²) followed by white shadenet house (19.66q per 1000m²) and then green shadenet house (17.74q per 1000m²).The open field condition observed significantly minimum growth attributes, yield attributes and fruit yield of okra was (11.08q per 1000m²) compared to different shadenet house. On the basis of benefit cost ratio, it is economically viable for the farmers to adopt green and white strips shadenet house with mulching for okra which shows B: C ratio as 1.98

5. References

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