International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Effect of Shade Net on Yield and Quality of Grapes cv. Thompson Seedless

Baryalai Serat[1], S.S. Kulkarni[2]

[1]M.Sc.(Hort.) Scholar; Department of Horticulture; Mahatma Phule Krishi Vidyapeeth, Rahuri - 413722 India

[2]Assistant Horticulturist; AICRP on fruits; Department of Horticulture; Mahatma Phule Krishi Vidyapeeth, Rahuri - 413722 India

Abstract: ***The present investigation entitled "Effect of shade net on yield and quality of grape cv. Thompson Seedless" was undertaken with an objective to study the effect of shade net on yield parameters, quality parameters and maturity of Thompson Seedless grapes. The field experiment was carried out during 2013-2014 at vineyard of All India Coordinated Research Project on Fruits, Department of Horticulture, MPKV, Rahuri. Experiment was conducted in Randomized Block Design (RBD) with nine treatments and three replications. Shade nets of four colours (Green, White, Black and Red) and two intensities (50% and 30% each) were used. The maximum weight of bunch (363.40g), yield per vine (10.90kg), yield per hectare (24.22t) and higher values of other yield parameters recorded in treatment T_2 (green colour 30% shade net) and was followed by T_1 (green colour 50% shade net). Maximum TSS (21.32 ^oBrix), total sugars (19.20%), reducing sugars (18.06%), non-reducing sugars (1.14%) and TSS:acidity ratio (31.82%) were in T_9 (control). The green colour shade net with 30% and 50% intensity were better to increase the bunch weight, average berry weight, yield per vine, yield per hectare and for retaining green colour of berries.***

Keywords: Shade net, grapes, quality, light intensity, maturity

1. Introduction

Grape (*Vitis vinifera* L.) is an important fruit crop of tropical and subtropical regions (25). The grapes are cultivated all over the world. India is one of the major grape producing countries in the world. Grapes in Maharashtra (India) are pruned twice (backward and forward pruning observed to be at different times and thus, the gr and maturity of bunches are exposed to differ conditions which influences quality of grapes.

Atmospheric temperature during the growth and fruiting season has definite role in the fruiting and fruit quality of grape. Direct sunlight during the bunch deve lopment leads to cause many ill effects. Higher temperatures do disturb natural source to sink flow and there by reduces the quality of the grapes.

Shade net is one of the tools to minimize the direct exposure of vines to sunlight. Secondly, it also helps to maintain micro-climatic conditions during high as well low temperatures and thus, helps to maintain normal physiological activities and there by quality.

2. Material and Methods

The present investigation entitled "Effect of shade net on yield and quality of grape cv. Thompson Seedless" was conducted during 2013 -2014 on 8-year old Thomson Seedless vines at All India Coordinated Research Project on Fruits, Department of Horticulture, MPKV., Rahuri.

Experiment was conducted in Randomized Block Design (RBD) with nine treatments and three replications. Shade nets of four colours and two intensities (Green, White Black and Red 50% and 30% each) were used. Vines were covered with shading nets at 30 days after forward pruning along the rows. The data was recorded on bunch weight, length and breadth, berry weight, length and diameter, yield per vine, yield per hectare, TSS, acidity, total sugar, reducing sugars and non-reducing sugars.

3. Results and Discussion

: revealed significant effect of different treatments t colour and intensity) on bunch weight, bunch length, bunch breadth, 100 berries weight, berry diameter, berry length, yield/vine and yield/ hectare. Non-significant difference in number of bunch was due to exposure of all vines is same condition from backward pruning up to forward pruning and was maintained to a restricted number i.e. 30 per vine.

The results revealed that the maximum weight of bunch (363.40g), bunch breadth (12.83mm), bunch length (22.10mm), berry weight (3.67g), berry length (27.67mm), berry diameter 16.67mm), yield per vine (10.90kg) and yield per hectare (24.22t) was in the treatment T_2 (green colour 30% shade net) and was followed by T_1 (green colour 50% shade net) (Table-1). Bunch weight, bunch length, bunch breadth and berries weight were significantly more in green shade net than other shade net colours. The ability of green coloured shade net to scatter more light gives more diffused radiation resulting into increased absorbed photosynthetically active radiation and ultimately increased the bunch length and bunch breadth. This is in accordance with (1) who reported that the fruit length and fruit diameter and number of fruit per plant were more in green colour shade net than other shade net colours. Similar results were recorded by Shahak *et al.*, (2004), Elad *et al.*, (2007) and shahak, (2008).

The bunch weight, bunch length, bunch breadth and berries weight were significantly more with 30 per cent shading intensity than 50% shading intensity. Lower the shading intensity, more the light flux reaching to the absorbing

media and more is the selectivity of absorption of photosynthetically active radiation and thus, resulting into more growth and increasing yield attributes. This is reflected into greeter fruit bunch breadth and bunch length. Increased shading intensity obstructs the light flux from reaching the absorbing media resulting into less absorption of photosynthically active radiation consequently reducing the yield attributes. Similar results were reported by Andhale, (2012) and Elad *et al.*, (2007).

Table 1: Effect of different shade net on yield parameters of grapes cv. Thompson Seedless

Sr. No	Treatment	Bunch weight (g)	Bunch Breadth (cm)	Bunch Length (cm)	Yield/ vine (kg)	Yield/ ha(t)	100 Berries Weight (g)	Berry weight (g)	Berry Length (mm)	Berry diameter (mm)
T_1	Green 50%	350.00	11.90	21.67	10.50	23.33	368.10	3.50	26.67	16.33
T_2	Green 30%	363.40	12.83	22.10	10.90	24.22	379.27	3.67	27.67	16.67
T_3	White 50%	300.10	10.10	18.40	9.00	20.00	290.33	3.00	23.00	15.00
T_4	White 30%	316.83	10.83	18.77	9.51	21.12	300.00	3.09	23.90	15.33
T_5	Black 50%	335.00	11.17	20.82	10.05	22.33	342.10	3.33	26.00	16.33
T_6	Black 30%	350.50	11.03	20.80	10.52	23.36	338.00	3.30	25.30	15.67
T_7	Red 50%	310.00	10.80	18.67	9.30	20.66	298.00	3.06	23.20	15.00
T_8	Red 30%	325.00	10.90	19.13	9.75	21.66	313.00	3.20	24.87	15.60
T_9	Control	310.00	10.00	18.23	9.30	20.66	256.00	2.77	22.67	15.00
SEm ±		10.34	0.38	0.82	0.31	0.69	13.28	0.17	0.88	0.64
CD at 5%		31.00	1.15	2.45	0.93	2.06	39.84	0.53	2.65	N.S.

This also might be due to the protection of bunch under the shade, which restricts the entry of more ultra violet radiations that might have helped to achieve berry weight and bunch weight. This is in accordance with Richard *et al.*, (2012) who reported that the fruit weight and size was larger under the blue and gray nets than white and control. Similar results are reported by (2, 4, 6, 8, 12, 18, 21, 23, 27) in Table grapes.

Less yield in black and red shade net was observed. The black and red shade net essentially acts as opaque material which gives less reflection of all light spectra, thereby reducing the photosynthetic activity and fruit yield (24), and thus could reduced yield in higher intensity of shading.

Increase in berry weight and bunch weight resulted in direct increase in yield per vine and yield per hectare.

4. Quality Parameter

Treatments had significant differ on quality parameter (Table 2)

More TSS, high total sugars, reducing sugars, non-reducing sugars, and TSS:acidity ratios were recorded under treatment T_9 (control without shade net), while the high acidity was observed under black shade net 30% (T_6).

TSS was significantly differed among the treatments. A higher TSS of (21.32◦Brix) was recorded in the control as compared to all shade nets. The result are in confirmation with the results of (15,18,21,27) who reported influence of canopy microclimate on berry composition.

Thus, it was found that the exposure of sunlight had greater influence on TSS of the berries. This might have been due to the increase in temperature a row the bunches, resulting in the increase of sugars accumulation at a faster rate. These results are in agreement with (3,5,10,11,12,13, 14,16,17,19,26,29) who found similar results in table or wine grapes.

Table 2: Effect of different shade net on quality parameters of grapes cv. Thompson Seedless

Sr.No	Treatment	TSS (ºBrix)	Acidity (%)	TSS : Acidity	Total sugars (%)	Reducing sugars (%)	Non- Reducing sugars (%)
T_1	Green 50%	20.75	0.78	26.60	17.64	16.74	**0.90**
T_2	Green 30%	20.53	0.76	27.01	17.75	16.81	**0.94**
T_3	White 50%	19.09	0.74	25.80	18.23	17.14	**1.09**
T_4	White 30%	20.09	0.71	28.30	18.92	17.81	**1.11**
T_5	Black 50%	20.12	0.82	24.54	16.86	16.05	**0.81**
T_6	Black 30%	18.32	0.92	19.91	16.94	16.06	**0.88**
T_7	Red 50%	18.97	0.82	23.13	17.09	16.20	**0.89**
T_8	Red 30%	19.93	0.71	28.07	17.30	16.37	**0.93**
T_9	Control	21.32	0.67	31.82	19.20	18.06	**1.14**
SEm ±		**0.52**	**0.06**	**0.97**	**0.64**	**0.47**	**0.05**
CD at 5%		**1.57**	**0.20**	**2.91**	**1.92**	**1.43**	**015**

Thus, higher TSS could be related to exposure of vines to light interception and in this context, the green colour was just better than the black one. The minimum acidity was recorded in the control as compared to the other treatments under shade net. Sugars accumulation is greater for light-exposed fruit than for non-exposed fruit. With increase the bunch exposure to the sunlight (control) the acidity was reduced which was also reported by Fatih *et al.*, (2012).

It was observed that the total sugars, reducing sugars and non-reducing sugars were at higher levels in control and 30% white shade net, where the vines were more exposed to sunlight as compared to other shading treatments.

It is to note that, in 30% white shade net, the sugars were with higher values. More reflectance and interception of light might have influenced on the temperature in the canopy and there by resulting to higher sugars concentration. The occurrence of pink berry disorder was lesser in black and green shade net than red, white and control.

More physiological activities in control than those the vines in the shade nets might have resulted in higher pink berry incidence.

Sunburn of berries was more in control (100% sunlight) than under shade net and might be due to high temperature. Similar results were observed by (28).

Harvest was delayed in 30% and 50% shade net when compared with the control (no net). Similarly Rustem *et al.,* (2011) reported that, Black shade net 50% treatment delayed harvest by 13 days as compared with the control. Similar results were reported by Fatih *et al.,* (1970) where maturity index was higher in unshaded grapes than in 50 and 30% shaded grapes.

Higher retention of green berry colour was observed in black 50% shade net might be due to low intensity of light which might have retained pigment formation in the berry skin and is in accordance with Kliewer, (1970) who reported that the low light intensity greatly reduce colouration of Pinot Noir grapes. Similarly Reynalds *et al.,* (1986) reported that there was increase in colouration under high light intensity (control) after veriason. Scoring for colour retention were recorded in green 30% and 50% shad net, respectively by (9, 18). The maximum retention of green colour of berry, which is the essential requirement of the international market, was recorded in green shade net, which helps in achieving the higher production of the exportable quality grapes from per unit area.

In the present study, the green shade nets of 30% and 50% were found to be better to increase the bunch weight, bunch length, bunch breadth, 100 berries weight, berry diameter, berry length, yield per vine and yield per hectare and also to retain green colour of berries.

Hence, it may be concluded that the covering vine with shade nets even after one month of forward pruning is helpful to increase exportable yield and quality of grapes.

References

[1] Andhale, R. P. (2012). Effect of shade net intensity and colours on micrometeorological parameters growth, yield and quality of capsicum. Ph.D. thesis submitted to MPKV., Rahuri, Dist. Ahmadnagar (M.S) India.
[2] Archer, A. and Strauss, H. C. (1989), Effect of shading on the performance of *Vitis vinifera* L. Cv. Cabernet Sauvignon. S. Afr. J. *Enol. Vitic*, 10(2): 74-77.
[3] Bowen P. (2009). Foundations of canopy management: the contributions of Dr. Mark Kliewer. Pacific Agri-Food research centre, Summerland, BC, Canada, VOH 1Z0: 1-5.
[4] Coombe, B. G., Bovio, M. and Schneider, A. (1987). Solute accumulation by grape pericarp cells V. Relationship to berry size and the effect of defoliation. J Exp. Biol. (38): 1789-1798.
[5] Crippen, D. D and Morrison, J. C. (1986). The effects of sun exposure on the phenolic content of Cabernet Sauvignon berry during development. *Am. J. Enol. Vitic.* 37(4):243–247.
[6] Dokoozlian, N. K. and Kliewer, W. M. (1996). Influence of light on grape berry growth and composition varies during fruit development. J. *AMER. Soc. Hort. Sci*., (121)5: 869-874.
[7] Elad, Y., Messika, Y., Brand, M., David, D. R. and Sztejnberg, A. (2007). Effect of coloured shade nets on pepper powdery mildew. *Leveillla taurica*. Phytoparasitica (**35**): 285-299.
[8] Evangelia C., Alessandra F. and Silvia G. (2006). Effects of altered microclimatic conditions on ripening and anthocyanin profile of "Nebbiolo" grapes. *Vinci Grugliasco To, Italy.* 44:1-14.
[9] Fatih S., Askin A., Metin K. and Mustafa S.I. (2012). Effect of different shading practices used at pre-harvest stage on quality and storage life of Sultana Seedless Grapes.*J.Agri.Scie.and Tech*. 2: 1234-1240.
[10] Hunter, J. J., De Villiers, O. T. and Watts. J. E. (1991). The effect of partial defoliation on quality characteristics of *Vitis vinifera* L. Cv. Cabernet Sauvignon grapes. II. Skin colour, skin sugar, and wine quality. *Am. J. Enol. Vitic.* (42): 13-17.
[11] Jessica, M. C. and James, A. K. (2006). Effect of shading on accumulation of flavonoid compounds in (*Vitis vinifera* L.) Pinot Noir fruit and extraction in model system. *J. Agric. Food Chem.* (54): 8510-8520.
[12] Kliewer, W. M. and Lider, L. A., (1968). Influence of cluster exposure to the sun on the composition of Thomson Seedless fruit. *Am. J. Enol. Vitic*. (19) 175-184.
[13] Kliewer, W. M. (1970). Effect of day temperature and light intensity on colouration of *Vitis vinifera* L. grapes. *J. Amer. Soc. Hort. Sci.* (95): 693-697.
[14] Kliewer, W. M. (1977). Influence of temperature, solar radiation and nitrogen on coloration and composition of Emperor grapes. *Am. J . Enol. Vitic.* (28): 96 – 103.
[15] Morrison, J. C. and Noble, A. C. (1990). The effect of leaf and cluster shading on the composition of Cv. Cabernet Sauvignon grapes and on fruit and wine sensory properties. *Am. J. Enol. Vitic* (41): 193 – 200.
[16] Nami Goto-Yamamoto, Kentaro, M., Mineyo, N., Kazuya, K. and Masahiko, K. (2011). Effects of temperature and water regimes on flavonoid contents and composition in the skin of red-wine grapes. *J. Int. Sci. Vigme. Vin.* 13 (29): 75-80.
[17] Naor, A., Gal, Y. and Bravdo, B. (2002). Shoot and Cluster Thining influence vegetative growth, Fruit yield and wine quality of Sauvignon blanc grapevine. J. Amer. Soc. Hort. Sci. 127(4): 628-634.
[18] Ramteke, S. D and Somkuwar, R. G. (2007). Effect of shade nets on berry growth and quality in Cv. Tas-A-Ganesh grapes. *Asian J. of Hort*. 2 (1):224-226.
[19] Reynolds, A. G., Pool, R. M. and Mattick, L. (1986). Influence of cluster exposure on fruit composition and wine quality of Seyval Blanc grapes. *Vitis*, (25): 85-95.

[20] Richard M. B., Luigi, M., and Luca C. G. (2012). Exploring the potential use of photo-selective nets for fruit growth regulation in Apple. *Chilean J. of Agri. Res.* 72 (2): 224-230.
[21] Rojas-Lara, B. A. and Morrison, J. S. (1989). Differential effect of shading fruit or foliage on the development and composition of grape berries. *Vitis*, (28): 199-208.
[22] Rustem C., Adem Y., Soner A., Metin K. and Yusuf Y. (2011). Effects of shading and covering material application for delaying harvest on gray mold disease severity. *Afri. J. of Biotech.* 10 (57): 12182-12187.
[23] Shahak, Y., Gussakovsky, E. E., Cohen, Y., Lurie, S., Stern, R., Kfir, S., Naor, A., Atzmon, I., Doron, I. and Greenblat-Avron, Y. (2004). Colour nets: A new approach for light manipulation in fruit trees. *Acta Hort*. (636): 609-616.
[24] Shahak, Y. (2008). Photo-selective netting for improved performance of horticultural crops. A review of ornamental and vegetable studies carried out in Israel. *Acta Hort.* (770):161–168.
[25] Shikhamany, S. D. (2001). Handbook of Horticulture. ICAR *Publ. New Delhi*: 182-188.
[26] Smart, R. E., Robinson, J. B., Due, G. R. and Brien, C. J. (1985). Canopy microclimate modification for the cultivar Shiraz. 11, Effects on must and wine composition. *Vitis*, (24): 119 – 128.
[27] Smart, R. E., Smith, S. M. and Winchester, R. V. (1988). Light quality and quantity effects on fruit ripening for Cabernet Sauvignon.*Am.J.Enol.Vitic*. 39(**3**): 250-258.
[28] Smit, A., Steyn W. J. and Wand, S. J. E. (2008). Effects of shade netting on gas exchange of Blushed Apple Cultivars. *Acta Hort.* 772: 73-79.
[29] Spayd, D. E., Tarara, J. M., Mee, D. L. and Ferguson, J. C. (2002). Separation of sunlight and temperature effects on the composition of *Vitis uinifera* cv, Merlot berries. *Am. J. Enol. Vitic.* (53): 171-182.