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## Fruit bagging for improvement of quality attributes in grape

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### Abstract

A field experiment was conducted to study the influence of fruit bagging on quality attributes of grape cv. Muscat Hamburg at Coimbatore during winter (August – December, 2018) and summer seasons (January – May, 2019). The grape clusters were bagged with UV stabilized non-woven polypropylene bags of different colours viz., white, yellow, blue, red and green immediately after fruit set and were removed before harvest. The unbagged clusters were treated as control. The harvested fruits were assessed for quality attributes and the results revealed that bagging with white colour non-woven UV-stabilized polypropylene bags (T<sub>3</sub>) was found to be significantly superior when compared to all other treatments and registered the highest total soluble solids (15.99°B and 17.27 °B), TSS-acid ratio (24.41 and 49.33), total sugars (14.47% and 15.42%), reducing sugars (14.07% and 14.98%), sugar-acid ratio (22.09 and 44.06) and the lowest titratable acidity (0.66% and 0.35%) during winter and summer seasons respectively. Based on the results, it is concluded that bagging of grape clusters with white colour non-woven UV-stabilized polypropylene bags (T<sub>3</sub>) immediately after fruit set improved quality attributes in grapes.

**Keywords:** Grape, fruit bagging, quality, attributes

### Introduction

Grapes (*Vitis vinifera* L.) belonging to family Vitaceae is one of the most important fruit crops cultivated in India. The fruits are used for table purpose and also for making value added products like raisins, wine, juice and canned products. In India, nearly 80% of the grapes cultivated is mainly utilized for table purpose. It is commercially grown in an area of about 137 thousand ha with a production of 2951 thousand MT and productivity of 22 t/ha. The major grape growing states in India are Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu (INDIASTAT, 2018-2019) [5]. The grape bunches are susceptible to various biotic and abiotic factors during the growth and development and which will deteriorate the quality as well as reduce the consumers' preference. Moreover, wide range of agro-chemicals is used in grapes to reduce the losses caused by various pests and diseases infestations (Sharma, 2009) [13]. Pre-harvest fruit bagging aids in producing high quality fruits in many fruit crops and it is adopted as a compulsory practice in hi-tech production of fruit crops in countries viz., Japan, China and USA. It acts as a physical protection barrier against mechanical and physical damage caused by various intercultural operations during bunch development and also protects the fruits from the damage caused by bats and birds. In addition, bagging practice offers several advantages like improved fruit quality attributes and fruit peel colour and reduced incidence of insect pests and diseases (Sharma *et al.*, 2013) [14], which in turn improves the consumers preference and increased marketability of the produce. Researches has been carried out in crops like peach, apple, loquat, mango and pomegranate in order to improve fruit quality by reducing physiological disorders and to improve fruit colouration. However, study on the effect of fruit bagging in grapes is very limited and hence the present study has been taken up to understand the influence of different coloured non-woven polypropylene bags on improving fruit quality in grape cv. Muscat Hamburg.

### Material and Methods

The field experiment was conducted in eight years old grape cv. Muscat Hamburg in a farmer's field in Thondamuthur block, Coimbatore. The study was conducted for two seasons viz., winter and summer during 2018-2019. The vines were pruned during the second fortnight of August,

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2018 and January, 2019 for winter and summer season crop respectively. The experiment was laid in Randomized Block Design (RBD) with six treatments and four replications with three vines per replication. Bagging of the grape clusters (Fifteen numbers per vine) were done during both the seasons by using different coloured UV stabilized non-woven polypropylene bags as detailed below;

T1 Control (without bagging)

T2 Fruit bagging with blue colour non woven UV stabilized polypropylene bag

T3 Fruit bagging with white colour non-woven UV-stabilized polypropylene bag

T4 Fruit bagging with yellow colour non-woven UV-stabilized polypropylene bag

T5 Fruit bagging with red colour non-woven UV-stabilized polypropylene bag

T6 Fruit bagging with green colour non-woven UV-stabilized polypropylene bag

The grape clusters/ bunches were covered with bags as per the treatment immediately after fruit set and were removed before harvest. The bunches were harvested on attaining full maturity during December, 2018 from winter season crop and during May, 2019 for summer season crop. The fruits were then analyzed for various quality parameters viz., total soluble solids (TSS), titratable acidity, TSS-acid ratio, total sugars, reducing sugars and sugar-acid ratio. TSS was determined by using hand refractometer (ERMA @Japan) and expressed in °Brix (°B). The titratable acidity as percent tartaric acid was estimated by titrating the freshly extracted juice from pulp against 0.1N NaOH along with phenolphthalein as an indicator (Ranganna, 1986) [18] and was expressed as percent tartaric acid equivalents. The TSS-acid ratio was calculated by dividing TSS by titratable acidity. The total sugars and reducing sugars were estimated by the method suggested by Somogyi (1952) [17] and expressed in percentage. The sugar-acid ratio was calculated by dividing total sugars with acidity.

## Results and Discussion

### TSS and acidity

Consumer preference for any fruit is determined by the quality attributes viz., TSS, acidity and total sugars. Muscat Hamburg is the leading commercial grape variety in Tamil Nadu and highly preferred for fresh consumption. Improvement in fruit quality with high TSS, total sugars and reducing sugars with less acidity by various measures will be highly appreciated by the growers.

In the present study, significant differences were observed for TSS, titratable acidity and TSS-acid ratio for both winter season and summer season crops due to fruit bagging immediately after fruit set with different coloured UV stabilized non-woven polypropylene bags in grapes when compared to the control (T<sub>1</sub>) (without bagging). Irrespective of the seasons, the treatment (T<sub>3</sub>) (Fruit bagging with white

colour non-woven UV-stabilized polypropylene bag) registered the highest Total Soluble Solids (15.99 °B&17.27 °B) and TSS-acid ratio (24.41&49.33) and the lowest acidity (0.66% & 0.35%). However, lowest TSS and TSS acid ratio and the highest acidity were registered in the control (T<sub>1</sub>) (without bagging) in both the seasons. The results of the present study is in line with earlier studies indicating that fruit bagging has positive influence on TSS content in several fruit crops viz., loquat, grapes, peach, guava, pear, mango, litchi and apple (Xu *et al.*, 2010 [23]; Xing and Xiu, 2005 [21]; Kim *et al.*, 2008b [8]; Singh *et al.*, 2005 [16], Lin *et al.*, 2008 [11], Watanawan *et al.*, 2008 [20], Debnath and Mitra, 2008 [2] and Sharma *et al.*, 2013 [15]). However, several workers have also reported that fruit bagging does not have any significant improvement in TSS and / or acidity in pear (Faoro and Marcia, 2004) [4], peach (Jia *et al.*, 2005) [7], apple (Xia *et al.*, 2009) [21], longan (Yang *et al.*, 2009) [24] and banana (Kimani *et al.*, 2010) [9].

### Total and reducing sugars

Bagging treatment significantly influences the sugar content *i.e.*, total and reducing sugars in grapes cv. Muscat Hamburg (Table. 2). In comparison with other bagging treatments and control of both seasons, the higher total sugar (14.47%&15.42) and reducing sugar content (14.07 % & 14.98 %) were found in the treatment (T<sub>3</sub>) (fruit bagging with white colour non-woven UV-stabilized polypropylene bag) while the control (T<sub>1</sub>) (without bagging) significantly reduces the sugar content. The highest sugar-acid ratio (22.09 & 44.06) was observed in the treatment T<sub>3</sub> whereas, the control (T<sub>1</sub>) (without bagging) registered the lowest sugar-acid ratio (16.61&34.15) irrespective of the seasons. Islam *et al.* (2017) [6] also reported that bagging mango cv. Mallika with white paper single layered bag increased TSS content, total sugars and reducing sugars compared to unbagged fruits. These results are in line with Awad *et al.* (2007) [1]; Wu *et al.* (2009) [20]; Lima *et al.* (2013) [10]; Nagaharshitha *et al.* (2014) [12]; Haldankar *et al.* (2015) [4]. In contrast, some studies (Lin *et al.*, 2008; Yang *et al.*, 2009) [11, 24] showed that sugar content was reduced on bagged fruits due to the effect of microenvironment. But in grapes, the conversion of complex carbohydrates into sugars are more and the ripening conditions especially temperature and light exposure under the white bags during the maturation period account for various sugars and monoterpenes (Singh and Singh, 1995) [16]. Thus, the results indicate that sugar accumulation in grapes depends on the temperature and solar radiations.

### Conclusion

In the present study, it is concluded that bagging of grapes with white colour non-woven UV-stabilized polypropylene bag has improved the quality of fruits with respect to TSS, acidity and sugars.

**Table 1:** Effect of fruit bagging on total soluble sugars, titratable acidity and TSS acid ratio in grape cv. Muscat Hamburg

Treatments	Winter season (August -December 2018)			Summer season (January-May 2019)		
	Total soluble solids (°B)	Titratable acidity (%)	TSS: Acid ratio	Total soluble solids (°B)	Titratable acidity (%)	TSS: Acid ratio
T <sub>1</sub>	15.55	0.71	21.98	16.88	0.41	41.16
T <sub>2</sub>	15.62	0.69	22.80	16.95	0.41	41.34
T <sub>3</sub>	15.99	0.66	24.41	17.27	0.35	49.33
T <sub>4</sub>	15.81	0.69	23.08	17.17	0.36	47.69
T <sub>5</sub>	15.77	0.69	22.85	17.11	0.38	46.24
T <sub>6</sub>	15.68	0.70	22.40	17.02	0.36	44.80
SE d	0.04	0.01	0.40	0.04	0.01	0.30
CD (0.05)	0.09*	0.02*	0.80*	0.08*	0.02*	0.75*

\*Significant at 5 percent level

**Table 2:** Effect of fruit bagging on total sugars (%), reducing sugars (%) and TSS ratio in grape cv. Muscat Hamburg

Treatments	Winter season (August -December 2018)			Summer season (January-May 2019)		
	Total sugars (%)	Reducing sugars (%)	Sugar to acid ratio	Total sugars (%)	Reducing sugars (%)	Sugar to acid ratio
T <sub>1</sub>	11.75	11.47	16.61	14.00	13.70	34.15
T <sub>2</sub>	13.91	13.67	20.31	14.26	13.83	34.78
T <sub>3</sub>	14.47	14.07	22.09	15.42	14.98	44.06
T <sub>4</sub>	14.04	13.72	20.50	14.86	14.50	41.28
T <sub>5</sub>	14.07	13.66	20.39	14.28	14.00	38.59
T <sub>6</sub>	13.41	13.08	19.16	14.19	13.83	37.34
SE d	0.05	0.05	0.8	0.07	0.06	1.7
CD (0.05)	0.11*	0.10*	1.6*	0.14*	0.12*	3.5*

\*Significant at 5 percent level

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