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EVALUATION OF COLOURED SEEDLESS TABLE GRAPE VARIETIES FOR INCREASE IN SHELF LIFE

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ABSTRACT: An experiment to study the shelf life of four table grape varieties was conducted at National Research Centre for Grapes, Pune (M.S.). Grape bunches packing and the cold storage condition for 30 days after pre cooling for 24 hours was according to the export standard. After cold storage, shelf life and other quality parameters were recorded for four days. Lowest physiological loss of weight was recorded in Sharad Seedless followed by Mahadev Seedless. These two varieties also performed better for the quality parameters in terms of bunch weight, 5 berry weight and berry diameter which are favourable for better shelf life. Significant differences were found for the quality parameters except total soluble solids (TSS). Overall, Sharad Seedless and Mahadev Seedless recorded with the lowest per cent of berry fallen and rotting among the four varieties studied.

Keywords: *Shelf life, clone, table grapes, varieties, yield.*

Grape (*Vitis vinifera* L.) is one of the major important fruit crops of the country grown on an area of 111,000 ha with an annual production of 1,235,000 tonnes (Anon., 1). Among the white seedless table grape varieties, the popular table grape varieties viz., Thompson Seedless and its clones (Tas-A-Ganesh, Sonaka and Manik Chaman) are being grown on the major area covering about 60% of the total acreage under grape cultivation. Maharashtra (Nasik, Sangli, Solapur and Pune district) is a leading state in production of grapes in the country. The grapes are mainly being exported to European market. It is a pre-requisite that export quality grapes should have more shelf-life to remain fresh for the longer period and fetch good price in the market. Some of the practices followed under field condition are harvest time and handling the produce. The quality of table grapes can best be maintained by harvesting them in cool morning temperature, subsequently keeping them under shade and cooling as soon as possible (Nelson, 9). In order to compete the grapes in the market, harvested grapes must retain quality for at least 10 weeks (Morris *et al.,* 7). The storage life of grapes has been increased through use of SO_2 and low temperature storage (Ballinger and Nesbitt, 3; Nelson, 9). In addition to these, the genetical make-up of the fruit also plays an important role in increasing the shelf life. Along with the white seedless grapes, coloured seedless are also being exported to different markets. Owing to the rates fluctuation due to the glut of white seedless in the main season in the market, the grape growers are shifting to either changing the pruning practices or diverting their cultivation from present white seedless to the coloured seedless grapes. In the recent years, different grape varieties are being grafted on rootstock to minimize the above mentioned problems. In addition, this rootstock may also help to improve better quality grapes as well as increase the keeping quality. Some of the local clones along with the present established varieties are being used by the grape growers for changing the pattern of grape cultivation. Since, coloured varieties are early to mature than the white seedless, Sharad Seedless, Flame Seedless and other local clones are becoming popular with the consumers. Considering this, an experiment was conducted to study the shelf life of these new varieties.

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MATERIALS AND METHODS

The experiment was conducted at the grape grower's field of Solapur region during the year 2010-11. The place situated in Maharashtra lies at N $17^0$42.679' and E $076^0$02.382'. Four promising coloured seedless table grape varieties viz., Mahadev Seedless, Sharad Seedless, Krishna Seedless and Flame Seedless were selected for the study. The experiment, consisting of four treatments, was laid out in RBD with five replications. Five year old vineyards of these varieties were selected to study the shelf life of grapes. Five vines were selected under each treatment. Bunches fulfilling the requirement of international market were selected and harvested. As per the standard protocol, the grapes were harvested during morning hours to avoid heat loss from the berries.

At the time of harvest, bunches fulfilling the requirement of export standard of international market were only selected and harvested as per the standard practices (Anon., 2). As per the treatments, about 5 kg grapes were harvested under each variety. Harvested grape bunches were then brought to laboratory for physico-chemical analysis. From the lot of 5 kg grapes, 100 berries were selected randomly and total soluble solids (TSS) were determined using digital refractometer. A drop of juice was extracted and placed on clean prism of refractometer and the lid was closed. Reading was taken directly from the scale at room temperature. The acidity was determined by method as described by Ruck (11). Ten ml of the extracted juice was diluted to 100 ml and titrated against 0.1 N NaOH. The thickness of the pedicel was recorded with the help of verneer calliper. The berry skin thickness was measured with pressure gauge. The other lot of bunches were then packed in corrugated boxes of 48 cm x 29cm x 12 cm size with appropriate ventilation supplied by MAHAGRAPES and kept for pre-cooling within six hours after harvest (Somkuwar *et al*., 14) and at temperature below 4.4°C (Chadha and Shikhamany, 4). After pre-cooling, the boxes were shifted to cold storage and were kept for studies for a period of 30 days. The physiological loss in weight (PLW) and per cent fallen and rotten berries were observed for 4 days in shelf at room temperature after 30 days of storage.

All statistical calculations for the data were performed using the GLM procedure of SAS System software, version 9.3 (SAS, 12).

RESULTS AND DISCUSSION

Yield and quality parameters

The data recorded on bunch and berry characters (Table 1) revealed that among the bunch quality parameters, higher average bunch weight (432.19 g) was recorded in local clone Mahadev Seedless followed by Sharad Seedless (375.66 g) whereas the minimum bunch weight of 246.46 g was recorded in Flame Seedless variety. The same trend was also observed for 5-berry weight, berry diameter and berry length (Table 1). Pedicel thickness plays an important role in increasing the shelf life in grapes. Significant differences were recorded for pedicel thickness. The variety Mahadev Seedless and Krishna Seedless had thick pedicel of 1.99 mm and 1.88 mm than the other varieties studied. Most of the quality parameters showed significant difference except TSS. Total soluble solids play an important role in quality maintenance. However, there was no considerable variation between the grape varieties in respect of TSS. Though the differences for acidity were found to be significant, the acidity recorded was at par among the varieties.

Shelf life parameters

The data collected on shelf life parameters in relation to four different grape genotype is presented in Table 2. The grapes under shelf were observed for shelf life for 4-days. Significant differences were recorded among the different varieties for shelf life during the first two day. However, the differences were found to be non-significant on third day in shelf. On the fourth day under shelf, the variation for PLW was seen more prevalent. Among the four different varieties evaluated for physiological loss of weight (PLW %), minimum physiological loss in weight (PLW) was recorded in Sharad Seedless (9.06%) followed by Mahadev Seedless (9.32%) whereas the variety Flame Seedless was found to be prone for more

Table 1: Yield and quality parameters in relation to different grape varieties.

Treatment (Variety)	Bunch weight (g)	5 Berry weight (g)	Berry diameter (mm)	Berry length (mm)	Skin thickness (mm)	Pedicel thickness (mm)	TSS (°Brix)	Acidity (%)
Mahadev Seedless	432.19[a]	34.68[a]	20.45[a]	28.81[a]	0.20[b]	1.992[a]	20.52[c]	0.41[c]
Sharad Seedless	375.66[b]	20.50[b]	17.03[b]	23.97[b]	0.16[d]	1.258[c]	21.46[b]	0.45[b]
Krishna Seedless	255.43[c]	18.80[b]	14.16[c]	25.46[b]	0.18[c]	1.882[b]	22.58[a]	0.41[c]
Flame Seedless	246.46[c]	8.80[c]	13.5[c]	13.91[c]	0.21[a]	0.946[d]	21.80[b]	0.46[a]
CV %	1.651	2.530	1.557	0.562	1.472	2.860	1.867	1.598
LSD 5 %	7.452	0.721	0.349	0.775	0.003	0.059	0.555	0.009
Significances	**	**	**	**	**	**	**	**

Table 2: Shelf life in relation to different grape varieties.

Varieties	PLW (%) Days in shelf				% Fallen berries				% rotten berries			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Mahadev Seedless	2.73[c]	4.73[c]	6.65[b]	9.32[c]	0	10.6[c]	12.59[b]	16.26[c]	0	3.65[c]	5.07[c]	8.61[c]
Sharad Seedless	2.71[c]	4.1[d]	6.47[b]	9.06[c]	0	7.96[d]	9.81[c]	13.03[d]	0	2.45[d]	3.06[d]	5.65[d]
Krishna Seedless	4.05[b]	5.84[b]	7.79[a]	11.64[b]	0	13.7[b]	21.31[a]	25.63[b]	0	7.21[b]	12.42[b]	19.14[b]
Flame Seedless	5.35[a]	6.4[a]	7.81[a]	12.53[a]	0	21.04[a]	21.97[a]	30.23[a]	0	13.44[a]	13.72[a]	25.93[a]
CV %	2.105	2.035	1.952	1.984	-	1.988	2.918	2.581	-	2.928	3.881	3.349
LSD 5 %	0.107	0.147	0.193	0.290	-	0.3651	0.660	0.757	-	0.269	0.458	0.684
Significances	**	**	**	**	NS	**	**	**	NS	**	**	**

desiccation (12.53%). The correlations among different characters were carried out. The PLW was found to be progressively increased from first day onwards in shelf. The data (Table 3) showed that the physiological loss of weight was negatively correlated with the parameters such as bunch weight, 5 berry weight, berry diameter, berry length and pedicel thickness; whereas positive correlation was recorded for the parameters such as skin thickness, TSS, acidity, percentage berry rotting and percentage berry fallen. The grapes were also studied for per cent fallen berries. Significant differences were recorded for per cent fallen berries. On fourth day under shelf, minimum loss of 13.03% was recorded in Sharad Seedless grapes followed by Mahadev Seedless (16.26%), Krishna Seedless (25.63%) and Flame Seedless (30.23%). The losses recorded for fallen berries resulted into more desiccation from the berries. This may be due to the skin thickness of the berries that might be helping to reduce the losses. The storage losses of grapes occur principally owing to desiccation and rotting, which can be as high as 90% depending on the storage conditions (Isbat and Zeba, 6). The grapes were stored under normal room temperature and rotting of berries increased progressively with duration of storage. Ballinger and Nesbitt (3) reported that Muscadine grapes in relation to shelf life behave differently for shelf life. Ngcoba *et al.* (10) also reported the weight loss in the Regal Seedless grape variety. The data on storage characteristics of different varieties under Indian condition is limited. Also other desirable characters such as TSS and acidity showed negative correlation with bunch weight, berry weight, berry diameter and berry length. As the number and size

Table 3: Correlation of various quality parameters in relation to different grape varieties.

Pearson Correlation Coefficients, N = 4											
Prob > |r| under H0: Rho=0											
Characters	Bunch weight (g)	5 Berry weight (g)	Berry diameter (mm)	Berry length (mm)	Skin thickness (mm)	Pedicel thickness (mm)	TSS (°Brix)	Acidity (%)	Rotten berries	Fallen berries	PLW %
Bunch weight (g)	1.0000	0.875	0.979	0.691	-0.214	0.417	-0.883	-0.294	-0.892	-0.880	-0.9194
5 Berry weight (g)		1.0000	0.939	0.900	-0.103	0.800	-0.708	-0.717	-0.751	-0.710	-0.7627
Berry diameter (mm)			1.000s0	0.738	-0.072	0.546	-0.892	-0.437	-0.813	-0.789	-0.8421
Berry length (mm)				1.0000	-0.4150	0.8926	-0.3542	-0.8283	-0.7521	-0.7106	-0.7315
Skin thickness (mm)					1.0000	-0.0755	-0.2201	0.0143	0.6313	0.6502	0.5803
Pedicel thickness (mm)						1.0000	-0.1824	-0.9907	-0.3826	-0.3241	-0.3630
TSS (°Brix)							1.0000	0.0787	0.5956	0.5879	0.6512
Acidity (%)								1.0000	0.2573	0.1968	0.2348
Rotten berries									1.0000	0.9980	0.9973
Fallen berries										1.0000	0.9957
PLW (%)											1.0000

of the berries increases, stored plant material gets distributed in them. This may leads to decrease in TSS of the berries. Pedicel thickness was negatively correlated with the berry rotting and berry fallen percentage.

Rotten and fallen berries are considered to be important trait for the export of the grapes (Fig. 1 and 2). Detaching the berries from pedicel during transportation may leads to berry rotting, which may affect the quality of the grapes. The berries rotten under shelf were counted on each day under

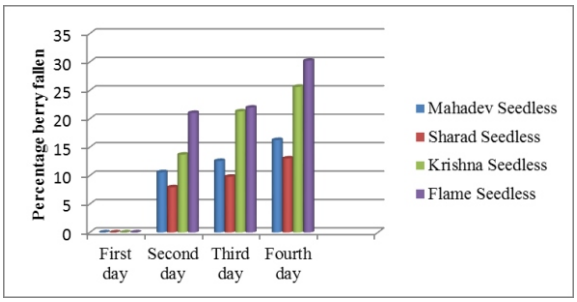

Fig. 1 : Percentage berry fallen after cold storage on first, second, thrid and fourth day.

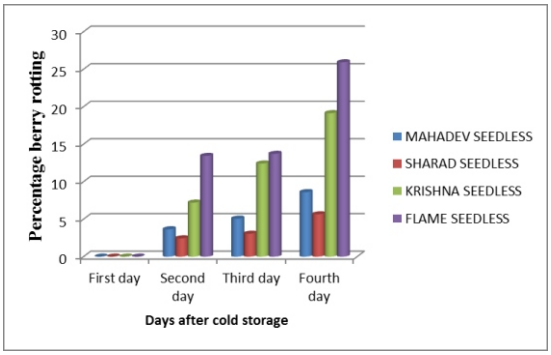

Fig. 2 : Percentage berry rotting after cold storage on first, second, thrid and fourth day.

shelf and the percentage of rotten berries was calculated. Significant differences were recorded for per cent rotten berries. The differences for berry rot was not observed during the first day, however, the rotting was progressively increased with the days in shelf. On second day under shelf, the variety Shard Seedless was reported less berry rot (2.45%) as compared to other varieties (Table 2). As the number of days increased, the percentage berry rotting increased. Walker *et al.* (15) observed

the per cent decay of maturity levels of density-sorted 'Fry' muscadine grapes in clamshell containers sealed with polyethylene bags during 6 weeks' storage at 2°C, where per cent decay increased with the storage time.

The post-harvest losses in the grapes are also reported (Anon., 2) in post-harvest profile in grapes by Department of Agriculture and Cooperation, where more pulp per berry, berry obtained from low nitrogen, healthy berries and grapes harvested at low temperature mentioned as important factors which were directly related with better shelf life. Dhillion *et al.* (5) reported that berry rotting was increased with the increase in fruit maturity. From the data it was seen that different genotypes behaved differently for shelf life. The results are in agreement with the reports of Somkuwar and Ramteke (13) who reported that Superior Seedless and Sonaka were found to be the best genotypes with respect to their keeping quality.

The introduction of new varieties having high consumer preference has made the grape crop more popular. From the study conducted, Sharad Seedless and Mahadev Seedless are found to be the best varieties suitable for export purpose looking towards their quality parameter after 30 days of cold storage. Proper varietal selection, crop and post-harvest management, infrastructure such as cold chain, facilities for marketing etc, will augment the cultivation of quality grapes and will help in increasing the exports.

REFERENCES

1. Anonymous (2012). Grapes. In: *Indian Horticulture Database*, Eds. Kumar, B., Mistry NC, Singh, B. and Gandhi, C.P., National Horticulture Board, Gurgaon, India: 68-3 75.
2. Anonymous (2009). Post harvest profile of grapes. Department of Agriculture and Cooperation, Directorate of Marketing and Inspection, Nagpur.
3. Ballinger, W. E. and Nesbitt, W. E. B. (1982). Quality of Muscadine grapes after sulfur dioxide treatments. *J. Am. Soc. Hort. Sci.,* **107**: 827-830.
4. Chadha, K. L. and Shikhamany, S. D. (1999). The Grape – Improvement, Production and Post Harvest Management. (Edn.) Malhotra Publishing House, New Delhi. pp. 529.
5. Dhillion, W. S., Bindra, A. S. and Cheema, S.S. (1997). Influence of Dormex and harvesting dates on the storage of grapes. *J. Res. PAU Ludhiana,* **34** (3): 283-289.
6. Isbat, M and Zeba, N. (2011)**.** Quality and shelf life evaluation of two grape varieties in different agro-ecological zones of Bangladesh. *J. Expt. Biosci.,* **2**(2):89-96.
7. Morris, J. R., Oswald, O. L., Main, G. L., Moore J. N. and Clark, J. R. (1992). Storage of new Seedless Grape cultivars with sulfur dioxide generators. *Am. J. Enol. Vitic*., **3**: 230-232.
8. Nelson, K. E. (1980). Improved harvesting and handling benefit table grape market. *California Agri.*, **34**:34-36.
9. Nelson, K. E. (1983). Effects of in-package sulphur dioxide generators, package liners and temperature on decay and desiccation of table grapes. *Am. J. Enol. Vitic*., **34**: 10-16.
10. Ngcoba, M., Opara, U. L. and Thiart, G. D. (2011).Effects of packaging liners on cooling rate and quality attributes of table grape (cv. Regal seedless). *VI International Symposium on Towards a Sustainable Food Chain Food Process, Bioprocessing and Food Quality Management* Nantes, France.
11. Ruck, J.A., (1978). Chemical Methods for Analysis of Fruits and Vegetable Products. *Canada Deptt. Agri. Publication.* No. 1154.
12. SAS 9.3 T S level 1 MO. Copyright © 2002-2010 by SAS Institute Inc., Cary.NC, USA. Licensed to India Agricultural Statistics Research Institute. Site 11601386.
13. Somkuwar, R. G. and Ramteke, S. D. (2005). Evaluation of grape genotypes for shelf life. *Ann. Plant Physiol.,* **19** (2): 133-136.
14. Somkuwar, R. G., Ramteke, S. D. and Shikhamany, S. D. (2002). Effect of ripeness on shelf life in Thompson Seedless grape. *Indian J. Hort*., **59**(3): 230-232.
15. Walker, T. L.; Morris, J. R.; Threfal, R. T and Main, G. L. (2001). Density separation, storage, shelf life, and sensory evaluation of 'Fry' Muscadine grapes. *HortSci*., **36**(5):941–945.