Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5614

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (4):** 964-968 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Sensory Characteristics of Dried-On-Vine Raisins as Influenced by Pre-Drying Treatments and Seedless Varieties of Grape (*Vitis vinifera* L.)

A. Venkatram[1*], A. S. Padmavathamma[1], B. Srinivas Rao[2], A. Siva Sankar[3], K. Manorama[4] and D. Vijaya[2]

[1] Department of Fruit Science, College of Horticulture, Rajendranagar, Hyderabad – 500030, Dr.Y.S.R. Horticultural University, Venkataramannagudem, Andhra Pradesh, India

[2]Grape Research Station, Rajendranagar, Dr.Y.S.R. Horticultural University, India

[3]Department of Crop Physiology, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad – 500030, India

[4]Quality Control Laboratory, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad – 500030, India

*Corresponding Author E-mail: venkatramambotu@gmail.com

Received: 25.07.2017 | Revised: 9.08.2017 | Accepted: 10.08.2017

ABSTRACT

The investigation was planned and executed in the Grape Research Station, Hyderabad, to study the influence of various concentrations of antioxidants (ascorbic acid, AA 500 ppm, 750 ppm and 1000 ppm and benzyl adenine, BA 50 ppm, 100 ppm and 150 ppm) with alkaline emulsion of ethyl oleate (AEEO, 2.4% potassium carbonate plus 1.5% ethyl oleate) as a pre-drying treatment on sensory characteristics of dried-on-vine (DOV) raisins prepared from seedless grape varieties viz. Thompson Seedless, 2A Clone, Sonaka, Manik Chaman and Merbein Seedless. The grape bunches were dried on the vine after severing the fruit bearing canes and leaving the canes that will carry the next year's crop. The fruit bearing canes are then sprayed with drying emulsions and harvested raisins are finally dried in dehydrators. Results showed that the various concentrations of antioxidants with AEEO influence color and appearance, texture, flavour, taste and overall acceptability of DOV raisins. Among the different pre-drying treatments used for raisin making, AEEO plus AA 1000 ppm was superior to others with respect to all studied sensory attributes. Regarding varieties, DOV raisins prepared from varieties Manik Chaman and Thompson Seedless were superior to others.

Key words: *antioxidants, alkaline emulsion of ethyl oleate, dried-on-vine raisins, sensory characters*

INTRODUCTION

Grape (*Vitis vinifera* L.) belongs to the family Vitaceae, one of the most important fruit crops of India. The fresh grape industry in the country is facing problems in marketing of the produce in both domestic and international market, as the quality standards stipulated by the regulatory bodies are becoming more and more stringent.

Cite this article: Venkatram, A., Padmavathamma, A.S., Rao, B.S., Sankar, A.S., Manorama, K. and Vijaya, D., Sensory Characteristics of Dried-On-Vine Raisins as Influenced by Pre-Drying Treatments and Seedless Varieties of Grape (*Vitis vinifera* L.), *Int. J. Pure App. Biosci.* **5(4):** 964-968 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5614

Moreover, the maximum benefits from grape cultivation can only be derived by establishing processing industries for the production of value added products like good quality raisin[1,2]. In India, about 78% of grape production is used for table purpose, nearly 17 to 20% is dried for raisin production, while 1.5% is used for juice and only 0.5% is used in manufacturing wine[3].

Raisins are a good source of fiber, potassium, iron, calcium and vitamin B and are free from fat and cholesterol. They contain only natural sugars as a source of energy. Besides sugars, essential amino acids and fatty acids, these are rich source of antioxidants[4,5]. Green raisins are highly valued for their fresh, attractive green color, sweet flavour and hence typically sold for two to three times the price of sun-dried raisins made from the same fresh grapes. Green raisins are dried in shade in ventilated houses; while red, black and yellow raisins are sun dried on rooftops and on the ground[6].

There are many factors affecting the quality as well as yield of raisins. The physical characteristics of raisins from different countries are quite different, while chemical characteristics are fairly consistent[7]. The technique of raisin production in India is mostly based on the dipping of the grape bunches in emulsion having 2.5% potassium carbonate and 1.5% ethyl oleate for a duration of 2 to 4 minutes, and subsequent shade drying in open tier system[2]. The dipping oil treatment alone induced soft texture, but it led to the development of brown rather greenish color[8]. Application of antioxidants like ascorbic acid and benzyl adenine effectively reduced browning and increased the storage period of many fruits[9].

A new development in raisin production in Australia has been to dry the bunches on the vine (DOV) after severing the fruit bearing canes and leaving the canes that will carry the next year's crop. The fruit bearing canes are then sprayed with drying emulsions and the run-off collected and reused. The harvested raisins are given a final drying in dehydrators. This technique works well using either Thompson seedless or Merbein seedless varieties. This technique may be applicable to Thompson seedless in Hyderabad area[10].

Telangana State falls under semi-arid tropical region wherein the major grape cultivation is confined to Ranga Reddy, Mahabubnagar and parts of Nalgonda district since decades. Since the harvest period (February to May) is during summer with low relative humidity, it is excellent for raisin making naturally or by different methods. The different varieties of seedless grapes grown here are vigorous and highly productive. The physico-chemical qualities of these grapes are also highly suitable for raisin making. Therefore, the main objective of our study is to know the effect of various concentrations of antioxidants along with alkaline emulsion of ethyl oleate on sensory characteristics of dried-on-vine (DOV) raisins prepared from seedless varieties of grape.

MATERIALS AND METHODS

The study was conducted at Grape Research Station, Dr.Y.S.R. Horticultural University, Rajendranagar, Hyderabad in Ranga Reddy district. The Grape Research Station is located at 77°85' East longitude and 18°45' North latitude and at an altitude of 542.6 m above mean sea level. The experimental location falls under semi-arid tropical climatic zone, having annual rainfall of 800 mm.

All chemicals used in experimentation and analysis were of analytical grade, purchased from Standard Chemical companies. A solution containing 2.4% potassium carbonate plus 1.5% ethyloleate (*i.e.* alkaline emulsion of ethyl oleate, AEEO) was prepared in a plastic bucket. The pH of the solution was adjusted to 11 while adding potassium carbonate. Dipping solutions of 500 ppm, 750 ppm and 1000 ppm of ascorbic acid (AA) were prepared by dissolving 5 g, 7.5g and 10 g of AA respectively in 10 liters of AEEO. Similarly 50 ppm, 100 ppm and 150 ppm of benzyl adenine (BA) were prepared by dissolving 0.5 g, 1 g and 1.5 g of BA respectively in 10 liters of AEEO.

Selected grape bunches of varieties Thompson Seedless, 2A Clone, Sonaka, Manik Chaman and Merbein Seedless on fruit bearing canes were trimmed by removing the small, damaged, infected and immature berries with scissors. Then fruiting canes were cut (cane severance) at fruit maturity of greater than 21 ^{o}Brix then the bunches were dipped in the emulsion prepared for dipping *viz.,* (A_1) AEEO + AA 500 ppm, (A_2) AEEO + AA 7500 ppm, (A_3) AEEO + AA 1000 ppm, (A_4) AEEO + BA 50 ppm, (A_5) AEEO + BA 100 ppm, (A_6) AEEO + BA 150 ppm and (A_7) AEEO as a control. Then, bunches were allowed to dry while hanging on fruiting canes from the trellis wires. The harvested raisins are given a final drying in dehydrators. Moisture testing was done frequently for a preserved level (approximately 15%)[8].

Sensory evaluation was done by panel of 15 personnel of both the genders at College of Horticulture and Grape Research Station for standard organoleptic attributes using the 5 point hedonic scale[11]. Score card (1 to 5 *i.e.* 1 for dislike very much to 5 for like very much) contains various raisin quality attributes *viz*., color and appearance, flavour, texture, taste and overall acceptability. The experimental data were subjected to analysis of variance (ANOVA) using factorial completely randomized design as per the procedure out lined by Panse and Sukhatme (1985)[12]. Least significant differences (Fisher's protected LSD) were calculated following significant F-test (p=0.05).

RESULTS AND DISCISSIONS

Effect of various concentrations of antioxidants (ascorbic acid, AA and benzyl adenine, BA) with alkaline emulsion of ethyl oleate (AEEO) as a pre-drying treatment on organoleptic score (5 points scale) for color and appearance, texture, flavour, taste and overall acceptability of dry-on-vine (DOV) raisins prepared from seedless grape varieties are presented in Table 1.

Color and appearance

There was significant difference was observed among the various concentrations of antioxidants with AEEO with respect to color and appearance of raisins (Table 1). Significantly maximum and on par color and appearance of DOV raisins was observed by Panelists in pre-drying treatments A_3 (3.88) and A_2 (3.83) whereas lower and on par in control (3.56) and A_4 (3.63). There was significant difference also observed among the varieties. It was highest in Manik Chaman (3.82) which was comparable with Thompson Seedless (3.78) and lowest in Sonaka (3.63) which was on par with Merbein Seedless (3.67) and 2A Clone (3.72). The interaction effect on color and appearance of DOV raisins among pre-drying treatments and varieties was not significant.

Texture

Significantly maximum and on par texture was noted in pre-drying treatments A_3 (4.07) and A_2 (4.02) whereas it was lower and on par in control (3.75) and A_4 (3.82). Regarding varieties, significantly highest values were recorded in Manik Chaman (4.01) which was comparable with Thompson Seedless (3.97) whereas it was lowest in Sonaka (3.82) which was on par with Merbein Seedless (3.86) and 2A Clone (3.91). The interaction effect was not significant on texture of DOV raisins (Table 1).

Flavour

It was evident from table 1 that, significantly maximum flavour was recorded by Panelists in pre-drying treatment A_3 (3.81) which was on par with A_2 (3.76) whereas it was lower and on par in control (3.49) and A_4 (3.56). Significantly highest values were recorded in Manik Chaman (3.75) which was comparable with Thompson Seedless (3.71) and lowest and on par flavour was noted in Sonaka (3.56) and Merbein Seedless (3.60). The interaction effect was not significant.

Taste

Significantly maximum and on par values (Table 1) with respect to taste of DOV raisins was noted by Panelists in pre-drying treatments A_3 (4.12) and A_2 (4.07) whereas lowest and on par in control (3.80) and A_4 (3.87). There was significant difference among the varieties with respect to the taste of DOV

raisins. Significantly highest values were recorded in Manik Chaman (4.06) which was comparable with Thompson Seedless (4.02) and lowest in Sonaka (3.87) which was on par with Merbein Seedless (3.91). The interaction effect was not significant regarding the flavour.

Overall acceptability

Significantly maximum overall acceptability of DOV raisins was recorded by Panelists in pre-drying treatments A_3 (4.05), which was on par with A_2 (4.00) whereas it was lower and on par in control (3.87) and A_4 (3.80). Regarding varieties, significantly highest overall acceptability values were recorded in Manik Chaman (3.98) which was comparable with Thompson Seedless (3.94) and 2A Clone whereas lowest in Sonaka (3.79) which was on par with Merbein Seedless (3.83). The interaction between various concentrations of antioxidants with AEEO and varieties was not significant on overall acceptability of DOV raisins (Table 1).

In terms of the overall assessment, the results obtained from our study, the pre-drying treatment AEEO + AA 1000 ppm (A_3) in all varieties evaluated by the sensory panel generally were rated as good[13]. The preference of Panelist for ascorbic acid treated products could be due to the taste of vitamin C, which positively influenced the original taste[14]. The DOV raisins prepared from the pre-drying treatment (A_3) AEEO + AA 1000 ppm in Manik Chaman and Thompson Seedless were superior in their sensory attributes *viz*., color and appearance, flavour, texture, taste and overall acceptability in the present study, which might be due to the genetic differences in skin, and phenolic content, which may also affect pigmentation[15]. Thompson Seedless raisins produced as DOV have higher raisin grades than those dried on trays, even for fruit harvested the same day and at the same sugar level[16].

Table 1: Effect of various concentrations of antioxidants with alkaline emulsion of ethyl oleate as a pre-drying treatment on sensory attributes like color and appearance, texture, flavour, taste and overall acceptability (5 points scale) of dried-on-vine raisins prepared from seedless varieties of grapes.

Pre-drying treatments (A)	Color and appearance	Texture	Flavour	Taste	Overall acceptability
A_1 – AEEO + AA 500 ppm	3.76^{bc}	3.95^{bc}	3.69^{bc}	4.00^{bc}	3.93^{bc}
A_2 – AEEO + AA 750 ppm	3.83^{ab}	4.02^{ab}	3.76^{ab}	4.07^{ab}	4.00^{ab}
A_3 – AEEO + AA 1000 ppm	3.88^{a}	4.07^{a}	3.81^{a}	4.12^{a}	4.05^{a}
A_4 – AEEO + BA 50 ppm	3.63^{d}	3.82^{de}	3.56^{de}	3.87^{de}	3.80^{de}
A_5 – AEEO + BA 100 ppm	3.66^{cde}	3.85^{cde}	3.59^{d}	3.90^{d}	3.83^{cde}
A_6 – AEEO + BA 150 ppm	3.70^{cd}	3.89^{cd}	3.63^{cd}	3.94^{cd}	3.80^{c}
A_7 – AEEO (Control)	3.56^{e}	3.75^{e}	3.49^{e}	3.80^{e}	3.87^{e}
S.Em±	0.04	0.04	0.03	0.03	0.04
CD at 5%	0.11	0.11	0.09	0.09	0.10
Varieties (V)					
V_1 – Thompson Seedless	3.78^{ab}	3.97^{ab}	3.71^{ab}	4.02^{ab}	3.94^{a}
V_2 – 2A Clone	3.72^{bc}	3.91^{bc}	3.65^{bc}	3.96^{bc}	3.88^{ab}
V_3 – Sonaka	3.63^{c}	3.82^{c}	3.56^{d}	3.87^{d}	3.79^{c}
V_4 – Manik Chaman	3.82^{a}	4.01^{a}	3.75^{a}	4.06^{a}	3.98^{a}
V_5 – Merbein Seedless	3.67^{c}	3.86^{c}	3.60^{cd}	3.91^{cd}	3.83^{bc}
S.Em±	0.03	0.03	0.03	0.02	0.03
CD at 5%	0.09	0.09	0.08	0.07	0.08
Interactions (A x V)	NS	NS	NS	NS	NS

Figures with different alphabet within pre-drying treatments and varieties are significantly different at $p \leq 0.05$; NS – Not significant.

CONCLUSION

From this study it can be concluded that the dried-on-vine raisins prepared from seedless varieties Manik Chaman and Thompson Seedless by using alkaline emulsion of ethyl oleate with ascorbic acid 1000 ppm as pre-drying treatment were significantly preferred by the Panelists.

Acknowledgements

Thanks to University Grants Commission of India for financial assistance and advisory committee for technical advice.

REFERENCES

1. Arve, S.D. Raisin making: An approach for value addition and higher profits. *Proceeding of the First Indian Horticulture Congress*, New Delhi. 891–894 (2004).
2. Adsule, P.G, Sharma, A.K, Banerjee, K and Karibasappa, G.S. Raisin industry in India: adoption of good drying practices for safe raisins. *NRC for Grapes*, Bulletin, **85: (974-976):** 209–215 (2012).
3. Adsule P.G, Karibasappa, G.S, Banerjee, K and Mundankar, K. Status and prospects of raisin industry in India. *Acta Hort.* **785:** 507–514 (2008).
4. Meng, J, Fang, Y, Zhang, A, Chen, S, Xu, T, Ren, Z, Han, G, Liu, J, Li, H, Zhang, Z and Wang, H. Phenolic content and antioxidant capacity of Chinese raisins produced in Xinjiang Province. *Food Research International*. **44:** 2830–2836 (2011).
5. Carranza-Concha, J, Benlloch, M, Camacho, M.M, Martínez-Navarrete, N. Effects of drying and pretreatment on the nutritional and functional quality of raisins. *Food and Bioproducts Processing*. **90:** 243–248 (2012).
6. Zach Lea, J.D. Indian Kishmish Khana Design. *United States Agency for International Development*, 1–4 (2005).
7. Bongers, A.J, Hinsch, R.T and Bus, V.G. Physical and chemical characteristics of raisins from several countries. *Amer. J. Enology and Viticulture*. **42:** 76-78 (1990).
8. Doreyappa Gowda, I.N. Evaluation of certain pretreatments for raisin making. *J. Food Sci. Technol.* **37 (2):** 121–125 (2000).
9. Venkatram, A and Bhagwan, A. Storage life improvement of custard apple (*Annona squamosa* L.) 'Balanagar' fruits by post harvest application of antioxidants. *Journal of Applied Horticulture*. **15(3):** 215–219 (2013)
10. Possingham, J.V. Development in the production of table grapes, wine and raisins in tropical regions of the world. *Acta Horticulture*. **785:** 45–50 (2008).
11. Adsule, P.G and Banerjee, K. Standardization of quality of Indian raisins with reference to codex standards and harmonization of Indian Standards. *Indian Food Packer*, July - August 59–63 (2003).
12. Panse, V.G and Sukhatme, P.V. *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi. (1985).
13. Parpinello, G.P, Heymann, H, Vasquez, S, Cathline, K.A and Fidelibus, M.W. Grape maturity, yield, quality, sensory properties, and consumer acceptance of Fiesta and Selma Pete dry-on-vine raisins. *Am. J. Enol. Vitic*. **63 (2):** 212–219 (2012).
14. Abano, E.E, Sam-Amoah, L.K, Owusu, J and Engmann, F.N. Effects of ascorbic acid, salt, lemon juice, and honey on drying kinetics and sensory characteristic of dried mango. *Croat. J. Food Sci. Technol.* **5 (1):** 1–10 (2013).
15. Angulo, O, Fidelibus, M.W and Heymann, H. Grape cultivar and drying method affect sensory characteristics and consumer preference of raisins. Journal of the Science of Food and Agriculture. **87**: 865–870 (2007).
16. Peacock, W.L and Swanson, F.H. The future of California raisins is drying on the vine. *California Agriculture*. **59 (2):** 70–74 (2005).