Intl. J. Food. Ferment. Technol. 5(2): 259-263, December, 2015

©2014 New Delhi Publishers. All rights reserved
DOI Number: 10.5958/2277-9396.2016.00018.0

RESEARCH NOTE

Influence of Thermovinification on Quality of Jamun (*Syzygium cumini*) Wine

Hanamant, R. Holegar*, Suresha, G.J., Jagadeesh, S.L. and Vandana A. Kalagudi

Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot, Karnataka, India

*Corresponding author: hanamant.holegar@gmail.com

Paper No. 106 Received: 5 feb 2015 Accepted: 16 Dec. 2015 Published:

Abstract

Thermovinification damages the hypodermal cell membranes and helps in releasing the anthocyanins from the tissues. The wine from jamun fruits was prepared using thermovinification, where the fruits were crushed and heated to a temperature between 60-80°C for 20-30 min. The wine was prepared with three different musts viz., juice, juice+skin and juice+skin+seeds. Various physico-chemical and sensory qualities of the wine were studied for a period of six months at two months interval to know the effect of thermovinification and different must of *jamun*. The alcohol content of *jamun* fruit wine was found maximum in the treatment involving Thermovinification – Pulp + Skin at fresh, 3 and 6 months after ageing. Significantly highest phenol content of 415.49 and 458.51 mg/L was recorded in the treatment viz., (Thermovinification – Juice) at 3 and 6 months of maturation. The thermovinified must of pulp+skin yielded organoleptically acceptable wine.

Keywords: Thermovinification, Anthocyanin, *Jamun* wine, Phenols, organoleptic quality

The *jamun* (*Syzygium cumini* L.) is an important unexploited indigenous fruit of the tropics, belonging to the family Myrtaceae. It has recently gained major importance as an arid zone horticultural crop because of its hardy nature and high yielding potential. *Jamun* fruits are universally accepted as good for medicinal purposes especially for curing diabetes because of its effect on the pancreas (Joshi, 2001). The fruit juice and the seed contain a biochemical called 'jamboline' which is believed to check the pathological conversion of starch into sugar in case of increased production of glucose. Besides, the *jamun* fruit is an effective food remedy for bleeding piles and correcting liver disorders (Joshi, 2001). The unripe fruit juice is stomachic, carminative and diuretic in nature and has cooling and digestive properties (Kirtikar and Basu, 1975). Bark of the tree is also useful in control of diarrhea and dysentery.

In preparation of wine, Thermovinification is an an important step. Thermovinification is a process where whole or crushed grapes are heated to a temperature between 60-80°C for 20-30 minutes to promote the diffusion of phenolic and colour compounds from the grape skins (Ribereau-Gayon *et al.* 2000). The heating damages the hypodermal cell membranes and the anthocyanins are released (Lowe *et al.* 1976; Sacchi *et al.* 2005). The coloured juice can be cooled and pressed or pressed and cooled to the fermentation temperature and the juice is handled as for normal white juice (Lowe *et al.* 1976). It can then be fermented into wine thermovinification has been attempted vary successfully to produce wine of better quality from grapes (Zimmer *et al.* 2002) and strawberry (Somesh *et al.* 2009).

Jamun fruits have successfully been attempted for the preparation of wine (Joshi *et al.* 2012). Since the fruit is a very rich source of anthocyanin, so it imparts antioxidant properties too. In view of these many medicinal and therapeutic properties of *jamun* fruit and because of its short availability period, an attempt has been made in this study to prepare wine from *jamun* fruit juice with thermovinification process. The results obtained have been discussed in this paper.

Material and Methods

Raw Meterials

The present investigation was carried out in the laboratory of Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, (University of Horticultural Sciences, Bagalkot), Arabhavi, Gokak taluk and Belgaum district of Karnataka during the period from 2012 to 2014. *Jamun* fruits were brought from the orchard of Kaitanal village located near Gokak city to conduct experiment. The ripe and healthy fruits of different sizes were used for the experiments.

Treatments

Fruits procured for the experiment were processed together in order to maintain homogeneity of the experimental material. The selected fruits were squeezed to extract the pulp and separated the seeds with hands. The details of various treatments are given below:

Treatment details	
T_1 :	Juice
T_2 :	Pulp + Skin
T_3 :	Pulp + Skin + Seed
T_4 :	Juice
T_5 :	Pulp + Skin
T_6 :	Pulp + Skin + Seed

Wine Preparation

For the preparation of must, 1 kg of juice, pulp along with skin and seeds was placed in fermentation flask and the TSS of juice/pulp was adjusted to 24° Brix by addition of powdered cane sugar. The acidity was adjusted to 0.9 per cent by addition of citric acid. The must was supplemented with 0.1 per cent di-ammonium hydrogen phosphate (DAHP) and 50 ppm sodium benzoate. This procedure was kept common for all the sets of treatments. After which three types of *must* were exposed to heat treatment (thermovinification) of about 82°C for two minutes. The *must* was normalized to ambient condition after which the yeast culture was added to all the treatments at the rate of 0.2% and kept for aerobic fermentation for 24 hours. The clear wine samples were siphoned off, filtered and pasteurized at 82°C for 5 minutes sealed in clean pre sterilized bottles, which were pasteurized at 60°C for 15 minutes. The bottles were stored at 13±1°C for maturation. These bottles were used for chemical analysis and organoleptic evaluation at initial, three and six months of ageing.

Sensory evaluation

All wine samples were evaluated by a semi-trained panel which consisted of 6 members. Each sample was coded prior to testing and placed in a random manner. The different samples were placed along with glass of water (to rinse the mouth) in the laboratory and panelists were instructed to evaluate each sample by tasting as per the score card as per the standard procedure (Joshi, 2006). The wine with score range of 9 to 12 out of 20 was regarded as commercially acceptable wine, those with a score range of 13 to 16 as standard wine and with a score range above 17 out of 20 were regarded as superior quality wine as per the rating given by Ough and Baker (1961). The wines with score below 9 were rated as unacceptable.

Analysis

Alcohol content of *jamun* wine was measured by using ebulliometer, an instrument used for determination of the alcohol content of water-alcohol solutions by determining the difference in boiling points between the pure water and the solution. Based on the comparison, the percentage alcohol (v/v) was determined by referring to tables or using the calculating dial.

Statistical analysis

The data recorded on the physico-chemical and organoleptic parameters were subjected to statistical analysis in CRD using ICAR research complex for Goa, (Web Agri Stat Package 2). Interpretation of the data was carried out in accordance with Panse and Sukhatme (1985). The level of significance used in 'F' test was p=0.05. Critical difference values were calculated wherever 'F' test was significant.

Results and Discussion

The results obtained on various physic-chemical characteristics of the wines are presented in Table 1

Table 1: Influence of thermovinification and must type on total soluble solids and pH of *jamun* wine during ageing

Treatments	Total soluble solids (°Brix)			pH		
	Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6
T_1: Juice	5.83^{c}	4.83^{d}	4.00^{d}	2.82^{e}	2.67^{d}	2.55^{c}
T_2: Pulp + Skin	6.00^{c}	5.17^{d}	4.33^{d}	2.83^{e}	2.70^{d}	2.56^{c}
T_3: Pulp + Skin +Seed	5.50^{c}	4.33^{d}	3.50^{d}	2.91^{e}	2.70^{d}	2.60^{c}
T_4: Thermovinification* – Juice	8.67^{ab}	7.50^{bc}	6.50^{bc}	3.19^{bc}	3.10^{b}	2.94^{b}
T_5: Thermovinification* – Pulp + Skin	11.00^{a}	10.00^{a}	9.00^{a}	3.74^{a}	3.62^{a}	3.43^{a}
T_6: Thermovinification*–Pulp+ Skin + Seed	9.67^{a}	8.83^{ab}	7.83^{ab}	3.62^{a}	3.49^{a}	3.32^{a}
Mean	**7.78**	**6.77**	**5.86**	**3.19**	**3.05**	**2.90**
S. Em±	**0.84**	**0.75**	**0.70**	**0.04**	**0.04**	**0.06**
CD at 5%	**2.48**	**2.23**	**2.06**	**0.13**	**0.13**	**0.18**

* heat treatment of must at 82°C for 2 minutes, CD = Critical Difference, NS = Non-significant

Different alphabets within the column are significantly different (p=0.05) according to Duncan's Multiple Range Test

Table 2: Influence of thermovinification and must type on alcohol content and titratable acidity of *jamun* wine during ageing

Treatments	Alcohol content (%)			Titratable acidity (%)		
	Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6
T_1: Juice	10.01	10.59^{c}	11.09^{f}	0.44^{c}	0.48^{d}	0.46^{c}
T_2: Pulp + Skin	10.06	10.86^{b}	11.26^{e}	0.42^{c}	0.47^{d}	0.45^{c}
T_3: Pulp + Skin +Seed	10.08	10.94^{b}	11.36^{d}	0.45^{c}	0.49^{d}	0.47^{c}
T_4: Thermovinification* – Juice	10.14	11.21^{a}	11.73^{c}	0.55^{b}	0.59^{bc}	0.57^{b}
T_5: Thermovinification* – Pulp + Skin	10.57	11.23^{a}	12.05^{a}	0.70^{a}	0.74^{a}	0.72^{a}
T_6: Thermovinification*–Pulp+ Skin + Seed	10.53	11.18^{a}	11.97^{ab}	0.66^{a}	0.69^{a}	0.67^{a}
Mean	**10.23**	**11.00**	**11.58**	**0.54**	**0.58**	**0.56**
S. Em±	**NS**	**0.06**	**0.04**	**0.02**	**0.02**	**0.02**
CD at 5%	**NS**	**0.18**	**0.14**	**0.05**	**0.05**	0.06

* heat treatment of must at 82°C for 2 minutes, CD and NS as Table 1

Different alphabets within the column are significantly different (p=0.05) according to Duncan's Multiple Range Test

and 3. The treatments T_5 (Thermovinification – Pulp + Skin) and T_6 (Thermovinification – Pulp + Skin + Seed) recorded significantly highest TSS, titratable acidity in fresh, at 3 and 6 months of ageing, whereas, the treatment T_1 (Juice) recorded the lowest TSS during ageing period. The treatments T_5 (Thermovinification – Pulp + Skin) and T_6 (Thermovinification – Pulp + Skin + Seed) recorded significantly highest pH in fresh, 3 and 6 months of ageing. Whereas, the treatment T_1 (Juice) recorded lowest pH during ageing period. The pH of fresh jamun fruit wine showed a slight decrease in all the treatments.

The TSS after fermentation showed significant variation among the treatments. This does mean that the change that takes place during the fermentation is dependent on *must* factors controlling the process of fermentation. This trend may also be due to fermentation of *musts* by using heat maceration technique (thermovinification) which resulted in different physico-chemical qualities that may favour or un-favour the sugar utilization by the fermentative yeast. The reduction in the TSS during ageing of wines is expected to be due to the slower yeast activity that may still prevail during ageing which converts sugars into alcohol (Owen *et al*., 2004).

The variations in the titratable acidity level due to treatment differences have been accounted in karonda wine (Bhajipale *et al*., 1998), mahua wine (Yadav *et al*., 2009), mango wine (Thippesha *et al*., 1997) and strawberry wine (Somesh *et al*., 2009).

Alcohol percentage of *jamun* wine was analysed from soon after fermentation and at three and six months after ageing in cold (13±1°C) storage and the results are depicted in table 2. In general, alcohol content in wine was increased as the ageing progressed in all the treatments. The alcohol content of jamun fruit wine was found maximum in the treatment T_6 (Thermovinification – Pulp + Skin) in fresh, 3 and 6 months after ageing, whereas, the minimum alcohol content was recorded in the treatment T_1 (10.01%) followed by the treatments T_2 and T_3.

It can be attributed to the higher amount of available sugars and the favourable must conditions for fermentation. During ageing, the alcohol level increased slightly in all the treatments. The variation in alcohol production depends on several factors such as initial sugar content, initial pH, and amount of by product formed, temperature maintained during fermentation, amount of quality sugar and alcohol tolerance limits of the yeasts (Thippesha *et al.* 1997).

Significantly highest phenol content of 415.49 and 458.51 mg/L was recorded in T_4 (Thermovinification – Juice) at 3 and 6 months after ageing. While, treatment T_1 (313.25 mg/L) recorded lowest phenol.

Table 3: Influence of thermovinification and must type on phenol content and total score of *jamun* wine during ageing

Treatments	Phenols (mg/L)			Total score (out of 20)		
	Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6
T_1: Juice	287.01^{e}	304.55^{c}	313.25^{f}	9.01^{f}	9.97^{f}	11.09^{f}
T_2: Pulp + Skin	300.60^{d}	358.29^{b}	327.50^{e}	9.80^{e}	10.49^{e}	11.61^{e}
T_3: Pulp + Skin +Seed	340.52^{b}	413.94^{a}	402.33^{d}	10.69^{d}	11.46^{d}	12.30^{d}
T_4: Thermovinification* – Juice	223.33^{f}	415.49^{a}	458.51^{a}	12.53^{c}	13.09^{c}	13.67^{c}
T_5: Thermovinification* – Pulp + Skin	368.11^{a}	415.29^{a}	436.87^{c}	16.35^{a}	16.77^{a}	17.40^{a}
T_6: Thermovinification*–Pulp+ Skin + Seed	307.71^{c}	364.48^{b}	453.26^{b}	16.10^{b}	16.44^{b}	17.01^{b}
Mean	**304.55**	**378.67**	**398.62**	**12.41**	**13.04**	**13.85**
S. Em±	**9.62**	**13.07**	**3.26**	**0.09**	**0.11**	**0.11**
CD at 5%	**28.6**	**38.84**	**9.69**	**0.26**	**0.31**	**0.32**

Increasing of phenolic compounds trend might be due to maceration with heat before fermentation leading to release of polyphenols during ageing period. However, the phenol content in wine is highly dependent on vinification techniques. During maceration has an inhibitory influence on oxidative enzymes, enabling maceration process to be performed without oxidation of polyphenols. Therefore, their extraction from berry skins is expected to be higher (Radeka *et al.* 2008).

The *jamun* fruit wine sensory for total score of wine as influenced by thermovinification showed significant differences as existing in Table 2. The treatment T_5 (Thermovinification – Pulp + Skin) recorded significantly highest score for overall acceptability during ageing which was on par with treatment T_6. The lower score for total score was recorded in the treatment T_1 followed by treatment T_2.

The decrease in pH of wine in all treatments might be due to production of large amounts of acids. Wines vary considerably in pH, with values below 3.1 being perceived as sour and those above 3.7 being perceived as flat (Jackson, 1994). However, during ageing all the treatments have recorded decrease in the pH. Similar observations of decrease in pH after fermentation and during ageing have been recorded by Shankar *et al.* (2004) in guava wine.

Thermovinification of must have resulted in the better organoleptic qualities in the wine and may have been retained during the ageing. Similarly, Somesh *et al*. (2009) concluded that the thermovinified young strawberry wines were found to be less harsh and astringent, and had better sensory attributes.

Conclusion

The *jamun* wine prepared from thermovinified must containing Pulp and Skin (T_5) was found to be superior with respect to biochemical and sensory qualities.

References

Bhajipale, B.J., Gupta, D.N. and Mehta, 1998. Effect of different stages of ripening of fruit of karonda wine. *Indian Food Packer*, **54**: 27-30.

Jackson, R.S. 1994. Wine Science: Principles and Application, Academic Press, pp. 236, 191, 592.

Joshi, S.G. 2001. *Medicinal Plants*. New Delhi: Oxford and IBH Publishing Co.

Joshi, V.K, Sharma, R., Giridhar, A. and Absol, Ghanshyam 2012. Effect of dilution and maturation on physic-chemical and sensory quality of *Jamun*, *Indian J. Natural Products Radiance*, **3**(2): 222-227.

Kirtikar, K.R. and Basu, B.D. 1975. Indian Medicinal Plants. Vol. 2, Mis Periodical Export, New Delhi.

Lowe, E.J., Oey, A. and Turner, T.M. 1976. Gasquet Thermovinification system perspective after two years operation. *Am. J. Enol. Vitic.* **27**(3): 130-133.

Ough, C.S. and Baker, G.A. 1961. Small panel sensory evaluations of wines by Scoring. *Hilgardia,* **30**(19): 587-619.

Owen, S.G., Majeed, M., Lawrence, A.W. and Linda, D.W. 2004, Effects of pectolytic enzymes and anti oxidants on the quality of dry wines made from pineapple (*Ananas comosus*. L. Merr) peel. *Food Agric, and Envi,* **2**(2): 135-142.

Panse, V.S. and Sukhatme, P.V. 1985. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi, 152-155.

Radeka, S., Stanka, H., Dordano, P., Igor, L. and Barbara, S. 2008. Effect of maceration on wine aroma compounds, Food Technol. *Biotechnol.* **46**(1): 86–92.

Ribereau-Gayon, P., Dubourdieu, D, Doneche, B. and Lonvaud, A. 2000, Handbook of Enology. Vol. 1 and 2. The Microbiology of Wine and Vinifications, John Wiley and Sons Ltd., England, pp. 255-257.

Sacchi, K., Linda, B. and Douglas, A. 2005. A review of the effect of winemaking techniques on phenolic extraction in red wines. *Am. J. Enol. Vitic.*, **56**(3): 197-206.

Shankar, S., Dilip, J. and Narayana, Y. 2004. Changes in chemical composition of guava wine during storage. *Indian Food Packer*, **12**: 56-58.

Somesh, S., Joshi, V.K. and Ghanshyam, A. 2009. An overview on strawberry wine production technology, Composition, maturation and quality evaluation. *Natural Product Radiance*, **8**(4): 356-365.

Thippesha, D., Chikkasubbanna, V. and Jayaprasad, K.V. 1997. Evaluation of mango (*Mangifera indica* L.) varieties for wine making. Beverage and Food World, pp. 26-29.

Yadav, P., Garage, N. and Diwedi, D.H. 2009, Standardization of pre-treatment conditions for mahua wine preparation. *J. Ecofriendly Agric.*, **4**(1): 88-92.

Zimmer, A., Joslin, W.S., Lyon, M.L., Meier, J. and Waterhouse, A.L. 2002. Maceration variables affecting phenolic composition in commercial-scale Cabernet Sauvignon winemaking trails. *Am. J. Enol. Vitic.* **53**(2): 93-98.