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Impact of Vinification Process on Colour Attributes of Jamun (*Syzigium cuminii* L.) Wine

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ABSTRACT

An investigation was carried out to know the effect of vinification method on quality of jamun wine. Colour in food is usually due to the presence of natural pigments like anthocyanins, carotenoids or chlorophyll. The variation in the colour of a system varies with changes in concentration of some of the components that form the basis of colorimetric analysis. The maceration techniques viz., cold soaking and thermovinification were tried on different must like juice, pulp with skin and pulp+skin+seed. In thermovinification of jamun mash the colour extraction process is largely a consequence of the heat process. The mean values of lightness (L) and yellowness (b*) decreased with increasing storage period whereas, redness (a*) values showed an increasing trend in jamun wine. Significantly maximum a* value and C^o value was observed in treatment T_9 (Thermovinification - pulp+skin+seed) six months after storage, whereas, maximum h^o was observed in treatment T_8. The light colour of the wine may be due to absence of skin and seed in the must during fermentation hence there was lesser extraction of colouring pigments and phenols which may impart dark colour to the wine.*

Key words: *Vinification. Jamun wine, cold soaking, Thermovinification, Storage*

INTRODUCTION

The jamun (*Syzygium cumini* L.) is an important unexploited indigenous fruit of the tropics, belonging to the family Myrtaceae. Jamun fruits are universally accepted to be very good for medicinal purposes especially for curing diabetes because of its effect on the pancreas[5]. Jamun fruits possess good taste and pleasant flavour. The attractive colour of the pulp is due to the presence of anthocyanin pigment and is mostly used for dessert purpose. The fruits are also used for preparation of delicious beverages, jellies, jam, squash, wine, vinegar and pickles[6]. The ripe jamun fruits are used for making preserves, squashes and jellies. Since the jamun fruits are highly perishable, they cannot be transported over long distances. Hence, there is a need to find out ways and means of processing the fruits into various non alcoholic and alcoholic beverages preferably near the site of production.

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Generally, fruits are crushed and used for wine preparation. Jamun seeds along with the pulp also have medicinal properties[5]. Hence, a novel method to utilize the whole fruits for the preparation of wine and different maceration techniques like, cold soaking was thermovinification attempted to maximize quality and health benefits.

MATERIALS AND METHODS

The present investigation on influence of cold soaking and thermovinification on quality of jamun wine was carried out during the period of 2012 - 2014.

The must (1kg) was inoculated with starter culture at 0.2 per cent and then kept for fermentation at room temperature. The start of fermentation was indicated by evolution of gas bubbles in the water through the rubber tubing. During active fermentation, foam formation was observed in the fermentation flasks. The end of fermentation was indicated by the cessation of foaming and bubbling and even from constant TSS recorded by the must during fermentation. The clear wine samples were siphoned off, filtered and pasteurized at 60 ^{0}C for 15 minutes. The bottles were stored at 13±1 ^{0}C temperatures for maturation. These bottles were used for analysis at initial, three and six months of ageing.

Treatment details

Treatments	**Fermentation with**
T_1:Control	Juice
T_2:Control	Pulp + Skin
T_3:Control	Pulp + Skin + Seed
T_4:Cold soak at 8^{o}C for 5 days	Juice
T_5:Cold soak at 8^{o}C for 5 days	Pulp + Skin
T_6:Cold soak at 8^{o}C for 5 days	Pulp + Skin + Seed
T_7:Thermovinification at 82^{o}C for 2 minutes	Juice
T_8:Thermovinification at 82^{o}C for 2 minutes	Pulp + Skin
T_9:Thermovinification at 82^{o}C for 2 minutes	Pulp + Skin + Seed

Note: In all the treatments *i.e.* Juice, Pulp + Skin, Pulp + Skin + Seed TSS and pH were adjusted to 24°Brix and 3.2, respectively.

Instrumental colour (*L* a* b* C^{o} and h^{o}*) analysis

The colour of the samples was measured using a Lovibond colour meter (Lovibond RT300, Portable spectrophotometer, The Tintometer Limited, Salisbury, UK) fitted with 8mm diameter aperture, D65 illuminant and10^{0} observer. The instrument was calibrated using the black and white tiles provided. Colour was expressed in Lovibond units *L** (Lightness/darkness), *a** (redness/greenness), *b** (yellowness/blueness), ***C^{o}*** (Chroma) and *h^{o}* (Hue). Samples of jamun wine were directly placed under the aperture of the colour meter. Three measurements were performed for each sample in three replicates and values were averaged.

RESULTS AND DISCUSSION

The mean values of lightness (*L**) and yellowness (*b**) decreased with increasing storage period whereas, redness (*a**) values showed an increasing trend in jamun wine. Significantly maximum *L** value of 4.81 was observed in treatment T_3 (pulp+skin+seed) in fresh wine. It might be due to fermentation without any maceration technique leading to slow release of polyphenol pigments present on fruit skin and seed. While, treatment T_7 (Thermovinification +juice) recorded maximum *L** values of 3.11 and 0.67 at three and six months of ageing, respectively which might be due to no contact with skin and seed during fermentation resulting in lower extraction of colouring pigments which makes resulting wine more lighter even if the *must* receive thrmovinification treatment. However, minimum *L** value of 1.57 was observed in T_5 (Cold soak+plup+skin) at initial, T_8 (Thermovinification+pulp+skin) (1.71) at 3 MAS and T_1 (juice) (0.14) at 6 months after storage (Table 1). Lower *L** value of the wine indicates the darkness. Similarly, fermenting wines from the juice/skin mixing trial, wines displayed the darkest (lower *L**), most saturated (higher *C**) colour with higher *a** values, attributed to their high polymeric (pH shift) and flavonol (co-pigment) contents[2].

Significantly maximum *a** values of 2.24, 2.43 and 3.72 was observed in treatment T_9 (Thermovinification - pulp+skin+seed) at 0, 3 and 6 months after storage, respectively. Reason for maximum *a** values in this treatment is the release of polyphenols present on skin and seeds into juice during heat maceration which imparting redness to jamun wine. In the present study, *a** values increased with increasing storage period it might be a due to release of polyphenols as observed during storage. The relative increase in *a** which in turn resulted in lower *L** values in wines is attributed to the increase in vitisin, a content of the wines[3].

Significantly maximum *b** value was observed in treatment T_7 (0.09) in freshly prepared wine. However, minimum *b** value was observed in T_2 (-0.80) (Table 1). Highest value of *b** indicate that yellowness, contrary to lowest means towards blue.

Significantly maximum *C** value was observed in treatment T_9 (1.28, 2.46 and 4.28, respectively) at 0, 3 and 6 months after storage. However, minimum *C** value was observed in T_1 (1.05) at six months after storage. Highest value of *C** indicate that saturation or vividness in jamun wine which may be resulted from the better extraction of pigments and polyphenols during the heat maceration of must.

Significantly maximum h^o was observed in treatment T_8 (370.88) in freshly prepared wine. However, minimum h^o was observed in T_1 (10.81) (Table 3). Similarly, pre-fermentation maceration resulted in no changes in wine hue (h^o) for any of the vintages, although previously pre-fermentation maceration at 4 or 10°C resulted in changes in wine hue towards purple-red for Pinot noir wines[4,7]. On the hue-circle, 360^o is identical to 0^o; hence redness is also denoted by 360^o. Values decreasing from 360^o to 270^o thus represent increasing blueness[1].

Table 1: Influence of cold soaking, thermovinification and *must* type on *L, *a** and *b** values of jamun wine during ageing**

Treatments #	*L** value			*a** value			*b** value		
	Ageing in months								
	Initial	3	6	Initial	3	6	Initial	3	6
T_1	4.77^{a}	2.28^{cd}	0.14^{d}	0.23^{f}	0.45^{f}	1.01^{e}	0.05^{a}	0.12^{a}	0.29^{a}
T_2	4.66^{a}	2.50^{bcd}	0.27^{cd}	2.06^{b}	2.34^{ab}	0.98^{e}	-0.80^{g}	-0.68^{d}	-0.46^{b}
T_3	4.81^{a}	2.58^{bc}	0.32^{c}	2.09^{b}	2.03^{bc}	1.19^{d}	-0.53^{f}	-0.59^{cd}	-1.27^{d}
T_4	3.89^{b}	2.87^{ab}	0.97^{a}	0.41^{e}	0.69^{ef}	1.19^{d}	-0.02^{b}	-0.05^{ab}	0.30^{a}
T_5	1.57^{e}	2.34^{cd}	0.72^{b}	1.03^{c}	1.53^{d}	3.41^{b}	-0.22^{d}	-0.44^{cd}	-0.54^{bc}
T_6	3.77^{bc}	1.90^{ef}	0.74^{b}	0.91^{d}	1.58^{d}	3.62^{a}	-0.41^{e}	-0.32^{abcd}	-0.33^{b}
T_7	4.64^{a}	3.11^{a}	0.88^{a}	0.41^{e}	0.93^{e}	1.29^{d}	0.09^{a}	0.06^{ab}	0.18^{a}
T_8	2.71^{d}	1.71^{f}	0.34^{c}	1.12^{c}	1.78^{cd}	2.23^{c}	-0.08^{c}	-0.23^{abc}	-0.87^{c}
T_9	3.39^{c}	2.21^{de}	0.88^{a}	2.24^{a}	2.43^{a}	3.72^{a}	-0.23^{d}	-0.33^{bcd}	-0.68^{bc}
Mean	**3.80**	**2.39**	**0.58**	**1.17**	**1.53**	**2.07**	**-0.24**	**-0.26**	**-0.37**
S. Em±	0.13	0.12	0.05	0.04	0.11	0.05	0.01	0.14	0.12
CD at 5%	0.41	0.37	0.14	0.12	0.35	0.15	0.04	0.44	0.37

#Refer methodology for treatment details

*L** = Dark - Light, *a** = Green – Red and *b** = Blue –yellow

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

Table 2: Influence of cold soaking, thermovinification and *must* type on C* and h^o of jamun wine during ageing

Treatments #	*C** value			h^o		
	Ageing in months					
	Initial	3	6	Initial	3	6
T_1	0.24^{b}	0.48^{e}	1.01^{d}	10.81^{e}	13.43^{bc}	34.94^{c}
T_2	1.24^{a}	2.46^{a}	3.67^{b}	351.58^{d}	345.12^{a}	353.84^{a}
T_3	1.06^{a}	2.13^{ab}	3.61^{b}	346.25^{d}	343.90^{a}	346.73^{a}
T_4	0.14^{b}	0.70^{de}	1.05^{d}	11.08^{e}	3.76^{c}	15.87^{c}
T_5	0.95^{a}	1.58^{c}	1.43^{d}	359.94^{bc}	344.21^{a}	332.29^{ab}
T_6	1.19^{a}	1.62^{c}	2.43^{c}	352.90^{cd}	348.71^{a}	344.48^{a}
T_7	0.45^{b}	0.98^{d}	1.43^{d}	13.31^{e}	19.93^{b}	7.74^{c}
T_8	1.18^{a}	1.82^{bc}	2.77^{c}	370.88^{a}	352.44^{a}	230.25^{b}
T_9	1.28^{a}	2.46^{a}	4.28^{a}	365.02^{ab}	352.11^{a}	341.30^{ab}
Mean	**0.86**	**1.58**	**2.41**	**242.42**	**235.96**	**223.05**
S. Em±	0.12	0.14	0.17	2.75	3.76	38.12
CD at 5%	0.36	0.42	0.53	8.18	11.17	113.26

#Refer methodology for treatment details
*C** = Chroma, h^o= hue angle
Different alphabets within the column are significantly different (p=0.05) according to Duncan's Multiple Range Test

CONCLUSION

In thermovinification of jamun wine the colour extraction process is largely a consequence of the heat process. By adopting these new vinification techniques in wine making helps to extract large amount of pigments leads to improvement in wine colur.

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