Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2904

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (2):** 976-980 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Influence of Pectinase Enzymatic Maceration on Organoleptic Parametres of Jamun (*Syzigium cuminii* L.) Wine

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Received: 14.04.2017 | Revised: 25.04.2017 | Accepted: 26.04.2017

ABSTRACT

The present investigation on pectinase enzymatic maceration was carried out to know the sensory qualities of Jamun wine was evaluated. Jamun wine was prepared from three different must types viz., juice, pulp+skin and pulp+skin+seed. The must was macerated with 0.25 and 0.50 % of pectinase enzyme. The other must parameters viz., TSS and pH was adjusted to 24°B and 3.2, respectively. The physicochemical and sensory quality of the wine was recorded in fresh and at 3 months interval up to 6 months. Organoleptic evaluation for all the quality attributes like appearance, colour, aroma and bouquet, acidity, sweetness, body, flavour, astringency, overall quality and total score were showed significant differences. The overall acceptability was significantly higher (16.14, 16.64 and 17.41) in T_8 (0.50% Pectinase – Pulp + Skin) followed byT_6 (15.88, 16.51 and 17.36) at initial, three and six months after ageing. The treatment combination of 0.50 per cent pectinase with must of pulp + skin (T_8) is rated as the best performing with respect to organoleptic quality attributes of wine.

Key words: *Jamun, Pectinase, Maceration, Must and Sensory quality.*

INTRODUCTION

Pectic substances are prominent structural constituents of primary cell walls and middle lamella in non-woody plant tissues. Pectinases are a group of enzymes that contribute to the degradation of pectin by various mechanisms. In nature, pectinases are important for plants as they help in cell wall extension and fruit ripening. They have a significant role in maintaining ecological balance by causing decomposition and recycling of plant materials. The industrial applications of pectiolytic enzymes include fruit juice clarification, tissue maceration, wine clarification, plant fibre processing, oil extraction, coffee and tea fermentation etc.

Enzymatic maceration contains high concentrations of both glycosidase and β-glucosidase acting on the first and second phase of enzyme mechanism, respectively able to release the aromatic constituents in finished grape wine[3].

Cite this article: Holegar, H.R., Suresha, G. J., Jagadeesh, S.L. and Vandana, A.K., Influence of Pectinase Enzymatic Maceration on Organoleptic Parametres of Jamun (Syzigium cuminii L.) Wine, *Int. J. Pure App. Biosci.* **5(2):** 976-980 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2904

MATERIAL AND METHODS

The present investigation was carried out in the laboratory of Department of Post Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi, during the period 2012 - 2014. Jamun fruits were brought from the orchard of Kaitanal village located near Gokak city to conduct the experiment. Ripe and healthy fruits with different size were used for the experiments. Fruits 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. For enzymatic maceration, the three musts viz., juice, pulp + skin and pulp + skin + seed were ameliorated with 0.25 and 0.50 per cent pectinase for 12 hours.

Treatment details

Treatments	Fermentation with
T_1: Control	Juice
T_2: Control	Pulp + Skin
T_3: Control	Pulp + Skin + Seed
T_4: Pectinase at 0.25%	Juice
T_5: Pectinase at 0.25%	Pulp + Skin
T_6: Pectinase at 0.25%	Pulp + Skin + Seed
T_7: Pectinase at 0.50%	Juice
T_8: Pectinase at 0.50%	Pulp + Skin
T_9: Pectinase at 0.50%	Pulp + Skin + Seed

Note: For all the treatments juice was used as *must*. TSS, pH and aerobic fermentation were maintained at 24°B, 3.2 and one day, respectively.

Organoleptic evaluation of wine

The organoleptic evaluation of wine was carried out by scoring wines numerically on a 20 point score card under six categories of sensory quality characteristics viz., appearance, colour, aroma and bouquet, total acidity, sweetness, body, flavor, astringency and general quality. The wine samples along with grape wine as a reference check was served for sensory evaluation. The average values of the scores given by a panel of 6 judges have been reported. 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[7]. The wines with score below 9 were rated as unacceptable.

Development of score card

All wine samples were evaluated by a semi trained panel which consisted of 6 members. The evaluation was carried out using a twenty point scale[1] which was based mainly on the appearance, colour, aroma, sweetness and overall acceptability.

Score card

Name of the judge: Date:

Name of the code: Experiment No:

Parameters	Score range	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Appearance	0-2									
Colour	0-2									
Aroma & bouquae	0-4									
Acidity	0-2									
Sweetness	0-2									
Body	0-2									
Flavour	0-2									
Astringency	0-2									
Overall quality	0-2									
Total score	0-20									

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 significance.

RESULTS AND DISCUSSION

Organoleptic evaluation for all the quality attributes like appearance, colour, aroma and bouquet, acidity, sweetness, body, flavour, astringency, overall quality and total score were showed significant differences. Appearance, colour, aroma, taste and subtle taste factors such as flavour of wine constitute the quality[5,6,9] reported that aroma and taste of wines is very complex and depend on a number of factors such as cultivars, agricultural land, vinification practices, fermentation and maturation. The overall acceptability was significantly higher (16.14, 16.64 and 17.41) in T_8 (0.50% Pectinase – Pulp + Skin) followed by T_6 (15.88, 16.51 and 17.36) at initial, three and six months after ageing, respectively (Fig. 1). This may be attributed to the fact that higher the concentration of pectinase and also fermentation along with pulp and skin produced better quality wine and altered physico-chemical qualities of wine. The parameters *viz.* colour, appearance, body and astringency have shown significant differences under initial, three and six months of ageing. Aroma and bouquet was found to be better in the treatment T_8 (0.50% Pectinase – Pulp + Skin) during ageing (Table 1). Flavour was also found to be better in T_8 (0.50% Pectinase – Pulp + Skin) during the study (Table 2). It could be attributed to the possession of better biochemical characteristics such as the level of alcohol, different kinds of sugars, titratable acidity, possibly lower volatile acidity, optimum quantity of phenolic substances in the treatments that received more scores. The wine prepared with *must* of juice, 0.25% Pectinase – Pulp + Skin + Seed resulted more astringent 1.58, 1.65 and 1.74, respectively initial, after three and six months of ageing. This may be due to the presence of more tannin. Lower phenolic compounds account for that flavor while larger polyphenols constitute to bitterness and astringency. The wine aged for six months was found to be better organoleptically as compared to three months old aged wine. This may be due to complexicity of tannins and protein polymerization taking place during maturation which results in smoothing of taste[1,6]. Oxygen and carbon dioxide can affect the fermentation changes[4]. Thus, the best performing treatments might have provided proper aerobic and anaerobic conditions to yield wines with better organoleptic qualities.

Table 1: Influence of pectinase and *must* type on sensory scores for appearance, colour and aroma and bouquet of jamun wine during ageing

Treatments #	Appearance (0-2)			Colour (0-2)			Aroma and Bouquet (0-4)		
	Ageing in months			Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6	Initial	3	6
T_1	0.94^{ef}	0.98^{d}	1.19^{e}	0.92^{f}	1.01^{de}	1.13^{de}	2.30^{c}	2.37^{bc}	2.60^{cd}
T_2	1.07^{cd}	1.11^{c}	1.26^{cd}	0.99^{e}	1.05^{d}	1.16^{d}	2.34^{c}	2.38^{bc}	2.56^{d}
T_3	0.88^{f}	0.96^{d}	1.18^{e}	0.89^{f}	0.98^{e}	1.11^{e}	2.10^{d}	2.19^{bc}	2.38^{e}
T_4	1.02^{de}	1.13^{c}	1.21^{de}	1.10^{d}	1.18^{c}	1.27^{d}	2.45^{c}	2.58^{ab}	2.69^{c}
T_5	1.11^{bcd}	1.18^{bc}	1.27^{c}	1.19^{b}	1.26^{b}	1.32^{b}	2.71^{b}	2.84^{ab}	2.94^{b}
T_6	1.18^{bc}	1.71^{a}	1.78^{a}	1.57^{a}	1.61^{a}	1.78^{a}	3.11^{a}	3.29^{a}	3.47^{a}
T_7	1.19^{b}	1.23^{b}	1.3^{c}	1.15^{c}	1.20^{c}	1.30^{bc}	2.70^{b}	2.82^{ab}	3.03^{b}
T_8	1.72^{a}	1.75^{a}	1.81^{a}	1.59^{a}	1.64^{a}	1.77^{a}	3.21^{a}	3.30^{a}	3.51^{a}
T_9	1.66^{a}	1.22^{b}	1.38^{b}	1.14^{c}	1.21^{c}	1.30^{bc}	2.45^{c}	1.66^{c}	2.70^{c}
Mean	**1.20**	**1.24**	**1.38**	**1.17**	**1.24**	**1.35**	**2.60**	**2.60**	**2.88**
S. Em±	**0.03**	**0.03**	**0.02**	**0.01**	**0.01**	**0.02**	**0.05**	**0.28**	**0.03**
CD 5%	**0.12**	**0.09**	**0.06**	**0.04**	**0.04**	**0.05**	**0.15**	**0.84**	**0.12**

Refer methodology for treatment details

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

Table 2: Influence of pectinase and *must* type on sensory scores for acidity, sweetness and body of jamun wine during ageing

Treatments #	Acidity (0-2)			Sweetness (0-2)			Body (0-2)		
	Ageing in months			Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6	Initial	3	6
T_1	0.93^{d}	0.99^{d}	1.03^{d}	0.95^{de}	1.02^{e}	1.07^{e}	1.07^{d}	1.14^{d}	1.28^{d}
T_2	1.02^{c}	1.14^{c}	1.22^{c}	1.01^{d}	1.12^{d}	1.17^{d}	1.25^{c}	1.30^{c}	1.31^{cd}
T_3	0.92^{d}	0.94^{d}	1.00^{d}	0.87^{e}	0.95^{f}	1.02^{e}	0.93^{e}	1.08^{d}	1.19^{e}
T_4	1.07^{c}	1.18^{bc}	1.23^{c}	1.11^{c}	1.25^{c}	1.31^{c}	1.35^{b}	1.40^{b}	1.45^{bc}
T_5	1.15^{b}	1.22^{bc}	1.28^{bc}	1.16^{bc}	1.27^{bc}	1.32^{bc}	1.33^{bc}	1.37^{bc}	1.47^{b}
T_6	1.68^{a}	1.73^{a}	1.78^{a}	1.52^{a}	1.59^{a}	1.70^{a}	1.57^{a}	1.64^{a}	1.68^{a}
T_7	1.21^{b}	1.27^{b}	1.33^{b}	1.21^{b}	1.26^{bc}	1.34^{bc}	1.32^{bc}	1.35^{bc}	1.38^{c}
T_8	1.70^{a}	1.74^{a}	1.79^{a}	1.56^{a}	1.60^{a}	1.70^{a}	1.58^{a}	1.68^{a}	1.72^{a}
T_9	1.16^{b}	1.21^{bc}	1.28^{bc}	1.21^{b}	1.30^{b}	1.37^{b}	1.32^{bc}	1.36^{bc}	1.39^{c}
Mean	**1.17**	**1.24**	**1.35**	**1.18**	**1.26**	**1.33**	**1.30**	**1.37**	**1.43**
S. Em±	**0.08**	**0.08**	**0.09**	**0.02**	**0.01**	**0.02**	**0.03**	**0.02**	**0.02**
CD 5%	**1.20**	**1.27**	**1.32**	**0.09**	**0.04**	**0.05**	**0.09**	**0.07**	**0.07**

Refer methodology for treatment details

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

Table 3: Influence of pectinase and *must* type on sensory scores for flavour, astringency and general quality of jamun wine during ageing

Treatments #	Flavour (0-2)			Astringency (0-2)			General quality (0-2)		
	Ageing in months			Ageing in months			Ageing in months		
	Initial	3	6	Initial	3	6	Initial	3	6
T_1	0.93^{e}	0.96^{e}	1.05^{d}	0.81^{e}	0.90^{d}	1.08^{e}	0.96^{e}	1.11^{e}	1.19^{e}
T_2	1.01^{d}	1.14^{d}	1.19^{c}	0.95^{d}	1.03^{c}	1.17^{d}	1.05^{d}	1.19^{d}	1.27^{d}
T_3	0.81^{f}	0.91^{e}	1.01^{d}	0.77^{e}	0.88^{d}	1.05^{e}	0.84^{f}	1.08^{e}	1.15^{e}
T_4	1.22^{c}	1.27^{c}	1.33^{b}	1.28^{c}	1.33^{b}	1.38^{c}	1.24^{c}	1.28^{c}	1.36^{c}
T_5	1.27^{bc}	1.31^{bc}	1.35^{b}	1.31^{bc}	1.36^{b}	1.42^{bc}	1.27^{bc}	1.35^{b}	1.41^{bc}
T_6	1.59^{b}	1.64^{a}	1.68^{a}	1.58^{a}	1.65^{a}	1.74^{a}	1.60^{a}	1.65^{a}	1.74^{a}
T_7	1.30^{b}	1.33^{b}	1.35^{b}	1.35^{b}	1.40^{b}	1.46^{b}	1.31^{b}	1.36^{b}	1.44^{b}
T_8	1.61^{a}	1.65^{a}	1.68^{a}	1.56^{a}	1.62^{a}	1.71^{a}	1.60^{a}	1.66^{a}	1.72^{a}
T_9	1.28^{b}	1.31^{bc}	1.34^{b}	1.28^{bc}	1.34^{b}	1.42^{bc}	1.30^{bc}	1.35^{b}	1.40^{bc}
Mean	**1.22**	**1.28**	**1.33**	**1.21**	**1.28**	**1.38**	**1.24**	**1.34**	**1.41**
S. Em±	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
CD 5%	**0.05**	**0.05**	**0.06**	**0.07**	**0.07**	**0.06**	**0.07**	**0.06**	**0.06**

Refer methodology for treatment details

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

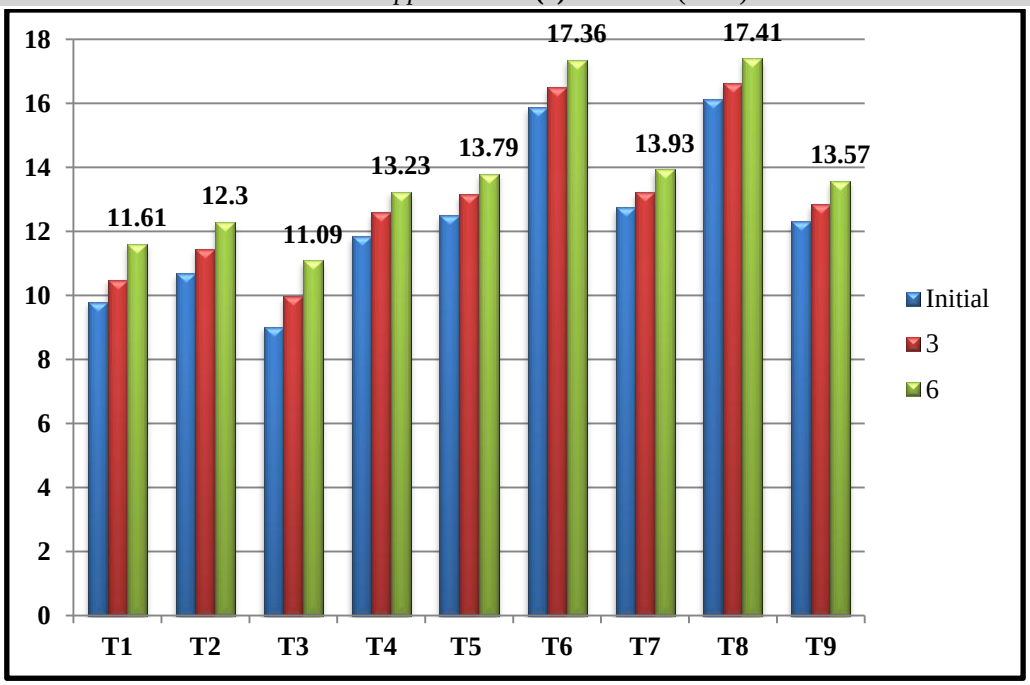

Fig. 1: Influence of pectinase and *must* type on overall acceptability (total 20 score) of jamun wine during ageing

CONCLUSION

The treatment combination of 0.50 per cent pectinase with *must* of pulp + skin (T_8) is rated as the best performing with respect to organoleptic quality attributes of wine. In conclusion, the general quality of jamun wine can be improved by adopting novel maceration techniques and there is a great scope for utilization of jamun fruits for wine making to reduce the post-harvest loss.

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