Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; SP6: 241-244

Kruthika MH
Department of Horticulture, College of Agriculture, Vijayapura, UAS, Dharwad, Karnataka, India

Babu P
Department of Horticulture, College of Agriculture, Hanumanamatti, UAS, Dharwad, Karnataka, India

Correspondence
Kruthika MH
Department of Horticulture, College of Agriculture, Vijayapura, UAS, Dharwad, Karnataka, India

International Web-Conference
On
New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development
(21-22 June, 2020)

Sensory evaluation of pomegranate fruit wines

Kruthika MH and Babu P

Abstract
An appropriate oenological process involves the screening of large numbers of natural yeast isolates to select desirable variants within a population of yeast strains. Therefore, yeast strains collected from different institutions and vineries were evaluated to study their influence on sensory quality of pomegranate wine. Among the eight yeast strains, *Saccharomyces cerevisiae* var. *ellipsoideus* with highest sensory score for body (1.69), flavor (1.63) and total score (16.46), considered to be the best viable strain for making pomegranate wine. Further, pomegranate juice was blended with grape, strawberry, plum and watermelon fruit juices in 75:25 and 50:50 ratios to improve various characteristics of wine quality. Wine prepared from blending pomegranate and plum in 75:25 ratios scored maximum for appearance (1.89) and overall quality (3.78) followed by pomegranate and plum in equal proportion. However, the wine samples of pomegranate with strawberry in 50:50 ratios were most liked by the sensory panel for its pleasant flavour.

Keywords: Yeast strains, Pomegranate fruit wine, Blending, Sensory evaluation.

Introduction
Pomegranate (*Punica granatum* L.) commonly known as 'Anar' belongs to family Punicaceae is native to the Middle East probably Iran. This nutrient dense antioxidant rich fruit has been well-regarded as a symbol of health, fertility and eternal life. The pomegranate juice having considerable health promoting properties like antimicrobial, antiviral, anticancer, antioxidant and antimutagenic effects is a well known energetic health drink [5]. It is one of the richest sources of riboflavin [14]. Pomegranate juice is rich in antioxidant phenolics and vitamins and contains good amount of sugar, hence can produce good quality wine as convert sugar into alcohol and gives good colour, aroma, flavor and appearance.
Fermentation is a viable technique in the development of new products with improved physicochemical and sensory qualities, especially nutritional and flavor components [6]. Generally, yeasts are the major contributor for modifying aroma, flavor, mouth-feel, color and chemical complexity. Selection of yeast strain during wine production is a crucial step because it can have greater influence on volatile and non-volatile components of the end product [3]. In fruit processing industry blending is an art to develop different colours, aroma, astringency, body, taste to suit the requirements. Blending is generally used to increase the complexity of the wine or enhance its aroma and flavor. It is an useful technique to overcome defects in varieties and improve the quality of wine from varieties which are deficient in chemical composition or colour [9]. Thus, in the present experiment an attempt has been made for screening different yeast strains to derive the best suitable strain and to develop best combination of blendwith other fruits in a right proportion that would impart well acceptable sensory quality attributes to the wine.

Material and Methods
Fully matured Pomegranate (var.'Super Bhagwa') fruits having uniform size and shape were procured from the field of a farmer by name Rathan Singh Rajput in a village Jambagi located in Vijayapura district and utilized for processing in to wine. Eight yeast strains collected from different institutes were used for fermentation of pomegranate arils. Five strains namely, *Saccharomyces cerevisiae* var. *ellipsoideus*, *Saccharomyces bayanus*, *Saccharomyces beticus*, *Saccharomyces fermentati* and *Saccharomyces uvarum* were collected from Heritage winery,

Ramanagara District in Bengaluru. *Saccharomyces cerevisiae-2226*, EC-1118 and IIHR strain were collected from Nisarga winery, Vijayapura, RICO winery, Vijayapura, and Horticulture Research Station (HRS), Thidagundi, Vijayapura, respectively and were maintained in a refrigerator at 4 ^{0}C. These strains were used to study their influence on sensory quality of wines prepared from pomegranate and blending with other fruits.

Preparation of wine

Pomegranate fruits were washed and cut to separate arils from the skin and the rind. The arils along with seed grinded and filtered using sieve filters to separate the juice. The extracted pomegranate juice was fermented in a glass jar adjusting TSS to 24°B and pH to 3.35. Sodium benzoate @ 100 ppm was added to the juice in order to prevent the growth of undesirable microorganisms present in the juice and kept for 24 hours. The juice was pasteurized and cooled to enhance the colour before inoculation of yeast. The starter culture of different yeast strains was inoculated in separate at the rate of 0.3 g/l of *must* and allowed to ferment for one day in aerobic and 21 days in anaerobic condition. Later, the wine was filtered using a clean muslin cloth and filled in pre-sterilised bottles for completion of slow fermentation. Finally, wines were clarified with 0.4 per cent bentonite clay and siphoned off 2-3 times at 10 days interval. To reduce the turbidity, further kept in refrigerator and siphoned off twice at 10 days interval. Thus the clear wine was decanted and filled in to pre-sterilized bottles, corked and kept for ageing at ambient condition.

Sensory evaluation

The quality of pomegranate and pomegranate based fruit wine samples was assessed by organoleptic means engaging a panel of eight quasi-trained experts using 20-point rating scale [2]. The parameters like appearance, acidity, sweetness, body, flavour and astringency were rated for a maximum score of two whereas, aroma and overall quality for maximum score of four. Adding the scores of all these quality parameters to total score for a maximum of twenty was calculated. Completely Randomized Design was followed while conducting the experiment and data collected on sensory characteristics of pomegranate wine were analyzed using statistical methods and computed at critical difference of five per cent level of significance (p<0.05) [15].

Results and Discussion

Wine tasting is actually a complex proposition involving much more than simply sipping fermented grape juice [7]. It is generally said that good wines are prepared from quality fruits, though quality can be improved during processing. Wine being used for human consumption, it is quite natural that they should be evaluated by organoleptic procedures to ascertain the quality and acceptability.

Appearance

Clarity, colour and appearance, taste and body are the characters responsible for acceptance and rejection of any wine [18]. The score for appearance of pomegranate wine was found non significant among the yeast strains. This may be due to uniformity in colour of all wine samples as a result of pasteurization. However, it was highest (1.75 out of 2.00) with wine produced using the strain *Saccharomyces cerevisiae*-2226. But in blended wines, significant difference was observed where, pomegranate and plum mixed in the ratio of 75:25 scored highest (1.89 out of 2.00) as a result of dominating colour of plum imparted by blending with pomegranate. Similar findings in case of wine prepared from clarified sapota juice that scored more (1.75 out of 2.0) for appearance [5]. The scores of pomegranate wine and blended fruit wine for colour and appearance observed in the present study compared well with the scores of 13 to 14 out of 20 for plum wine [8].

Aroma

Fresh wine aroma, widely considered to be a key aspect of quality is the result of interaction between components of the fruits themselves and those produced during processing, fermentation and aging and the consumers sense of smell [17]. Non significant differences were observed both in pomegranate and pomegranate based fruit wine with respect to aroma. The sensory score for aroma ranged from 3.03 to 3.62 out of 4.00 in pomegranate wine prepared using different yeast strains, being highest (3.62) with the IIHR strain. In case of blended wine, pomegranate wine without blending showed maximum score for aroma (3.43). It was well recognized by the panellists so much due to formation of good flavouring compounds like esters during ageing, and that masked the original flavour of fruits imparted in wines when blended with pomegranate in other treatments.

Acidity

Score for acidity also showed non significant differences for both pomegranate and blended wine. However, pomegranate juice fermented using *Saccharomyces cerevisiae* var. e*llipsoideus* scored highest for acidity (1.59 out of 2.00) which may be attributed to its acidic nature and pH level. Whereas in case of blended wine, the highest score for acidity (1.59) was seen in unblended wine (control).The chemical composition of many fruit juices is not balanced from an organoleptic point of view and to avoid chemical alteration such as neutralizing, increasing or lowering acidity, juice of varying compositions are blended together to provide the desired balance of sweetness and sourness.

Sweetness

Score for sweetness registered non significant differences for the pomegranate wine prepared using different yeast strains that ranged between 1.14 and 1.53. This is attributed to the variations in the residual sugar level which imparts sweetness to the wine. However, blended wine registered significant differences wherein the pomegranate juice blended with strawberry in equal proportion rated higher for sweetness (1.92 out of 2.00) which might be due to optimum sugar concentration in this combination. These results were on par with the wine prepared from mango [10].

Flavour

Strong aromatized juice can well be appreciated only on dilution. Juices counteract the acids of one another and regulate brix: acid ratio. By blending, it is possible to bring out the latent flavour of the ingredient juice and the resultant blend due to multiplicity of flavour and colour is outstandingly unique. Non significant differences were observed with respect to flavor score for the pomegranate juice fermented with different yeast strains but it was significant with pomegranate blended wine. The flavour score for pomegranate wine ranged from 1.35 to 1.63 out of 2.00. Whereas in blended wine highest score of 1.85 was found in blending pomegranate and strawberry in 50:50 ratio.

Followed by this, pomegranate blended with plum in equal proportion (50:50) accorded 1.81 scores for flavour. This may be due to the flavouring compounds of strawberry juice and plum pulp added in to wine during fermentation. Esters have fruity and floral impact and are important in sensory property of wines. Strawberry wine observed an increase in total esters during maturation and attributes it to the phenomenon of ageing that is desirable for the development of proper flavor [19].

Body

The score for the body also showed non significant differences in both pomegranate and pomegranate based fruit wine. The body score was highest (1.69 out of 2.00) with pomegranate juice fermented using *Saccharomyces cerevisiae* var. *ellipsoideus*, Similarly, jamun wine prepared using pulp + skin + *Saccharomyces cerevisiae* var. *ellipsoideus* recorded the highest score (1.71) after six months of ageing [11]. While in blended wine it was with blending pomegranate and plum in equal proportion (1.77). The scores of pomegranate wine and pomegranate blended wines observed in the present study for body were well comparable to scores of plum wine [8].

Astringency

The scores for astringency also showed non significant differences for wine prepared using different yeast stains and blended pomegranate wine. The score for astringency ranges from 1.49 to 1.78 out of 2.00 in pomegranate wine attributed to high tannin content but when pomegranate juice was blended with other fruit juices score for astringency decreased and it was lowest in wine prepared by blending pomegranate and plum in equal proportion (0.91). This may be attributed to the blending effect that reduced tannin content with the use of different fruits. Decrease in astringency of sapota wine was observed during ageing [16]. The results observed in the present study are also in agreement in case of pomegranate wine [14].

Overall quality

The overall quality score of both pomegranate and blended wine observed non-significant differences. However, higher score for overall quality received by pomegranate wine prepared using IIHR strain (3.79). In blended wines it was highest in ameliorating pomegranate and plum in 75:25 (3.78) and in 50:50 (3.72) ratios and adjudged the best combination of blending. The overall quality scores obtained in the present study are in accordance with the findings [12] for pomegranate wine and in blending papaya and watermelon in 60:40 ratio [1].

Total score

Non significant differences were observed both in pomegranate and pomegranate based fruit wine with respect to total score and it was highest with pomegranate wine prepared using *Saccharomyces cerevisiae* var. *ellipsoideus* (16.46 out of 20). Correspondingly, the highest total score of 15.45 and 15.86 was obtained in jamun wine prepared using pulp + skin + *Saccharomyces cerevisiae* var. *ellipsoideus* after three and six months of ageing respectively [11]. However, blending pomegranate and strawberry in equal proportion scored highest total score of 16.80 followed by blending pomegranate and plum in 50:50 ratio (16.36).

Table 1: Sensory quality characteristics of pomegranate wine

Treatments	Appearance (2.00)	Aroma (4.00)	Acidity (2.00)	Sweetness (2.00)	Flavour (2.00)	Body (2.00)	Astringency (2.00)	Overall quality (4.00)	Total score (20.00)
T_1 - *Saccharomyces cerevisiae* var. *ellipsoideus*	1.66	3.43	1.59	1.14	1.63	1.69	1.73	3.54	16.46
T_2 - *Saccharomyces bayanus*	1.68	3.03	1.53	1.42	1.35	1.54	1.54	3.39	15.48
T_3 - *Saccharomyces beticus*	1.66	3.33	1.54	1.39	1.54	1.38	1.65	3.46	15.76
T_4 - *Saccharomyces fermentati*	1.56	3.05	1.54	1.37	1.56	1.50	1.67	3.44	15.51
T_5 - *Saccharomyces uvarum*	1.62	3.43	1.51	1.53	1.58	1.66	1.78	3.55	16.39
T_6 - *Saccharomyces cerevisiae*-2226	1.75	3.34	1.53	1.41	1.51	1.58	1.66	3.60	16.32
T_7 - EC-1118	1.66	3.44	1.62	1.39	1.46	1.67	1.53	3.49	16.24
T_8 - IIHR strain	1.53	3.62	1.61	1.50	1.43	1.55	1.49	3.79	16.25
Mean	1.64	3.33	1.56	1.39	1.51	1.57	1.63	3.53	16.05
S. Em. ±	0.09	0.15	0.11	0.14	0.08	0.10	0.11	0.14	0.52
C.D. @ 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Sensory quality characteristics of fruits blended pomegranate wine

Treatments	Appearance (2.00)	Aroma (4.00)	Acidity (2.00)	Sweetness (2.00)	Flavour (2.00)	Body (2.00)	Astringency (2.00)	Overall quality (4.00)	Total score (20.00)
T_1 - Pomegranate + Grape (75:25)	1.41	2.97	1.38	1.53	1.63	1.47	1.24	3.16	14.78
T_2 - Pomegranate + Grape (50:50)	1.53	2.66	1.49	1.51	1.47	1.60	1.40	3.15	14.81
T_3 - Pomegranate + Strawberry (75:25)	1.71	2.70	1.56	1.48	1.44	1.56	1.24	3.21	14.91
T_4 - Pomegranate + Strawberry (50:50)	1.88	3.06	1.39	1.92	1.85	1.68	1.36	3.67	16.80
T_5 - Pomegranate + Watermelon (75:25)	1.49	2.66	1.34	1.36	1.56	1.54	1.18	3.13	15.13
T_6 - Pomegranate + Watermelon (50:50)	1.66	2.54	0.99	1.66	1.29	1.45	1.16	3.31	14.07
T_7 - Pomegranate + Plum (75:25)	1.89	3.28	1.21	1.89	1.79	1.57	0.95	3.78	16.35
T_8 - Pomegranate + Plum (50:50)	1.84	3.23	1.36	1.72	1.81	1.77	0.91	3.72	16.36
T_9 - Pomegranate (100)	1.66	3.43	1.59	1.14	1.63	1.69	1.73	3.54	16.43
Mean	1.68	2.95	1.37	1.58	1.61	1.59	1.24	3.41	15.51
S. Em. ±	0.11	0.29	0.17	0.14	0.12	0.13	0.22	0.21	0.90
C.D. @ 5%	0.31	NS	NS	0.39	0.33	NS	NS	NS	NS

Conclusion

Sensory evolution of pomegranate wine revealed that *Saccharomy cescerevisiae* var. *ellipsoideus* scored highest for body, flavor and total score of all the quality parameters. Blending pomegranate and plum in 75:25 ratio scored maximum for quality attributes like appearance and overall quality followed by pomegranate and plum in equal proportion for overall quality and were most liked by the sensory panel. From this it may be concluded that the yeast strain *Saccharomyces cerevisiae* var *ellipsoideus* could be satisfactorily used to prepare pomegranate wine and blends of pomegranate and plum in 75:25 and 50:50 ratios rated most acceptable proportions to produce wine of superior quality.

References

1. Adedeji TO, Oluwalana IB. Physico-chemical, sensory and microbial analysis of wine produced from watermelon (*Citrulluslanatus)* and papaya (*Carica papaya).* Blend. Food Sci. Quality Mngt. 2013, 22-88.
2. Amerine MA, Berg HW, Cruess WV. Technology of wine making, 3rd Ed., AVI Co. West Port, Connecticut, 1972, 126-132.
3. Fundira M, Blom M, Pretorius IS, Rensburg PV. Selection of yeast starter culture strains for the production of marula fruit wines and distillates. J Agric. Food Chem. 2002; 50:1535-1542.
4. Gaharwar AM, Ughade JD, Madake M, Lokhande C, Nagarka. Study on preparation of roselle and fruits blended roselle wine using yeast *Saccharomyces cerevisiae.* J Pharmacogn, Phytochem. 2018; 7(6):1338-1341.
5. Gautam SK, Chundawat BS. Standardization of technology of sapota wine making. Indian Food Packer. 1998; 52(1):17-21.
6. Holegar HR. Influence of cold soaking, thermovinification and pectinase on quality of jamun wine. *M. Sc. (Hort.) Thesis,* Univ. Hort. Sci., Bagalkot (India), 2014.
7. Holkar VK. Compendium of winter school on value addition of grapes with special reference to wine making, 2010, 145-150.
8. Joshi VK, Attri D, Bhushan S. Biological deacidification of plum (*Prunus saliciana*) must and quality of wine produced. Beverage and Food World. 2002, 33-36.
9. Joshi V. Studies on growth, yield and wine production from different varieties of grape (*Vitis vinifera* L.). *Ph. D. Thesis,* 2011; Acharya N.G. Ranga Agri. Uni. Rajendranagar, Hyderabad (India).
10. Kulkarni JH, Singh H, Chadha KL. Preliminary screening of mango varieties for wine making. J Food Sci. Technol. 2002; 17:218-221.
11. Lokesh K. Studies on preparation of jamun (*Syzygium cumini* L.), *M. Sc. (Hort.) Thesis,* Univ. Hort. Sci., Bagalkot (India), 2012.
12. Matapathi SS. Screening of wine yeasts and pomegranate (*Punica granatum* L.) cultivars for wine production. *M.Sc. (Agri.) Thesis,* Uni. Agri. Sci., Dharwad, Karnataka (India), 2002.
13. Nikard AG, Adsule RN, Chavan UD. Effect of diammonium hydrogen phosphate and SO_2 levels on the quality of pomegranate wine. Beverage and Food World. 2003; 30(1):55-56.
14. Nilesh PJ, Pravin J, Bhaskar OA. Medicinal importance of pomegranate wine. *Ijppr. Human*, 2016; 6(3):114-128.
15. Panse, Sukhatne. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi, 1978.
16. Pawar RA. Studies on preparation of wine from blended juices of commercially grown grape cultivars. *M. Sc. (Agri.) Thesis.* Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra (India), 2002.
17. Sanchez PE, Diaz-Marato Hidalgo MC. Gonzalez-Vinas MA, Perez-Coello MS. Aroma enhancement in wines from different grape varieties using exogenous glycosidases. Food Chem. 2005; 92:627-635.
18. Shukla KG, Joshi MC, Yadav S, Bisht NS. Jambal wine making: Standardization of a methodology and screening of cultivars, J Food Sci. Technol. 1991; 28(3):142-144.
19. Somesh S, Joshi VK, Ghanshyam A. An overview on strawberry wine production technology, composition, maturation and quality evaluation. Natural Product Radiance. 2009; 8(4):356-365.