J. Hortl. Sci.
Vol. 9(1):74-77, 2014

Evaluation of new grape hybrids and French cultivars for wine production

K. Ranjitha, B.N.S. Murthy[1] and E.R. Suresh
Division of Post Harvest Technology
ICAR - Indian Institute of Horticultural Research
Hessaraghatta Lake Post, Bengaluru - 560089, Karnataka, India
E- mail: ranjitha@iihr.ernet.in

ABSTRACT

This study aimed at evaluating newly developed hybrids and recently introduced cultivars of French grapes grown in mild tropics of South India for quality wine production. Wines produced from French grapes, viz., Cabernet Sauvignon, Shiraz, Pinot Noir, Sauvignon Blanc, Chenin Blanc and Ugni Blanc scored 15.0 -16.8 in the Davis Score Card for organoleptic analysis. Wines from red Hybrid 18/10 possessed phenolic content of 2097mg/l, had a brilliant colour and sensory score of 13.1. Hybrid 23/2 gave good quality white, dry table wines with a sensory score of 13.4.

Key words: Wine quality, grape variety, hybrid, phenolics, wine colour

INTRODUCTION

Composition, flavour and other properties characteristic of grape varieties or hybrids are extremely important in determining wine quality. Varietal distinction is further strengthened by soil and microclimate the vineyard grows in (Jackson and Lombard, 1993). In India, remarkable success has been achieved in grape production, and productivity of fresh grapes is highest in the world. At present, grape is grown over an area of 106,000 ha, with annual production of 881,000 tonnes in India for table grape and raisin production (http://nhb.gov.in/database-2010.pdf). However, recent years have witnessed a spurt in wine making by small-scale wineries due to increasing demand in the domestic market and, also, due to liberalized taxation offered by various state governments. Indian wineries have begun small-scale export of wines made from indigenous and exotic varieties cultivated in their own vineyards (http://indianwine.com). Intensive efforts for grape improvement over the decades have also resulted in introduction of exotic varieties and development of new hybrids in India (Singh *et al*, 1998). Earlier scientific reports based on juice-yield and must-quality parameters show that cultivars Shiraz, Cabernet Sauvignon, Merlot, Zinfandel, Sauvignon Blanc, Ugni Blanc, Vermentino and Garganega are recommendable for commercial wine production in the Maharashtra region of India (Karibasappa and Adsule, 2006). Present paper describes the quality of wines prepared from new hybrids developed under the grape improvement research programme at Indian Institute of Horticultural Research (IIHR), Bengaluru, as also from the classic French wine varieties grown in Bengaluru region of South India (12°58'N and 77°38'E, located 920m above MSL), a region typified by mild tropical climate.

MATERIAL AND METHODS

Dry table wines were prepared from berries of various hybrids developed at IIHR and French grape cultivars grown in vineyards of the institute. Harvested red grapes were washed, de-stemmed and sulfited with potassium metabisulphite (200mg/l) and hand crushed. TSS was adjusted to 22°Brix using cane sugar. For white wine preparation, the juice was extracted after sulphiting, followed by adjustment of TSS. The resultant grape must was inoculated with 48h old starter culture of *Saccharomyces cerevisiae* var. *ellipsoides* strain Montrachet no. 522 @ 2%v/v. Fermentation was carried out at 18°C, with occasional stirring of the must or juice, till completion as measured using a Brix hydrometer. The young wines were pressed, racked and clarified using calcium bentonite (400mg/l) and were bottled and stored at 10±2°C for aging for a year. Biochemical characteristics of wine such as, pH, acidity, phenolic content, total residual sugars, volatile acidity, alcohol content, hue and chroma were analyzed. Sensory attributes of the wines were evaluated on the 20-point Davis score card (Amerine and Ough, 1982).

[1]Division of Fruit crops, ICAR - Indian Institute of Horticultural Research, Hessaraghatta Lake Post Bengaluru - 560089, Karnataka, India

Table 1. Characteristics of grape hybrids/ French cultivars used in wine making

Hybrid/Cultivar	Characteristics	TSS (°Brix)	pH	Acidity (% tartaric acid)
Hybrid 25/11 (Bangalore Blue X Thompson Seedless)	Vines are medium croppers and responds to spur pruning; Berries deep red in colour, seedless, round in shape	21.6±0.8	3.3±0.1	0.53±0.02
Hybrid18/10 (Bangalore Blue X Beauty Seedless)	Vines are low to moderate in vigour, respond well to spur pruning; medium croppers; Bunches small to medium in size, well filled with dark coloured, round, seeded berries; Coming to harvest very early	23.4±0.6	3.4±0.0	0.67±0.01
Hybrid 19/29 (Bangalore Blue X Cheema Sahebi)	Vines are moderately vigorous and are good croppers; Respond well to spur pruning; Bunches medium in size, well filled and winged; Berries are round to ovoid in shape, medium sized, seeded and deep tan in colour	23.0±0.6	3.5±0.3	0.53±0.02
Hybrid 21/31 (Bangalore Blue X Convent Large Black)	Vines are low to moderate in vigour; a prolific yielder, responding to spur pruning and double cropping; Bunches small in size, well filled; Berries round, tan coloured and seeded	24.6±0.45	3.4±0.1	0.53± 0.03
Hybrid 22/10 (Bangalore Blue X Convent Large Black)	Vines are vigorous and prolific bearers; Respond well to spur pruning; Bunches medium in size and well filled; cylindrical; Berries round, seeded, greenish in colour	21.6±0.5	3.5±0.0	0.37± 0.02
Hybrid 28/2 (Black Champa X Queen of the Vineyards)	Vines are low to moderate in vigour; medium croppers; Bunches small to medium in size, well filled; Berries ovoid, seeded, greenish in colour; Has distinct Muscat flavour	24.6±0.3	4.3±0.2	0.36±0.03
Hybrid 23/2 (Bangalore Blue X Queen of the Vineyards)	Vines are moderately vigorous; medium croppers; Bunches medium in size and well filled; Berries round to ovoid, seeded, greenish-yellow in colour; Pulp meaty with mild Muscat flavour	22.4±0.3	3.4±0.1	0.46±0.05

Data given are Mean ± Standard Deviation of triplicates

RESULTS AND DISCUSSION

The new hybrids developed at IIHR, Bengaluru, and French wine grape varieties grown in mild tropics of South India, were analyzed for quality parameters like TSS, pH and total acidity. Data are presented in Tables 1 and 2. The must from wine grapes is characterized by pH 3-3.5, titratable acidity 0.5-0.7% and TSS of over than 20°Brix (Amerine and Ough, 1982). Hybrid E28/2 possessed higher must pH than required for wine grapes, while, the other varieties had an optimal must pH ranging from 3.3 to 3.5. TSS of all the varieties was satisfactory, with two varieties, viz., E21/31 and E28/2 having a value as high as 24.6°Brix. All the red hybrids possessed titratable acidity in the range suitable for wine grapes, while, all the white hybrids had slightly lower titratable acidity than required for wine grapes. It is worthwhile to note that all the hybrids yielded much sweeter berries with lesser acidity than their female parent 'Bangalore Blue' (a local grape cultivar in South India characterized by moderate TSS of 18-19°B) and high titratable acidity (0.8-1.0%). These characteristics limit the variety's suitability for wine production (Chadha and Shikhamany, 1999). All French wine grape cultivars produced quality berries as indicated by TSS, pH and titratable acidity values. This points to a potential of growing these newly-introduced cultivars in South Indian viticultural areas for producing high-quality wine grapes. Our studies also show that titratable acidity levels in these fall just about in the optimal range. A number of parameters such as light,

Table 2. Grape must quality in French wine grape varieties grown in mild tropical region of South India

Cultivar	TSS (°Brix)	pH	Acidity (% tartaric acid)
Cabernet Sauvignon	21.0±1.0	3.5±0.1	0.42±0.02
Shiraz	22.8±0.6	3.5±0.2	0.54±0.04
Pinot Noir	21.0±0.8	3.5±0.1	0.74±0.01
Sauvignon Blanc	24.0±0.7	3.6±0.1	0.64±0.02
Chenin Blanc	22.5±0.4	3.5±0.2	0.70±0.04
Ugni Blanc	21.0±1.0	3.4±0.2	0.56±0.09

Data given are Mean ± Standard Deviation of triplicates

temperature, location, climate, irrigation and fertilization influence wine grape quality. Sugar-acid balance in the grapes, however, can be optimized by harvesting the berries at optimal ripening stage (Suresh and Ethiraj, 1987). Acidity of the grape varieties can be improved by adjusting harvest dates.

Characteristic composition and sensory score of the red wines in various varieties were studied (Table 3). Red, dry table-wines are characterized by pH 3-3.5, 0.4-0.6% acidity, <1% residual sugar, 10-12% alcohol, 190-3800mg/l phenolics and <0.1% volatile acidity (Amerine and Ough, 1982). Wines all possessed the characteristic composition typical of red, dry table-wines. All the wines were fermented till TSS was reduced to zero and the wines devoid of acescent as indicated by alcohol, residual sugar and volatile acidity estimations. Highest phenolic content (2097mg/l) was observed in the wines made from Hybrid 18/10, a value higher than average phenolic content of red wines (1800mg/l). Wines made from French grapes possessed good hue values, but Hybrid 25/11 had the highest value, while, Hybrid 21/11 had the lowest value. Intensity of colour (chroma) was highest in Hybrid 18/10, followed by Hybrid 25/11. High brilliance of Hybrid 18/10 may be explained by high phenolic content. Wine phenolics are important quality components contributing to colour, taste and mouth feel. These form stable, pigmented polymers with anthocyanins giving red wine its long-term color stability (Kennedy *et al*, 2002). Among French wines, Shiraz possessed the lowest phenolic content, while, Cabernet Sauvignon had the highest value. Among the red wines Cabernet Sauvignon is reported to be rich in tannic acid (Amerine *et al*, 1980). Sensory quality of wines in all French varieties was superior to that in the new hybrids. However, the new hybrids (except Hybrid 19/29) too produced standard quality wines without any noticeable defect, as indicated by sensory scores. Wines made from Bangalore Blue grapes are typified by a foxy flavour and high acidity; But, these characteristics were eliminated from wines made from hybrids. Sensory panel too pointed to the unique "fruity and floral aroma" of Hybrid 18/10 wines, which could be attributed to a perfect mix of the labrusca flavour of Bangalore Blue with the spicy flavour of 'Beauty Seedless'. Phenolic content of wines from this hybrid is also quite high compared to other wines. Hybrid 25/11 wines possessed 'grass-floral' aroma notes.

Table 3. Biochemical composition and sensory score of red, dry table-wines made from new hybrids and French grape cultivars grown in mild tropical region of South India

Variety	Wine composition								*Sensory score
	pH	Acidity (% tartaric acid)	Alcohol (%)	Residual sugar (mg/l)	Phenolic content (mg/l)	Volatile acidity (% acetic acid)	Hue value	Chroma	
Hybrid 25/11	3.8 ± 0.0	0.54 ± 0.02	11.3 ± 0.6	250 ± 34	1040 ± 56	0.03	1.00 ± 0.02	0.80 ± 0.00	12.8 ± 2.5
Hybrid 18/10	3.7 ± 0.1	0.42 ± 0.05	12.0 ± 0.5	650 ± 58	2097 ± 42	0.03	0.83 ± 0.03	1.14 ± 0.04	13.1 ± 2.0
Hybrid 19/29	3.5 ± 0.1	0.48 ± 0.04	11.1 ± 0.1	790 ± 69	1230 ± 69	0.03	0.80 ± 0.54	0.32 ± 0.02	11.2 ± 1.3
Hybrid 21/31	3.6 ± 0.2	0.53 ± 0.02	12.0 ± 0.4	190 ± 51	1245 ± 78	0.03	0.32 ± 0.01	0.75 ± 0.03	12.2 ± 1.8
Cabernet Sauvignon	4.2 ± 0.1	0.43 ± 0.03	12.0 ± 0.5	720 ± 47	1354 ± 25	0.01	0.88 ± 0.02	0.43 ± 0.02	16.7 ± 1.4
Shiraz	3.4 ± 0.1	0.48 ± 0.04	11.4 ± 0.5	670 ± 36	735 ± 29	0.01	0.70 ± 0.04	0.30 ± 0.02	16.8 ± 1.5
Pinot Noir	3.5 ± 0.1	0.70 ± 0.04	11.0 ± 0.2	580 ± 18	1080 ± 36	0.05	0.96 ± 0.04	0.98 ± 0.03	16.2 ± 0.7

Data given are Mean ± Standard Deviation of triplicates; *Values are Mean ± Standard Deviation of 10 replicates

Table 4. Composition and sensory score of white, dry table-wines prepared from new white hybrids and French cultivars grown in mild tropical region of South India

Variety	Wine composition							Sensory score
	pH	Acidity (% tartaric acid)	Alcohol (%)	Residual sugar (mg/l)	Phenolic content (mg/l)	Volatile acidity (% acetic acid)	OD at 450nm	
Hybrid 22/10	4.0 ± 0.0	0.48 ± 0.03	11.2 ± 0.6	798 ± 39	265 ± 21	0.02	0.258 ± 0.007	12.1 ± 1.2
Hybrid 28/2	4.3 ± 0.1	0.38 ± 0.02	12.0 ± 0.7	768 ± 48	317 ± 32	0.03	0.375 ± 0.008	11.1 ± 1.6
Hybrid 23/2	3.8 ± 0.0	0.41 ± 0.03	11.2 ± 0.4	635 ± 24	363 ± 20	0.04	0.251 ± 0.002	13.4 ± 1.3
Sauvignon Blanc	3.9 ± 0.2	0.49 ± 0.03	12.0 ± 0.5	780 ± 56	460 ± 20	0.04	0.288 ± 0.003	15.9 ± 1.0
Chenin Blanc	3.8 ± 0.1	0.58 ± 0.04	12.0 ± 0.5	569 ± 68	320 ± 25	0.02	0.186 ± 0.004	16.2 ± 0.8
Ugni Blanc	4.0 ± 0.1	0.61 ± 0.02	11.3 ± 0.4	900 ± 35	400 ± 23	0.06	0.230 ± 0.002	15.0 ± 1.7

Data given are Mean ± Standard Deviation of triplicates

Characteristic composition and sensory scores of white, dry table-wines prepared from IIHR hybrids and French wine grape cultivars is presented in Table 4. Hybrid 28/2 possessed high pH, low titratable acidity and lowest sensory score. Average phenolic content of white wines is 300mg/l (Amerine and Ough, 1982). Phenolics' content was lowest (265mg/l) in Hybrid 22/10. Phenolic content of these wines can be increased by prolonging skin-juice contact time during must preparation, as reported earlier in other varieties (Darias-Martýìn *et al*, 2000). Sensory scores of the hybrids were also satisfactory, but had a lower rating than in French wines. A distinct Muscat flavour in wines from hybrid 23/2 and 28/2 was noted by the judges' panel in sensory evaluation.

In all, the results show a potential for newly-developed grape hybrids developed by Indian Institute of Horticultural Research, Bengaluru, as useful in wine-making, besides their use otherwise. Further research is needs for evaluating general acceptability, standardizing optimal harvest stage, pressing stage, etc., to enhance sensory properties of the finished wine. Results of this study also indicate that French wine varieties produce quality berries and wine under mild tropical conditions of South India.

ACKNOWLEDGEMENT

The authors thank Dr. A.S. Sidhu, Director, and Dr. S.D. Shikhamany, Former Director, Indian Institute of Horticultural Research, Bengaluru, for their encouragement in wine research work, and Mr. C. Lokesh for helping in laboratory analysis.

REFERENCES

Amerine, M.A. and Ough, C.S. 1982. Methods for Analysis of Musts and Wines. Wiley Interscience Publications, New York, p 374

Amerine, M.A., Berg, H.W., Kunkee, R.E., Ough, C.S., Singleton, V.L. and Webb, A.D. 1980. Technology of Wine Making. AVI Publishing Company, Connecticut, p 790

Chadha, K.L. and Shikhamany, S.D. 1999. The Grape: Improvement, Production and Post Harvest Management. S.D. Malhotra Publishing House, New Delhi, p 580

Darias-Martýìn, J.J., Rodrýìguez, O., Dýìaz, E. and Lamuela-Raventós, R.M. 2000. Effect of skin contact on the antioxidant phenolics in white wine. *Food Chem.,* **71**:483-487

http://indianwine.com/cs/blogs/about_wine/archive/2006/06/25/984.aspx accessed on 15.09.2011

http://nhb.gov.in/database-2010.pdf. Accessed on 10.10.2011

Jackson, D.I. and Lombard, P.B. 1993. Environmental and management practices affecting grape composition and wine quality - A review. *Amer. J. Enol. Vitic.*, **44**:4409-4430

Karibasappa, G.S. and Adsule, P.G. 2006. Evaluation of wine grape genotypes by National Research Centre for Grapes at their farm at Pune, Maharashtra, India. *Acta Hort*., **785**:497-504

Kennedy, J.A., Matthews, M.A. and Waterhouse, A.L. 2002. Effect of maturity and vine water status on grape skin and wine flavonoids. *Amer. J. Enol. Vitic.*, **53**:268-274

Singh, R., Murthy, B.N.S. and Rama, S.T. 1998. 'Arka Neelamani', 'Arka. Shweta', 'Arka Majestic' and 'Arka Chitra': new hybrid *grapes*. *Ind. Hort.*, **43**:28-29

Suresh, E.R. and Ethiraj, S. 1987. Effect of grape maturity on the composition and quality of wines made in India. *Amer. J. Enol. Vitic.,* **38**:329-331

(MS Received 23 October 2012, Revised 12 June 2013, Accepted 20 July 2013)