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Fermentation of banana juice using grape fruit juice inoculum

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Abstract
Present study was performed to investigate the effect of white grape must (WGM) and red grape must (RGM) inoculum on fermentation of banana wine. The banana must was prepared from pulp of ripe banana fruits. Pectinase enzyme and potassium metabisulphite (KMS) were added to the juice. Then it was chaptalized to 19°Brix. Diammonium phosphate (DAP) was added to this and pH adjusted to 3.5. The inoculum of WGM and RGM were used at a concentration of 10% for the fermentation banana must separately. After inoculation the fermentation was carried out at 20 ^{O}C for about 22 days. Physico-chemical parameters were then analyzed and concentration of volatile acids (VFA) was determined by using gas chromatography (GC). Banana wine produced using WGM and RGM had °Brix (6.1), alcohol (4.38 and 4.24%) and titratable acidity (0.93 and 0.88%) respectively. All nine volatile acids analyzed were detected in both wines. Significant effect was not observed on physicochemical parameters of banana wine produced by using different grape must inoculums.

Keywords: Banana must, banana wine, volatile acids, red grape must and white grape must

Introduction
Wine is a fermentation product included in alcoholic beverage category and is produced by fermentation of fruit juice. The fruit having good amount of sugar can be used as a substrate for production of fruit wine and the wines thus produced are generally named after the fruit used such as apple, banana, pineapple, orange, coconut, mango and strawberry wine (Reddy *et al*., 2012; Shweta *et al*., 2016; and Ranjitha *et al*., 2015) [13, 17, 12]. Beside high production of banana fruit, its post harvest loses are more because of its perishable nature. Thus production of banana wine is one the alternative to prevent the postharvest loses of banana fruits. For this appropriate yeast inoculum should be used. Grape fruits are the most common substrates for the production of fruit wine either by using wild yeast present on the fruits or by adding suitable yeast starter. The fruit itself has plenty of fermenting normal flora which is used for production of wine. Thus we can employ grape fruits as a direct source of fermenting yeasts.
Various reports on production of banana wine are increasing (Onwuka and Awam, 2001; Akubor *et al*., 2003; Cheirsilp and Umsakul, 2008; and Isitua and Ibeh, 2010) [10, 1, 3, 5]. However as per our knowledge very less work is reported in India which focuses on fermentation of banana wine by using grape juice inoculum as well as on volatile acid analysis of such wines. With respect to this here we have made an attempt to investigate the effect of fermentation of banana wine by using grape juice inoculum on physicochemical parameters and volatile acid in banana wine.

Material and methods
Preparation of banana must
Ripe banana fruits were procured from local market of Nanded, Maharashtra, India. These fruits washed with tap water, hand peeled, cut in to thin slices and then grind in mixer. This pulp homogenate was then mixed with water in 1:1 proportion. To this 0.02% of pectinase enzyme to reduce the viscosity and 100 mg/L potassium metabisulphite (KMS), to kill the unwanted microorganisms, were added and the mixture was held at room temperature for 4 h. Pectinase treated juice was then chaptalized to 19°Brix using table sugar, DAP at a concentration of 100 mg/L was added to this and its pH was adjusted to 3.5 using citric acid and calcium carbonate. Then it was kept at 10 °C until required.

Fermentation experiment

Healthy white and red grapes were used for preparation of inoculum. The grape fruits were homogenized in a mixer grinder and homogenized grape musts were directly used as an inoculum for fermentation of banana must. Four hundred ml aliquots of banana musts were inoculated with 40 ml each of red and white grape musts which were prepared by grinding the red and white grapes respectively in duplicates. After inoculation the fermentation was allowed to continue at 20 °C for about 22 days. Progress of fermentation was monitored by observing total soluble solid profile of the must.

Physico-chemical analysis

The pH of the must was measured with a digital pH meter (Systronics, India), pre-calibrated with buffers of pH 4.0 and 7.0. Titratable acidity was determined by titrating with 0.1 N NaOH and alcohol % by specific gravity method as described by AOAC. Total soluble solids (TSS) were determined using Abbey's refractometer (0-32) in terms of °Brix (Jacobson, 2006). Moisture % was determined by oven drying at 100 - 105 °C. Volatile acidity was determined by titration of distillate samples and expressed as percent of acetic acid per 100 ml of wine. Concentration of metal ions was analyzed by using inductive coupled plasma-optical emission spectroscopy (ICP-OES) (Thermo Fisher-ICAP 6300 DUO) after digestion of wine samples. Concentration of volatile acids (VFA) was determined by using gas chromatography (GC) as mentioned previously (Satav and Pethe, 2017) [15].

Results and discussion

Physicochemical parameters of banana wines fermented by using two different must inoculums were analyzed and are presented in table. Soluble solid of wine fermented with both strains was found to be same. Specific gravity, TA, VA and alcohol% obtained by using white and red grape musts were also found to be almost same in both wines. Concentration of various elements was also analyzed in both wines and no large difference in concentrations was observed in both wines for almost all elements.

Table 1: Physicochemical properties of Banana wine inoculated with different grape must

Parameter	WGM inoculum	RGM inoculum
°Brix	6.1	6.1
Alcohol %	4.38	4.24
Specific Gravity	0.9983	0.9981
Titratable Acidity (%)	0.93	0.88
Volatile Acidity (%)	0.012	0.012
Moisture %	97.72	97.81
Total Solid %	2.28	2.19

Table 2: Concentration (mg/L) of various elements in banana wine

Ca (mg/L)	36.98	36.37
Fe (mg/L)	0.41	0.42
Mg (mg/L)	93.95	95.38
Mn (mg/L)	1.02	1.06
P (mg/L)	120.30	106.42
Zn (mg/L)	7.16	7.22

Table 3: Volatile acids detected in Banana wine inoculated with different grape must

Acid (mg/L)	White grape must (WGM)	Red grape must (RGM)
Acetic Acid (AA)	185.51	243.64
Propionic Acid (PA)	5.26	4.42
Iso-Butyric Acid (IBA)	448.80	431.37
Butyric Acid (BA)	22.25	13.28
Iso-Valeric Acid (IVA)	15.17	10.82
Valeric Acid (VA)	1.21	1.64
Iso-Caproic Acid (ICA)	353.92	485.63
Caproic Acid (CA)	6.00	16.52
Heptanoic Acid (HA)	55.36	61.72

Nine different volatile acids present in banana wines fermented by using two different must inoculum, white grape must inoculum and red grape must inoculum, were analysed (Table 3). The concentration of iso-butyric acid found to be higher as compared to other acids in wine with white grape must (WGM). Its concentration in wine with white grape must (WGM) and red grape must (RGM) was found to be 448.80 and 431.37 mg/L respectively. Acetic acid was present at concentration of 185.51 and 243.64 mg/L in wines with WGM and RGM respectively.

Iso-caproic acid was also detected at high concentration in both wines. Its concentration is higher than other acids in wine with RGM. The detected concentration in WGM and RGM was found to be 353.92 and 485.63 mg/L respectively. Valeric acid (1.21 and 1.64 mg/L), propionic acid (5.26 and 4.42 mg/L) and caproic acid (6.00 and 16.52 mg/L) were detected in lowest amount as compare to other acids in both the wines. Butyric acid was preset at concentration of 22.25 and 13.28 mg/L in WGM and RGM respectively. Its concentration was `found to be almost two fold higher in WGM. Heptanoic acid was also detected at significant level in both wines and found to be slightly higher in RGM (61.72 mg/L) than WGM (55.36). Various authors reported the volatile fatty acids from other wines (Shinohara, 1985, Perestrelo *et al*., 2006, Duarte *et al*., 2010, Reddy *et al*., 2010) [16, 11, 4, 14].

Conclusion

Significant effect was not observed on physicochemical parameters of banana wine produced by using different grape must inoculums. However slight difference was observed in concentration of some volatile acids.

References

1. Akubor PI, Obio SO, Nwadomere KA, Obiomah E. Production and quality evaluation of banana wine. Plant Food Hum. Nutr. 2003; 58(3):1-6.
2. AOAC. Official methods of analysis. Association of official analytical chemist, 13th Edn. Washington DC. 1980.
3. Cheirsilp B, Umsakul K. Processing of banana-based wine product using pectinase and α-amylase. J. Food Proc. Eng., 2008; 31(1):78-90.
4. Duarte WF, Dias DR, Oliveira JM, Teixeira JA, de Almeida e Silva JB, Schwan RF. Characterization of

different fruit wines made from cacao, cupuassu, gabiroba, jaboticaba and umbu. LWT - Food Sci. Technol., 2010; 43(10):1564–1572.
5. Isitua CC, Ibeh IN, Novel method of wine production from banana (*Musa acuminata*) and pineapple (*Ananas comosus*) wastes. African J. Biotechnol. 2010; 9(44):7521-7524.
6. Jacobson JL. Introduction to wine laboratory practices and procedures. Springer Science & Business Media, New York, 2006, 164-166, 269-271.
7. Joshi VK, Sandhu DK, Kumar V. Influence of addition of insoluble solids, different yeast strains and pectinesterase enzyme on the quality of apple wine. J. Inst. Brew. 2013; 119(3):191-197.
8. Joshi VK, Sharma S, Devi MP. Influence of different yeast strains on fermentation behaviour, physico-chemical and sensory qualities of plum wine. Indian J. Nat. Prod. Res. 2009; 8(4):445-451.
9. Nadagouda MG, Lingappa K, Bheemareddy VS, Malipatil SG. Optimization of Solid State Fermentation Conditions for the Production of Cellulase by Using Trichoderma viride GSG12. Bioscience Discovery. 2016; 7(1):01-06.
10. Onwuka U, Awam FN. The potential for baker's yeast (*Saccharomyces cerevisiae*) in the production of wine from banana, cooking banana and plantain. Food Serv. Technol. 2001; 1(3-4):127-132.
11. Perestrelo R, Fernandes A, Albuquerque FF, Marques JC, and Câmara JS. Analytical characterization of the aroma of Tinta Negra Mole red wine: Identification of the main odorants compounds. Anal. Chimi. Act. 2006; 563(1):154-164.
12. Ranjitha K, Narayana CK, Roy TK. Process standardization and quality evaluation of wine from Cavendish banana (*Musa*, genome AAA) cv. Robusta. Indian J. Horti., 2015; 72 (1):153-155.
13. Reddy LVA, Joshi VK, Reddy OVS. Utilization of tropical fruits for wine production with special emphasis on mango (*Mangifera indica* L.) wine. In: Microorganisms in Sustainable Agriculture and Biotechnology. *Springer Publisher*, Netherland, 2012, 679-710.
14. Reddy LVA, Kumar YS, Reddy OVS. Analysis of volatile aroma constituents of wine produced from Indian mango (*Mangifera indica* L.) by GC-MS. India J. Microbiol. 2010; 50(2):183-191.
15. Satav PD, Pethe AS. Production and physicochemical characterization of wine from banana (*Musa acuminata*). Asian J. Microbiol. Biotechnol. Envi. Sci. 2017; 19(2):425-431.
16. Shinohara T. Gas chromatographic analysis of volatile fatty acids in wines. Agri. Biol. Chem., 1985; 49(7):2211-2212.
17. Shweta H, Joshi P, Valmiki S, Wine production from over ripened banana. World J. Pharma. Pharmaceu. Sci. 2016; 5(6):1461-1466.
18. Singh RS, Kaur P. Evaluation of litchi juice concentrate for the production of wine. Indian J. Nat. Prod. Res., 2009; 8(4):386-391.