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Fermentation of Banana Must Using Mango Fruit Inoculums

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ABSTRACT

Wine was prepared from eight different varieties of banana (Khozikodu, Karpurchakra keli, Palaykondan, Alpan, Pisang celyan, Lamby, Karpurvalli and Ardhapuri). Alcohol% of the wines produced using different varieties of banana were found to be in the range of 4.34 to 7.89. Highest Alcohol % observed was 7.89% in wine produced using ardhapuri variety.The Ardhapuri variety in which more alcohol production was found was used as reference in this study. This study was performed to investigate the effect of mango fruit must inoculum on fermentation of banana wine. The banana must was prepared from pulp of ripe banana fruits of Ardhpuri variety. 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 banana juice and mango juice was used at a concentration of 10% for the fermentation banana must separately. After inoculation the fermentation was carried out at 20°C for about 22 days. Physicochemical parameters were then analyzed and concentration of volatile acids (VFA) was determined by using gas chromatography (GC). Banana wine produced using banana juice and mango juice inoculum had °Brix (6.1and 6.5), alcohol (4.38 and 4.24%) and titratable acidity (0.93 and 0.83%) 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 must inoculums.

Keywords: Banana must, banana wine, volatile acids, mango must

I. INTRODUCTION

Banana is one of the most important economic fruit crops. Because of high moisture content and textural characteristics, It is highly perishable in nature. By adopting proper post harvest management practices and processing into value added products, Post harvest losses of banana can be reduced. Banana wine is a nutritious alcoholic beverage with low alcohol content. The cost of production of banana based alcoholic beverages is much cheaper than other fruit based beverages.

Banana fruit is having good amount of sugar which 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,grape, banana, pineapple, orange, coconut, mango and strawberry wine (Reddy et al., 2012; Shweta et al., 2016; and Ranjitha et al., 2015). Mango fruits are also one of the 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 mango 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). However as per our knowledge very less work is reported in India which focuses on fermentation of banana wine by using mango juice inoculum as well as on volatile acid analysis of such wines. Hence, the present study is aimed at evaluating physicochemical analysis of banana wine by using mango must inoculum.

II. 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 mango fruits were used for preparation of inoculum. Ripe mango fruits after removing seeds and peel were homogenized in a mixer grinder and homogenized mango musts were directly used as an inoculum for fermentation of banana must. Four hundred ml aliquots of banana musts were inoculated with 40 ml of mango musts which were prepared by grinding the mango 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.

III. 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.

IV. 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 mango must was also found to be different 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 Banana Must and Mango Must

Parameter	Banana Must inoculum	Mango Must inoculum
°Brix	6.1	6.5
Alcohol %	4.38	4.24
Specific Gravity	0.9983	0.9981
Titratable Acidity (%)	0.93	0.83
Volatile Acidity (%)	0.012	0.016
Moisture %	97.72	97.81
Total Solid %	2.28	2.09

Table 2: Concentration (mg/L) of various elements in banana must & mango must inoculated wine

Elements	Banana Must inoculum	Mango Must inoculum
Ca (mg/L)	36.98	35.45
Fe (mg/L)	0.41	*0.32*
Mg (mg/L)	93.95	*94.38*
Mn (mg/L)	1.02	*0.95*
P (mg/L)	120.30	*101.*36
Zn (mg/L)	7.16	6.75

Table 3: Volatile acids detected in Banana wine inoculated with banana and mango must inoculum

Acid (mg/L)	Banana Must inoculum	Mango Must inoculum
Acetic Acid (AA)	185.51	258.12
Propionic Acid (PA)	5.26	4.30
Iso-Butyric Acid (IBA)	448.80	417.22
Butyric Acid (BA)	22.25	24.22
Iso-Valeric Acid (IVA)	15.17	12.76
Valeric Acid (VA)	1.21	1.77
Iso-Caproic Acid (ICA)	353.92	466.61
Caproic Acid (CA)	6.00	8.87
Heptanoic Acid (HA)	55.36	57.25

Nine different volatile acids present in banana wines fermented by using two different must inoculum, banana must inoculum and mango must inoculum were analysed (Table 3). The concentration of iso-butyric acid found to be higher as compared to other acids in wine with banana must . Its concentration in wine with banana must and mango must was found to be 448.80 and 417.22 mg/L respectively. Acetic acid was present at concentration of 185.51 and 258.12 mg/L in wines with banana must and mango must inoculum respectively.

Iso-caproic acid was also detected at high concentration in mango must inoculated wines. Its concentration is higher than other acids in wine with Mango must inoculated wine. The detected concentration in banana must and mango must inoculated wine was found to be 353.92 and 466.61 mg/L respectively. Valeric acid (1.21 and 1.77 mg/L), propionic acid (5.26 and 4.30 mg/L) and caproic acid (6.00 and 8.87 mg/L) were detected in lowest amount as compared to other acids in both the wines. Butyric acid was present at concentration of 22.25 and 24.22 mg/L in banana must and mango must inoculated wines respectively. Heptanoic acid was also detected at significant level in both wines .Various authors reported the volatile fatty acids from other wines (Shinohara, 1985, Perestrelo et al., 2006, Duarte et al., 2010, Reddy et al., 2010).

V. CONCLUSION

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

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