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RESEARCH PAPER

Effect of different levels of T.S.S on the quality of pineapple (*Annanus comosus* L.) Wine

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SUMMARY : The investigation on the preparation of wines from pineapple was carried out at the Fruit Beverage Research Centre, Department of Soil Science and Agricultural Chemistry, Konkan Krushi Vidyapeeth, Dapoli. The amelioration of powdered sugar at different levels of 20° B, 25° B, 30° B, 35° B, and 40° B was tried. The chemical analysis of wines exhibited that, the wine prepared from 30°B was found to be the best.

Key Words : Pineapple, Wine, TSS

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Pineapple is an important fruit crop of India preferred for tropical wine making. The fruit in addition to being eaten fresh can also be canned and processed in different forms. Pineapple is a good source of carotene (vit A), amino acids (vit C) and also vit B1 and B2. Besides, it is also source of bromelian, a digestive enzyme. Its pleasant flavors and exquisite taste qualifies pineapple as one of the choicest fruits throughout the world. The fruits are also processed into several products such as juice, canned slices in sugar syrup, jam or jelly, dehydrated products and wine (Lodh *et al*., 1973 and Bose and Mitra 1999).

India produces 44 million tones of fruits every year, out of which 10-25 million tones per annum is lost during the process of handling, transportation and marketing. The cost of post harvest losses is estimated to be Rs. 23,000.00 crores per year in our country. In a survey conducted by Deka *et al*. (2004) it is reported that the post harvest losses in Assam state is about 9.25 per cent, such fruits can be used for a production of wine. The wine from pineapple can be an important value produces.

Preparation of low alcoholic beverages such as wine from such fruits may prove to be remunerative. The fruit wines are not only liked by wine fanciers but also good healthy drink. Extensive research has been made on production of wine from jambal (Shukla *et al*., 1991), banana (Kotecha *et al.,* 1995), custard apple (Kotecha *et al.,* 1995), Mulberry (Kotecha *et al.,* 1995) and several other fruits. However, the pineapple fruit which is available in plenty in Konkan region has not been exploited in this regard. An attempt was, therefore, made to utilize pineapple fruits for preparation of wine in order to attract commercial attention to this fruit crop.

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EXPERIMENTAL METHODS

Fruits:

Pineapple fruits were procured from Western Ghats around the College of Agriculture, Dapoli, Ratnagiri District (MS) and clear juice was extracted from the fruits.

Preparation of must:

The clear juice was taken in different vessels and the T.S.S. content of juice was adjusted to 20° B, 25°B, 30°B, 35°B

and 40° Brix by addition of powdered sugar. The juice was supplemented with 0.1% diammonium hydrogen phosphate (DAHP) and potassium metabisulphate (KMS) was added @ 100 ppm SO_2 (Kotecha *et al.*, 1995). After adjusting the T.S.S, addition of DAHP and KMS, the juice *i.e.* must was taken in fermentation flask (1kg/flask) and pasteurized at 80° C for 20 minutes and then used further for fermentation.

Fermentation:

Pasteurized must (1kg) after cooling was taken in fermentation flasks and inoculated with yeast inoculum 0.30 g per kg of must *Saccharomyces cerevisiae* var. bayanus (No.8609) was procured from the Kamaltara Enterprises, Nasik. The fermentation flasks were kept in room temperature. The end of fermentation which took about 10-20 days was indicated by the cessation of foaming and bubbling. After fermentation, the assembly was dismantled. The fermentation flasks were heated at 78-79° C for 20 minutes to inactivate yeast to stop further fermentation and after cooling bentonite was added at the rate of 0.1g/100ml, mixed well and allowed to stand for 3 to 4 days. The content were centrifuged at 5000 rpm for 20 min. and clear wine was collected in sterilized bottles (Kotecha *et al.*, 1995). The bottles were sealed and stored at 0-5° C until used for chemical analysis and organoleptic evaluation.

Chemical analysis:

The TSS content was determined with help of Erma hand refractometer (A.O.A.C., 1975). The pH of juice was measured by Lab-India µpH meter (Model PHAN). The crude protein, ascorbic acid, titratable acidity as citric acid, sugars and tannis were determined as per the procedures described by Ranganna (1977). The alcohol content in wine was determined by the method reported by Natu *et al*. (1986).

EXPERIMENTAL FINDINGS AND ANALYSIS

Pineapple juice TSS content was 13.6° Brix, 11.57 per cent total sugar, 2.48 per cent reducing sugar and 9.09 per cent non-reducing sugar. The pH of pineapple juice was 3.71. The per cent acidity of the juice was 0.67. The ascorbic acid and protein content of pineapple juice were 28 mg 100^{-1} ml and 0.45 per cent, respectively. The pineapple juice contained 0.132 per cent tannins. The results are in accordance with Man (2005) and Patil and Patil (2006).

The chemical composition of pineapple wine changed significantly as influenced by different levels of TSS (Table 1). Total sugar content in wine varied from 1.41 per cent to 11.45 per cent. With respect to the total sugar content of wine showed an increasing trend with increase in TSS level. This may be due to adjustment of TSS level by addition of sugar. The lowest total sugar content was recorded by treatment 20° B (1.41%).

The lowest reducing sugar content in wine was recorded by 20° B (0.41%), while the highest reducing sugar content was recorded by 40° B (6.47%). The reducing sugar content of wine was found to be increasing with increase in TSS levels from treatment 20° B (0.41%) to 40° B (6.45). This observation was in agreement with the findings of Aanand (2003) and Man (2005). The non reducing sugar of wine varied from 0.46 per cent to 0.73 per cent. The minimum non-reducing sugar content in the wine was recorded by treatment 35° B (0.46%) and it was superior over rest of the treatments. While maximum non-reducing sugar of wine was recorded by treatment 30° B (0.73%). The highest titratable acidity of wine was recorded by T_5 (1.01%) which was at par with 35° B (1.0%) and lowest titratable acidity of wine was recorded by 20° B (0.86%). Among the various TSS levels tried there were significant difference observed in pH. The lowest pH was recorded by 20° B (3.54) which was at par with 25° B (3.56) and highest pH was recorded by 30° B (3.60%). Similar results were reported by Shukla *et al.* (1991).

The ascorbic acid (mg 100^{-1} ml) content varied between 6.05 to 9.84 mg 100^{-1}ml. The highest ascorbic acid content of wine was recorded by 35° B (9.84 mg 100^{-1}ml) which was significantly superior over rest of the treatments, while lowest ascorbic acid of wine was recorded by 30° B (6.05 mg 100^{-1}ml). These results are in line with observation made by Lakshmana and Lengaiah (2004).

The tannin content of wine varied from 0.041 to 0.051 per cent (Table 1). The lowest tannin content was recorded by 25° B (0.041%) and significantly superior over rest of the treatments and the highest tannin content of wine was recorded by 20° B

Table 1 : Chemical composition of pineapple wine prepared from different total soluble solids (Mean of three replications)

Treatments	TSS (°B)	Total sugar (%)	Reducing sugar (%)	Titritable acidity (%)	pH	Ascorbic acid (mg 100 g^{-1})	Tannin (%)	Proteins (%)	Alcohol (%)
T_1 (20 °B)	6.40	1.41	0.41	0.93	3.54	9.08	0.051	0.17	8.3
T_2 (25 °B)	8.07	2.18	0.92	0.86	3.56	7.92	0.041	0.23	10.36
T_3(30 °B)	10.47	3.38	1.57	0.96	3.60	6.05	0.047	0.21	12.01
T_4(35 °B)	10.91	7.63	4.30	1.00	3.58	9.84	0.045	0.17	8.89
T_5(40 °B)	25.4	11.45	6.47	1.01	3.58	7.52	0.046	0.30	8.23
S.E. ±	0.067	0.038	0.128	0.007	0.006	0.062	0.001	0.009	0.143
C.D. (P=0.01)	0.259	0.147	0.496	0.026	0.025	0.241	0.003	0.033	0.558

Table 2 : Average alcohol yield in relation to utilization of sugars for fermentation.

Initial (^{O}Brix)	Average (^{O}Brix) utilized	Sugar utilized (%)	Per cent alcohol yield
20	13.6	68	8.3
25	16.93	67.72	10.36
30	20.0	66	12.01
35	17.13	49	8.89
40	14.60	36.5	8.23

(0.051%).Tannin content of the wine decreased after fermentation. This could be due to utilization of more amount of tannins by the yeast cells. These results are in conformity with the data reported by Bhajipale (1997) and Dunseath (1999).

Among the TSS level there was significant difference with respect to protein content. Highest protein was recorded by treatment 40° B (0.30%) and lowest protein content was recorded by 35° B and 20° B (0.17%). This could be due to fact that amino acids are the major source of nitrogen to the yeast cells. Consumption rate of amino acids depends upon the rate of nitrogen assimilation of yeast cells, nitrogen requirement of yeast cells and presence of other nitrogenous compounds in the must and the rate of amino acid metabolism in the yeast cells. These results are correlated with results reported by Ough and Baker (1961).

The highest alcohol content was recorded by treatment 30° B (12.01%) followed by 25° B (10.36%). Alcohol is the important tool used to measure the quality of wine. This could be due to fact that amount of alcohol produced depends upon fermentation efficiency of yeast strain, capacity of sugar uptake. These results are in conformity with data by Ayogu (1999).

The data on percentage of sugar utilized during fermentation and its corresponding alcohol yield in given in Table 2. Indicates that the percentage sugar utilized for fermentation is about 67 to 68 per cent in treatments 20° B to 30° B which shows better efficiency as compared to 35° B and 40° B which had an higher percentage of sugar but unable to utilized more than half of its quantity and hence is less efficient. This suggests that to obtain a higher alcohol yield, the initial °Brix should be adjusted in between 25 to 30 for a better alcohol yield and a good quality wine.

The wine prepared from pineapple fruits were evaluated for their organoleptic characteristics by a panel of ten experienced judges on 20 point score card. The scores for overall quality of pineapple wine determine by taking the mean of all the six sensory quality characteristics *viz.,* colour and appearance, body, aroma, astringency, taste and over all acceptability.

Results of organoleptic evaluation showed that treatment 30° B (13) recorded maximum score. Whereas, least points were scored by 40° B (9). This may as due to the fact that the treatment 30° B was superior in most of the characters like colour, appearance, body, taste, astringency, and overall acceptability. The treatment T_3P_2 of 30 ^{O}Brix adjustment TSS to must is suppose to be the best treatment for the production of good quality pineapple wine.

A protocol for preparation of a good quality pineapple wine has been standardized during this investigation out of the various treatments tried. The treatment of 30°Brix adjustment TSS to must is suppose to be the best treatment for the production of good quality pineapple wine. So it can be concluded that 30° B is a superior for yielding a good quality pineapple wine.

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