

RESEARCH ARTICLE

EFFECT OF FERMENTED CONDITIONS ON PINEAPPLE WINE PROCESS

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ABSTRACT

An investigation was undertaken to optimize the processing conditions for making of good quality wine from pineapple juice. The process technology with respect to level of initial juice total soluble solid (TSS), level of sugar, and level of total acid content to raise the juice TSS and fermentation time has been standardized to make acceptable wine from the pineapple juice. The juice was extracted from the ripe fruits of Queen cultivar. The wines made by adjusting sugar level of 24 °Brix with sucrose, acidity level of 0.5 % and fermentation up to 14 days were found to be appropriate to produce acceptable wine from pineapple juice.

KEYWORDS

fermentation, pineapple, sucrose and wine

1. INTRODUCTION

Pineapple (*Ananas comosus*) is one of the important food crops of the world, especially in the tropics. It is grown in many countries, namely, Australia, India, Indonesia, Philippines, South Africa, Thailand and Vietnam etc. (De La Cruz Medina and García, 2005; Farid, 2016). Pineapple is a good source of vitamin A (carotene) and B and it is rich in vitamin C and calcium. It is also containing an enzyme, bromelin. The pineapple fruits are mainly consumed as fresh or canned slices. These are also processed into several products such as juice, jam or jelly, dehydrated products and wine (Kraus, 2003; Manzar and Rejaul, 2015; Vipul Chaudhary et al., 2019).

The fruit wines are getting more and more popular owing to their nutritive value and refreshing taste. A good quality wine is prepared from a fruit juice with good aroma and presence of colouring phenolics like anthocyanin, carotenoid and flavonoid, in addition to TSS and acidity. These include grape, apple, orange, cherries, and pineapple etc. (Joshi et al., 1991; Manzar and Rejaul, 2015; Ningli, et al., 2017). The pineapple juice with good flavour, and attractive yellowish colour is a suitable raw material to prepare good fruit wine.

The technology of wine making from grape has been quite advanced. However, very little is known about making of wine from pineapple. To make acceptable wine with about 10 % alcohol content and acid level of 0.5 - 0.7 %, the TSS of starting juice need to be near 20 - 24 °Brix. These conditions are usually achieved in grape juice. However, in most other fruit juice, the TSS varies from 8 - 15 °Brix and total acid content ranges from 0.1 - 0.4 %. For example, the TSS of pineapple juice is about 10 - 15 % and acid level is 0.2 - 0.4 %. Hence, the juice needs to be supplemented with extra sugar and acid. The level of sugar may affect the rate of fermentation, residual TSS, level of alcohol and acceptability of wine. Hence, it was planned to use sucrose and four levels of total acid content for starting juice to make pineapple wine.

2. MATERIALS AND METHODS

The peel pineapple fruits (cv. Queen) was cut into small pieces and extracted with kitchen blender to obtain the pulp. It was then screened through muslin cloth to obtain the juice. The juice was then centrifuged at 3000 X g for 30 minutes to obtain the clear juice. The clear juice was used for chemical analysis and for making wine.

The clear juice was adjusted TSS using sucrose and acidity using citric acid as follows:

Table 1: Experimental design

No	Volume of the clear juice (mL)	TSS (°Brix)	Total acid content (%)
1.	500	20	0.4
2.	500	20	0.5
3.	500	20	0.6
4.	500	20	0.7
5.	500	22	0.4
6.	500	22	0.5
7.	500	22	0.6
8.	500	22	0.7
9.	500	24	0.4
10.	500	24	0.5
11.	500	24	0.6
12.	500	24	0.7
13.	500	26	0.4
14.	500	26	0.5
15.	500	26	0.6
16.	500	26	0.7

Each experiment was then supplemented with 5 % v/v fresh culture of *Saccharomyces cerevisiae* var. *ellipsoides*. The fermentation was carried

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out at 25 ± 1 °C up to 14 days. At the end of fermentation, the wine was clarified by using bentonite 0.1% by centrifugation at 3000 Xg for 30 min. The wines were bottle and evaluated for chemical composition and organoleptic properties. The pineapple wines obtained from different treatments were analyzed for chemical compositions (AOAC, 1990). The alcohol content in the wine was determined by method (AOAC, 1990). The sensory evaluated of wines were carried out according to the method of on 10-point hedonic score card (Amarine et al., 1980).

3. RESULTS AND DISCUSSION

3.1 Physico-chemical composition and recovery of pineapple juice

The data on physico-chemical composition of fully ripe pineapple fruits are presented in Table 2. The data indicate that, the fruits contained 41.7 % peel, 58.3 % pulp and 42.2 % juice. The clear juice exhibited a TSS of 15.0 °Brix, acidity 0.35 %, total sugar 12.8 %. The juice also had reducing sugars 11.2 %, ascorbic acid 27.9 mg/100 mL. These values were compared to those reporters (Manzar and Rejaul, 2015; Vipul, et al., 2019).

Table 2: Physico-chemical composition of pineapple fruit and juice

No.	Parameter	Content
1	Peel (%)	41.7
2	Pulp (%)	58.3
3	Juice (%)	42.2
4	Composition of Juice	
	- TSS (°Brix)	15.0
	- Acidity (%)	0.35
	- Reducing Sugars (%)	11.2
	- Total Sugars (%)	12.8
	- Ascorbic acid (mg/100 mL)	28.0

3.2 Effect of fermentation period, levels of initial TSS on rate of fermentation (TSS) of juice

The data on changes in final TSS during fermentation of juice as influence by sucrose levels are presented in Figure 1. The data indicate that TSS decreased during alcoholic fermentation. The fermentation of juice was found to be most active during the first four days as indicated by a rapid

fall in TSS. After that the TSS decreased slowly and the alcoholic fermentation was found to be terminate at about 14 days as indicated by constant final mean TSS values. The final TSS of wine ranged from 5.0 to 6.5 °Brix depending upon levels of sugar. The decrease in TSS content of the wine indicate that the speedily utilization of sugar present in the must during fermentation. In addition of sugar up to 24 °Brix, the results showed so that the final TSS of wine was 6.2 °Brix. Comparing with other results on preparation of fruit wine indicated that at sugar levels of 23 °Brix the wine contained 6.2 to 6.5 °Brix, according to the wines were prepared, by adjusting TSS level of 16, 18, 20, 22 and 24 °Brix the wine contained 5.0 to 8.0 °Brix (Kotecha, 1995; Jawahar, 2001). The results are obtained in agreement with other reporters.

3.3 Effect of levels of initial acidity on sensory properties of wine

The average scores for sensory properties of the wine are presented in Table 3. The fresh wine had an attractive colour (yellow) and harsh in taste. The overall acceptability score for the wine ranged from 7.0 to 8.6. The wine prepared from sucrose 24 °Brix, and acidity of 0.5 % scored maximum (8.8) for overall acceptability and 22 °Brix, 0.7 % acid content had minimum score (6.0).

From the sensory score showed that the wine prepared form sucrose 24 °Brix and acidity of 0.5 % scored higher for all characters than the others.

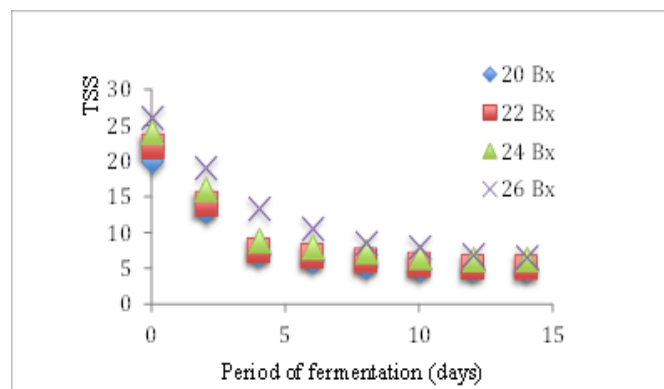


Figure 1: Effect of fermentation period, levels of initial TSS on rate of fermentation (TSS)

Table 3: Effect of types and levels of sugar on sensory properties of fresh pineapple wine

Types of sugar (°Brix)	The initial acid content (%)	Characters					
		Colour & appearance	Consistency & cloudless	Aroma	Taste	Astringency	Overall acceptability
20	0.4	7.5	7.5	7.7	7.9	7.5	7.6
20	0.5	7.8	8.0	8.0	8.0	8.0	8.0
20	0.6	7.6	8.0	7.6	7.8	7.4	7.7
20	0.7	7.3	7.5	7.1	7.0	6.9	7.2
22	0.4	6.4	6.3	6.2	6.4	6.1	6.3
22	0.5	7.2	7.0	7.1	7.0	7.0	7.0
22	0.6	6.9	6.8	7.0	7.1	6.8	6.9
22	0.7	6.1	6.0	6.2	6.0	5.9	6.0
24	0.4	8.3	8.5	8.5	8.6	8.6	8.5
24	0.5	9.0	8.7	8.6	8.8	8.9	8.8
24	0.6	8.4	8.2	8.0	8.5	8.2	8.3
24	0.7	8.1	8.4	8.2	8.0	8.1	8.2
26	0.4	7.2	7.0	7.1	7.0	7.0	7.1
26	0.5	7.4	7.4	7.3	7.2	7.1	7.3
26	0.6	7.3	7.0	7.1	6.8	6.9	7.0
26	0.7	7.0	6.5	6.6	6.5	6.4	6.6

3.4 Chemical composition of different pineapple wines

The data on chemical composition of different pineapple wines are presented in Table 4. The data indicate that final TSS of wine ranged from 4.8 to 6.5 °Brix. The results showed that final TSS varied according to levels of sugar. Final TSS of wine is lower with lower beginning TSS of the

must.

The reducing sugars of the wine prepared from 4 treatments ranged from 2.0 to 2.8%. The maximum reducing sugars was observed in 26 °Brix and minimum in sucrose 20 °Brix.

The total sugar content in the wines ranged from 2.2 to 3.0%. The maximum total sugar was observed in 26 0Brix and minimum in 20 0Brix.

The ascorbic acid of the wine ranged from 25.7 to 26.4mg/100ml. The results showed that ascorbic acid decreased slightly during alcoholic fermentation.

The alcohol content in the wine ranged from 8.5 to 10.5 % v/v. The maximum alcohol was observed in sucrose 26 0Brix and minimum in 20 0Brix. Alcohol content of the wine increased with increased in TSS of the must.

The pH of the wine prepared from different treatment ranged from 3.3 to

3.4. The result showed that the pH decreased during fermentation.

A group researcher found that, wine prepared from ber contained 4.8 to 12.2 0Brix, 2.7 to 8.2 % reducing sugars and 7.3 to 12.1 % alcohol (Adsule et al., 1992). Some researchers reported that the wine prepared from guava contained 6.2 to 6.5 Brix, 3.5 to 4.0 % reducing sugars, 4.9 to 5.6 % total sugars and 8.1 to 9.2 % alcohol (Jawahar et al., 2001). According to the wine prepared from blended juice of commercially grown grape cultivars contained 6.9 to 8.5 0Brix, 0.58 to 0.69 % acidity, 1.22 to 2.74 mg/100 g ascorbic acid, 5.8 to 6.4 % reducing sugars, 6.3 to 6.9 % total sugar and 7.3 to 8.4 % alcohol (Kraus, 2003). The data observed on the chemical compositions of wine were in agreement with the other reporters.

Table 4: Chemical composition of different pineapple wines

No.	Types and levels of sugar (°Brix)	TSS (°Brix)	Reducing sugars (%)	Total sugar (%)	Ascorbic acid (mg/100ml)	Alcohol content (%v/v)	pH
1	20	4.8	2.0	2.2	26.4	8.5	3.4
2	22	5.1	2.3	2.4	25.7	8.7	3.3
3	24	6.2	2.4	2.6	26.5	10.2	3.4
4	26	6.5	2.8	3.0	25.7	10.5	3.3

4. CONCLUSIONS

After considering both the chemical compositions and organoleptic properties of pineapple wines prepared under various conditions, it concludes that the use of sucrose to rise the TSS to 24 0Brix, acidity of 0.5 % and fermentation up to 14 days are appropriate to produce acceptable pineapple wine. However, the TSS and acidity of pineapple wine are quite low. The TSS is required to rise by adding extra sugar and the acidity by adding citric acid. These increase the cost of wine. Hence, there is a need to develop suitable pineapple varieties with higher juice TSS and acidity.

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