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Investigation of factors affecting to banana wine *(Musa chiliocarpa & Musa basjoo sieb)* fermentation

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Abstract
Banana ***(****Musa chiliocarpa & Musa basjoo sieb)* fruits contain high nutrition sources of carbohydrate, minerals and vitamins. Banana-based wine has a good aroma and can be considered a healthy alcoholic beverage. We determine the percentage of sugar 8% added to the fermented mixture. Amount of yeast added to the fermentation batch is 20 g/l; pH 3.6 is appropriate. Fermentation time is 11 days. We successfully produce banana wine with medium product quality.

Keywords: Pre-test scores, Post-test scores, Usage of Internet and Number of concepts viewed.

1. Introduction
A banana is an edible fruit produced by several kinds of large herbaceous flowering plants in the genus *Musa*. The fruit is variable in size, color and firmness, but is usually elongated and curved, with soft flesh rich in starch covered with a rind which may be green, yellow, red, purple, or brown when ripe. The fruits grow in clusters hanging from the top of the plant. Almost all modern edible parthenocarpic (seedless) bananas come from two wild species – *Musa acuminata* and *Musa balbisiana*. The scientific names of most cultivated bananas are *Musa acuminata*, *Musa balbisiana*, and *Musa paradisiaca* for the hybrid *Musa acuminata M. balbisiana*, depending on their genomic constitution.
Banana, a wonderfully sweet fruit with firm and creamy flesh that come pre-packaged in a yellow jacket, available for harvest throughout the year consists mainly of sugars and filers which make it a source of immediate and slightly prolonged energy. When consumed, reduces depression, anaemia, blood pressure, stroke risk, heartburns, ulcers, stress, constipation and diarrhoea. It confers protection for eyesight, healthy bones, kidney malfunctions, morning sickness, itching and swelling, improves nerve functions as well as help people trying to give up smoking (Idise *et al*, 2011).
Some studies about the banana-based products can be elaborated as follows: P. I. Akubor *et al*. (2003) investigated production and quality evaluation of banana wine. Juice was extracted from banana (*Musa sapientum*) pulp. The juice contained 3.0% total sugars, 0.08% protein, 0.35% ash, 5°Brix soluble solids (SS), 9 mg/100ml vitamin C and pH 4.45. The juice ameliorated to 18°Brix was inoculated with 3% (V/V) Baker's yeast (*Saccharomyces cerevisiae*) and held at 30 ± 2°C for 14 days. Soluble solids (SS), pH and specific gravity decreased while titratable acidity (TA) increased with increasing length of fermentation of the juice. The wine produced had 5% (V/V) alcohol, 0.04% protein, 48° Brix SS, 0.85% TA and 1.4 mg/100ml vitamin C. Sensory evaluation results showed there were no significant differences ($p > 0.05$) in flavor, taste, clarity and overall acceptability between banana wine and a reference wine. The banana wine was generally accepted.
B. Cheirsilp and K. Umsakul (2008) processed banana-based wine product using pectinase and α-amylase. Banana must was treated with pectinase and α-amylase to hydrolyze pectin and starch prior to its use to produce a wine product. The synergistic activities of the enzymes enhanced hydrolysis of the complex carbohydrates. A decrease of 55% in the viscosity and a 2.7-fold increase in the amount of extracted juice were obtained after incubating with 0.05% (w/w) of pectinase at 4 ^{0}C for 2 h, followed by treating with 0.05% (w/w) of α-amylase at 50C for 3 h. A 15 and 39% increase in total soluble sugars and reducing sugars in extracted juice were achieved, respectively. Enzyme-treated banana must was diluted with four volumes of water and then fermented by yeast to produce banana wine. The pretreatment of banana with enzymes before wine fermentation resulted in a higher level of reducing sugars than that of the

control (nonenzyme-treated banana wine) during fermentation. The clarity of the enzyme-treated banana wine was also fourfold higher than that of the control at 25 days of fermentation. The concentrations of total soluble solids, total soluble sugars, and alcohol in the enzyme-treated banana wine and the control have no significant differences.

G.R. Pandhre *et al*. (2010) prepared wine from banana**.** The present investigation was carried out with objective to prepare of wine from banana fruit by fermentation using wine yeast *Saccharomyces cerevisiae*. The physico-chemical characteristics of banana fruit pulp were analyzed to judge its suitability for preparation of wine. Process of preparation of banana wine was standardized and prepared wine was analyzed for its physico-chemical and sensorial quality attributes. The results revealed that sparkling wine, acidic in taste (titrable acidity (0.96%) with 8.2 per cent of alcohol content could be successfully prepared by using banana fruit as base raw material. Sensorial quality attributes of banana wine were compared with commercial grape red wine. The sensory evaluated rated banana wine quite acceptable as alcoholic beverage and is comparable with commercially available market wine.

Idise *et al*. (2011) studied wine produced from banana (*Musa Sapientum*). Fermentation of banana must for 144 h was carried out using recipes A to D. Recipe A contained a mixture of banana must with natural yeast. A was enhanced with granulated sugar to obtain recipe B. Recipe C contained recipe A augmented with granulated sugar and bakers' yeast while recipe D (control) contained only granulated sugar solution and bakers' yeast. Wine produced had values that ranged from 31.4 ± 0.29 to 33.2 ± 0.12°C for temperature, 3.38 ± 0.017 to 3.54 ± 0.052 for pH, 0.999 ± 0.0085 to 1.02 ± 0.0058 for specific gravity, 0.586 ± 0.018 to 0.71 ± 0.017 for optical gravity, 1.37 ± 0.075 to 1.383 ± 0.152 for percentage (%) alcohol (v/v), 0.271 versus 0.012 to 1.348 ± 0.072 for percentage (%) titratable acidity, 8.2 ± 0.099 to 9.38 ± 0.283 for total aerobic counts and 3.5 ± 0.5 to 4.75 ± 0.1 for Rf. Malo-lactic fermentation after 48 h was evident. Taste testing showed very little differences in wines from recipes A to C. Statistical analyses of tested parameters at 95% confidence level showed no significant differences. The wine from the control was similar to natural palm wine in taste and characteristics. Wine could thus be produced from banana for immediate consumption, within 48 h, using the recipes A to C.

Alvarenga *et al*. (2011) carried out potential application of *Saccharomyces cerevisiae* strains for the fermentation of banana pulp. This paper aimed at evaluating the fermentation behavior of selected *Saccharomyces cerevisiae* strains in banana pulp and they were compared with commercial yeast (baker's yeast) for subsequent production of distilled spirits. Five types of microorganisms were used: Four yeast strains obtained from accredited microbiology laboratories were isolated from domestic cachaça distilleries.

C.C. Gavimath *et al*. (2012) conducted comparative analysis of wine from different fruits. Fermentation of fruit juices is a relative and simple avenue for reducing post-harvest wastage of mainly perishable fruits, hence perishable fruits can be used for production of wine. In the present investigation we used papaya, banana, orange and lime fruits. Observations were recorded for acidity, microbial count and alcohol content. In this study banana fruits yield good quantity and quality alcohol when compare papaya orange and lime.

Awe, S. *et al*. (2013) examined proximate and mineral composition of locally produced pawpaw and banana wine. This study evaluates the proximate and mineral composition of fruit wines produced locally from ripe Pawpaw (*Carica Papaya*) and Banana (*Musa Sapientum*) using commercial *Saccharomyces cerevisiae* (E. C Kraus USA) and compared them with Red wine (Carlo Rossi). Carbohydrate contents of the produced wines were 6.1% (banana wine) and 6.2% (pawpaw wine); sugar contents were 0.1 g/100g (banana wine) and 0.2 g/100g (pawpaw wine), Vitamin C contents were 10mg/100g (pawpaw wine) and 15mg/100g (banana wine); while protein contents were 0.12 (pawpaw wine) and 0.28 mg/l (banana wine). The total solid contents were 7.0 (pawpaw wine) and 7.3 mg/ml (banana wine), dissolved solid content ranged between 990 -1650 mg/l while crude fibre and crude fat were absent in all the wines. The K^+ Na^+ Mg^+ Ca^{++} and Cl^- contents were 12, 64, 48, 0.8 and 24 and 21 mg/l, content ranged between 64 and 78 mg/l, content ranged between 48 and 54 mg/l); content ranged between 0.8 and 12mg/l; while content ranged between 24 and 60 mg/l.

Evans Chidi Egwim *et al*. (2013) investigated the effect of pectinase on the yield and organoleptic evaluation of juice and wine from banana and paw-paw. The study investigated the effectiveness of varying concentrations of pectinase on the yield of banana and paw-paw juice. It also evaluated the organoleptic scores of wines produced from the juice of banana and paw-paw made using the pectinase extracted juice. The pectinase juice extraction gave yields of 63.4% and 78.7% for banana and paw-paw compared to 38% and 43% for non-enzymic extractions. Maximum enzyme performance was at concentration of 6 mg/ ml resulting in a slurry volume of 188.0 ml for banana and 160 ml for paw-paw slurries. This enzyme concentration (6 mg/ml) also gave the juice with the least juice density of 0.940 for paw-paw juice and 1.003 for banana juice respectively. The reducing sugars were 1098.2 mg/ 100 g and 968.8 mg/ 100 g for banana and paw-paw. The titratable acidity were 2.0% and 0.8% for banana and paw-paw juices. The pH of the wines from paw-paw and banana were not significantly ($p<0.05$) affected by the concentration of the enzyme used in their juice extraction. Organoleptic evaluation after two weeks of ageing showed that banana wine was better accepted. This may be as a result of its higher reducing sugar content. The research clearly demonstrates the potential and applicability of pectinase in improving yield in the banana and paw-paw juice extraction process.

Prabir Dhar *et al*. (2013) conducted the production of banana alcohol and utilization of banana residue. Aim of the study was production of alcohol from banana juice which use as complete replacement of malt in alcohol production by utilizing pure culture of *Saccharomyces cerevisiae* as fermenting organism. Banana juice was made from banana pulp by using pectinase enzyme. Optimization of amount of pectinase enzyme for juice production and optimization of pH of the final product were also aim of this study. Pectinase enzyme used for liquefying the pulp production was 0.0003% (w/v). The sugar percentage found in the banana juice was 18%. A sequential study has been done by consecutive pH levels of 4.5, 5.0, 5.5, 6.0, 6.5, and 7.0 in the final product. The best product was obtained at pH 6.0 with respect to taste; pH was regulated only after the complete fermentation of the banana juice but just before the filtration process. Alcohol percentage of the product was 8% (v/v) at 28 ^oC. Total number of colonies detected was 21 in freshly prepared alcohol and total number of colonies detected was 20 in the beer after 5 months from production. Another aim of the work was utilization of the banana residue for the production of fiber enriched cookies. High fiber enriched cookies were prepared using 5%-20% level of fiber obtained from banana residue. 7%-10% fiber content was obtained as best parameter for cookie production and final moisture content of cookie was 3%.

Vietnam is a country with four seasons, but raw materials for the production of wine, mainly grapes, pineapple, strawberry and etc. While bananas are being widely grown in many places (especially in the South) but the result of it will be used to feed on the word not yet take advantage of wine production to a main stream way. Also bananas are tropical fruit with storage time not so high on the output of high harvesting bananas affair but no consumer demand for consumption of bananas there should the price of bananas sold is quite low. So we decide to research factors affecting to wine banana (Musa chiliocarpa & *Musa basjoo sieb*) fermentation in order to create the new liquor products, traditional features, take advantage of the abundant banana source material and create new trend for the technology of wine and also enhance economic value for the banana trees.

2. Material & Method

2.1 Material

Musa chiliocarpa & *Musa basjoo sieb* are selected at medium ripen stage, not damaged and kept in dry clean cool place to avoid exposing to direct sunlight. Other raw materials: saccharose, acid citric, ethanol.

2.2 Research method

- Sensory evaluation: TCVN 3215-79
- Chemical analysis:
+ Methanol residue in 1 Litter of Ethanol: TCVN 378:1986
+ Aldehyde residue: 51 TCN-TQTP 0005-2003
- Microbial testing:
+ TPC: TCVN 4884:2005
+ Escherichia coli: TCVN 6846:2007
+ Streptococcus faecalis: 3351/2001/QĐ-BYT
+ Clostridium perfringens: 3348/2001/QĐ-BYT

2.3 Statistical analyses

These were carried out using Microsoft excel 2003 at 95% confidence level.

3. Result & Discussion

3.1 Effect of saccharose supplementation for fermentation

Experiments were conducted in three prototypes with the concentration of sugars fermented fluids at 200 brix, 220 brix and 240 brix respectively. All three models are fermented at the same condition: pH 3.6, the expected additional yeast as 20 g/l, fermented at a normal temperature. Then all product of three templates are evaluated and measured alcohol content.

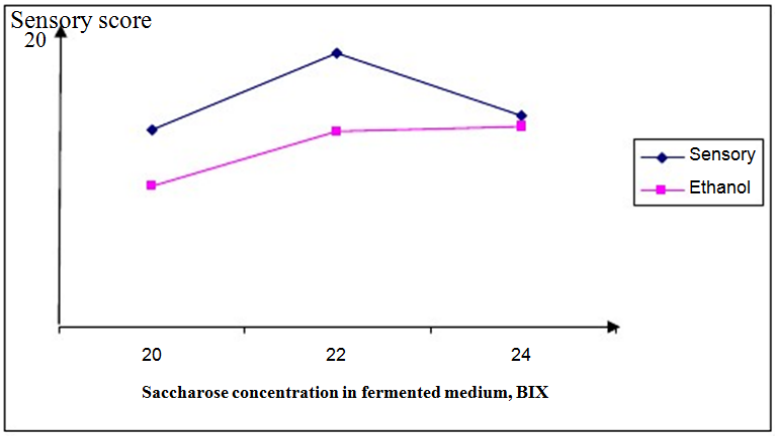

Fig 1: Effect of saccharose concentration to wine sensory quality

Look at the figure 1 we saw with sample concentration is 220 brix reaching the highest sensory coefficients. If we continue to increase the sugar concentration the sensor point will be dropped. Although the alcohol content of the sample at the moment have increased. When we add sugar much more, it reaches as high as alcohol content. Because the nature of fermentation as much incentive to ethanol intake, it creates as much, but the increase has a certain limit. If the concentration is too high it will cause major osmotic pressure, owing to bad change to normal physiological state of yeast. The active yeast fermentation time, weakness extends, not sugar radical metabolism, and ethanol accumulation also inhibit yeast activity. On the other hand, the higher sugar concentration it makes recurrent amounts of yeast activity. On the other hand the higher sugar levels make the reduction of lactic bacteria, it will be certain destruction created the volatile acid and manit causing a sour unpleasant taste. In addition during the fermentation process produces many products involved in redox reactions, the pigments makes the wine's color is changed. But if the concentration of low fermentation when there's not enough added sugar or the amount of the substance for the fermentation process is low. So the food source to the yeast use to increase biomass as well as the process of transformation of sugar into alcohol isn't enough so the fermentation process takes place mostly concurrent alcohol content low gain. On the other hand the amount of substance is less then the short fermentation time, the substances created the fragrance has not formed much, strong astringency. So we choose saccharose concentration ideal for fermentation is 220BRIX equivalent to saccharose supplementation 0.85%.

3.2 Effect of yeast supplementation to fermentation

Experiments conducted in three prototypes with the corresponding amount of additional yeast: 18 g/l, 20 g/l and 22g/l. All three were conducting fermentation in the same conditions: room share the same concentrations of fermentation the optimal results from previous experiments, pH 3.6 is expected to ferment at normal temperature. Then all products of three templates are evaluated and measured alcohol content is obtained.

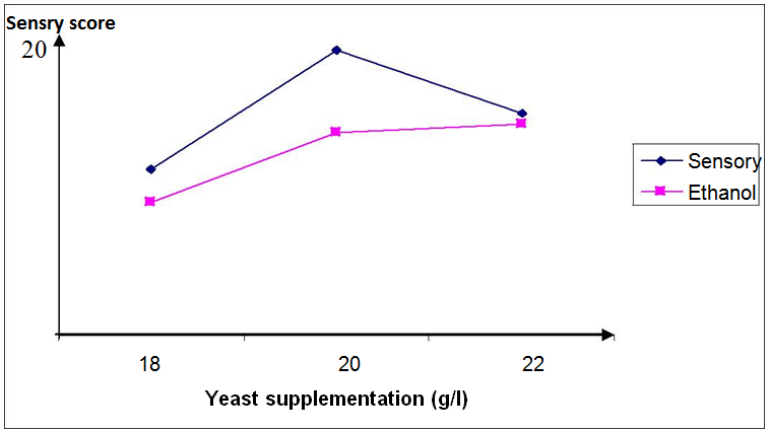

Fig 2: Effect of yeast to wine banana wine sensory score

Looking at the figure 2 we see sample applications have additional yeast cake is 18 g/l banana juice has low sensory point we continue to increase the amount of the additional yeast up 22g/l then the sensory point gain is very high but if we continue to increase the amount of yeast cake up 22g/l then the sensory scores being dropped significantly although the alcohol content has not increased significantly.

When the amount of yeast added to the fermented mixture increases, the alcohol content achievement also increases respectively. Since then the amount of yeast cells during fermentation mixture as much better mixed sugar fermentation are more radical metabolism so the alcohol content to achieve higher. Longer amount of yeast cells during fermentation mixture at least mixed sugar fermentation are not radical metabolism so the alcohol content lower gain. In addition, insufficient amount of additional yeast for fermentation makes the strange bacteria have operational conditions create the by product reduces the quality of the wine. As the operation of acetic, lactic acid bacteria etc do for wine is sour.

On the other hand the amount of yeast added to the fermented mixture as the primary fermentation time shorter. The original substance quantities (220 brix fermented mixture of sugar concentration), the amount of the additional yeast cakes ranging in form would much more yeast is much more metabolites. So the time necessary to metabolize all the initial sugar into alcohol is shorter.

Yeast likes to be the deciding factor leading to fermentation fast or slow, strong or weak. The amount of yeast added to the fermentation room must ensure enough for fermentation takes place quickly, that does not facilitate the development of harmful bacteria. The amount added to the fermented yeast affects the main fermentation time, alcohol content reach or influence the quality of the finished wine.

Through three prototypes we choose the additional yeast intake suitable for banana wine fermented fluids Musa chiliocarpa is 20 g/l banana juice.

3.3. Effect of banana juice pH for fermentation

Experiments conducted in three prototypes with the pH of fermentation environment as follows: 3.4; 3.6; 3.8. All three templates are fermented in the same conditions with optimal sugar levels from previous experiments, the same amount of yeast optimal supplement retrieved results from previous experiments, fermented at normal temperature. Then the products of all three templates are evaluated and measured alcohol content From figure 3 we noticed the similarities between the two lines indicates the alcohol content & sensory point as follows: When we increase the pH of the environment room fermented from 3.4-3.6, sensory point as well as the alcohol content of the sample are increased but keep increasing pH up, sensory point and alcohol content are all dropped significantly.

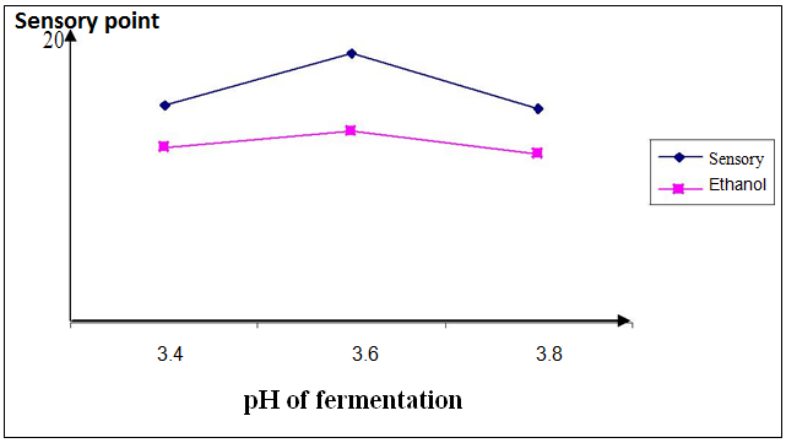

Fig 3: Effect of pH to fermentation

When the pH of the mixture increases the alcohol content also increases with increasing pH, but too high an alcohol content again dropped. The pH of the environment room fermenting too low or too high are active inhibitors of yeast (a number of yeasts have been killed). Hence the weak place fermentation, yeast's fermentation capacity is weak and has many by-products created cause smell, taste of inferior products. Each kind of different yeast pH suitable for them grow and develop

is different to the type of yeast used in this experiment, they are compatible with a pH value close to 3.6. Because in this pH level of alcohol measured creation is the highest. That lab we selected were pH of fermentation most appropriate translation is equivalent to 3.6% of citric acid supplements is 0.28% compared to raw materials.

3.4 Effect of fermentation time

Experiments are conducted in 4 samples corresponding to the time of main fermentation in the sample was 7, 9, 11, 13 days. All four samples were fermented in supply conditions with optimal parameters taken from the days of experiments before: the concentration of sugar added to yeast fermentation batch, the pH of the environment room of fermentation, fermented at a temperature usually. Then the product of 4 samples were assessed and measured alcohol content.

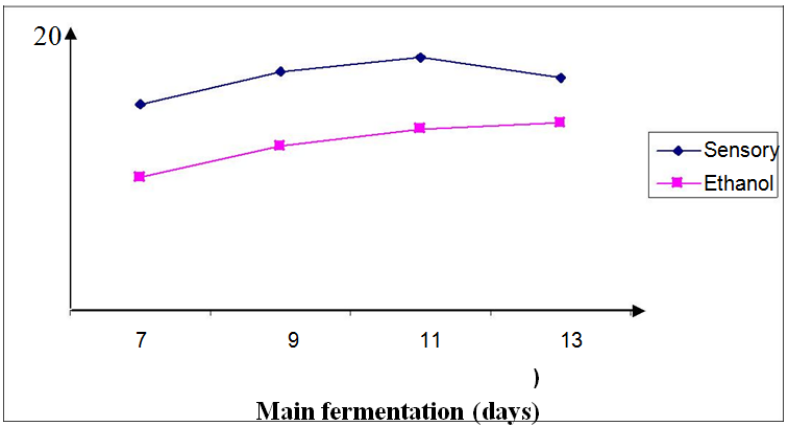

Fig 4: Effect of main fermentation time to wine quality

From the figure 4, the fermentation time is seen as increasing the alcohol content reach as high but from 11 to 13 days permitted at a negligible change. The model with fermentation time 11 days on sensory rating is the highest. If the primary fermentation time too short will have enough time to metabolize sugar runs out yeast into wine lead to the reducing sugar left many makes of wine has sweet taste, no smell of wine fermenting. But if the primary fermentation time spans over the allowable limit while the wine achieved high alcohol content but sour due to the activity of the yeast was weaker, the other microbes work and which is lactic bacteria destroying glyceryl makes wine with tartthat bitter taste of acrolein. So the study of main fermentation time defined for the fermentation process is urgently needed it will influence the quality of the finished wine. We select the time the primary fermentation for banana wine manufacturing process 11 days.

3.5 Effect of mixture for *Musa basjoo sieb* product accomplishment

Experiments were conducted with 3 templates corresponding to the proportion of mixed *Musa basjoo sieb* banana wine are: 15, 20 and 25% V. These products are then proceeded to sensory evaluation.

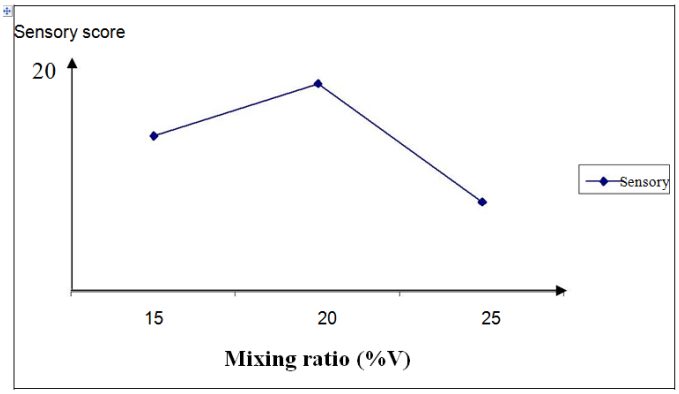

Fig 5: Effect of mixing ratio of *Musa basjoo sieb* to fermentation

Observe figure 5 above shows that if we increase the percentage distribution of banana wine matches pit up from 15% to 20%, then the corresponding sensory scores will rise but if further rate increases the sensory quality schemes will be dropped very low. The second prototype is most appreciated. So the second prototype was selected as the banana wine auction distribution rate of *Musa basjoo sieb* for banana wine manufacturing process. The wine so it should proceed to filter out alcohol as soon as fermentation ends. To facilitate the process of filtration in wine we need to increase the alcohol content for wine products by adding banana wine that causes the *Musa basjoo sieb* coating is precipitated floor vase is then separated by filtration method. In addition, the banana wine competition of wine distribution and seed after ferment if not removes will be a favorable environment for the damaged nature. Further harmonizing the sensory criteria are color, smell and taste. The sensory evaluation of the prototype model 2 deems there is harmony between the highest sensory norms should be rated. In the prototype 3 top distribution rate did not have the necessary harmonization should not be selected as the

mixing proportion. Picking banana wine auction distribution rate of *Musa basjoo sieb* is 20% V compared to handle milestone banana wine making process during mixing ratio.

3.6 Preservation time to banana wine quality

After the product is obtained from the processes are preserved at a temperature usually sensory and is from time to time in turn are: 2, 4, 6 weeks is obtained. Based on the figure 6 we see over time preserving products to improve product quality.

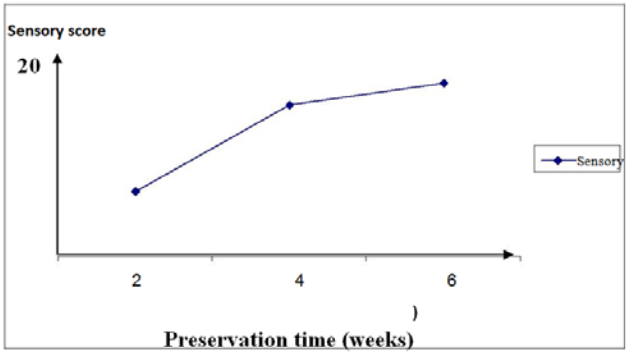

Fig 6: Effect of preservation time to product quality.

Fig 7: Banana wine

3.7 Evaluate the quality of products from the process

After determining the optimal parameters for the fermentation process and establish a banana wine manufacturing processes we've let out products and sensory evaluation board consisting of 5 reviewers are as follows:

The total score with the weight of the product is 16.6, according the quality hierarchy table the results tested at the Pasteur Institute: acceptable microbiological load and low concentrations of methanol, aldehyt acquired the high quality assurance and food safety so banana wine production is evaluated as medium ranking.

Table 1: Sensory score for banana wine products from the process

Quality parameter	Sensory score of specialists					Total score	Average score	The important factor	The point of weight
	A	B	C	D	E				
Turbidity	4.5	4.5	4.5	4.5	4.5	22.5	4.5	0.8	3.6
Color	4.6	4.5	4.3	4.2	4.4	21.0	4.2	0.8	3.4
Aroma	5.0	3.0	5.0	4.0	3.5	20.5	4.0	1.0	4.0
Taste	4.0	4.0	4.0	4.0	4.0	20.0	4.0	1.4	5.6
								Total score	16.6

3.8 Production cost of 100 litres of banana wine

The cost of materials is the banana Musa chiliocarpa and *Musa basjoo sieb* per litres of wine:

- 1 kg banana Musa chiliocarpa/ 2.7 litres of Musa chiliocarpa wine.
- 1 kg of *Musa basjoo sieb* bananas banana wine/ 0.7 litres of *Musa basjoo sieb* wine.
- White alcohol: 1 litre.
- Extra material costs:
- The amount of sugar added to reach 85 percent is 220 brix material.
- Citric acid addition: 0.28%.
- Two-component volumetric alcohol to mix with 100 litres of banana wine
- 20%*100,000 = 20,000 ml (*Musa basjoo sieb* wine)
- 80%*100,000 = 80,000 ml (Musa chiliocarpa wine)
- Raw material weight to ferment 100 litres banana wine:
- Musa chiliocarpa weight: 80,000/2,700 = 29.63(Kg)
- *Musa basjoo sieb* weight: 20,000/700 = 28.57(Kg)
- Sugar: 85%* 29.63 = 25.155 Kg
- Citric acid: 0.28%* 29.63 = 0.08264 Kg
- White acolol: 20,000/700 = 28.57 litres

Table 2: Production cost to produce 100 litres of banana wine

Description	Weight	Unit	Amount (VND)
Musa chiliocarpa	29.63 Kg	5,000 VND/kg	148,150
Musa basjoo sieb	28.57 Kg	6,000 VND/kg	171,420
Sugar	25.155 Kg	12,000 VND/kg	301,860
Citric acid	0.08264 Kg	130,000 VND/kg	12,396
White alcohol	28.57 litres	15,000 VND/kg	428,550
Energy	2/3 gas tank	300,000 VND/kg	200,000
Labor	5 person	50,000 VND/person/day	250,000
Total			1,512,376

So the cost of raw materials to produce 1 litre of wine and bananas are 15,123 VND. This cost plus the cost of public money and wear and tear of the equipment is scheduled to price this product is 16,000 VND/ litre. That price fits people's consumption level.

3.9 Comparision of banana wine to similar products

Compared with other similar products on the market: the wines of pineapple, dragon fruit, banana wine products also are full of typical components of wine such as ethanol, sugar, organic acid components aroma. Product quality is ranked under TCVN 3215-79 with a sensory scorecard system is established. Tested results at the Pasteur Institute show acceptable values.

3.9.1 Technical and economic value

On the economic value of raw material to produce abundant banana wine, lower raw material prices and crop of bananas year-round should actively be domestic raw materials produced here are a very important factor for industrial production. With the introduction of banana wine manufacturing process on the actual production will be the new trend for wine industry contributes to the market a new product that has value and enhance economic value for the banana trees. This is an advantage compared to other wines on the market today.

3.9.2 Market trend

Consuming behavior in market now trends to use more wine and new innovative products creating diversity for the wine industry. This is an opportunity for banana wine products are to reach consumers more easily. Some pictures of the products currently on the market as follow:

Fig 8: Some common wine products in the market

4. Conclusion

Banana (*Musa Sapientum*) is a fruit common in the tropics and is non-seasonal. It is readily available in Vietnam. Due to its high sugar content, it is suitable for the production of wine. In the making of banana wine, banana juice was used as an adjunct (to increase the fermentation efficiency) and to obtain higher ethanol content in the final product. To the product being put into actual production and high productivity need further study some of the following issues: the study using different factors for fermentation. In the future, it's necessary to study on the soaking time bananas *Musa basjoo sieb* but ensuring the health effects. Study on extraction of substances in the banana liqueur from which measures up reasonably reduced.

References:

1. Akubor PI, Obio SO, Nwadomere KA, Obiomah E. Production and quality evaluation of banana wine. Plant Foods for Human Nutrition 2003; 58(3):1-6.
2. Alvarenga, Mendonca R, Carrara, Geocze A, Silva, Maria C *et al*. Potential application of *Saccharomyces cerevisiae* strains for the fermentation of banana pulp. African Journal of Biotechnology 2011; 10(18):3608-3615.
3. Awe S, Eniola KIT, Kayode-Ishola TM. Proximate and mineral composition of locally produced pawpaw and banana wine. American Journal of Research Communication 2013; 1(12):388-397.
4. Cheirsilp B, Umsakul K. Processing of banana-based wine product using pectinase and α-amylase. Journal of Food Process Engineering 2008; 31(1):78-90.
5. Egwim EC, Ogudoro AC, Folashade G. The effect of pectinase on the yield and organoleptic evaluation of juice and wine from banana and paw-paw. *Annals*. Food Science and Technology 2013; 14(2):206-211.
6. Gavimath CC, Kalsekar DP, Raorane CJ, Kulkarni SM, Gavade BG, Ravishankar BE *et al*. Comparative analysis of wine from different fruits. International Journal of Advanced Biotechnology and Research 2012; 3(4):810-813.
7. Emmanuel IO, Ikenna OE. Studies of wine produced from banana (*Musa Sapientum*). International Journal for Biotechnology and Molecular Biology Research 2011; 2(12):209-214.
8. Pandhre GR, Hashmi SI, Patil JA. Studies on preparation of wine from Banana. International Journal of Processing and Post Harvest Technology 2010; 1(2):103-106.
9. Dhar P, Das S, Banerjee S, Mazumder S. Production of banana alcohol and utilization of banana residue. International Journal of Research in Engineering and Technology 2013; 2(10):466-470.