

The Effect of Processing Method and Ratio of Water Extraction To The Characteristics of Purple Yam (*DioscoreaAlata*) Wine

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ABSTRACT

Wine obtained from the fermentation of alcohol by the yeast *Saccharomyces cerevisiae* to the sugars and belong to the class B liquor with the alcohol content of 5-20% v / v. This study was aims to determine the effect of processing method and ratio of water extraction to the characteristics of wine Purple Yam.

The study used a completely randomized design (CRD) with factorial pattern consisting of two factors, namely the processing method (P) and the ratio of purple yam with water (A). Treatment processing method (P) as the first factor, consists of two levels: P0 = Fresh purple yam, P1 = Dried purple yam, as the second factor is the ratio of purple yam: water (A), which consists of three levels: A0 = ratio purple yam: water (1: 1), A1 = ratio purple yam: water (1: 1.5), A2 = ratio purple yam: water (1: 2). The results of research showed that processing methods with dried Purple Yam and water (1: 1) gives the best results with a total of acetic acid 0.22% w / v, pH 3.72, TSS 11.30% brix, ethanol 11.73% v / v and total yeasts 31.67 cfu/ml, and according to the Indonesian National Standard (SNI 01-4018-1996) the characteristics of the wine produced cassava purple preferred by the panelists that color is purple and preferably panelists (3.30), distinctive aroma Purple Yam (4, 45), flavor Purple Yam (3.90) and overall acceptance panelists preferred

Keywords :Purple Yams, Processing method, Ratio and Wine

INTRODUCTION

Wine is an alcoholic beverage that has been known since about 4000 Masehi, as a traditional drink in the Middle East and mainland Europe (Sudjatha, and Wisaniyasa. 2003). Wine obtained from the fermentation of alcohol by the yeast *Saccharomyces cerevisiae* to simple sugars found in grapes and other fruits. Wine classified into class B liquor with alcohol content of 5-20% v / v involved in the regulation of the Minister of Health No.86 / Menkes / Per / IV / 1977 dated 29 April 1977 (Rahayu and Rahayu, 1988). Wine is known as a beverage fermented from grapes that have been cooked by the yeast *Saccharomyces cerevisiae*. Wine as alcoholic drinks also can be made from various raw materials containing carbohydrate and derivatives (Sudjatha and Semadi, 1997, Nwachukwu *et al.*, 2008) Therefore, other raw materials, such as purple yam (*Dioscoreaalata*) can be used as a substitute for grapes, in addition to other raw materials to be used as wine.

D. alata is also referred to as greater yam, Asian greater yam and ten-month yam (Martin, 1976). It is more important as food in West Africa and the Caribbean than in Asia and the Americas where it originated, and has been competing with the most important native species, *D. otundata* Poir. It was introduced to Africa some hundred years ago from Malaysia through agriculturists and by Portuguese and Spanish seafarers (Martin, 1976; Treche, and Agbor-Egbe, 1996)).

Purple Yam (*Dioscoreaalata*), is one of the tubers are widely available in Indonesia (Harijono *et al.*, 2013). In general these types of bulbs are less preferred for consumption because of the slimy and itching. Until now, its use is still very limited, generally still consumed as Purple Yam boiled, steamed, grilled, compote and chips. Purple Yam has advantages in terms of nutrient content compared to other tubers (Sulistyono and Jaminton, 2004). In addition to the high carbohydrate content, is also rich in vitamin C and anthocyanins, so it should be wide utilization Purple Yam expanded (Ocloo and Ayernor, 2010; Harijono *et al.*, 2013). Purple Yam is an agricultural food that is seasonal, so in a fresh state should be immediately processed because it would be easily damaged (Martin, 1976) As to ensure their availability throughout the season then it needs to be further processed into dried cassava which is generally not easily damaged.

Dried purple yam is a product of processed dried tubers, with a longer shelf life than fresh ingredients. Making dried purple yam can provide raw materials throughout the season. In the process of making wine, an important factor to note is the ratio of water in the extract. Water used in this study had a specific criteria, that is, free of microbes and low hardness. The ratio of water treatment on the extract 1: 1, 1: 1.5 and 1: 2. Ratio of water in the extract is a medium that can affect the activity of microbes in the process, but it can be obtained the extract with more volume and quality of the wine is good and meets ISO standards.

MATERIALS AND METHODS

Place and Time Research

This research was conducted at the Laboratory of Food Processing, Laboratory of Food Microbiology and Laboratory of Food Analysis, Faculty of Agricultural Technology, Udayana University

Materials and Equipment

The materials used in this study is purple yam, alcohol 70% (Ika), yeast Na Kok Liong (NKL), banana leaf, sugar, distilled water and sodium bisulfite. While the chemicals necessary for the analysis is a phosphate buffer pH 7.0 and pH 4.0, 0.1 N NaOH (JT. Baker), Phenolphthalein (JT. Baker), APDA (Acidified Potato Dextrose Agar) and citric acid (Merck).

The equipment used in the study are gas stove (Hitachi), Pots Steamer and Waskom (brand Java), balanced scales 3 kg (Lion Star), Knives stainless steel, aluminum foil, mortar porcelain, thermometer, filter fabrics, filter paper, glass, spoon and fork meal stainless steel. While the equipment required for the analysis is the scales analytic (Adventurer Ohaus and Metler Toledo AB-204), pH meter (Jenway 3010), Vinometer, Hand refractometer (Atago 870 100), distillation, tool microsyringe, Bottle diluent, Pumpkin servings of 100 ml and The test tube and measuring cup 50 ml (Pyrex), Petri dish, Becker glass 50 ml, Erlenmeyer 250 ml (Schott Duran), Pipette volume of 1 ml (Kimax), mikroburet (Blau brand), Autoclave (Model 25 X All American), Oven (Blue M-Single Wall TC 11), Transferpipette (brand), rod bent, Incubator (Mettler) and Laminar (brand Assorted Lab Type HS 079S) and Quebec colony counter brand American Optical.

Experimental design

In this study, the experimental design used was completely randomized design (CRD) with factorial pattern consisting of two factors, namely the processing method (P) and the ratio of Purple Yam and water (A). Treatment Methods (P) as the first factor, consists of two levels: P0 = Fresh Cassava, P1 = Dried Purple Yam, as the second factor is the ratio of cassava: water (A), which consists of three levels: A0 = ratio Purple Yam: water (1: 1), A1 = ratio of Purple Yam: water (1: 1.5), A2 = ratio of Purple Yam: water (1: 2).

There are six treatment combinations and each treatment was repeated three (3) times, in order to obtain 18 experimental units. Data obtained from the observed variables analyzed by analysis of variance and if there are significant among the treatments, the analysis followed by Duncan test (Steel and Torrie, 1993).

Making wine with fresh Purple Yam.

Purple Yam sorted, peeled, washed, cut into small pieces and steamed until half cooked. Then added yeast Na Kok Liong (NKL) as much as 0.1% w/w and fermented process is carried out for 4 days. Furthermore, the fermented products was destroyed by the crusher and added water in accordance with the treatment. The mixture is then pressed to obtain a liquid of products. The liquid was then added sulfites as much as 50 mg/l, Sugar 15% w/v and the pH was adjusted from 3.5 to 4.00 (the addition of citric acid or NaOH) using a pH meter. The liquid

products was then put into the bottle to ferment for 10 days at room temperature. Once fermentation is complete the process of aging for two months, the aging process is done with silence wine that has been fermented by removing the plastic tube from the lid and close the bottle tightly.

Making wine with dried Purple Yam processing

Purple Yam sorted, peeled, washed, cut into small pieces and put into oven until dry (70°C, during 14 hours). Once dried, then steamed until half cooked and then added yeast NKL (Na KokLiong) as much as 0.1% w/w and fermented process is carried out for 4 days. Furthermore, the fermented products was destroyed by the crusher and added water in accordance with the treatment. The mixture is then pressed to obtain a liquid products. Liquid products was then added sulfites as much as 50 mg/l, Sugar 15% w/v and the pH was adjusted from 3.5 to 4.00 (the addition of citric acid or NaOH) using a pH meter.

The liquid products was then put into the bottle to ferment for 10 days at room temperature. Once fermentation is complete the process of aging for two months, the aging process is done with silence wine that has been fermented by removing the plastic tube from the lid and close the bottle tightly.

RESULTS AND DISCUSSION

Total Acetic Acid (% w/v)

Based on the analysis of the total acetic acid of purple yam wine shows that the ratio of water treatment, processing and treatment of the interaction between the two treatments was not significant ($P > 0.05$). The average value of total acetic acid of Purple Yam wine can be seen in Table 1. The average value of total acetic acid of Purple Yam wine ranged from 0.21 to 0.22% w/v .

Table 1. The average value of Total Acetic Acid (% w/v) Purple Yam Wine

Ratio of water	Processing Method		Average
	P0	P1	
A0	0,22	0,22	0,22 a
A1	0,22	0,22	0,22 a
A2	0,21	0,21	0,21 a
Average	0,22 a	0,22 a	

Remarks: The Average value that followed by the same alphabet in the same row and Colom performed insignificantly ($P > 0,05$).

Acetic acid bacteria which appeared at the early stages of the fermentation, may have constituted the endogenous microflora of the substrate and thrived on the products of hydrolysis of cassava polymer. A similar observation was noted by Treche, and Agbor-Egbe (1996). These observations were corroborated by Ezeronye (2001), who reported that acetic acid production is usually accompanied with the lowering of pH of the fermenting liquor from 7.2 to 3.4, thus, inhibiting proteolysis resulting from the activity of the microorganism.

Based on observations in Table 1 can be seen that total acetic acid contained in wine of Purple Yam not in accordance with the standards established in the SNI 01-4018-1996. Total acetic acid are allowed in the SNI is a maximum of 0.2%^{w/v}, while the total acetic acid contained in wine of Purple Yam amount higher than that limit ranged between 0.21 to 0.22%^{w/v}.

The degree of acidity (pH)

Based on the results of the analysis of the diversity of the pH Purple Yam wine showed that the treatment ratio of water in the extract was highly significant ($P < 0.01$), whereas for the treatment of processing method and the interaction between the two treatments was not significant ($P > 0.05$). The average value of the degree of acidity of the wine Purple Yam can be seen in Table 2.

Table 2. The average value pH of Purple Yam Wine

Ratio Water	Processing Method		Average
	P0	P1	
A0	3,74	3,72	3,73 c
A1	3,84	3,85	3,85 b
A2	3,97	3,98	3,97 a
Average	3,85 a	3,85 a	

Remarks: The Average value that followed by the same alphabet in the same row and column performed insignificantly ($P > 0,05$).

Total Soluble Solid (% Brix)

Based on the results of analysis of variance to total soluble solids of Purple Yam wine showed that the ratio of water treatment on the extract was highly significant ($P < 0.01$), whereas for the treatment and processing method of the interaction between the two treatments was not significant ($P > 0.05$). The average value of total soluble solids of Purple Yamwine can be seen in Table 3.

Table 3. The Average Value of Total Soluble Solid (%Brix) Purple Yam Wine

Ratio Water	Processing Method		Average
	P0	P1	
A0	11,37	11,30	11,33 a
A1	9,03	9,07	9,05 b
A2	7,23	7,20	7,22 c
Average	9,21 a	9,19 a	

Remarks: The Average value that followed by the same alphabet in the same row and Colom performed insignificantly ($P > 0,05$).

Glucose and sucrose are the main free sugars reported in yam tubers (Kouassiet *al.*, 1990; Hariprakash and Nambisan, 1996). The presence of maltose and fructose were reported after tubers were stored for some days (Hariprakash and Nambisan, 1996). Other sugars found are pentose and mannose (Omijeh, 1986)

Ethanol Contents (% v/v)

Based on the analysis of diversity on ethanol Purple Yam wine showed that the treatment ratio of water in the extract was highly significant ($P < 0.01$), whereas for the treatment and processing of the interaction between the two treatments was not significant ($P > 0.05$). The average value of the alcohol content of wine Purple Yam can be seen in Table 4.

Table 4. The Average Value of the Ethanol Content (% v/v) Purple Yam Wine

Ratio Water	Processing Method		average
	P0	P1	
A0	11,77	11,73	11,75 a
A1	10,33	10,30	10,32 b
A2	9,07	9,03	9,05 c
average	10,39 a	10,35 a	

Remarks: The Average value that followed by the same alphabet in the same row and colom performed insignificantly ($P > 0,05$).

Table 4 shows that the average value of the ethanol content ranged from 9.05 to 11.75%, with the highest alcohol content at treatment water ratio of 1: 1 (A0) is 11.75% and the lowest ratio of water treatment 1 : 2 (A2) that is equal to 9.05%.

High alcohol levels are caused by glucose and fructose is high in the product (Ezeronye, 2001). Sugar content directly affects the alcoholic fermentation, because the amount of material that can be converted into alcohol (ethanol) is determined by the sugar content in the materials (Anonymous, 1997; Ezeronye, 2001). At a higher sugar content will lead to the production of higher alcohols. According Ocloo and Ayernor. (2010) the amount of alcohol (ethanol) produced in addition to depending on the amount of sugar that is also due to the efficiency of yeasts convert sugar into alcohol. Sugar is a source of carbon that is needed by yeasts during fermentation, so with a high sugar content it provided enough nutrition to grow so that the yeast will more actively solve the sugars into alcohol (Buckle, et al., 1987; Ocloo and Ayernor, 2010). According to the Indonesian National Standard for wine 01-4018-1996 ethanol content ranging from 8-20% v/v . Ethanol content of wine Purple Yamso in accordance with ISO ranging from 9.05 to 11.75% v/v .

Methanol Content (% v/v)

The result of analysis by gas chromatography have undetectable levels of methanol in wine of Purple Yam for all treatments. Levels of methanol in wine are very limited in number

even expected nothing because these substances are toxic to the body, especially the nerves. This means that already meet the quality requirements of wine stipulated in SNI 01-4018-1996, in which the methanol content in wine is allowed max. 0.1% v/v of alcohol contents.

Total Mold and Yeast (Cfu/ml)

Based on the results of analysis of variance showed that the ratio of water treatment, processing method and the interaction between the two treatments was not significant ($P > 0.05$) to total mold and yeasts of Purple Yam wine. The average value of total mold and yeasts of Purple Yam wine can be seen in Table 5.

According SNI 01-4018-1996 yeast contamination in wine products a maximum of 50 cfu/ ml, whereas the Purple Yam wine produced has a mold and yeast contamination ranging from 33.17 - 42.50 cfu / ml. This means that Purple Yam wine produced meets the requirements set forth in ISO.

Sensory Evaluation

Results of sensory evaluation that include color, odor and flavor (test scores) and overall acceptance (hedonic test) against Purple Yam wine is produced, can be seen in Table 6.

Table 6. The average value of the test scoring for color, odor and flavor and hedonic test the overall acceptance

Treatment	Average Value			
	Color	Odor	flavor	overall acceptance
POA0	4,60 a	4,40 ab	3,80 b	4,65 ab
POA1	3,85 b	3,60 b	3,90 b	4,30 bc
POA2	1,20 e	5,00 a	5,10 a	5,30 a
P1A0	3,30 c	4,45 ab	3,90 b	3,90 bc
P1A1	3,20 c	4,55 ab	3,55 bc	4,10 bc
P1A2	1,95 d	3,80 b	2,85 c	3,30 c

Color

Results of analysis of variance showed that the processing and comparison of water was highly significant ($P < 0.01$) against Purple Yam wine color purple. The average value of the color test scoring can be seen in Table 7. In Table 7 it can be seen that the average value of test scores given by the panelists of the color Purple Yam wine ranged from 1.20 to 4.60 with the criteria of normal purple to purple color is very dark. The 20 panelists who gives his assessment of the color Purple Yam wine, most of the panelists expressed like - very like the color of the wine produced.

Odor

Results of analysis of variance showed that the processing and comparison of water was not significant ($P > 0.05$) on the odor of wine Purple Yam. The average value of the test scoring against aroma can be seen in Table 8.

Based on examination of Table 8 it can be seen that the average value of test scores given by the panelists on the odor of Purple Yam wine ranged from 3.60 to 5.00 with ethanol odor criteria little sting to ethanol rather overpowering. The 20 panelists who provide the assessment of the odor Purple Yam wine, most panelists expressed very like odor Purple Yam wine is produced, because the wine has a distinctive odor Purple Yam.

Flavor

Results of analysis of variance showed that the processing and comparison of water was highly significant ($P < 0.01$) to taste Purple Yam wine. The average value of the taste test scoring can be seen in Table 9.

Based on examination of Table 9 it can be seen that the average value of test scores given by the panelists to taste Purple Yam wine ranged from 2.85 to 5.10 with the criteria of taste ethanol rather not bite until ethanol is very biting.

Of the 20 panelists who provide assessment to taste Purple Yam wine, most panelists expressed love the taste of wine produced Purple Yam because the wine has a distinctive flavor Purple Yam can still be perceived by the panelists.

Overall acceptance

Results of analysis of variance showed that the processing and comparison of water was highly significant ($P < 0.01$) to the overall acceptance Purple Yam wine. The average value of the hedonic test the overall acceptance can be seen in Table 10.

Overall acceptance given to Purple Yam wine panelists based Table 10 ranges from 3.30 to 5.30 with the criteria rather not like to moderately like. The average value obtained at the highest overall acceptance P0A2 treatment (treatment without dried/fresh and water ratio of 1: 2) that is equal to 5.30, while the lowest for the treatment P1A2 (processing with dried and water ratio of 1: 2) that is equal to 3, 30.

CONCLUSION

Processing Method and Ratio water (1:1) showed the best characteristic of Purple Yam wine such as total of acetic acid 0,22% $^b/v$, pH 3,72, TSS 11,30 % brix, ethanol 11,73% $^v/v$ and total mold and yeast 31,67 cfu/ml. the Purple Yam wine products was in Indonesian Nasional Standards (SNI 01-4018-1996), with the preference test were preferred by the panelist such as color (3,30), odor (4,45), flavor (3,90) and Overall preferred.

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