

# Ethanol of ajwa

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**Abstract.** Dates ajwa is a special fruit. One of the obvious advantages listed in the hadith of Rasulullah SAW. In addition, the glucose content is very high, thus potentially producing ethanol after fermentation. Self-explanatory calendar searches as ethanol producers have not been reported, so they need to be explored. This study traces ethanol to fermented dates with hydrolysis and without hydrolysis. The results showed that the volume of ethanol produced by hydrolysis was larger, ie 15.5 mL/day, compared without hydrolysis, ie as much as 6.5 mL/day. In the flame test, the fermentation results with hydrolysis longer lit than without hydrolysis. The benefits of the study provide information that dates as well as rizki ajwa, also can produce intoxicating substances.

## 1 Introduction

Dates are one of the ten fruit species mentioned in the Qur'an [1]. Ajwa is one type of dates (*Phoenix dactylifera*). This fruit is often called the Rosul date, because the tree is only in madinah and the person who first introduced is Prophet Muhammad SAW. The hadith of the Prophet SAW reveals the virtue of this fruit, that if consumed as much as 3 or 7 can ward off magic [2], and then in another hadith mentioned this fruit can serves as medicine [3]. As Mallaping's research, *et al.*, shows that the potential of dates can recover blood lactate, so that the dates can be used as an alternative food source for workers to increase their productivity through efficient recovery of fatigue [4]. The same study was conducted by Sani, *et al.*, indicating that dates can be used as dietary supplements and antimicrobial agents [5]. In line with research Hamada *et al.*, that Pits of date palm could be an excellent source of functional foods components with the exclusion of phytic acid [6].

In addition to these virtues, these fruits contain very high sugar, is glucose content 51.3 grams /100 grams and 48.5 grams/100 grams for the content of sucrose [7] and according Kamarudin *et al.*, revealed that glucose contained about 20-70% in dry weight [8].

Meanwhile, the potential of date palms other than as a good food, can also intoxicating (QS Al Nahl 76). Potentially intoxicating suspected because of high glucose content. As research conducted by S. Awe and SN Nnadoze, which indicates that the palm fruit can be used as fruit wine with a good microbiological standart [9]. In line with other research performed by Bhusari, *et al.*, which showed that the palm fruit can be used as a wine with a good microbiological standart [10].

Potential dates browsing as an intoxicating substance has not been widely reported, on the basis of this, it is

worth exploring the potential of ajwa dates to produce intoxicating substances.

## 2 Methods

### 2.1 Qualitative Analysis of Sugar Content at Ajwa Dates

#### 2.1.1 Ajwa Dates Hydrolysis

Dates that have been separated seeds cut then dried in the heat sun and oven. Then ground to a certain size. Dried dried fruit weighed 25 grams and then put into 250 ml Erlenmeyer. Into Erlenmeyer added 50 ml H<sub>2</sub>SO<sub>4</sub> 1% and erlenmeyer sealed with cork and then heated at 121°C for 30 minutes. Separated water phase was then added 100 ml of 4% NaOH and closed tightly and reheated at 121°C for 30 minutes. The solid phase was washed with water several times.

#### 2.1.2 Fermentation Process

The hydrolyzed date palm fruit juice is added with 4 grams of *Saccaromyces Cerevisiae* and stirred at 150 rpm until homogeneous. After that Erlemeyer 250 ml containing the date palm is connected to a rubber hose and the end of the hose is inserted into the water to avoid direct contact with air. Furthermore the solution is fermented for 1 day, 3 days and 5 days (according to treatment). The solution is separated by a date slurry so that the alcohol and water liquor are obtained.

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### 2.1.3 Purification of Ethanol (Distillation)

The obtained ethanol is purified by distillation. The fermented liquid is fed into the distillation flask and then heated to a temperature of 80 °C. The distillation process is carried out for 1.5 - 2 hours until ethanol does not drip again. The distilled ethanol is measured.

### 2.1.4 Analysis of Bioethanol Dates

#### a. Qualitative

The purified bioethanol is introduced into 5 ml porcelain cup then in flame test.

#### b. Quantitative

Bioethanol was measured with GC-MS to determine the resulting ethanol content.

## 3 Result and Discussion

Date palms contain very high sugar, is glucose content 51.3 gram/100 gram and 48.5 gram/100 gram for the content of sucrose [11]. The presence of sugar content on ajwa dates is evidenced by the positive results of the Molisch, Barfoed and Benedict tests shown in **Table 1**.

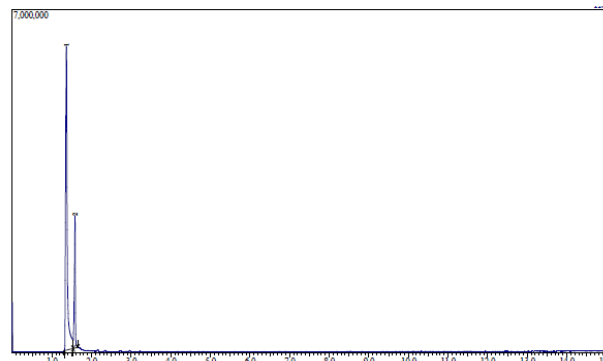
**Table 1.** Qualitative Test of Sugar Content.

Dates Extract		Qualitative Testing		
		Molisch Test	Barfoed Test	Benedict Test
Solvent	Aquadest	+	+	+
	Ethanol	+	+	+

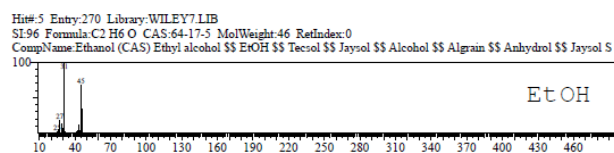
Sugar content in high dates is a potential raw material for ethanol production [12]. Bioethanol is produced from sugar which is the result of fermentation activity of yeast cells. A good yeast used to produce an bioethanol is from the genus *Saccharomyces*. *Saccharomyces cerevisiae* produces *zimase* and *invertase* enzymes. *Zimase* enzyme serves as the breaking of sucrose into monosaccharides (glucose and fructose). The *invertase* enzyme further converts glucose to an bioethanol [13]. Sugar content of 10 - 18% in the fermentation medium generally produces a lot of ethanol.

The qualitative test of ethanol content on fermented dates is evidenced by positive results on flame test, due to the flammability of ethanol.

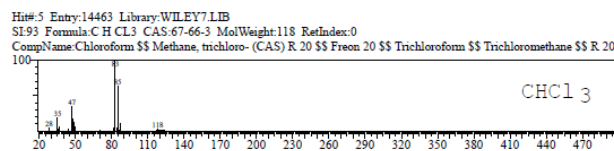
Additionally, ethanol from fermented palm ajwa analyzed by GC-MS. The GC-MS spectra in **Figure 1** shows that the sample of the experimental results has two peaks. It shows that the first distillation product on the bioethanol is not 100% pure ethanol. At the time of retention 1,365 there is the first peak which indicates the presence of ethanol. While at retention time of 1.581 there is a second peak indicating the presence of chloroform compound. To find out what compounds are present in the sample, it can be known from the GC-MS libraries presented in **Figures 2** and **3**.



**Fig. 1.** Results of GC-MS Chromatogram of Bioethanol Samples.



**Fig. 2.** The ethanol spectrum of the GC-MS Instrument Library.



**Fig. 3.** The chloroform spectrum of the GC-MS Instrument Library.

Based on the chromatogram of **Figure. 2** it can be ascertained that the sample of the experimental results contained a bioethanol compound. This is evidenced by the ethanol relative molecular formula (C<sub>2</sub>H<sub>5</sub>OH) is 46 as shown in the spectrum.

Ethanol produced from the fermentation of the ajwa dates is indicated in **Table 2**.

**Table 2.** The volume of ethanol produced by day.

Treatment	Initial Volume (ml)	Volume ethanol (ml)/day		
		1	3	5
Hydrolysis	100	2.0	7.0	13.5
Without Hydrolysis	100	1.0	3.0	6.3

Based on **Table 1** shows that the highest bioethanol volume get on the fermentation time of 5 days. Time fermentation has an effect on which bioethanol yields are getting longer fermentation time then the bioethanol will increase. However, when fermentation is too long then the nutrients in the substrate will be exhausted and yeast *Saccaromyces cerevisiae* can no longer ferment the ingredients.

In addition, the amount of ethanol produced by hydrolysis is more that 15.5 mL/day compared with without hydrolysis ie 6.5 mL/day. This is because the process of hydrolysis or called saccharification can break down complex carbohydrates (like sugar, cellulose and hemisolulose into sugar monomers) into simpler

components. Therefore, at the time of the fermentation process, the yeast used will directly degrade the glucose of the hydrolysis result so that the fermentation process runs optimally to produce more ethanol.

## 4 Conclusion

Dates have the potential to produce ethanol as evidenced by flame tests and GC-MS test results. The ethanol volume resulting from the fermentation of ajwa dates with hydrolysis was higher at 15.5 mL/day, compared with no hydrolysis ie 6.5 mL/day.

We ackonledge to UIN Sunan Gunung Djati Bandung.

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