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Technology**

Department of Chemistry

**Alcohol Content in Some Sudanese
Barley Beverage Sharboate**

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Dedication

- To our Parents who gave us hope and wished us to success.
- To our teacher who supported and supported and Supervisor our project.
- To our College who stood based us to the end.
- To everyone who provided us with information ideas and support.

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Abstract

Three sample of local home product (Sharboat) were stores for the following up of the chemical development of the ethyl alcohol during storage for two and four days under different condition. Gas Chromatography was used to test the sample, the results show that ethanol content varies with time and yeast and condition of storage.

All samples showed the presence of ethanol when initially examined. All samples showed increase in alcoholic content in Sharboat, when stored for four days at room temperature with addition of yeast extracts.

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1-1-Introduction:

Barley beverage are found in Sudan in local markets and people drink it regularly. The temperature in Sudan in the most month of the year is high, Barley beverages are stored at this high temperature for days. This study was done in order to detect the presence of alcohol in Barley beverage and in local Sudanese drinks (home made) due to bad storage condtions.

Ethanol may be formed as a product of fermentation process of Barley beverage and some local Sudanese drinks. High storage temperature may result in this fermentation.

1-2-Definition of alcohol:

An alcohol is an organic compound that contains a hydroxyl group as a functional group and the general formula is ROH, where R is alkyl or aryl group.

The R-group may be open chain or cyclic, it may contain a halogen atom.

The hydroxyl,(OH) group, is the functional group, which determines the properties characteristic of the family. Variation in structure of the R group may affect the rate at which the alcohol undergoes certain reaction, and even in a few cases, may affect the kind of reaction.

1-3-Ethanol:

Ethanol is not only the oldest synthetic organic chemical used by man, but also one of the most important alcohol, (Morrison and Boyd, 1992)

Ethanol was first prepared synthetically in 1826 through the independent efforts of Henry Hennel in Great Britain and S.G Serullas in France. In 1828, Michael Faraday prepared ethanol by acid-catalyzed hydration of ethylene, a process similar to that which is used today for industrial ethanol preparation.

1-3-1- Physical Properties:

Ethanol is a volatile, flammable, color less liquid that has a strong characteristic odor. It has a density of 0.789 g/ml . It is boiling point 78.5°C , It burns with a smoke less blue flame that is not always visible in normal light . Ethanol is hydroxyl group is able to participate in hydrogen bonding , rendering it more viscous and less volatile than less polar organic compounds of similar molecular weight . Ethanol is versatile solvent , miscible with water and with many organic solvent.

(Merck) Ethanol is miscible with water contrasts with that of longer – chain alcohols

(five or more carbon atoms), whose water miscibility decreases sharply as the number of carbon increases (Morrison and Boyd,1972). Ethanol is slightly more refractive than water.

1-3-2-Hydrogen Bond:

The hydroxyl group is quite polar and most important, contains hydrogen atom is bonded to the highly electronegative oxygen atom. Through the hydroxyl group, ethanol is capable of hydrogen bonding. Show Hydrogen bonding in alcohol,(Morrison and Boyd, 2001)

1-3-3- Production Of Ethanol:

In Industry:

Ethanol is produced both as petrochemical, through the hydration of ethylene, and biologically, by fermenting sugars with yeast. Economically the former process depends on the prevailing prices of petroleum while the latter one depends on that of grain feed stocks.

-Production of ethanol in industry (Morrison and Boyd, 1992)

Alcohol intake and absorption:

Although there is no such thing as normal alcohol in the countries. When alcohol in human body but the percentage of ethanol allowed (0.0%) in Muslim consumed, it goes into the stomach, where it is not digested. Since it has small molecular size, approximately 10-20% of the quantity consumed is absorbed in to the blood stream through the mucosal lining of the stomach. The remaining 80% is absorbed in the small intestine.

The degree and rate of absorption of alcohol from the stomach are governed by several factors which include:

a\The quantity of alcohol ingested

b\ The nature and quantity of diluting and membrane containing substances presents.

c\The concentration of alcohol drink

There for, alcohol consumed after a meal would have a slower absorption rate than alcohol taken on an empty stomach, other condition being the same.

Alcohol that is consumed on an empty stomach reportedly reaches its maximum concentration in the blood within 30 minutes being reached up to 90 minutes after digestion.

1-4-History of alcohol in Sudan:

I think it was from Sudanese customs and traditions that viewed proud Self- esteem , And not detect .We find in the North light wines such as marisa, kasra, Walshrobot and heavy wines such as all kinds of race (ethnicity) and made from dates , is most fames and powerful ethnic types and the percentage of alcohol is very high , and was made and What was his distillation (Butler) . And all of that kind of ignorance . Also find the same types of wines in various parts of the Sudan and the different raw material to manufacture and have aspade , and all

her wines are made from the area of agricultural products , for example , in the South the same type of Beirut but ethnic made from coffee and bananas . In West Sudan ethnic manufactures orange (Gebel Marra) and GEF corn . (Elamin, 1990).

In the colonial era , there were laws governing alcohol and work alanadi and hours of work , and was under police protection and close 5p.m . Whistle from rotating , balanadi they had local permits certification . Nanny still in the South and some Western Sudan are the staple food of the polulation . the extend that the child When his weaning balmerish and God forbid.

1-4-1- Local Sudanese Drink (Sharboat Drink):

Sharboate , a fames Sudanese indigenous date juice , has been used as drink for any centuries . Nowadages it used as common drink in Eid Aladha and sometime in wedding celebration, especially by people from northern Sudan .

Sharboat is mad either with addition of yeast extract or without . flavoring material are also added to it.

1-5-Date Palm:

The date palm is a palm in the genus phoenix extensively cultivated for its edible fruit.

1-5-1-Origin and distribution:

The date palm is believed to have originated in the lands around the Persian Gulf and in ancient times was especially abundant between the Nile and Euphrates rivers. It was claimed that it ranged in prehistoric times from Senegal to the basin of the Indus River in northern India, especially between latitudes 15 and 30. There is archeological evidence of cultivation in eastern Arabia in 4000B.C. Nomads planted the date at oases in the deserts and Arabs introduced it into Spain it has long been grown on the French Riviera, in southern Italy, Sicily Greece. Through the fruit does not reach perfection in these areas. Possibly it fares better in the Cape Verde Islands, for a program of date improvement was launched there in the late 1950s. Iraq has always led the world in date production. Presently, there are 22 million date palms in that country producing nearly 600000 tons of dates annually (Morton,1987)

In Sudan date grow Predominately in northern parts where rainfall is scarce .(Musa ,1998). They grow near rivers and streams on silty soils where the water table is high and non-stagnant along the River Nile . Many varieties cultivated in most parts of the Sudan (Elamin , 1990) .

In the last ten years due to the Sudan of the Nile many trees in other areas such as Khartoum .(Musa , 1998) .

1-5-2-Sugars Contents of Date Fruit:

Date fruit contains a large of Sugar . A study of thirty-four date varieties from start of maturity showed that the predominant Sugar were fructose (12.6- 43.3 g\100g) and glucose (16.4- 54.2 g\100g). was found that two Omani date varieties , fard and Khalas contain about 44.75% and 43.6% glucose respectively . source was not practically detected in most varieties (Myhara etal, 1998).

1-5-3- Data Juice:

Juice of date is one of richest food stuffs in neutral compounds such as mono Saccharides

, di Saccharides , mineral as essential element for the growth of micro organism specially yeast and hence production of ethanol . (Wright , 1907)

1-6-Alcoholic beverage:

An **alcoholic beverage** is a drink that contains ethanol. Alcoholic beverages are divided into three general classes for taxation and regulation of production: beers, wines, and spirits

1-6-1-Distilled beverages:

A **distilled beverage, spirit, or liquor** is an alcoholic beverage produced by distilling ethanol produced by means of fermenting grain, fruit, or vegetables. Unsweetened, distilled, alcoholic beverages that have an alcohol content of at least 20% ABV are called *spirits*. For the most common distilled beverages, such as whiskey and vodka, the alcohol content is around 40%. **Basic steps in the production of ethanol.**

Milling:

Grind grain used as raw material for ethanol production as wheat or corn, that are brought by Trucks are placed in storage. These funds contain Rotary cylinder or a hammer mill which You grind grain to give more surface area.

Herzegovina/bleed:

In this process a series of reservoirs are used for mixing the dry cereal with water and enzymes, With heating and stirring. During this process the starch in the grain begins to break the sugar alkelkos.

Fermentation:

Fermentation is the heart of the ethanol manufacturing process, during the fermentation process usually uses yeast to turn sugar into Ethanol, and the conversion could take 40 to 60 hours to complete.

Distillation:

The process used to separate water and ethanol depending on the point of their boiling ethanol boils faster so evaporates to the top

Distillation apparatus consisting of two columns, the first column is to be filled with water and ethanol with directing them from the steam source

Below, the second column is heated the ethanol that will emerge from the top and the course of contaminated water from the bottom.(Brown and Lemay, 2006)

Ethanol extract from the top is treated with more equipment in the distillation. Either contaminated water coming out of the bottom of it flowing into the tank. Distillation have produced:

-Ethanol

After confirming that the product meets the specifications required ethanol pumped into the tank and stored there.

-Water

Contaminated water that comes out of the bottom being aggregated in the reservoir and the water container material
Suspended solids (grain) which can be extracted and used as feed water to enter the unit.

Centrifuge:

Contaminated water is pumped with the solid material stuck to the centrifuge, and high speed is Separation of liquids and solids. Fluid is pumped to a storage tank or solid materials are used to make Distilled grain wet.

Drying:

Centrifugal process tracking altgivi of solid materials resulting from the expulsion Intentg distilled grain dry.

Evaporation system:

Produce package thin layer can pass the evaporator uses a combination of heat and humidity to make Drink liquid texture.(Brown and Lemay,2006)

Rectified spirit

Rectified spirit, also called "neutral grain spirit," is alcohol which has been purified by means of "rectification" (i.e., repeated distillation)

1-6-2-Fermented beverages:

Fermentation Process:

Glucose is the main source of energy for living system in general not just human begins .The from glucose released when the glucose molecule is taken apart in the cell . This process is known as cell respiration . The process of cell respiration involves many complex steps.

Some chemical reaction requires air or oxygen . This reaction is called anaerobic . However , The first series of steps in cell respiration in all ways occur in the absence of air oxygen . A reaction that takes place in the absence of oxygen is called anaerobic . There for respiration that occurs without oxygen is called anaerobic respiration .

Another name for anaerobic respiration is fermentation. Which is a chemical reaction that splits complex organic compounds in to relatively simpler substances. During fermentation, sugar (usually glucose) is changed to carbon dioxide and alcohol or various organic acids.

Fermentation is an important step in the metabolism of glucose in the body. However, it is also an important process in food science since it is used in preserving and preparing many of the foods we eat. Food is fermented for three basic reactions. First, fermentation extends the time food can be stored without spaling. Second, it makes some food more enjoyable to eat. Fermentation makes some food more usable.

Fermentation in food involves a change in the raw food material. It can occur in either animal or vegetable food. It is brought about by the growth of micro organisms. Micro organisms are single cells of microscopic size. They can not be seen by the human eye but through microscope. Micro organisms are also called microbes.

The micro organisms involved in fermenting food can be bacteria, yeast, or mold, or combination of these.

There are three types of bacteria fermentation, Lactic acid bacteria, Acidic acid and carbon dioxide-producing bacteria, (Kay and Sharon, 1989)

1-7-Alcohol poisoning:

A case of poisoning as a result of excessive consumption of a large amount of alcohol in a short time. Alcohol weakens the capacity of performance nerves that control breathing and heartbeat. Activate the gag reflex when the body cannot handle the amount of alcohol consumed. In this case the opposite may be the puke, called gag. So goof, reflex weakens the body absorbs alcohol, which can cause alcohol poisoning.[2] alcohol poisoning requires immediate medical attention.(Barce and Kranzelok, 2002)

Species:

- Acute alcoholic poisoning.
- A chronic alcoholic intoxication.

Reasons:

Because of alcohol poisoning is excessive consumption of alcoholic beverages ausharb alcohol materials.

Symptoms:

- Unconscious.
- Cooler in the skin and lips, and a general decrease in body temperature.
- Lip cyanosis and skin.
- Loss of concentration.
- Difficulty walking or standing.
- Confusion.
- Vomiting.
- Slow and irregular breathing.
- Irritation and ulceration of the stomach.

Treatment:

The patient may be suffering from alcohol poisoning for washing stomach saline is used in the washing process. one of the most important initial treatments are: oxygen, provide the patient with fluids through a vein to compensate for the loss of fluids to prevent dehydration, can, in certain cases, the use of glucose, thiamine, and periodic medical follow-up of the patient's condition and also a certain diet to help get rid of the effects of alcohol that cause alertness. alcohol poisoning can be fatal if not treated in time.

1-7-1- A cute Alcoholic poisoning:

Due to the large intake of alcohol , and which distinguish two phases:

The phases of irritability and excitement : It is characterized by an acute awareness of disorder and then catch in situations of stutter speech.

Treatment:

Vary according to the stage of poisoning: in the phase of irritability we give neural sedatives such as barbiturates, benzodiazepines and vitamin B6.

Either in hibernation with loss of consciousness and increase blood sugar, treatment depends on acceleration of exhaust of alcohol to give solutions of sugar dextrose may start at 5% (despite the presence of high blood sugar)

to activate the macro function and thus laying the largest possible quantity of alcohol to alcohol metabolism.

And give with sugary solutions doses of regular insulin (crystallized) at a rate of 10-20 units per liter of dextrose 5% as it works to reduce blood sugar

1-7-2-Chronic Alcoholic Intoxication:

This phenomenon occurs when alcohol and accompanied by all of the symptoms associated with alcohol:

- all forms of blood deficiency (B12-iron-folic acid ...).
- as a result of the lack of nicotine acid amide P.P Vit.
- chronic atrophic gastric mucous membrane and lack intrinsic factor secretion Castle.
- atrophic cirrhosis. (Barce and Kranzelok)

1-8-Effects of alcohol on the human body:

1-8-1-The effect of alcohol on the central nervous system:

Passing alcohol to person dealt with alcohol in the following stages:

-The stage of Euphoria: Alcohol concentration is 25-50 mg/100 ml of blood characterized this phase with alcoholic person satisfaction and psychological satisfaction and begins to abide by social morality which becomes ready to lip

-Physical disturbance: the stage where the focus of alcohol 100 mg/100 ml of blood, and then words incomprehensible and pronunciation is unclear (stutter) and disrupted the volitional movements control does show horizontal. And the accompanying changes in the electrical activity of the brain, when up to 150 mg/100 ml ; then the higher nerve centers become idle and loses control of the human will and become involuntary movements and troubled and unbalanced.

-Alcohol: drunkenness and stage is reached when the alcohol concentration of 200 mg/100 ml of blood, and then the person in the case of sugar

-Death: when the concentration of alcohol to 500-600 mg/100 ml of blood. (Kay, 1989)

1-8-2-The effect of alcohol on cardiovascular system:

Start with small doses of alcohol are the heart muscle, heart rate increases and the volume of heartfelt, and explain the evolutionary result of a reflexive verb is caused by vasodilation in General including Coronal and peripheral vessels in the face and the limbs; so face reddish congested due to increased perfusion with high temperature and is accompanied by sweating.

But it turns out that the expansion of vascular accident with alcohol does not prevent a bout of Angina Pectoris and believed that the inhibition of pain when the alcoholic

patients and patients of angina is caused by inhibition of the expanded influence of central venous; so do not recommend alcohol description of dilating coronary prevention of angina pectoris.

1-8-3-Influence on temperature:

Alcohol lowers internal temperature least Central:

First: heat loss via peripheral vessels

The second is: the inhibition of the heat Centre located in the area.

1-8-4-The impact of alcohol on your digestion:

- Small doses of alcohol are small doses of gastric mucosa and increase the secretion of HCl and digestive juice on liver walbenrias

- In large doses: curdled protein which leads to disorder in the digestion of proteins. Also cause an acute hepatitis inflammation of the stomach, causes anemia iron deficiency that reduces the absorption of iron. (Dorga and Rudra, 2005)

1-8-5-The impact of alcohol on the metabolism:

1. The effect of alcohol on blood glucose:

Show large doses of alcohol acute effect of raising blood sugar alert result device friendly start who frees the adrenaline that alerts the adenil siklas which in turn converts ATP to cAMP, and the last level of the liver enzyme activates phosphorylase which activates glycogen

synthesis in the liver decomposition process to form the glucose-1-phosphate

In the case of alcohol addiction, alcohol causes the blood sugar shortages as a result of inhibiting the the development of glucose

2. Proteins:

Alcohol causes a decrease in the level of proteins in the blood (decreased absorption from the intestines and reduces duplicated in the liver) (Cay, 1989)

1-8-6- Impact of alcohol on pregnancy and fetus:

Alcohol can pass the placental barrier and affect the fetus during pregnancy is aborted as factors in the incidence of abortion when alcohol addicts increased by 3 times the rate in non-alcohol.

If not abortion and the child is born, he named the child alcohol to it during pregnancy up alcohol in certain mechanism and specific times. (Gay, 1924)

1-8-7- Effects of alcohol on urinary system:

Alcohol effect of diuretic because it inhibits release antidiuretic hormone ADH from the posterior pituitary urine; add to increase the amount of fluid intake, such as beer, coffee and tea.

1-9-Drug interactions:

-Alcohol + tricyclic antidepressants leads to increased inhibition of C.N.S

-Alcohol + antihypertensive drugs of different types of arterial pressure leads to increased arterial pressure drop

-Alcohol + (antihistamines H1, benzodiazepines, barbiturate) leads to increased inhibition of C.N.S

-Alcohol and alcohol addiction get used:

-Alcohol vehicles fast events for get used pharmacological (eclampsia yielded chronic alcoholic) enters the patient quickly in its two stages: the stage of addiction psychological dependence and physical dependence

In severe cases, delirium tremens Delirium marks appear Tremens.(Merck)

Anemia:

Heavy drinking can cause the number of oxygen-carrying red blood cells to be abnormally low. This condition, known as anemia, can trigger a host of symptoms, including fatigue, shortness of breath, and lightheadedness.

Cancer:

"Habitual drinking increases the risk of cancer. Scientists believe the increased risk comes when the body converts alcohol into acetaldehyde, a potent carcinogen. Cancer sites linked to alcohol use include the mouth, pharynx, larynx , esophagus, liver, breast, and colorectal region.

Cardiovascular disease:

Heavy drinking, especially bingeing, makes platelets more likely to clump together into blood clots, which can lead to heart attack or stroke.

Heavy drinking can also cause cardiomyopathy, a potentially deadly condition in which the heart muscle weakens and eventually fails .It causes rapid loss of consciousness and, in the absence of immediate treatment, sudden death.

Cirrhosis:

Alcohol is toxic to liver cells, and many heavy drinkers develop cirrhosis, a sometimes-lethal condition in which the liver is so heavily scarred that it is unable to function.(Moffat,2004)

1-10-Alcoholic hepatitis:

Alcoholic hepatitis is an inflammation of the liver resulting from excessive intake of alcohol, and is usually accompanied with fatty liver, which is the initial stage of alcoholic liver disease and may contribute to the development of fibrosis, cirrhosis of the liver. Its symptoms are jaundice, weight loss and fatigue and hepatic encephalopathy. Mild cases of it are controlled by the body itself, but severe cases may lead to death, but can be treated with corticosteroids.

1-11-Benefits of drink Alcohol:

Moderate alcohol consumption has significant health benefits. These benefits include reducing the risk of heart attack, reduce the risk of diabetes, reduce the risk of Alzheimer's disease, reduce the risk of stroke, and to increase the health and life of consumers in General, there are a number of evidence that several moderate doses reduce the risk of blood clotting, stroke, but an Australian study showed that drinking alcohol moderately equivalent of two glasses of alcohol a day increases the risk of breast and bowel cancer, throat and mouth by a large. (Kay, 1989)

Alcohol reduces heart attacks, ischemic strokes and circulatory problems through a number of identified ways. They include:

1-Improving blood lipid profile by increasing HDL (“good”) cholesterol and decreasing LDL (“bad”) cholesterol.

2-Decreasing thrombosis by reducing platelet aggregation, reducing fibrinogen

3-Other ways such as reducing blood pressure, and reducing blood insulin level

1-11-1-Reduce Stress, Anxiety and Tension:

Research shows that the consumption of alcohol in moderate amounts can lead to certain psychological benefits. Low levels of alcohol can trigger stress reduction, ease feelings of anxiety and help consumers to reduce tension. These psychological effects of moderate drinking are positive ones that can be beneficial to the consumer

1-11-2-A Longer Life:

Studies from a number of different countries including China, the United States and England indicate that longevity is highest among groups of people who drink alcohol in moderation. (Kay,1989)

Chapter Two

Materials and Methods

2-Material and Method:

-1-Samples:

Local Sudanese products:

Sharboat

2-2-Chemicals:

Absolute ethanol (99.98%), Distilled water

2-3-Apparatus:

Volumetric flask, pipettes

2-4-Instruments:

Gas Chromatography type: QP 2010 (FID) Shimadzu

Condition: General column DB-210

Rotary evaporator, Balance

Methods:

Three sample of local products of Sharboat. The first sample was stored at room temperature for two day, and second sample was added yeast for two day, and third sample at room temperature for four day of yeast extracted .

After each stage of storage 250g from each samples were transferred to the rotary evaporate for about two hour after that extraction were weighed.

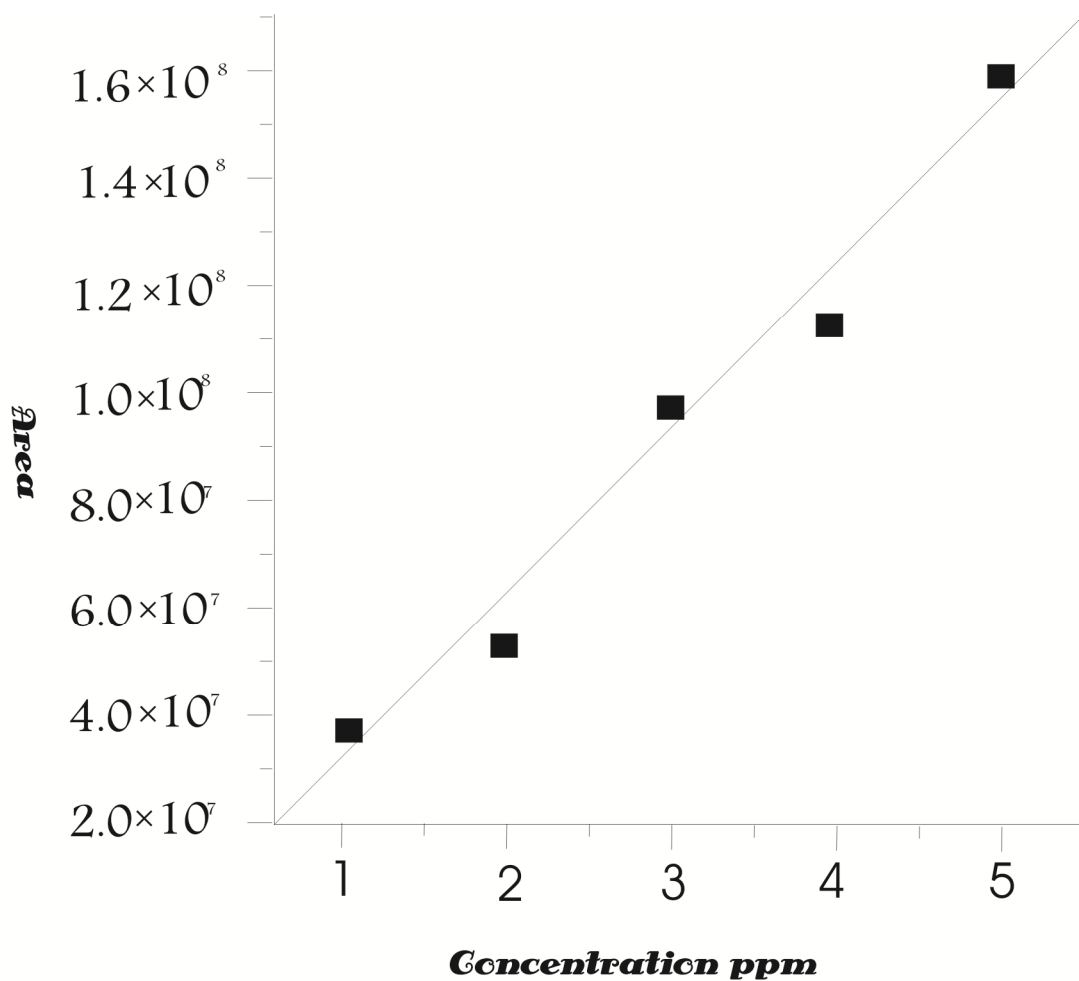
After that two micro liter of any sample was injected in GC and the peak was determined.

According to peak appear was prepared standard solution concentration 1,2,3,4 and 5ppm from absolute ethanol. After that all these standard was injected in GC.

Chapter Three-Results and Calculation

Table 3-1: Show Concentration and Area under peak for Sharboat drink (from above GC curves)

Concentration (ppm)	Area Under peak
1	35073018.8
2	52731764.2
3	96167332.6
4	109930392.1
5	156633582.4



$$Y=A+B*X$$

Parameter	Value	Error		
A	10357.17			
B	3.0032E7			
R	SD	N	P	
0.98579	9.34302E6	5	0.00203	

3-2- Calculation:

$$Y = A + B X$$

Where Y is Area, A is Intercept, B is a slop and X is a concentration ppm

1-

$$5262153 = 10357.17 + 3.0032 X$$

$$X = 1.7 \text{ PPM}$$

$$= 0.00003 \text{ M}$$

2-

$$10719303 = 10357.17 + 3.0032 X$$

$$X = 3.5 \text{ PPM}$$

$$= 0.00007 \text{ M}$$

3-

$$139391094 = 10357.17 + 3.0032 X$$

$$X = 46 \text{ PPM}$$

$$= 0.001 \text{ M}$$

3-3-Conclusion and Recommendations:

3-3-1-Conclusion:

In this study we found that local product is not completely free from alcohol. Their alcoholic content of them increase with the increase time and addition of yeast. There for further control of storage conditions required to prevent any subsequent fermentation.

3-3-2-Recommendations:

In this study the alcoholic content was examined under different condition of storage, we study toxicity of beverages e.g increase of methanol, aldehyde.....

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