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Thermal changes and their effect on glycerin industry

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Abstract

Our current research includes the mechanism through which glycerin can be manufactured and its prominent role in preserving foods of all kinds. This research work is considered one of a group of scientific research works that ultimately lead to the production of glycerin for use in performing a specific function. In our research experiment, (400 grams) glucose sugar was dissolved in (1 liter) of water, (adding this amount of sugar to the water while it was boiled for about 15 minutes, add sugar with extra 15 minutes, add (0.05 honey), (8 mg yeast) was added with shaking for a 5 minutes, (50 mg olive oil) was added, closed the lid tightly of each bottle, and leave them 24 hours. And after completing the manufacturing process during which the desired properties needed in food preservation and other uses are obtained, the product passes through it represents the glycerin in its raw form. There are aerobic steps in the manufacturing process and anaerobic steps, and fermentation and filtration processes until the component is transferred to the distillation device, so that the distillation process is the last step in our experiment, which ends with giving a viscous product affected by exposure to a high temperature of more than one hundred degrees Celsius.

Keyword: *(food preservation, glycerin, temperature change, and velocity).*

Introduction

Glycerin is known as a viscous liquid characterized by a sweet taste, lacks odor and color. Glycerin is a sugar alcohol and the reason for its solubility in water is the presence of three hydroxyl-alcohol groups (OH.) (1). Glycerin was produced industrially for the first time in 1779 from the residues and waste left over from soap production, and since that time it has been used continuously and successfully in most industries, including the medical industries and the food industry and packaging. Usually, the production of (100 kg.) of bio diesel yields approximately (10 kg.) of glycerin, with purity of around (50 % – 55 %) (2). We can consider glycerin as an alcohol derived from sugar used in many industries, including soap making, preservatives, as well as lubricants. Although it can be bought ready-made from the commercial market, or made in different ways from vegetable oils and the rest of the ingredients needed to make it, it is easier and cheaper to make it from ingredients that we have in abundance and by sequential and precise successive steps that ultimately lead to obtaining a liquid Semi-condensed represents glycerin useful in the medical, industrial and food aspects. Food preservation includes a number of measures that must be taken in order to preserve the properties of foods or the desired nature of various foods, within a specific time frame, so that they remain safe and preserve their properties and at the same time enjoyable when consumed. Any particular food product can be developed by applying several techniques used in different processing, in order to maintain it in suitable conditions. The determination of nutritional stability is very important and is based on a scientific basis, not an empirical one, and this is what is determined by food scientists and engineers. There is a relatively complete coverage of food preservation found in the Handbook of Food Preservation and in other references as well (3, 4). The content of vitamins, proteins, color and taste, as well as the nutritional value of various foods, is an important factor for the durability and stability of the compound, and affects its storage and packaging, in addition to its solubility and texture (5, 6, 7). It is worth noting that the thermo dynamic description of glycerin is a goal to reach a condensed liquid that has the characteristics that distinguish it from other liquids in terms of composition and function, which is glycerin, and on this basis, the temperature affects the change

of glycerin properties in terms of viscosity and other features. Glycerin can be produced by using many processes, and feed-stocks. It may be obtained by propylene synthesis through different pathways (8) , by hydrolysis of oil, and by trans-esterification of fatty acids, or oils. However, glycerin production can be also carried out by many processes that lead fermentation with yeast; like saccharomyces cerevisiae , candida , bacteria like Bacillus , and algae; like dunaliella tertiolecta, (9). But the manufacture of glycerin in the way we are now studying is safer than other methods, as it depends on raw materials available to us in daily life and available in the markets and cheap, and it is carried out within scientific steps that depend on actual experiments carried out by a group of researchers in the past from previously conducted studies and applied researches.

2. Materials and Methods

3.1. Materials

(400 gm.) glucose sugar, 1 liter of water, 2 tablespoons of honey, (100 gm.) of baking yeast, 2 spoons of olive oil, (50 gm) of charcoal, (100 gm) of ethyl alcohol, a 2-liter bottle with a very small hole in its cap, filter paper, or anything used for filtering, a (steel container with a tight and controlled lid), burner, and a distillation device (10).

2.2. Methods

The methods are carried out within specific and fixed steps at specific times, and with fixed proportions, quantities and ingredients that ultimately lead to obtaining the product that required being prepared, and with ideal specifications that are useful in preserving foods of all kinds. Glycerol has been manufactured, depending on the process and raw materials according to the followed method (10, 11), by which the desired properties can be obtained, and given the different types of raw materials and the type of reactions used and the different number of methods during the production process. The steps of methods are summarized of the following steps:

1. Sterilize tools that are used in the manufacture with water and salt.

2. Washing with fresh water and dried well.

3. Boiling a (1 ml distilled water) in the steel pot for about 10 minutes.

4. Adding of (100 g sugar) during the boiling of water for 15 minutes extra.

5. Adding (25 g honey) with shaking for about 5 minutes, and the container is without fire to cool with covered it by tightly lid.

6. The whole amount is powered into the plastic bottle, and 10 mg yeast (Saccharomyces *cerevisiae*) is added with shaking very well for a 5 minutes.

7. Adding (50 mg olive oil) , with shake for one minute.

8. Closed the lid is tightly, and we make a very small hole with a pin in the lid, and leave it to ferment for 24 hours.

9. Filtering the liquid by means of filter paper, without fire.

10. Adding amount of (50 ml of 90 % ethyl alcohol) and stir well, and then heated solution until the alcohol volatilizes.

11. Glycerin is passed with coal, and left for a period not exceeding a day.

12. Re-dissolved it in pure water, and transferred to the distillation apparatus , to obtain of pure glycerin.

After the product has been obtained in its final form and its stable viscous texture, but it may change if it is exposed to high temperatures exceeding (100 °C) , thus it may be lost its most important properties necessary to perform its basic functions in the medical, industrial and biological fields.

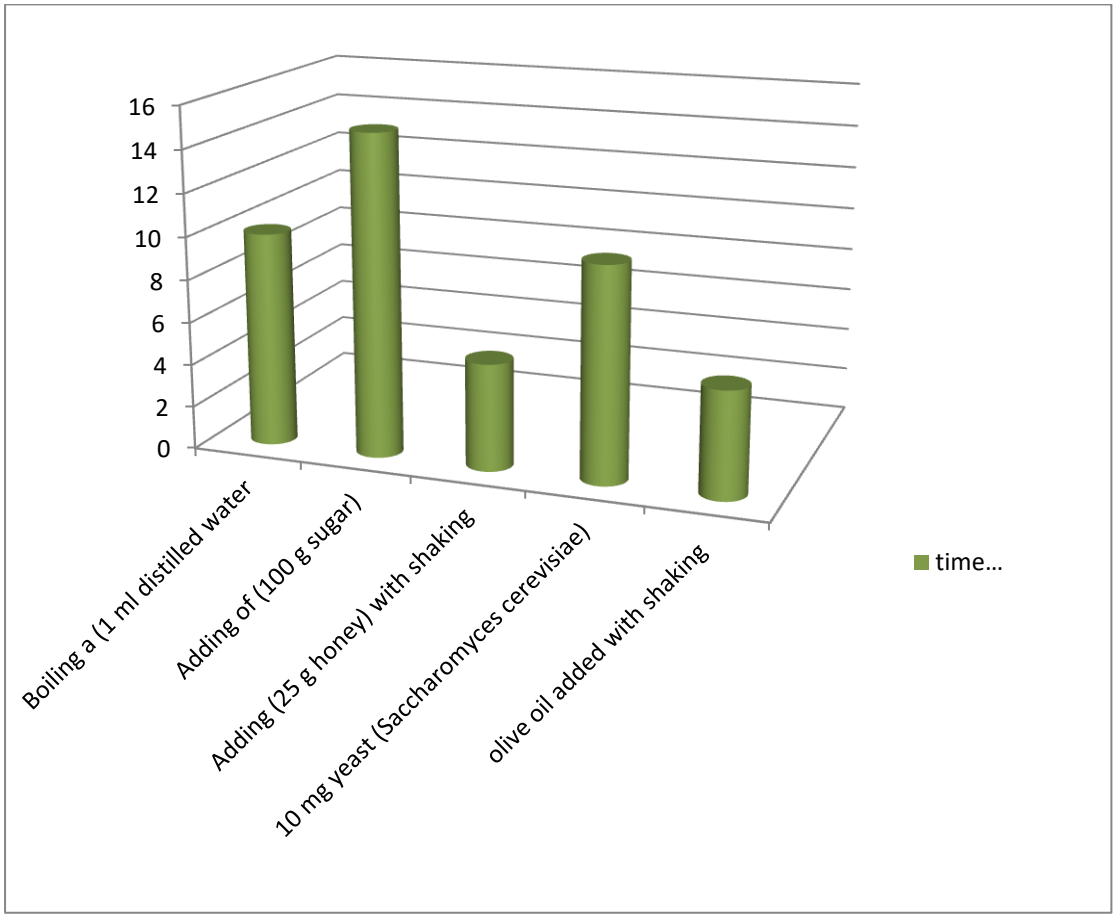
3. Result

The manufacturing took place in several steps and stages within different times, each step or gave a result that is complementary to the result before it to be specific to a specific purpose in the manufacturing process. As shown in **table no. (1)** Below:

Table No. (1)*: (Represented several types of work through different times, to perform main purposes).*

Time minutes	Type of work	Purposes
1. 10	Boiling a (1 ml distilled water) in the steel pot.	For the preparation to other processes of manufacturing of glycerin.
2. 15	Adding of (100 g sugar) during the boiling of water.	For the starting of manufacture.
3. 5	Adding (25 g honey) with shaking, (then left to cool with covered it by tightly lid).	To prepare it to anaerobic conditions.
4. 10	10 mg yeast (Saccharomyces *cerevisiae*)	To spread the yeast homogeneously in the solution.

	is added with shaking very well.	
5. 5	Adding (50 mg olive oil), with shaking.	To distribute the olive oil in the whole solution and increase density.



The work steps varied according to the time measured in minutes, as shown in **chart no. (1)** below:

Chart No. (1): *Represents the type of work in each step and the time (as minutes), to be performed accurately to maintain the system of the work mechanism accurately. Then leave the product for at least 24 hours.*

Through the results of the current research study, it was found that the glycerin that was manufactured has a fixed amount of viscosity, which is the resistance of a fluid to flow, and the amount of its resistance to pressure that forces it to move and flow. It is clear from the results that the higher the temperature, the lower the viscosity of the manufactured glycerin. the following **figure no. (1)** Shows the relationship between temperatures on viscosity:

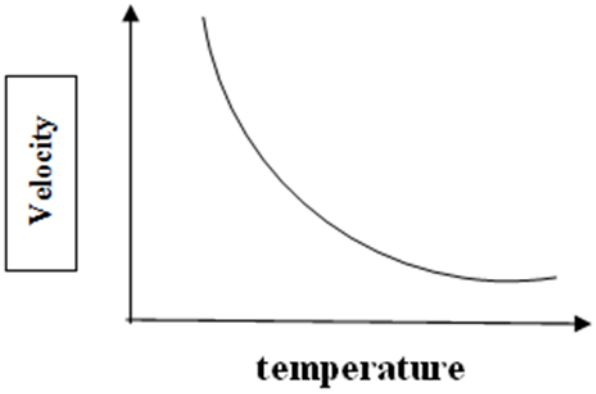


Figure no. (1): *shows the effect of temperature on viscosity.*

4. Discussion

Due to the multiple reports of continuous exposure to the influence of high-intensity oscillating magnetic fields on biological systems, which consequently leads to exposure to various diseases, most of which lead to the activation of malignant cells (12) inside the body, in addition to disrupting the functions of the organs, disturbing the human immune system and allowing bacteria It affects packaging materials and food (13), and this leads to the spoilage of various types of canned food, but if glycerin is used in the process of food packaging and packaging, all these problems will never occur, because glycerin prevents the growth of microorganisms and microbes in food This process ensures the safety of food and the absence of contamination, as well as not changing the characteristics of foods that lead to food spoilage. A study by (Hemanthe Kumar , et al) (14), developed the initiatives which taken by India in an agriculture department, and food sciences in order to make the cultivated product attainable, for all by publishing them in open , and impact getaway journals, and repositories. Salisbury. and, et al. (15) analyzed the publication and citation modalities of food science faculty at the university of Arkensas for a fourteen year period (1990 to 2003). So many researches are performed to use successful method for preservation of food like packaging of food by glycerin, this method need the manufacturing of glycerin by numerous steps. First, all the tools that are used in the manufacture must be sterilized with water and salt, then washed with fresh water and dried well, then a liter of water is boiled in the steel pot for a period not exceeding a

quarter of an hour with the provisions of the lid, then sugar is added during the boiling period, then left to boil for a period of time. An extra quarter of an hour for boiling, after this stage, honey is added and the container is lowered from the fire, then left to cool without removing the lid that covers it. After the liquid has cooled inside the container, it is transferred quickly and poured into the plastic bottle and baking yeast is added to it, while shaking the bottle well for a few minutes to ensure the spread The yeast is homogeneously in the solution, then olive oil is added and we continue to shake the bottle for a period not exceeding one minute, then make sure that the lid is tightly closed, and we make a very small hole with a pin in the lid in order that the package does not explode due to the effect of fermentation, after that Leave it to ferment for 24 hours. On the next day, we start with the second step by filtering the liquid by means of filter paper or filtering in another way in order to isolate the yeast from the liquid. But it is not pure, we download it from the fire. Add to it amyl alcohol and stir well in order to separate the glycerin from the suspended matter, and then heat until the alcohol volatilizes. As a last step, glycerin is passed with coal and left for a period not exceeding a day to ensure its complete purity from odors and impurities. It is re-dissolved in pure water, and transferred to the distillation apparatus. With the distillation process, we obtain pure, medically guaranteed glycerin that is safe for use in medicine, food, cosmetics and various other purposes. When the glycerin was heated, the cohesive forces between the molecules decreased and this led to the reduction of the attractive forces between them, ultimately leading to a decrease in the viscosity, according to its basic rule (16).

Viscosity is a property of liquids and gases, but it is greater in liquids than it is in gases. During the treatment of viscosity, we will notice that it is very similar to the stress and strain of the shear tangent in solid bodies (17). The viscosity of a fluid can be defined as the resistance that a fluid exhibits when flowing over solid surfaces. The viscosity of liquids is greatly affected by temperature inversely, as it decreases with increasing temperature, and increases with its decrease. This can be explained by the fact that the increase in temperature reduces the effect of the forces of attraction between molecules, as it leads to an increase in the kinetic energy of the molecules of the liquid, and this

consequently leads to a decrease in the viscosity of the liquid. On this basis, the viscosity of liquids decreases as the temperature rises (18). The high viscosity liquid glycerin molecules are tightly bound together, and thus are less able to move in the normal state unless exposed to a temperature above 100 degrees. Its friction with the solid object in contact with it increases, and viscosity can be described as internal friction between the liquid molecules, which generates resistance to glycerin in preventing the influence of microorganisms and microbes that lead to food decomposition and spoilage on the one hand, as well as killing microorganisms and microbes on the other hand. For this reason, glycerin was considered a strong preservative because it possesses these important properties that work to preserve food for the longest possible period of time. It should be known that there are different types of glycerin, which differ according to the method of work and the purpose of use in our daily life. Not every type of glycerin is used in the manufacture of food products, but there are other purposes for glycerin, including medical and industrial, cosmetics, and techniques in this area have varied

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5. Conclusion

One of the most important things that leads to the development of the researcher is that his research or research study and theories lead to an application and production through which he can benefit from a certain idea and a certain theory that distinguishes him, and distinguishes his research work in the service of human society, especially that our current research includes several things, including (Manufacture of glycerin, its use in food preservation, and the effect of other influences on the viscosity of glycerin, such as raising the temperature to a level above the normal limit). Through this applied scientific research work, we invite researchers to develop research ideas and seek collaborative work together in order to integrate ideas until arriving at a good constructive idea through which to develop industries emerging from agricultural reality, preserving the food we eat, and raising the efficiency of production. Food and preserve it from damage to it from contamination with microbes, or other contaminants

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