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Effect of the activity of bacteria on changing the conditions of the biological environment and production of biogas

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ABSTRACT

The current research includes studying the effect of the effectiveness of bacteria in changing the biological environmental conditions, leading to the production of biogas, through a series of chemical and biological reactions that end with the production of methane, and that this technique depends mainly on the anaerobic fermentation mechanism of organic waste that occurs. Because of the bacteria leading to the formation of a medium rich in protein and nitrogen, and on this basis it is considered a suitable technology consisting of a triangle (energy, development, and environment). Therefore, the process of fermentation of organic materials away from the air leads to a complete change of the environmental characteristics, producing methane gas in a biological way, and by the activity of anaerobic bacteria, resulting in the formation of methane (NH_4) and carbon dioxide (CO_2) at rates of (68%, and 15%), respectively, while the remaining percentage is (17%) formed from each of the gases of nitrogen N, and hydrogen H, in addition to a significant proportion of hydrogen sulfide H_2S. And that the gas formed is a colorless gas, it ignites without the escalation of smoke, forming a clear blue flame that is very hot, and it is considered lighter than air that is difficult to liquefy, its ignition temperature exceeds (500 degrees Celsius).

Key words : *Bacterial activity, Biological environment, Biogas.*

Introduction

The process of producing biogas from the influence of biological activities resulting from bacteria leads to important aspects of life, and these aspects can be developed into means that can be used in many scientific, academic and applied horizons that can be used in the economic development of peoples. The process of producing biogas based on chemical reactions and biological transformations is formed through anaerobic digestion, which is the final outcome of the care of bacteria, and this leads to various challenges that come from the type of nutrition and its residues side by side and their impact on the living environment on which the living organisms live in a form. General, including humans, in various parts of the world. Therefore, through experiments and multiple studies and delving into this technology, biomass, rich in proteins and fats, contains a high percentage of energy and thus has a high potential for biogas production, specifically methane. But it can sometimes cause disruptions to the same process by forming different compounds to be inhibitory or foam up (Kovács *et al.*, 2013, and Lienen *et al.*, 2013). Bacterial activities have a prominent role in the technological aspect in the modern era, due to the urgent need for this matter, which people suffer from problems, and appropriate solutions must be devised in order to keep pace with the modern scientific development that has led at the

present time to the scientific and economic renaissance in the whole world. And due to the importance of these activities for micro-organisms in general and for bacteria in particular, which are accompanied by micro-anaerobic reactions and fermentations, and this process in turn leads to the production of a group of components, the most important of which is the biogas represented by methane and other gases, one of the known uses of biogas in general is its use in cogeneration units that produce electricity, and heat (Eder, 2018, and Pecorini *et al.*, 2017). It has now become the first and last reliance on scientific products based on vital experiments that lead to benefit from a specific application that is useful in solving a life problem that benefits society, in addition to disposing of food waste resulting from human action as waste that cannot be used in its reality. Unless they go through multiple stages in which the action of bacteria and their activity intervene in changing the biological properties of these components, which are the main material in the production of biomass, which have gone through stages that made them radically change from a non-beneficial but harmful state to a beneficial and beneficial state in every sense of benefit Compensate for the use of conventional fuels.In addition, heat recovery has become of great importance, because the revenues from the sale of electrical energy are constantly paradoxical (Lantz, 2012). In the era of speed in which we live, we must reach modern means that can be used as an alternative to the traditional energy used in the past, in order to invest these renewable energies as well as get rid of harmful substances resulting from human action as vital waste. It is very clear that the total size of each component that represents biological waste must be carefully estimated in order to reduce the negative impact on the environment and thus eliminate environmental pollution (Hakawati *et al.*, 2017), as well as to maximize and estimate its profit in global markets and market it in the correct manner.

Methods

The process of producing biogas is a process of bacterial decomposition with sequential and sequential stages linked to each other, and this production depends on the type of organic materials that are considered biological wastes that enter the anaerobic fermentation process, there are wastes that are rapidly digested and the transformation from one state to another, and there are some residues Less degraded, such as firewood and tree debris. And that the rate of chemical reactions, biological transformations and bacterial activity depends on the temperature, so that it increases with increasing temperature.

First step : Low temperatures of (20) degrees celsius, and it is usually a precise step, as it is the first step on which the rest of the production steps depend, *(Psychrophilic* bacteria) works at this temperature level.

Second step : The average temperature level of about (30) degrees celsius, at which they operate (*Mesophilic* bacteria).

Third step: Raising the temperature to (60) degrees Celsius, (*Thermophilic* bacteria) work in it, which is very sensitive to fluctuations in high temperatures.

Biogas is produced, represented by methane gas, which includes a process of purification from impurities and removal of the remaining pollutants represented by carbon dioxide, thus raising the level of quality and purity (Urban, 2013 and Aryal *et al.*, 2018). Organic wastes that go through the stages of digestion are subject to a minimum pH level of 2, and a maximum value of 6, meaning that they are subject to change and control, so they are few in the first stage and in the first three weeks of the decomposition and fermentation process, and gradually increasing the pH increases the time. Which includes volatilization of acids, and nitrogenous compounds that produce the biogas represented by methane. The reason for this is that microbes are more active and effective. Biogas production depends mainly on the concentration of solids, and the higher the concentration of the fermentation solution, the higher the biogas production rate. The concentration must be kept at a constant rate, since the conversion of organic matter to a gas decreases as the concentration of solids in the fermentation solution tends. The addition of nutrients and carbon nitrogen in certain proportions is very important for the success of the decomposition of organic matter. Among the most important nutrients used for this purpose are (nitrogen, carbon, sulfur, phosphorous, iron, and nickel). Nutrients are important in maintaining the activity of the bacteria that work on anaerobic digestion. Then this stage is followed by the initiation process, so that the bacteria begin to multiply at first slowly, but upon adding the initiator from a successful fermented source, leading to

the emergence of a certain volume of the fermentation solution followed by an increase in the activity of the fermentation process (Qiaen *et al.*, 2016). Stirring the contents of the digester daily throughout the production process, which takes between one to two months, if the steps are correct and free of error. The highest rate of biological reaction, leading to the production of acid, and thus the biogas represented by methane gas.

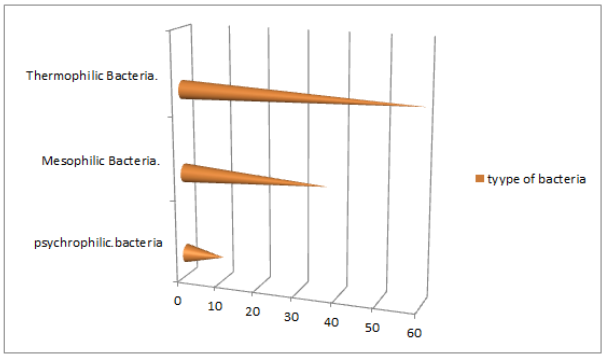

Fig. 1. The rate of fermentation, and conformation increased as the temperature rises in the possible range that is necessary for the life of these microbes and their effectiveness for the desired purpose.

Discussion

The biological waste resulting from human and animal actions can be recycled and transformed from one state to another, and that is within a group of transformations in which the chemical properties of the base material change that will be subject to the influence of certain types of bacteria adapted to live in different environments according to the conditions. Where it grows is influenced by temperature changes, the pH of the medium in which chemical reactions will take place, and biological changes. Mostly the waste used should be highly susceptible to decomposition from the production of a large amount of gas and contain a high percentage of carbon in the form of cellulose and protein sugar. The waste must contain a small percentage of lignin that is difficult to disassemble through biological activity. When using residues rich in non-dissolved carbohydrates or rich residues reduced to liquid carbohydrates, it was found that the acidity rate started at the beginning of the fermentation process, and this pH level is less than 6.5 in decline caused by the rapid rate of production of fats and acids and the slow rate of bacterial use of these acids which low acidity rate. The natural properties and composition of organic waste determine the pH that kills it because of its suitability for anaerobic digestion and its ability to produce bio gas. The higher temperature adversely affects the enzymes during the anaerobic fermentation process and reduces the feeding rate and the process occurs at 97 °C, and the methane producing bacteria are - the production of methane gas in a wide range of temperatures ranging from the types of bacteria most affected by fluctuating temperatures and other types of Bacteria, especially those producing acetate, can grow and function efficiently even at low temperatures. Methane bacteria have been classified into three groups according to their temperature adaptation. In order to produce a fixed amount of gas, there must be a pH of approximately (7.5). The anaerobic digestion process is carried out with high efficiency, microorganisms grow better in neutral media (Sung *et al.*, 2018). We can show you the rate of chemical reactions, the rate of nutrition, as well as the growth of microorganisms depending on the different temperatures. The rate of fermentation, and conformation increased as the temperature rises in the possible range that is necessary for the life of these microbes and their effectiveness for the desired purpose, as is illustrated in Fig. 1 to a way that clearly shows this relationship.

An increase the concentration of nutrients necessary for the growth of bacteria, such as often occurs if the precipitate is left for a period longer than it should be. Symptoms of poisoning at minimum levels slow or decrease in the rate of gas production and in severe cases the entire chemical process stops due to poisoning and death of bacteria, and methane bacteria are more sensitive and affected food poisoning (Lindkveist *et al.*, 2018). Therefore, some substances are not allowed to reach fermentation, such as pesticides, disinfectants, etc., because they kill methane bacteria. The amino acids have the highest physiological importance arising from the decomposition of proton materials, and they are considered to be alkaline and acidic at the same time, and the oxidation process requires the participation of many types of bacteria, such as; *decomposition and fermentation bacteria;* these bacteria convert organic compounds such as carbohydrates, proteins and fats into sugars, starches and amino acids, as well as higher fatty acids, neutral compounds higher than methanol, and simple compounds of

acetic acid, another type is; *bacteria producing hydrogen and acetate;* these bacteria act at the end of the first stage converting the previous converted products into hydrogen and acetate, and *acetate-producing bacteria*; these work in a wide range of mono- and complex organic compounds and carbon atoms and convert them into acetic acid. Biogas bacteria use hydrogen, carbon dioxide, the produced acetate and methanol and convert them into methane, and the main source of gas production is acetic acid. Fermentation products contain chemical energy (they are not completely oxidized), but they are considered waste products, as they cannot be represented more than that without the use of oxygen (or any other highly oxidizing electron acceptor). As a result, the production of adenosine triphosphate through the fermentation process is less adequate than oxidative phosphorylation, while the pyruvate is completely oxidized to CO_2. Although the clarification that the fermentation process was generally the result of the interaction of microorganisms represents a tremendous advance in knowledge at that time, the basic nature of the fermentation process itself was not clarified, or even demonstrated that it was occurring by microorganisms which were always clearly present. Many scientists, including Pasteur, have successfully attempted to extract the fermentation enzyme from yeast (Rahmean *et al.*, 2017), they all accused the successful opportunity when, in 1897, the German chemist Eduard Bouchner managed to confine the yeast and extract juice from it, then he found what surprised him that this "dead" liquid has the ability to ferment a glycemic solution, forming carbon dioxide and alcohol just as much as living yeast. 15th the unknown "brewers" behaved and interacted just like organized brewers (Bacciolei *et al.*, 2017). Since then the term enzyme has been used and applied to all ferments. It was then understood that the fermentation process is caused by enzymes produced by microorganisms. In 1908, Bouchner received the Nobel Prize in Chemistry for his accomplishments in that field. In many European Union countries, anaerobic digestion stations have been used by injecting biogas into the national gas networks in order to benefit from them for domestic use. This results in pure biogas obtained by the biological transformation technology associated with the chemical reactions required for this, and it is delivered to the natural gas network by pipeline, at a low cost which usually represents one of the highest costs of the stations (Hoo *et al.*, 2018). Maintaining the environmental conditions at a constant level is very necessary for the stability of the product's purity and its freedom from impurities, gases or other components, which, if obtained, will lead to its impurity or non-suitability at all.

Conclusion

In this research, studying the impact of the vital activities of bacteria and knowing their most important activities in direct contribution to changing the biological environment, thus leading to the production of biogas, which is considered an alternative to the conventional gas currently available, in order to reach an alternative source of energy that we need in our daily life, and that Through mechanisms and processes in which specific types of bacteria are excited according to the temperature control of the medium in which the reaction takes place, as well as the acidic pH function, leading to the digestion of the base material and maintaining constant reaction conditions for the purity of the biogas that can be obtained in Stations. This work and achievement is considered part of the intellectual and economic renaissance in the world, which results in the application of pioneering scientific research theories that lead to the development of science and technology.

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