Economic importance of alcoholic fermentation - lab report example

Science, Biology

Economic Importance of Alcoholic Fermentation

The energy needed for this process results from oxidation and reduction reactions undertaken by these microorganisms as well as the chemical compounds used in fermentation. Also, there are some end products that generated as a result of fermentation. Different types of fermentation include alcoholic, lactic acid, acetone- ethyl alcohol, propionic acid, acetone-butyl alcohol, and butyric- acid (Buglass, 2011).

In alcoholic fermentation, the initial process is the breakdown of glucose. The cell breaks down glucose to produce energy in the absence of oxygen. The process is called glycolysis and takes place in the cytosol of the cell.

The energy released from this reaction is useful in the conversion of NAD+ to NADH. The energy is also used in binding ADP to inorganic phosphates. Production of two pyruvate molecules follows. Breakdown of the two pyruvate molecules takes place leading to the production of two acetaldehydes and two CO2 as a waste product. It then follows that the two acetaldehydes undergo the conversion to two ethanol using the H+ ions from NADH, which is converted back to NAD+.

Alcoholic fermentation has many applications. Some of these applications are the production of ethanol fuel, in bread baking, in the fermentation of foods such as milk and vegetables, and the production of alcoholic beverages such as wine and beer. Despite the fact that the general principle of fermentation is the same for all products, the method of achieving it and the end results differ. Beer preparation by fermentation involves picking rye, wheat, or barley followed by germinating, drying, and pulping it into a mash. The mash is mixed together with hot water and transferred to a fermentation

vessel to commence the process of fermentation. Yeast is added to the mixture that converts the sugar present in the ash to carbon dioxide and alcohol. Once the beer is filtered and conditioned, it is ready for consumption. The purpose of this experiment is to determine the rate of respiration by considering the amounts of CO2 produced in cellular respiration by yeast. The experiment uses sucrose, dextrose, starch, glucose, and distilled water as food sources. MethodsThe first procedure was the creation of a hypothesis regarding the rate of fermentation for the four different substrates and recording them. Labeling of five small test tubes and five large test tubes with numbers 1-5 followed. The next step was filling the five small test tubes with the substrate solution to two-thirds full. Pasteur pipette aided in finishing filling the test tubes with a thoroughly mixed yeast solution. It was advisable to mix the yeast suspension immediately before adding it to the tubes and the filling of the tubes be as full as possible while holding them over a sink. The larger tube was inverted and placed over the smaller tube containing the yeast suspension and glucose. The use of a finger or a pencil aided in pushing the smaller tube all the way into the larger tube and then inverted both tubes so that the opening of the larger tube is up. Repetition of the same procedure followed for the other four tubes. The next step was placing the five test tubes in a 370c incubator and recording the time. The time at the start of the incubation was 7. 55 pm. It was crucial to check the tubes every five minutes to observe the size of the gas bubble that accumulates in the small tube. What followed next was stopping the experiment when the gas bubble in any of the tubes was approximately one-half of the length of the tube. There was a record of the time when the

experiment terminated. The removal time of the tube from the incubator was at 8. 07 pmUpon removal of the tubes from the incubator, holding each tube over a sink and quickly inverting them followed. The use of a finger or a pencil was crucial in keeping the small tube in position while inverting so that the liquid inside the small tube remained there. Then, the larger tube was lifted off of, the smaller tube and the smaller tube set in a test tube rack repetition of the same procedure took place with the other tubes. Measurement of the size of the gas bubble produced was the total volume of the tubeless the amount of liquid that remained in the tube. The measurement of the amount of liquid in each of the tubes was by a graduated cylinder. Recording of the values took place in a table. The final step was the measurement of the total volume of one of the small tubes with a graduated cylinder. With this number, it was easy calculating the volume of the gas produced. The calculations then followed, and the results entered in a table. Results The substrates used were glucose, dextrose, sucrose, starch, and diluted water and hypotheses were a fast reaction, fast reaction, slow reaction, slow reaction, and no reaction respectively. The table shows the results. Test-tubeSubstrateHypothesis- Rate of Fermentation1GlucoseFast Reaction2DextroseFast Reaction3SucroseSlow reaction4StarchSlow reaction5Distilled waterNo Reaction Table 1 Alcohol fermentation experiment resultsTubeThe volume of the tube (ml)Remaining liquid (ml)Co2 produced (ml)Rate of CO2 production (ml/ minute)1-Glucose10 ml4. 8 ml5. 2 ml0. 392- Dextrose10 ml4. 4 ml5. 6 ml0. 373-Sucrose10 ml4 ml6 ml0. 44- Starch10 ml9. 4 ml0. 6 ml0. 045- distilled water10 ml9. 6 ml0. 4 ml0. 026DiscussionThe rate of fermentation of the

yeast is directly proportional to the amount of carbon dioxide produced. In our experiment, sucrose has the highest rate of evolved carbon dioxide followed by dextrose, glucose, starch, and finally distilled water. Sucrose follows the hypothesis stated in the methodology because it enters the cell and the glycolytic pathway. The reason for the high rates of fermentation of sucrose is because it contains glucose and fructose molecules that are easily broken down by the enzymes released by yeast. The slow rate of fermentation in starch is because of its inability and size to enter the yeast's cell efficiently. Fermentation occurs naturally in foods under the right conditions. ConclusionAlcoholic fermentation leads to the production of ATP forms of energy and alcohol. The process takes place in anaerobic conditions. The two types of organisms that use the process of fermentation are yeast and some bacteria. Saccharomyces species are the commonly used type of yeast. The yeast species include Saccharomyces uvarum and Saccharomyces cerevisiae. Also, many molds of genera Mucor, Aspergillus, and Fusarium are well known for their abilities of alcohol fermentation (Buglass, 2011). These organisms convert sugars to ethyl alcohol. Yeasts are facultative anaerobes. They survive in both aerobic and anaerobic conditions. The yeast makes ATP by aerobic respiration in the presence of oxygen but turns to fermentation under anaerobic conditions.