Yeast Experiments for the High School Student

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Fermentation.

To demonstrate fermentation by yeast, mix a solution of molasses and water (1 to 10) and completely fill the upper arm of each of two fermentation tubes. Introduce a piece of yeast cake half the size of a pea into one of the tubes. Set aside at room temperature for a few hours or over night. Within an hour small bubbles should begin to collect in the top of the fermentation tube containing yeast, and by morning, the molasses solution should be completely driven out of the upper arm into the reservoir below (Fig. 1) all due to the fact that yeast in fermentating, gives off CO_2 gas. The gas rises and forces the molasses solution out. Alcohol, of course, is a product of this activity and its presence can be detected by its odor. No such changes should take place in the control.

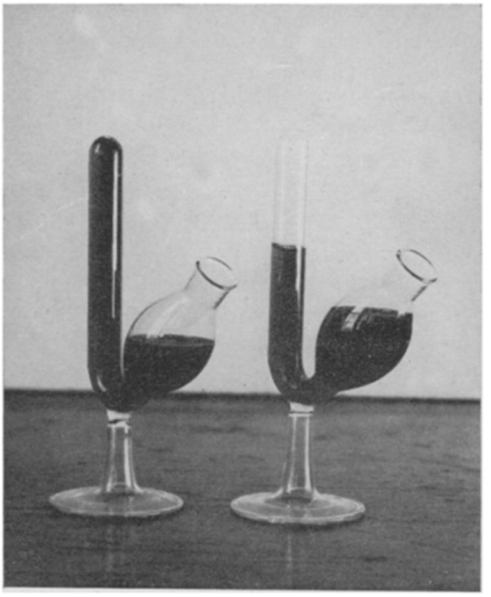

Figure 1. Left: at the beginning of the experiment; right: after an interval depending on room temperature the gas resulting from the fermentation process has collected in the closed arm of the fermentation tube.

To demonstrate that CO_2 is produced, fill a bottle with 500cc. of molasses solution mentioned above and add half of a yeast cake. Close the mouth of the bottle with a one-hole stopper through which extends a tube bent as shown in Figure 2. The other end should be submerged in a test tube of lime water. At room temperature, CO_2 should be given off in quantities sufficient to bubble through the lime water and make it become quite turbid.

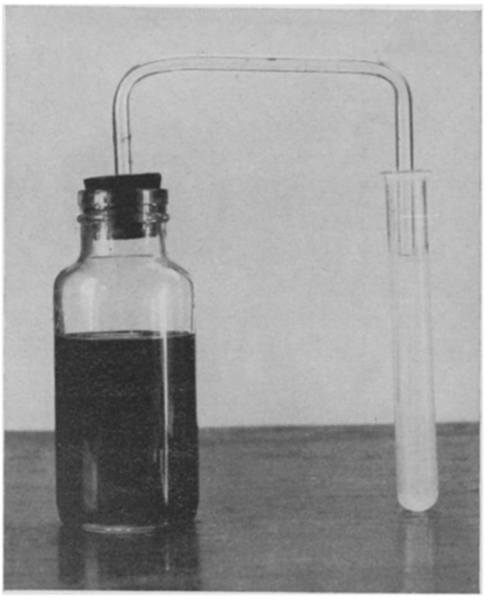

Figure 2. Gas forced through the glass tube will bubble through the limewater in the test tube and cause a milky deposit.

Microscopic Examination.

Smear a drop of yeast suspension from one of the fermenting solutions mentioned above on a microscope slide; cover with cover slip and examine under high power. By running a drop of iodine solution under the cover slip, temporary staining will result.

To prepare a permanent mount, dilute a drop of the yeast solution with two of distilled water and smear thinly on a microscope slide. Allow to air dry. Fix by passing through a Bunsen flame a couple of times. Flood with methylene blue stain for 2 minutes. Rinse with distilled water; dry; cover with balsam and a cover slip.

Spore formation.

Chamberlain in *Methods in Plant Histology* recommends that "a cake of Fleischmann's yeast be put in a mixture of equal parts of grape juice and distilled water with 1 gram of peptone. Allow to bud freely over night at 30°C. Place material in a plaster-of-Paris cup with a depression, and put the cup in a small Stender dish with water coming nearly to the top of the cup. In 60–70 hours there should be abundant spore formation."