

is that official in the U. S. P. for the identification of morphine (U. S. P., page 276). It was found that by employing a small piece of pumice stone, previously heated to a white heat to keep it from floating, bumping prevented and the liquid distilled quietly.

AN IMPROVISED CONDENSER.

In view of the fact that not all pharmacists have access to a Liebig or other form of water-jacketed condenser, I carried out a series of experiments to ascertain whether the test could be made without the use of such a condenser, by having the long arm (about 25 inches) of the bent tube extend into the test-tube receiver, which was placed in water containing ice.

The three fractions of 2 mls each were tested, and in every case where a positive reaction was obtained by employing the Liebig condenser an equally characteristic color was produced by this apparatus, thus indicating that if the water-jacketed type of condenser is not at hand, the simple expediency of using a long glass tube is satisfactory.

The above method of testing for methyl alcohol in beverages and pharmaceuticals is trustworthy, easily applied and rapid.

RESEARCH AND ANALYTICAL LABORATORIES
OF THE LOUIS K. LIGGETT COMPANY.

VINEGAR BEE.*

BY LEASURE K. DARBAKER.

Some years ago there existed a fad for making vinegar artificially, by using the "vinegar bee," molasses, sugar and water. This fad has returned, probably brought back by the national prohibition. Many enterprising firms are advertising the vinegar bee under various names as vinegar bees, beer bees, wine bees, Australian bees, California bees and other designations. Extravagant claims are made for this product and a fancy price is asked, which is much out of proportion to the original cost and value. Some years ago the writer studied this peculiar collection of organisms known as the "vinegar bee" and submits the following account of his results, which are not complete, due to the loss of some of the notes on this work.

Vinegar bees consist of a mixture of various organisms, held together in masses by the organism's mucilaginous sheath and also by the filaments of the mold, with which the bacteria and yeasts are mixed.

Our cultures were obtained from various sources and were grown as follows: About 15 Gm. of the dried bee or 30 Gm. of the moist bee were added to 1 l. of water, in which had been mixed one tablespoonful of molasses. The cultures were placed in a wide-mouth vessel, covered with gauze, and kept at room temperatures and were fed every morning by adding to each culture one teaspoonful of sugar. When a light-colored molasses and white sugar were used a pale-yellow colored vinegar was produced, but when dark-colored molasses and brown sugar were used, the vinegar was of a dark brownish color.

In about 10 days the greatest amount of alcohol was obtained and in about

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18 days the greatest amount of acetic acid had been formed. After this time the bees slowly died, probably killed by the excessive amount of acetic acid and other products.

Cultures were successfully made in alcohol 4 percent and acetic acid 2 percent which had been added to a filtered solution of 50 Gm. of yeast boiled in 1 l. of water. This prepared food caused a more rapid growth than the water, sugar and molasses. Cultures were also successfully made on wort gelatin.

The organisms concerned in this production of alcohol and acetic acid have a great tendency towards pleomorphism and it was found that pure cultures of some of the organisms, when subcultured a number of times, produced involute forms.

In practically all the vinegar bees examined there were present two main organisms:

1. *Saccharomyces tyrisormis*.
2. *Bacterium vermiformæ*.

Other microorganisms constantly found and isolated were:

1. *Mycoderma aceti*.
2. *Mycoderma vini*.

The *Saccharomyces tyrisormis* is one of the many wild yeasts which are constantly present in the air, while *Bacterium vermiformæ* is probably a sub-species of *Bacterium pasteurianum*. *Mycoderma aceti* should be classed separately as it probably is one of the involuted forms of *Saccharomyces* and shows this tendency from culture to culture. *Mycoderma vini* is also one of the involute forms and is an aerobic yeast-like fungus. The *Mycoderma aceti* cohere by their mucilaginous sheath and form a film called the mother of vinegar, in which are embedded various other organisms. These organisms are strictly aerobic.

If there is much sugar in the fluid in which the *Mycoderma vini* is growing, it will form a film, which is tough and elastic. The growth of the vinegar-producing organisms practically ceases in an alcohol content of 10 percent and 14 percent kills them. Their growth is inhibited when the acetic acid content is 5 percent and they are killed when it is over 12 percent.

Mycoderma aceti which form the membranous pellicle on the surface are best subdivided into:

Bacterium aceti, which appear as rod-shaped organisms with a constricted middle and lie in parallel chains in the surface film. When grown in pure culture, they appear as smooth, moist, veined colonies, in about 24 hours at 34° C. When grown on wort gelatin, the colonies are elevated, rounded, grayish, waxy and with an entire margin, many appearing somewhat star-shaped in outline.

Bacterium pasteurianum are larger than the *Bacterium aceti* and are thread-like; many are swollen, showing involution forms, one of which probably is the *Bacterium vermiformæ*. In pure cultures they show a dry wrinkled film. On wort gelatin the colonies are rugose and the organisms remain in chain-like formation. The sheath stains blue with Lugol's solution, while the *Bacterium aceti* sheath stains brown. These organisms have a very large mucilaginous sheath.

Bacterium Kutzingianum resembles *Bacterium aceti* but occurs singly or in pairs. Their growth is similar to that of *Bacterium aceti* with these differences:

They show a creeping growth up the side of the container and on gelatin wort grow as a shiny colony. The bacterium sheaths stain blue with Lugol's solution.

Bacterium xylinum was found in several specimens; they grow as a thick tough leathery film. The sheath stains blue with Lugol's solution. This organism may cause the vinegar to lose its sour taste if cultured too long. Its growth is inhibited by shutting off the supply of oxygen.

Bacterium acetigenum is very motile and will not liquefy wort gelatin and is found in nearly all mother of vinegar.

Bacterium oxydans is very motile and will not liquefy wort gelatin.

Bacterium industrius was found in one specimen. It is very motile.

Bacterium vermiforme is characterized by having a swollen sheath.

Bacterium termo is very short and motile. The cultures have a damp, musty odor and grow as grayish wrinkled films.

Saccharobacillus Pasteurianus was found in hop cultures only, so it is unlikely that it is a normal constituent of the vinegar bee. It is an alcohol producer and if grown too long will give a very bitter taste to the culture media.

Several specimens showed organisms resembling *Bacillus viscosus* and *Bacillus Acidi lactici*, but unfortunately were not isolated.

Mycoderma cerevisiae grows as a dull gray wrinkled colony. The cells contain 1 to 3 highly refractive granules. This organism did not produce fermentation and it was strictly aerobic.

One of the molds found in practically every specimen was *Penicillium glaucum*. This organism will aid acetic fermentation in sugar solutions.

It is probable that some of the other yeasts concerned in vinegar production and found in vinegars could be isolated from vinegar bees. The chief ones are: Primary—*Saccharomyces pastorianus* (*Mycoderma pastorianus*), *S. ellipsoidus*, and *S. anamalus*. Secondary—*Saccharomyces marxianus*, *S. exiguus*, *S. Ludwigii* and *S. membranaefaciens*. Organisms which cause the same results as the vinegar bee were cultivated but unfortunately not isolated, by boiling corn meal for two hours under 15 pounds steam pressure, mixing the cooled corn meal with molasses and exposing to the air, when in several days copious growths were obtained; also by exposing solutions of bakers' yeast in molasses to the air.

Vinegar bees are a mixture of organisms probably coming from the air and may contain harmful as well as the desired vinegar-forming organisms. Great care should be exercised in obtaining cultures and in their preparation to exclude all pathogenic organisms. It was found that all the pathogenic organisms which will grow in vinegar solutions are anaerobic.

INORGANIC INCOMPATIBILITIES OF ORGANIC DRUGS.*

BY CARL BRAUBACH.

The occurrence of a crystalline sediment in a proprietary preparation, in connection with the bursting of numerous bottles, led the proprietor to ask for advice as to its nature and the best method of eliminating it, as he thought this was the cause of the bursting.

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