

Effect of Oxygen on Inhibition of Fungi

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The inhibition of one fungus by another in pure culture is a phenomenon that has been found to be of frequent occurrence. The true nature of the cause of inhibition has not, as yet, been definitely determined. Also, there is quite a variation in the amount or extent of influence that one fungus has over another. From various sources there have been isolated certain bacteria that have been found to cause considerable inhibition of certain fungi in pure culture growth in vitro under normal laboratory conditions. My purpose was to determine the effect of an atmosphere of pure oxygen on the inhibition of a fungus plant pathogen colony by a bacterial colony.

Technique.—The organisms used were pure cultures of *Colletotrichum nigrum* and *Bacterium* sp. (F-5.) Equal amounts of Difco potato dextrose agar were poured into six sterile petri plate tops, which were then covered with 8-inch squares of glass. Four of these petri plates were then inoculated at one side with 8-mm. disks of *C. nigrum*, the mycelium side being on the agar. After 72 hours, when the fungus had shown some growth, two of these plates were inoculated with *Bacterium* sp. opposite the fungus and also the remaining two plates, which had been poured and had not previously been inoculated. The three inoculations were made as follows:

- (a) *In oxygen*—1 plate with *C. nigrum* only.
1 plate with *B. sp.* only.
1 plate with both cultures on opposite sides.



Fig. 1. *B. sp.* (control).

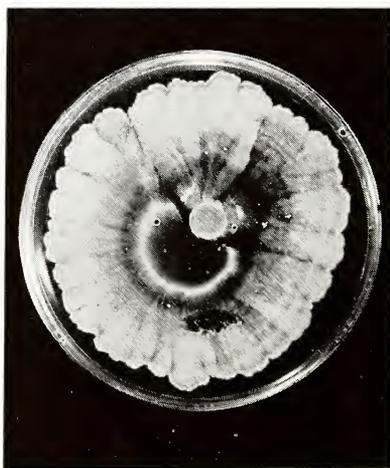


Fig. 2. *B. sp.* (in oxygen).

(b) *Control*—same series as in (a), growing under normal conditions.

Three brass gas chambers (Fig. 7) were then sterilized and allowed to cool. The prepared plates (series A) were then each placed over a brass chamber and sealed air-tight with a paraffin-vaseline mixture. The three control plates were also inverted on glass plates. Oxygen was then forced into each gas chamber in turn until all the air had been forced out. A fresh supply of oxygen was forced in daily, sufficient to insure practically a pure atmosphere of oxygen. Measurements



Fig. 3. *C. nigrum* (control).



Fig. 4. *nigrum* (in oxygen).

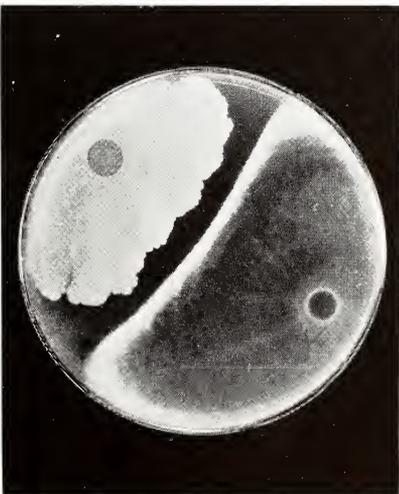


Fig. 5. *B. sp. x C. nigrum* (control).



Fig. 6. *B. sp. x C. nigrum* (in oxygen).

of increase in colony diameter were taken every 48 hours for the 14 days that the experiment was carried on.

Observations.—Due to the more rapid growth of the two organisms together in the control, the advancing edge of the *C. nigrum* colony showed as a straight line across the plate—a sign of strong inhibition—48 hours before the same phenomenon appeared with the two colonies together in the oxygen. The advancing edge of a normally developing colony is convex. In the control, there was a clear space 0.8 cm. wide between the two colonies; in the oxygen, the clear space was 1.2 cm. wide.

Conclusion.—1. *Bact. sp.* (control) showed considerably more development than *Bact. sp.* (in oxygen), the former colony reaching the edge of the petri plate by the end of 240 hours and the latter not reaching the edge of the petri plate even after 336 hours (Figs. 1, 2).

2. With *C. nigrum* (control), the colony diameter after 336 hours was 8 cm., while that of *C. nigrum* (in oxygen) was 7.1 cm. at the end of the same period (Figs. 3, 4).

3. With the two organisms together in the oxygen, both seemed to increase in size proportionately, this continuing throughout the length of the experiment. However, when the size of the colonies at the beginning of the experiment is considered, the increase in size of the bacterial colony was 2.8 cm., while that of *C. nigrum* was only 1.8 cm.

4. With the two organisms together in the control, both colonies seemed to increase in size proportionately; however, if the initial colony size be considered, *B. sp.* showed a growth increment of 3.0 cm., while that of *C. nigrum* was 2.2 cm. (Figs. 5, 6).

5. The difference in width of the open space between the two colonies can be attributed to the reduction in growth of both colonies by the oxygen.

6. With the two organisms growing individually, the graph (Fig. 8) shows that *B. sp.* and *C. nigrum* will develop more rapidly under ordinary laboratory conditions than in an atmosphere of oxygen. The bacterial colony in both cases shows greater development than that of the fungus in air and in oxygen.

7. From the results and observations, it would seem that an atmosphere of oxygen has little effect, if any, on inhibition.

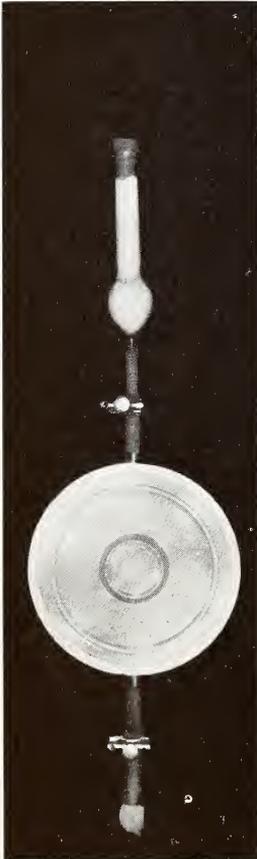


Fig. 7. Gas chamber apparatus.

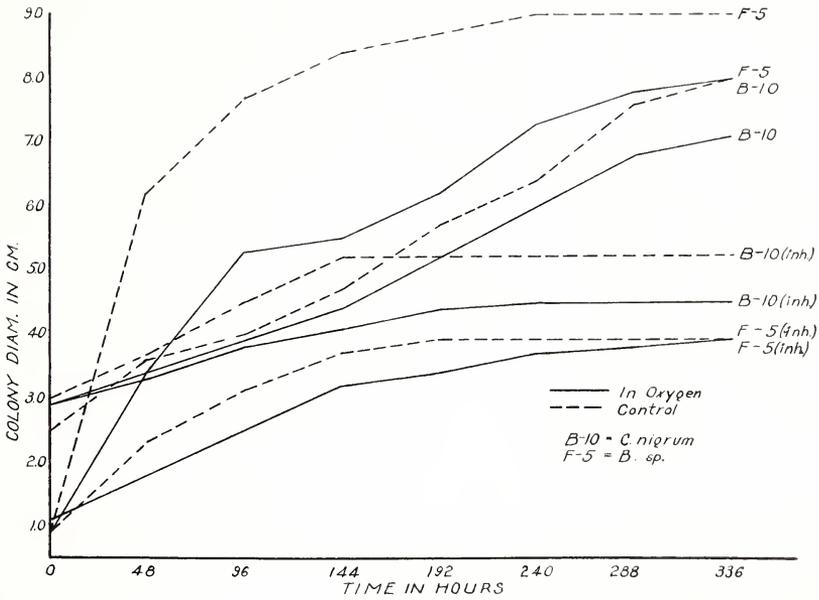


Fig. 8.