THE EFFECT OF ULTRA-VIOLET LIGHT ON THE FERMENTING ABILITY OF YEASTS

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Problem: This problem was suggested by the discordant reports in the literature concerning the effect of ultra-violet on the fermenting ability of yeasts. Some workers report that ultra-violet light accelerates the fermenting ability of yeasts, while others report that ultra-violet light greatly inhibits their fermenting ability.

Method: In view of the differences of opinion on this question, it was decided to repeat and extend some of the experiments. More refined methods have been developed which allow more reliable results. Four different modifications of technique were used as follows: (1) irradiation of dextrose-broth cultures, (2) irradiation of aqueous suspensions of yeast before inoculation, (3) irradiation of fermenting cultures, (4) irradiation of dextrose broth before inoculation. Each experiment was carried out in duplicate and in some cases many times.

The source of ultra-violet light in this experiment was a Cooper-Hewitt lamp operated at 110 volts and 5 amperes (D. C.) at a distance of 25 cm. A fairly constant temperature was maintained during irradiation by means of an electric fan directed toward the light. A fermentometer described by Rahn (1929) was used to determine the rate of fermentation. This method of measuring fermentation has the advantage of determining the rate for very short intervals of time immediately after exposure, thereby eliminating the possibility of fermentation by cells which were never exposed to the light. The gas pressure in the fermentometer was produced against mercury in the open arm. The record of the pressure was kept in millimeters of mercury. All irradiation was carried out in quartz flasks.

Saccharomyces cerevisiae and Fleischmann's commercial pressed yeast were the principal yeasts used in this experiment.

Conclusions

(1) Yeasts are destroyed when exposed directly to the effects of ultra-violet light.

(2) Irradiation of dextrose-broth cultures of fermenting yeasts in quartz apparatus for periods of time totaling 1 hour and 20 minutes seriously inhibited their fermenting ability.

(3) Exposure of yeasts in aqueous suspension to ultra-violet light destroyed so many cells that no gas was formed in 24 hours; very small amounts were formed in 31 hours. The non-irradiated controls showed regular active gas formation.

(4) Exposure of dextrose-broth cultures to ultra-violet light after fermentation had begun, greatly inhibited gas formation.

(5) Dextrose broth irradiated for a long time before inoculation tended to ferment more slowly than the non-irradiated control media.

(6) No observations were made to indicate that exposure of yeasts or media to ultra-violet before inoculation increased the amount of gas formed.