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FACTORS INFLUENCING THE PRODUCTION
OF ACETIC ACID FROM CORN STALKS
BY THERMOPHILIC BACTERIA

C. H. WERKMAN AND R. H. CARTER

Among the factors influencing the yields of acid in the thermophilic acetic acid fermentation of corn cobs are: (1) hydrogen ion concentration at which the process takes place, (2) state of division of substrate, (3) temperature of incubation, (4) source of inoculum. The optimum pH for acid yield was found to be near 9.0 with a range of good yields from pH 8.5 to 9.5. The reduction in yields is marked below pH 8.5 and above 9.5. The pH was adjusted daily. Using large inoculations (5% by volume) of actively growing cultures the yields of acid were greatest during the first day and showed a reduced yield on each successive day. The high alkaline fermentations showed greater yields on the first day but showed a more marked decline on succeeding days than did the more nearly neutral fermentations.

The yields calculated as percent of acetic acid at different pH values are shown in Table I. The experiment was stopped on the 19th day when the flasks in the favorable range were showing some fermentation. The percentage yields of acid calculated as acetic per day are shown in Table II for the optimum range of pH. Some formic acid and traces of butyric were produced.

The optimum temperature was found to be close to 63° C. The maximum was 72° and below 50° the fermentation was not typical. Grinding the cobs to increase the surface area increased the rate of fermentation and the yield. Goat manure furnished a good source of inoculum although soil or other manures may be used.

No pure cultures or mixtures of pure cultures were obtained which would produce as high yields of acid as the impure mixtures obtained from manure inoculations. The efficiency of the impure culture increased upon repeated transfer. The rate of acid production increased until fermentation was complete within 7 days.

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Table I

EFFECT OF pH ON YIELD OF ACID

pH	7.2	7.5	8.0	8.5	9.0	9.5	10.0	10.5
% Cob as acetic	2.8	2.4	13.5	21.8	23.1	20.9	13.9	14.0
No. of experiments averaged	5	1	8	6	6	4	3	3

Table II—Daily Yields¹ of Acid as Acetic in Optimum Range of pH.

No. of EXPERI- MENTS AVERAGED	pH	DAY									
		1 %	2 %	3 %	4 %	5 %	6 %	7 %	8 %	9 %	10 %
6	8.5	3.0	2.7	2.2	2.0	1.8	0.9	0.8	0.8	0.8	0.8
6	9.0	3.4	2.5	2.7	1.5	1.6	1.3	2.0	1.2	1.2	1.0
4	9.5	3.9	2.8	2.4	2.3	1.4	1.3	0.8	0.8	0.9	0.9

¹ Calculated as per cent by weight of cob.