A NEW TYPE OF GASEOUS FERMENTATION OCCURRING DURING THE SALTING OF CUCUMBERS

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A study was made of the microorganisms responsible for the production of hydrogen in cucumber fermentations.

The experimental work dealt chiefly with the isolation, identification and biochemical studies of this group of organisms as well as observations upon their typical fermentations under commercial conditions.

Twenty-nine strains were isolated from cucumber fermentations in salt ranging from 20 to 60 per cent saturation. Detailed studies of the morphological, cultural and physiological characteristics of 20 of these strains placed them in the genus Aerobacter, and showed that they conformed more closely to the cloacae species than to aerogenes, the only other species now described in Bergey's Manual.

Fermentations in buffered dextrose broth, cucumber juice and 19 carbon compounds were studied. Influence of salt, pH and temperature was determined in dextrose broth for the type strain, and H_2: CO_2 ratios were determined for fermentations in cucumber juice, dextrose, and 13 other carbon compounds.

These fermentation studies showed that: the optimum temperature was 35°C. with 5° and 45°C. as the minimum and maximum limits; the pH range in a buffered series extended from 4.25 to 8.85 with the optimum about 5.3; there was a progressive decrease in gas production as the salt concentration increased above five per cent saturation; the gas evolved from the fermentation of the various carbon compounds showed that the H_2: CO_2 ratio depended upon the carbon source fermented.

Studies were made of the gaseous fermentation brought about by the Aerobacter in cucumber fermentations in 20, 40 and 60 per cent saturated brines. Results showed that the typical active hydrogen fermentation was usually produced in the 60 per cent brines while in the 40 per cent brines the active fermentation may or may not be produced. Small amounts of hydrogen may be produced in the 20 per cent brines or it may be entirely absent.

The gas evolution, as well as the composition of the gas, demonstrated that typical fermentations in both 40 and 60 per cent brines were divided into two distinct gas evolution phases; the first was brought about by the Aerobacter group and during the active period of fermentation the gas ratio of hydrogen and carbon dioxide was about 1 : 1; the second phase was brought about by the yeasts, during which period the gas was composed of practically all carbon dioxide.

A comparison of gas evolution from fermentations in 20, 40 and 60 per cent brines revealed that, in general, the fermentations at the higher salt concentrations resulted in larger quantities of evolved gas.

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