

# An Occurrence of Bloaters During the Finishing of Sweet Pickles <sup>(1), (2)</sup>

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**D**URING the past year, our attention was called to an isolated case of gaseous fermentation of sweet stock which had occurred during the finishing process. In this particular instance, about one-quarter of the stock (3,000-3,600 count size<sup>3</sup>) from a 40-bushel tank had resulted in "bloaters" or hollow cucumbers (See Fig. 1). Prior to the time that our initial observations were made, there had been an adjustment of the acid content by the addition of vinegar, hence it was not possible to determine the original acidity although it was known to have been low, possibly 15-16 grains acetic acid. Since the fermentation was over, there was no opportunity to make routine bacteriological observations. However, it was possible to make chemical determinations upon the fermented liquor as to end-products, as well as analysis of the gas from the bloaters, since the latter were still partially distended from gas pressure. Consequently, a two and one-half gallon container of cucumbers, covered with the original liquor, was taken from the upper portion of the tank for analysis.

## Methods of Analysis

**T**HE gas-filled cucumbers were opened under saturated brine solution and the escaping gas was trapped by displacement in an inverted glass funnel supplied with a short piece of rubber tubing and pinch clamp. The gas was analyzed in a modified Williams gas analysis outfit according to the procedure previously described.<sup>4</sup>

Determinations upon the liquor were made with respect to titratable acidity, volatile acids, alcohols and esters. The methods of analysis used were those of the Association of Official Agricultural Chemists.<sup>5</sup>

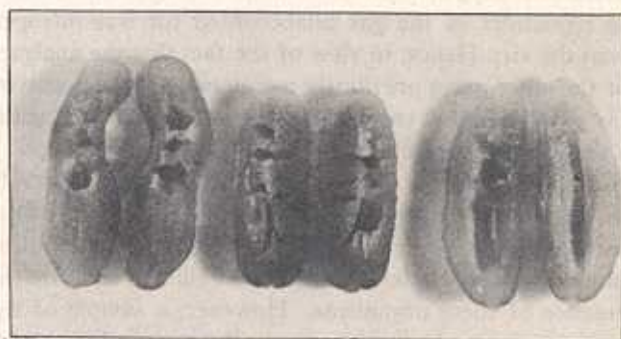


Figure 1. Typical examples of bloaters formed in sweet stock.

## Results

**T**HE results of the chemical determinations upon the fermented sweet liquor and the results of the gas analysis are shown in Table 1.

Table 1. Acid, Alcohol and Ester Content of the Fermented Sweet Liquor and Composition of the Gas from Bloaters or Hollow Cucumbers.

Titratable acid-ity as acetic acid	Volatile acids as acetic acid	Alcohols as ethyl alcohol**	Esters as ethyl acetate	Analysis of gas from bloaters		
				CO <sub>2</sub>	H <sub>2</sub> <sup>1</sup>	O <sub>2</sub>
grains	grains	pct.	pct.	pct.	pct.	pct.
19.3*	18.5	0.51	0	91.1	0	1.6

\*Final value at time of analysis; the liquor tested 21° Baumé.

\*\* Percent by volume.  
Analysis for methane or other combustible hydrocarbons proved negative.

Because the vinegar content had been increased as a control measure when active gas evolution was noted, the values shown for titratable acidity and degrees Baumé do not represent the original acid and sugar content.

No significant difference is noted between the titratable acidity and volatile acid content. This indicates that the gaseous fermentation of the liquor was not accom-

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<sup>2</sup> Presented at the Technical School for Pickle and Kraut Packers, at East Lansing, Michigan, February 18, 19 and 20, 1941.

<sup>3</sup> Number per 45 gallon cask.

<sup>4</sup> Veldhuis, M. K. and Etchells, John L. Gaseous Products of Cucumber Fermentations. Food Research, 4, No. 6, p. 621-630. 1939.

<sup>5</sup> Association of Official Agricultural Chemists, Official and Tentative Methods of Analysis, 4th ed., Washington, D. C. 1935.

