A STUDY OF pH OF STRICTLY FRESH COMMERCIALLY-SHUCKED EASTERN OYSTERS

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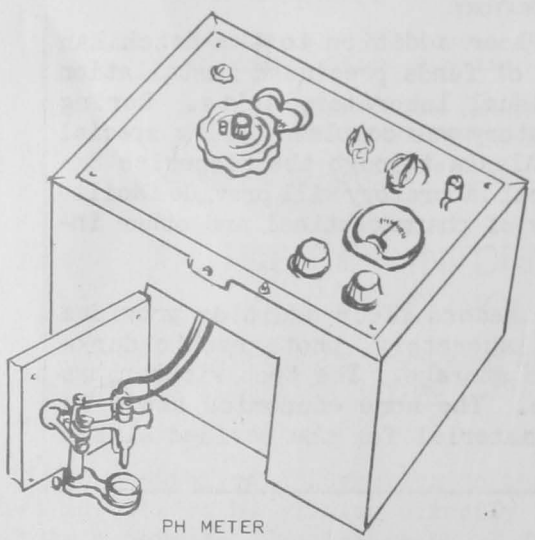
INTRODUCTION

The determination of pH of shucked oysters as a means of indicating the relative freshness of the product is relied upon to a considerable extent. State health departments, grocery store chains, the Armed Services, and others concerned with the inspection, distribution, and consumption of shucked oysters are becoming more and more dependent upon pH values to guide them in judging freshness and for use as a basis on which quality may be expressed, at least partly in objective terms rather than relying entirely on personal observations or opinions.

The idea is not a new one. Hunter and Linden (1923) reported a relationship between pH and odor of oysters; and later Hunter and Harrison (1928) suggested that pH measurements might prove valuable in determining quality of shucked oysters. Along with other work being done with shucked Eastern oysters at the Service's College Park, Maryland, Technological Laboratory in the early 1940's, pH values and their relation to the degree of freshness of oysters were determined for a relatively large number of samples of commercially-shucked oysters. These tests indicated that pH values are useful in following changes in freshness of the oysters (Pottinger 1948).

Some packers and shippers of shucked oysters believe, however, that pH is not a reliable enough indication of the quality of oysters. They claim that wide variations occur between pH values of individual oysters, and that low pH values, indicating decreased freshness, are often obtained with strictly fresh oysters. Such variations would obviously nullify the usefulness of the test.



PH METER

To obtain further data on pH of strictly fresh oysters, in general, and on individual oysters, in particular, and to determine the range of pH values, a series of determinations were begun by the College Park Laboratory in the winter of 1949-50. It was planned to continue the study the following oyster season, but because of a change in projects, the work has not progressed beyond that which was done the first season. This report is based on that work.

EXPERIMENTAL PROCEDURE

The pH determinations were made on strictly fresh shucked oysters at the time of preparation for packing. Practically all of the studies were made at one

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shucking house in the Upper Chesapeake Bay area, so that at least a fairly complete picture of pH values of oysters from one area over most of the oyster season was obtained. Some tests were also made at Crisfield, Md., and Chincoteague, Va., during the latter part of the winter. Shell stock from Eastern Bay (Norfolk, Va., area) and from Tangier Sound (Virginia) was available for the tests at Crisfield.

Samples, on which the pH determinations were made, were obtained at the packing table, immediately after coming from the blowing tank and final skimming table. Samples were also brought to the Laboratory for further pH determinations after holding at ice temperature.

Determinations were made on individual oysters ground through a meat chopper; three oysters ground together; six oysters ground together; and on the oyster liquor. Oysters of two size designations, standards and selects, were used. The pH determinations were made with a Beckman, laboratory model G, pH meter.

Oysters from approximately 100 samples were examined at the plant in the Upper Chesapeake Bay area during the season. Only a few samples were examined at plants in other areas. The average pH values are given in table 1.

Table 1 - Average pH values of strictly fresh oysters from various areas

SAMPLE	SELECTS				STANDARDS	
	Upper Chesapeake Bay	Eastern Bay	Tangier Sound	Chincoteague	Upper Chesapeake Bay	Eastern Bay
	pH	pH	pH	pH	pH	pH
Single oyster	6.62	6.80	6.70	6.50	6.55	6.80
Three oysters*	6.62	6.84	6.68	6.52	6.55	6.79
Six oysters*	6.64	6.83	6.70	6.53	6.53	6.79
Liquor	6.82	6.98	6.97	6.56	6.76	6.97

* COMPOSITE SAMPLE.

For a given area and within a size designation, average pH values of the oysters have shown very little variation, whether taken singly, in groups of three, or in groups of six oysters. The range in pH of the ground fresh meats at the time of packing was quite narrow. For example, the variation in pH of the Upper Chesapeake Bay oysters was between 6.50 and 6.62 for the standards, and 6.58 and 6.68 for the selects. At the same time, the range in pH of the liquor was between 6.70 and 6.82 for standards, and 6.80 and 6.86 for selects. An equally narrow range was found with the oysters from the other areas.

A gradual drop in pH occurred during storage of the oysters in crushed ice. The values for individual oysters within a particular lot were found to stay within a rather narrow range for any given day. There was some variation in pH between lots as a whole, however. Some lots had an off-odor and were considered stale after being held about two weeks, while others were still in a good condition at this time. The difference in keeping quality and pH of two lots of Upper Chesapeake Bay oysters stored in crushed ice is shown in table 2.

At the time an off-odor was first noticeable, however, the pH of all lots was usually very nearly 5.80, with individual oysters occasionally having a pH value as high as 5.98 but seldom much below 5.80. As has been found in previous work with shucked oysters, the pH of the liquor was initially higher than that of the ground meats, but the two values approached each other as the holding period progressed.

Table 2 - pH values of two lots of Upper Chesapeake Bay oysters during storage in crushed ice

Lot	Sample	Number of days storage in crushed ice									
		Initial	1	3	4	5	8	10	15	18	22
		pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
A	Oysters	6.58	6.46	6.38	6.26	6.24	6.20	6.15	5.82*	5.66	--
	Liquor	6.81	6.60	6.52	6.42	6.36	6.32	6.24	5.85*	5.62	--
B	Oysters	6.55	6.50	6.42	6.38	6.32	6.26	6.19	6.15	6.14	5.80*
	Liquor	6.71	6.65	6.60	6.52	6.50	6.44	6.38	6.30	6.24	5.78*

* OFF-ODOR (OYSTERS CONSIDERED STALE).

SUMMARY

In summary, the pH values for strictly fresh shucked Eastern oysters were found to fall within a rather narrow range. No unduly low values were found.

LITERATURE CITED

HUNTER, A. C., AND HARRISON, C. W.
1928. BACTERIOLOGY AND CHEMISTRY OF OYSTERS WITH SPECIAL REFERENCE TO REGULATORY CONTROL OF PRODUCTION, HANDLING AND SHIPMENT. U.S. DEPARTMENT OF AGRICULTURE. TECH. BULL. NO. 64.

HUNTER, A. C., AND LINDEN, B. A.
1923. AN INVESTIGATION OF OYSTER SPOILAGE. AMERICAN FOOD JOURNAL, VOL. 18, NO. 11 (NOVEMBER), PP. 538-40.

POTTINGER, S. R.
1948. SOME DATA ON PH AND FRESHNESS OF SHUCKED EASTERN OYSTERS. COMMERCIAL FISHERIES REVIEW, VOL. 10, NO. 9 (SEPTEMBER), PP. 1-3.

FISHERIES EXPERIMENTAL COMMISSION OF ALASKA HOLDS MEETING

Members of the Fisheries Experimental Commission of Alaska held their first meeting of the new fiscal year in Ketchikan during June to discuss the program of the technological laboratory for the next biennium. The Fishery Products Laboratory, Ketchikan, Alaska, is operated jointly by the Alaska Fisheries Experimental Commission and the U. S. Fish and Wildlife Service. Members of the Commission are: J. W. Mendenhall, Chairman; J. A. Dassow, Secretary; and Andrew Gunderson.

The original agreement between the Commission and the Service for cooperative work was executed in February 1940. The ultimate objectives are research and development towards advancement of the fisheries industries of Alaska. Besides the technological research studies, the Service employs a fishery marketing specialist who carries out educational and market development studies. Cooperative work is also carried out with the Agricultural Extension Service of the University of Alaska.