

Cooperative Pickling Investigations of the United States Department of Agriculture*

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AS a Nation we have suddenly found ourselves in a position where production and more production is the watchword. With it has come the demand for the elimination of waste and the preservation of the things we possess. These facts apply to food as they do to any other commodity with which we must fight this war. We must not only produce food but we must preserve it and prevent deterioration and spoilage of the fruits of our labors.

The Department of Agriculture has been interested in research on the brining and pickling and fermentation of food products for many years. These methods of food preservation can be used for the storing of food material in bulk, as contrasted with most methods of preservation which demand small containers. The shortage of certain strategic and critical materials commonly used for small containers make the storage of products in large containers highly desirable and in certain cases a necessity. Brined, fermented or pickled products may be held for long periods of time in large vats or tanks for canning during the off season or transported in bulk containers to retail establishments. Such means of storage should be used to the fullest at the present time and every effort should be put forth to increase the efficiency of this method of preserving food products and to cut the losses from spoilage to the minimum. It is to these ends that the cooperative research of the United States Department of Agriculture is being turned.

Many of you here will remember the reports on pickling research which the late Dr. Edwin LeFevre gave before this Association. His work was carried out in small containers in his laboratory in Washington. He discovered many valuable basic facts under these adverse conditions and he, as well as others, realized the need for work under actual commercial conditions. There was an apparent lack of interest on the part of research agencies as well as industry and the work did not graduate from the laboratory stage until about 1935.

In that year a sum of \$10,000 was made available to the United States Department of Agriculture for conducting

pickling research. Naturally the first thought was to put this research on a large enough scale to reflect commercial conditions. It was realized that to accomplish this it would be necessary to build a laboratory and pilot scale salting station and to have large amounts of fresh cucumber stocks available. Most of you will readily agree that to do all of this on the fund available would have been almost impossible. Past experiences had shown that the raising of cucumbers for pickling on land available in Washington was very impractical, and it was, therefore, believed necessary to conduct work elsewhere.

At this time the work of Dr. Ivan Jones and his co-workers in North Carolina came to our attention. They were conducting small-scale research on the salting of cucumbers at a large pickle plant and were obtaining very worthwhile results with the available personnel and funds. The soundness of their program, the availability of raw material and laboratory space and general location seemed to offer a logical point for cooperative effort. Accordingly a cooperative agreement was made with the North Carolina Agricultural Experiment Station to pool the personnel and resources of that institution and those of the U. S. Department of Agriculture. Instead of having to construct a laboratory building, space was made available at the North Carolina State College. By pooling resources it was possible to construct a pilot-scale salting station using 85-bushel vats for the experiments. Wishing to use all of the funds possible for research, and being unable under the law to sell any salt stock produced, it seemed desirable to spend much of the money on raw material. Accordingly, an agreement was made with a large pickling company to furnish working space and all of the fresh cucumber stock, at no cost to the research program, and to receive the salt stock when the experiments were finished. The splendid cooperation of this company has contributed greatly to the research program.

In order to learn of the problems of the industry as a whole a short survey was made of plants in the Middle West and South. This was necessary because the program had to be designed to develop information for the benefit of the entire industry. When funds are appro-

priated to the Department of Agriculture they carry with them the provision that the work is "for the benefit of the people of the United States." Therefore, neither work nor information can be confined to any small area or group. The work has been based upon the needs and problems of the industry as presented to us members of your organization and other interested parties. If work has not been done on certain problems it has been because members of your industry have been reluctant to bring them to our attention. All in all, the pickling industry has been frank and very helpful, and this attitude has been reflected in the amount of work that has been done and in the accomplishments to date. The facilities of the pickling research station and the information we have are available to the industry at all times upon request.

THE results of the cooperative research program have been made available through publication in scientific and trade journals which are widely distributed to the food industry. The limited funds available for the purchase of reprints of these articles do not make it possible to send a copy to each member of the pickling industry. Our usual supply of two hundred is distributed as long as it lasts, to all who request copies or information that is given in the reprint. Our mailing list is fairly complete but it is our hope that we may enlarge it to serve the entire industry. Any who are not on the mailing list and who have not received copies of the articles mentioned may obtain such upon request. More than fifteen articles have been published within the last three years and several manuscripts are now in preparation. Most of these have joint authors representing the U. S. Department of Agriculture and the North Carolina Agricultural Experiment Station. The published articles have covered a wide field and were designed to shed light on particular processes, or to aid in the solution of spoilage problems. It is our earnest hope that they have been of value to members of the pickling industry.

Each year the members of the staff of the Department Field Station at Raleigh, N. C., and members of the North Carolina Agricultural Experiment Station have attended the Pickle and Kraut Technical School at East Lansing, Michigan. Many of you have attended that school and know of the great benefits derived from the three days' sessions held under the direction of Dr. F. W. Fabian. At this meeting there is free discussion of the problems encountered by the two industries, and the results of research programs are presented and discussed by scientists. This school is unique in its make-up and in the type of discussions carried on during the sessions, and probably has no counterpart in any other industry. Representatives of pickling plants come from all over the Nation, and because it is truly representative of the industry it has always been a pleasure for us to participate. Last year our cooperative research group at Raleigh, N. C. contributed one-third of the entire program; this year it expects to present five papers. One of the outstanding facts

is that the results of the various pickling research programs seem applicable to all parts of the industry regardless of location.

The results of research reported thus far include papers on pasteurization, heat penetration and methods of examination of a fresh cucumber product; the chemical and bacteriological changes in dill brines and methods for the canning and pasteurization of genuine dill pickles; the occurrence of bloaters in salt stock and during finishing of sweet pickles; the incidence of yeasts in cucumber fermentation; and the influence of the addition of sugar to brines in pickle fermentation. Some of the work, though basic in nature, has led to an explanation of practical problems. For example, it has been found that the formation of bloaters is markedly influenced by the brine concentration during fermentation, and that the higher the initial concentration the more likelihood there is of bloater formation. For many years the addition of sugar to dills and other fermenting pickles has been advocated, but it has been shown on a commercial scale that the addition does not result in an increased acid production.

THE fermentation of various types of vegetables and fruits offers a method of storing foods in bulk for future processing and use. It should prove of value during this emergency period when we must produce and process more food for our allies and ourselves. The pickling industry will play a part in that program, and believing that the results of our cooperative research may be of service to the manufacturers, the papers to be presented at the Pickle and Kraut Packers Technical School this year will be in the form of reviews. These will bring together, and up to date, the results obtained over a period of years. If any of those present are interested in receiving reprints of these reviews or of other papers they are advised to write to Dr. J. L. Etchells, U.S.D.A., Box 5578 or Dr. Ivan Jones, North Carolina State College at Raleigh, N. C.; copies will be sent as soon as available. It is not enough to produce food. The food must be preserved so as to maintain maximum quality; any spoilage which results from improper methods of handling is not only a loss to the manufacturer but a waste of effort and much needed food. It is, therefore, the duty of every manufacturer to make use of all available information on the preparation, processing and storage of his product in order to insure the maximum yield and maintenance of quality. It is to make such information available to the entire industry that the cooperative pickling research of the United States Department of Agriculture and the North Carolina Agricultural Experiment Station is being continued at Raleigh, N. C. There is still much work to be done for, as you know, there are many unsolved problems. If any member of the pickling industry has a problem we want him to know that the facilities of the research station at Raleigh are available to him, and that while we can make no promise to solve it for him, every effort will be made to do so.