POST-HARVEST OPERATIONS AND PRODUCT UTILIZATION STUDIES ON BANGOS Chanos chanos (Forskal)

By

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Fish, most perishable of all protein foodstuffs, deteriorates in quality soon after harvest. The operations that follow harvesting must then be carefully considered, knowing too that the market price of fish is partly determined by its state of quality as it finally reaches the consumer. To assure its availability and ease of transport, a portion of the harvested fish should be converted to products of better keeping quality.

This paper, although with its limitations, attempts to review in a nutshell the recent investigations made locally on the utilization aspects of bangos. Cost analyses and feasibility studies on the manufacture of various products require more intensive study, however. It is apparent that the development of the bangos processing industry will depend initially on the quantity of raw material made available to the fish processor.

Bangos utilization studies have been the subject of interest of various food researchers, largely due to its special flavor and popularity as a food item in the Filipino diet. Local investigations on the handling, processing and quality control of bangos may be classified into the following areas:

1. Handling, chilling and freezing
2. Preliminary operations, smoking, salting and drying
3. Canning of bangos formulations
4. By-product utilization

Recent studies made will now be discussed briefly according to these areas of concentration.

I. Handling, Icing and Transport

The use of low temperature as in chilling or icing is the simplest and cheapest method by which the onset of spoilage in fish is retarded.

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Studies on icing bangos for transport by boat, air, or land were conducted recently by the Food Terminal Incorporated (FTI) formerly Greater Manila Terminal Food Market (GMTFM) (Dolendo, et al, 1975.)

Four types of containers with the same dimensions were studied for use in boat transport at a travel time of 24 hours. Fish were pre-chilled, prior to packing in containers. Results showed that the insulated containers (1 cu meter in volume) provided with drainage outlets at the bottom, with bañeras separated from each other by wooden dividers, gave the best quality of fish and negligible loss in weight.

For air transport, if fish were pre-chilled prior to packing at the source, with the center temperature of fish at $0^{o}C$, a travel time of 1 hr, good quality of fish could be obtained, at a low ice to fish ratio of 1:20, or without ice at all. Styrofoam boxes with a net capacity of 60 kg were preferred for air transport.

The market quality of chilled bangos was assessed by objective tests and was found to fluctuate within the same batch of samples. This indicates the heterogenous quality of fish sold in the market and hence reflects the varying quality of handling operations used by the industry (NRCP Report, 1971).

II. Preliminary Operations (Deboning), Salting, Smoking, Drying and and Other Products

The weight of bangos ranging from 32 g to 1,345 g and length from 6.1 cm to 53 cm were studied in relation to meat yield against round weight. Meat yield of bangos increased with round weight up to 700 g, beyond which the curve levelled off (Arroyo, 1975). The percentage yield of edible portion of bangos as compared to some species of fish has also been determined.

The preparation of boneless bangos has received considerable attention due to the convenience and better edibility resulting from the complete deboning operation. In the process when the backbone is separated from the flesh, the neutral haemal and some pleural spines attached to it are removed. Skill is required, however, to remove the several spines embedded in the muscles—38 branching spines at the dorsal portion, 14 spines from the nape along the lateral line, and 16 fine branching spines along the ventral muscles (Arroyo, 1974: BFAR Leaflets).

Fish curing such as salting, smoking, drying and marinading may be employed to improve the keeping of quality of bangos. A review of

the researches completed involving fish processing in the Indo-Pacific area, including the Philippines was made recently (IPFC Studies, 1967; Orejana, 1973).

Studies have been made on the development of smoked soft-boned bangos and its storage qualities as related to the physico-chemical characteristics of the product while stored at various temperatures. Preparation of smoked soft-boned bangos involved the following operation: cleaning and eviscerating the fish, soaking the fish in brine at desired salt concentration, pressure cooking, drying and smoking at optimum temperature. Brining at 95°C, pressure cooking at 15 lb for one hour and storage for about three weeks at 10-20°C yield a product of good quality as indicated by objective and subjective tests (Baclig, 1970).

Preliminary studies on the effect of salt impurities, duration and temperature of smoking, brine concentration and type of fuel on the quality of smoked and salted bangos have also been conducted.

Unlike soft-boned bangos which is pressure-cooked without deboning, smoked boneless bangos has been prepared and its quality correlated with storage temperature, method of packing and brine concentration. Microbiological and chemical tests are correlated with sensory evaluation to assess the quality of the product (Guevara, et. al., 1975).

Fish protein concentrate (FPC) has also been prepared from bangos. This protein-rich powder may be used as a flavoring agent or food supplement and can be stored indefinitely due to its low moisture and fat content. FPC prepared from bangos has an advantage over those prepared from other species due to its light color and good flavor. No organic solvent is necessary if mechanical pressing operations are done efficiently. This drastically reduces the cost of FPC preparation. The amino acid content of the unprocessed bangos has also been compared to be rich in essential amino acids (Orejana, 1974).

III. Canning of Bangos

The canning of bangos has been subject to investigations in the past years by several research agencies, particularly the Bureau of Fisheries and Aquatic Resources (BFAR), and National Institute of Science and Technology (NIST). Product formulations have been made for the following, to mention a few: canned bangos, sardine style, bangos in oil, with tausi, with pork, escabeche-style, salmon style, and many others. Recently, the development of canned fish sausage with skinned bangos, as well as paksiw na bangos packed in glass jars has been made (Arroyo, et. al., 1975). French sardine style formulations have been prepared (Gonzales, et. al., 1970) and or Marfori, et. al., in 1974 conducted a storage life study on canned bangos.

As early as 1957, Sulit, et al, published procedures on the canning of bangos and the preparation of some by-products from the fish. The steps involved in canning include essentially, the following: dressing of bangos, cutting into can-length size, brining, pre-cooking, filling into cans, exhausting, sealing, processing at required temperature and time, cooling and labelling. The ingredients added during the filling operations depend on the formulations desired.

IV. By-Product Utilization

The conversion of waste materials of bangos processing to stable by-products may spell the difference between profit or loss in the bangos processing industry. Fish meal and fish silage, hydrolysate (bagoong and patis) and oils, guanine extracts are a few of the more important by-products prepared from bangos offals.

In a recent study, fish meal and silage were prepared from bangos offals. Fish meal was prepared by steaming followed by drying and grinding while fish silage was prepared by using varying concentrations of sulfuric acid to hydrolyse the tissues and dissolve the bones. The two types of products which can both be used as feed ingredients were compared, based on proximate analyses and pepsin digestibility test. Net protein utilization calculated from data obtained on pepsin digestibility test was used to determine the protein quality of these feed supplements. Proximate analyses--protein, moisture and ash content, and BTU values of fish meal and fish silage are shown in Tables 4 and 5. Statistical analyses showed that the difference in the digestibility values expressed as percentage nitrogen was significant at 10% level (Flores, et al).

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