

A PRELIMINARY STUDY ON THE PRESERVATIVE ACTION OF FURASUKIN AND MILD HEAT IN CANNING BAÑGOS

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ONE PLATE

ABSTRACT

Furasukin, chemically known as 5-nitro-2-furaldehyde semi-carbazone, is a tasteless, odorless and emulsionized germicide which has been proven experimentally to be harmless to the body. This study attempts to determine the value of furasukin in preserving canned bañgos without the use of pressure cooker, and in reducing the length of time and degree of heat in processing.

Furasukin was added in proportions of 1/10,000, 1/20,000, 1/50,000, 1/70,000 based on the weight of the fish before sealing the cans. Experiments were performed on three lots, each of 6 cans, for each of the proportions of the furasukin and for control. These were processed in boiling water for 30, 60, and 90 minutes, respectively. The cans were stored at room temperature and observed for spoilage.

All the controls and that with low concentrations of furasukin spoiled after the third day. The rest of the experimental packs remained unspoiled after six months of storage.

The results thus obtained proved that furasukin in most proportions may be used in the preservation of canned fish and possibly other fishery products and nonacid foods without the use of pressure cooker.

INTRODUCTION

The search for new and improved processing methods in the fish-packing industry is being conducted in various technological laboratories to improve the quality of canned products and lower the cost of production. Andersen et al. (1949) announced a new principle in food preservation which would find application in the processing of fish, shrimps, crabs, and other fishery products. Their work which was mostly done on vegetables indicates that food can be preserved with only mild heat treatment (212° F. or lower for a few minutes) in the

presence of very small amounts of an antibiotic, subtilin. Morse (1950) reported the same results in his preliminary experiments on vegetables. Tarr experimented with streptomycin, penicillin, subtilin, polymixin B, circulin, neomycin, bacitracin, gramicidin, metholyl gramicidin, rimocidin, terramycin, chloromycetin and aureomycin on the preservation of fish and meat. His results indicated that aureomycin, terramycin, and chloromycetin, in the order named, proved effective inhibitors of bacterial growth while rimocidin inhibited yeast growth. The California State Bureau of Food and Drug Inspection, however, warned the canning industry to refrain from using antibiotics in processing until further studies have been made to determine their possible effects to the human body (1949).

Little has been reported on the use of germicides in fish canning. Japan, one of the ranking fishing countries of the world, has announced the use of a powerful germicide, furasukin, in the preservation of fish and other food products. Furasukin, chemically known as 5-nitro-2-furaldehyde semicarbazone, is an emulsified germicide, also available in the market in the forms of tablets, pills and powder. This drug is now extensively used in Japan as a food preservative and is recommended by Japan's Fisheries Agency and Fishery Research Society in the cold storage of fish. At present this product is not available in Philippine markets and no work has so far been done regarding its utilization and significance in the fisheries industry.

Experiments on the antibacterial effect of furasukin by Fujino (1948) indicate that it is a potent germicide even at very low concentrations. Gyoozo et al. (1951) revealed that fish soaked in a solution containing 1/10,000 furasukin, 3 per cent table salt, 0.4 per cent CaCl_2 , and 0.6 per cent acetic acid, not only prolonged the length of preserving the freshness of the fish but also delayed "hara-kire" or the state of being disembowelled due to the putrefaction of the alimentary canal. Toxicity studies of furasukin made by the Putrefaction Technology Laboratory, Chiba University (1950) showed that the administration of 1/25 MLD of furasukin (MLD, 0.5 g/kg) daily to rabbits revealed no symptoms of poisoning on autopsy.

A preliminary experiment was undertaken to determine the preservative effect of furasukin on the canning of fish without the use of pressure heating equipment, its effect on the possible reduction in the length of the cooking period, and the degree of heat needed in processing fishery products and other nonacid foods treated with it.

MATERIALS AND METHODS

Bañgos, *Chanos chanos* (Forskål), freshly caught from the Dagatdagatan Salt-water Fishery Experimental Fishponds in Navotas, Rizal Province, were used in the experimental tests. The fish were dressed—the fins, scales, viscera, heads and other entrails removed, and allowed to drain after washing. They were then cut into can-length pieces, weighed, and placed into half-pound tuna cans. Furasukin was then added in varying proportions of 1/10,000, 1/20,000, 1/50,000 and 1/70,000, based on the weight of the fish. Furasukin was not added in the cans used as control. The cans were half-sealed, exhausted, and finally sealed immediately. Three experiments were made. A bath of boiling water was employed in effecting sterilization using the processing times of 30, 60 and 90 minutes, respectively in each. For each experiment six cans for each of the different proportions of furasukin and the control were provided. After processing, the cans were stored at room temperature and observed daily for external manifestations of internal spoilage. Representative experimental packs were opened and examined physically, organoleptically, and bacteriologically after six months storage (fig. 1).

RESULTS AND DISCUSSION

Table 1 shows the effect of furasukin added in various proportions to the canned bañgos. All the controls processed for 30, 60 and 90 minutes were spoiled after three days of storage. One can treated with 1/70,000 furasukin and processed for 90 minutes was also spoiled. Careful examination of the can showed that faulty sealing was the cause of spoilage.

Two weeks later, the cans of bañgos preserved with 1/70,000 and 1/50,000 and processed for 30 minutes were already in a bad state of decomposition revealing the characteristic foul odor of spoiled canned foods (fig. 1). Bacteriological examination (Table 2) showed the presence of great numbers of both aerobic and anaerobic bacteria, but those processed at 60 and 90 minutes although spoiled gave less bacterial count than those processed for 30 minutes. All the other experimental cans including those processed for 30 minutes but with 1/20,000 to 1/10,000 furasukin were not spoiled even after six months of storage (Table 1).

TABLE 1.—Showing the effect of furasukin on canned bañgos (Chanos chanos) Forskål.

Processing		Number of cans	Amounts of furasukin	Length of storage (days)							
Time	Temperature			3	14	30	60	90	120	150	180
30	212	6	control	+							
		6	1/10,000	—	—	—	—	—	—	—	—
		6	1/20,000	—	—	—	—	—	—	—	—
		6	1/50,000	—	+	—	—	—	—	—	—
		6	1/70,000	—	+	—	—	—	—	—	
60	212	6	control	+							
		6	1/10,000	—	—	—	—	—	—	—	—
		6	1/20,000	—	—	—	—	—	—	—	—
		6	1/50,000	—	—	—	—	—	—	—	—
		6	1/70,000	—	—	—	—	—	—	—	
90	212	6	control	+							
		6	1/10,000	—	—	—	—	—	—	—	—
		6	1/20,000	—	—	—	—	—	—	—	—
		6	1/50,000	—	—	—	—	—	—	—	—
		6	1/70,000	1 can spoiled	—	—	—	—	—	—	

NOTE:

+ Spoiled.
— Normal.

TABLE 2.—Effect of furasukin on bacteria in canned bañgos.

Processing		Amounts of furasukin	Bacteria + 104 per gram	
Time	Temperature		Aerobes	Anaerobes
30	212	Control	(Not determined)	(Not determined)
		1/10,000		
		1/20,000		
		1/50,000	3.175	2.211
		1/70,000	8.255	7.900
60	212	Control	0.010	
		1/10,000		
		1/20,000		
		1/50,000		
		1/70,000		
90	212	Control	0.010	
		1/10,000		
		1/20,000		
		1/50,000		
		1/70,000	0.010	0.005

The foregoing results showed the preservative action of furasukin in canned bañgos at the amounts ranging from 1/20,000 to 1/10,000 processed for 30 minutes, and 1/70,000 to 1/10,000 processed for 60 to 90 minutes. It is quite evident that the amount of furasukin preservative to use in canning bañgos is inversely proportional to the length of processing time; that is, if less preservative is used the time for processing must be made longer in order to insure complete preservation.

SUMMARY AND CONCLUSION

Three sets of experimental packs of canned bañgos were treated with varying proportions of furasukin and processed in boiling water for 30, 60 and 90 minutes. The cans were stored at room temperature and examined daily for external manifestation of internal spoilage.

On the third day the controls showed signs of fermentation by the bulging of tops brought about by gas formation. After two weeks the cans with fish treated with low concentration of furasukin 1/70,000 to 1/50,000 and processed for 30 minutes showed characteristics of spoilage. The remaining experimental packs were normal or unspoiled even after six months of storage as evidenced by bacterial and organoleptic tests.

The result thus obtained clearly showed the preservative action of furasukin ranging from 1/20,000 to 1/10,000 and at least 1/50,000 at processing times of 30, 60 and 90 minutes, respectively.

Based on the results of the experiments, furasukin can be used to preserve canned bañgos and possibly other fishery products and canned nonacid foods without the use of high-pressure heating device.

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ILLUSTRATIONS

PLATE 1

Canned bañgos, *Chanos chanos* (Forskål) showing the degree of disintegration according to the amounts of furasukin and length of processing time used.