IMPACT OF GAMMA IRRADIATION ON CHEMICAL AND MICROBIAL QUALITY OF TUNA (*Thunnus albacares*) AND TILAPIA *(Oreochromis sp.)* STORED IN ICE

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Thesis submitted to the

Rajarata University of Sri Lanka

for the award of the Degree of Master of Philosophy

in Food Chemistry

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ABSTRACT

Global demand for fishery products is increasing and the major problem with respect to distribution of fishery products is their susceptibility to spoilage, mainly due to the contamination of spoilage and pathogenic microorganisms. By lowering the temperature of the fish, spoilage can be retarded and if the temperature is kept low enough, spoilage can be almost stopped. With the observation of the joint committee of FAO/WHO/IAEA that irradiation of any food commodity up to an overall average dose of 10 kGy presents no toxicological hazard, there has been worldwide interest in using the technology for shelf-life extension of various foods including fishery products. Therefore, several studies has been conducted to evaluate the suitability of gamma irradiated products to substitute existing fish preservation techniques.

The study has been carried out to identify the variations occur due to the gamma irradiation in fish flesh using two major food fishes in Sri Lanka. Yellowfin Tuna and Tilapia, which are highly demanding marine and fresh water fishes were selected for the study to evaluate the effects of gamma irradiation. The irradiation has been conducted at 1, 3, 5, 7, and 10 kGy doses and microbial and chemical quality of fish types were examined just after the irradiation. The results revealed that microbial growth was

inhibited by gamma irradiation. Lipid oxidation and hydrolysis were not affected by gamma irradiation. Fatty acid compositions of these fishes showed significant fluctuations with the irradiation dose. Therefore, the optimum irradiation dose for the best quality product with minimum quality deterioration was identified as the low doses below 3 kGy irradiation.

The shelf-life of gamma irradiated tilapia stored in ice was studied to identify the changes occurring during low temperature storage. The storage was extended up to 77 days and revealed that shelf-life of tilapia stored in ice was prolonged with the irradiation dose. According to the microbial growth the shelf-life of control (without irradiation) was remaining only up to 7 days while 1 kGy and 3 kGy irradiation showed 56 days and 70 days of shelf-life. Lipid deterioration has been increased with the storage. Saturated, Monounsaturated and Polyunsaturated fatty acids were changed with the storage and showed significant fluctuations with the storage. Palmitic, Oleic, Linoleic and Docosahexaenoic acid showed significant fluctuations throughout the storage. The results revealed that the 1 kGy irradiation has the ability to preserve the tilapia stored in ice with minimum quality deterioration.

The shelf-life of gamma irradiated tuna fish muscle was evaluated to identify the quality changes occurring with the storage in ice. The storage was proceeded up to 35 days of storage with 7 days' time intervals. The microbial growth was highly correlated with the irradiation dose and storage time. Low dose (< 3 kGy) irradiation does not showed significant influence in lipid deterioration while high doses increased the lipid deterioration. Saturated fatty acids in 1 kGy irradiated tuna and monounsaturated fatty acids in both irradiated doses were significantly increased with the storage while polyunsaturated fatty acids showed reduction in both treatments with the storage.

Therefore, 1 kGy irradiation has been identified as the optimum dose for the best quality preservation of tuna muscle with storage in ice.

Histamine is a causative agent for scombroid foodborne poisoning which effect quality of fish products. Therefore present study has been conducted to evaluate the effect of gamma irradiation on histamine content in yellowfin tuna fish fillets. Fish flesh was treated by Co-60 source at doses of 1, 3, 5, 7 and 10 kGy. Initial determinations were made just after irradiation (0 hours) and second determinations were made after storing control and irradiated packs for 24 hours at room temperature. The highest increment of histamine content was detected in control sample after 24 hours of storage and rate of increment of histamine is 9.97 %. After 24 hours of storage, low doses (< 3 kGy) showed lower histamine increment rate than higher doses, in increment in histamine content. Inspite of increment in bacterial count in 1 kGy irradiated sample, all other samples were not exceeded the maximum level of acceptance in bacterial count either after 24 hours of storage. The results revealed that the low dose irradiation ($\leq$ 3 kGy) can implement for the better safety of yellowfin tuna fish fillets according to the changes in the histamine content and bacterial count.