

Summary of Doctoral Thesis

Enrollment year: y m

UGAS Specialty:

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Title	Effects of drying, packaging and storage condition on the quality and shelf life of dried fishery products
<p>This study analyzed the chemical and microbiological hazards of dried seafood products in Bangladesh and investigated the effects of drying, packaging and storage on biochemical, microbiological and sensory properties of dried fishery products of Bangladesh.</p> <p>In chapter 1, the state of knowledge regarding the contamination level of dried fish by heavy metals, harmful pesticides for human, degree of lipid oxidation and status of microbial quality of dried fishes from several districts in Bangladesh was studied. Results revealed that several common dried fish contaminated with excess amount of heavy metals (Pb, Cd, Cr etc.), pesticide residue (dichlorodiphenyltrichloroethane, heptachlor, endrin, aldrin, di-eldrin), more lipid oxidation products, excess total plate count (TPC) and presence of highly pathogenic <i>E. coli</i>, <i>Salmonella sp.</i> <i>Vibrio sp.</i> found in few dried fish can cause substantial human health hazard after consumption. The possible factors of these hazards are traditional drying, use of illegal pesticides with higher dose, lack of maintaining proper hygiene, sanitation, packaging, storage, distribution, and water pollution. Moreover, factors influencing quality and safety of dried fishery products were also studied. To reduce quality loss of dried fishery products, excellent quality raw materials with vacuum drying, oven drying, solar tunnel drying with different pre-treatments of chlorinated wash, bleeding, gutting, blanching, ultrasound, and treatment with various plant extracts as clove, <i>M. oleifera</i>, tea polyphenol and salt along with clove extract have a broad potential application for the improvement of quality and safety of the dried products. Moreover, various chemical preservatives have also been found to be effective in increasing better organoleptic scores of the products although they have potential carcinogenic and toxic effects on human health. Drying temperature and relative humidity should below 60°C and 10-43%, respectively to prevent loss of nutrients, quality decrease and consumer acceptability. Multilayer plastics, polyethylene films of high gauge, poly vinyl</p>	

alcohol film containing 2% green tea extract along with vacuum packaging and oxygen scavenger packaging ensure the best quality protective effectiveness to prevent the dried fishery products from absorbing moisture and oxidizing of lipid. Recommended storage conditions for dried products are <60% relative humidity and temperature from 0-10°C; low oxygen levels of 0.5%. Low dose gamma irradiation (<5 kGy) reduces microbial loads, extends the shelf life and improves the taste and texture of dried fish. Ultraviolet light treatment, 10 mins cold oxygen plasma treatment, 3 mins atmospheric plasma treatment, corona discharge plasma (0-3 mins) and high hydrostatic pressure effectively inactivate the microbial contaminants from dried fishery products with better sensory properties. These findings will be helpful to develop an effective quality control and assurance program for producing safe fishery products for domestic consumption as well as earning foreign currency.

In chapter 2, the effects of different drying methods with different pre-treatments on the physico-chemical, microbiological and sensory properties of *Hypophthalmichthys molitrix* and *Megalaspis cordyla* were evaluated. Results showed that the dried fish produced by solar tunnel drying method were rehydrated more rapidly than the products produced by traditional, improved and improved (T+C) drying methods. The protein, lipid and ash contents were found no significant ($p > 0.05$) difference among different drying methods on dry matter basis. Significantly ($p < 0.05$) the lowest moisture and total volatile base nitrogen (TVB-N) contents were observed in dried fish produced by solar tunnel drying method. Significantly the highest peroxide value, acid value, carbonyl value and aerobic plate count were found in traditionally produced dried fish compared to the fish dried by improved, improved (T+C) and solar tunnel drying methods. Sensory evaluation results revealed that solar dried products showed superior quality than the products produced by traditional and improved drying methods. The results revealed that the dried fish produced by solar tunnel drying method indicated the best product in terms of physico-chemical, microbiological and sensory aspects.

In chapter 3, sun dried *Trichogaster fasciata* was stored with airtight polyethylene bags at room temperature to investigate the changes in physical, chemical, microbiological and sensory characteristics for 90 days. Moisture content of *T. fasciata* was significantly ($p < 0.05$) increased from 15.1% to 17.8% during the storage period. No significant ($p > 0.05$) difference

was observed in protein, lipid and ash contents on dry matter basis during storage. However, amount of lipids of the dried fish slightly decreased with the increasing of storage time. The pH value of dried *T. fasciata* decreased significantly from 6.5 to 5.9 during the storage period. The peroxide value (PV) increased from 13.8 to 27.9 meq/kg of lipid. Similarly, acid value and conjugated diene of the lipids increased significantly, and this result suggested that lipid oxidation occurred over this period. Microbial load also increased from 1.1 to 8.4 log CFU/g with the increasing of storage time. However, according to the results during storage within 60 days, the PV of the lipid was 19.17 meq/kg, lower than the regulation, and the results of the sensory evaluation and physical characteristics of dried *T. fasciata* (water reconstitution rate > 40%, pH > 6.0), it was found that dried *T. fasciata* was edible and acceptable for human consumption up to 60 days of storage.

In chapter 4, this experiment was conducted to investigate the effects of *Moringa oleifera* water extract pre-treatment (1.5, 2.5 and 3.5%) and vacuum packaging on quality and lipid oxidation of sun dried Punti (*P. sophore*) during storage at ambient temperature for 7 months. Biochemical, aerobic plate count, and sensory changes of dried *P. sophore* were monthly analyzed. Total phenolic content, total flavonoid content and DPPH radical scavenging activity of moringa water extracts were also evaluated. Moringa water extracts had potent antioxidant activity. Moringa extract treated and vacuum-packed dried fishes showed lower aerobic plate count, total volatile base nitrogen than the untreated vacuum-packed samples. Vacuum packaging and moringa treatment significantly reduced the lipolysis (acid value) and oxidation of lipid (peroxide value and thiobarbituric acid reactive substance) in *P. sophore*. Application of moringa did not affect significantly on the sensory properties of the product. Results demonstrated that pre-treatment with moringa water extract (2.5%) and vacuum packaging could be an alternative to reduce the quality deterioration and lipid oxidation and improve the quality as well as shelf life of this dried product during processing and storage.

According to the research, the physico-chemical, microbiological and sensory quality and shelf life of dried products greatly influenced by various processing, drying methods, packaging methods and storage conditions. Further studies might be carried out the effects of packaging

materials and techniques, and storage temperature on quality characteristics and shelf life of dried fishery products.

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