Fish Curry in Retort Pouch

P.K. VIJAYAN, T.K. SRINIVASA GOPAL, K.K. BALACHANDRAN and P. MADHAVAN
Central Institute of Fisheries Technology, Cochin 682 029

Flexible retort pouch is an ideal alternate to metal containers like aluminium and tinplate cans for heat processed foods. This paper reports a study on fish curry processed in retort pouch and its shelf life evaluation for 24 months. Fish curry was processed using seer fish (*Scomberomorus guttatus*) in retort pouch of three layer configuration with plain polyester/aluminium foil/cast polypropylene. 210-220 g curry was filled in 17 x 15.5 cm size pouch, exhausted by steam injection for 5 min, heat sealed and heat processed at 121°C for 32 min giving F_0 11.5. The curry remained sterile throughout the storage period at ambient temperature (25-30°C) and retained acceptable sensory characteristics.

Key words: Fish curry, retort pouch, storage

Retort pouch introduced as an alternate to metal containers has been a technological and commercial success in USA, UK, Canada and Japan. The collapse of canned seafood industry in India partly because of the over-dependence on imported tinplate for can making is a strong reason for considering retort pouch as a container for heat processed food. The raw material for flexible pouch such as aluminium, polyester and polypropylene are available in India and hence offers good scope for its indigenous manufacture. The present study reports the storage characteristics of a ready to consume fish curry processed in flexible retort pouch.

Materials and Methods

Retort pouch (The Metal Box Company, UK) with three layer configuration of 12 μ plain polyester/15 μ aluminium foil/75 μ cast polypropylene was used. Seer fish (*Scomberomorus guttatus*) from the local landings was brought to the laboratory in ice. It was filleted skinned and cut into pieces about 4 x 2.5 x 1.5 cm and thoroughly washed in potable water.

Fish curry was prepared as per the recipe reported by Vijayan and Balachandran (1986) with some modification (Table 1). The onion slurry was heated with constant stirring in about three fourth of the oil till the colour became light brown. The tomato slurry was also fried separately to a light brown colour and kept apart. Ginger and green chilly were fried to light brown colour in the remaining quantity of oil and turmeric powder followed by fish masala and chilli powder were added and mixed thoroughly under a low flame till the chilli powder became light brown. Fried onion and tomato were added to this mixture and mixed thoroughly. The fish mixed with

Table 1. Recipe for fish curry

Ingredients	Weight, g
Fish dressed and cut into small pieces	1000
Onion (ground into slurry)	500
Tomato (ground into slurry)	250
Ginger (peeled and grated)	20
Green chilli (cut into small pieces)	15
Chilli powder	25
Turmeric powder	3
Fish masala powder	25
Groundnut oil	200
Vinegar (1.5% glacial acetic acid), ml.	15
Salt	60
Water (ml)	750

vinegar and kept separately for 10 min was then added followed by water and salt and continued heating till the gravy became thick and the fish pieces cooked sufficiently.

120 g fish and 90 g gravy were filled manually in each pouch. Air from the filled pouch was exhausted by steam flushing as per the method of Madhwaraj *et. al.* (1992). Adequate number of pouches were fixed with glands and thermocouples were carefully fixed and the tips inserted into the meat pieces for recording core temperature using Masibus Digital Temperature Scanner and Recorder. F_0 was computed by the equal time interval method described by Patashnik (1953). The pouches were arranged in perforated aluminium trays and loaded into a retort modified for providing over pressure and water cooling under pressure and heat processed for 32 min at 121°C resulting in F_0 11.5. The pouches were then cooled rapidly by spraying water under pressure. They were wiped dry and kept in a dust proof cabinet at ambient temperature (25-30°C). Water extractives (FDA, 1983), heat seal strength (ASTM, 1972) and burst strength (Ajera, 1984) were determined.

The post-process performances of the retort pouch and fish curry were evaluated every three months during the storage of 24 months after allowing a stabilisation period of 10 days for the initial analysis. The performance of the pouch was evaluated by direct observation for defects such as pin holes, wrinkles/creases on seal area, stain/rust spots, leakage of fluids, delamination of inner/outer ply etc. (Jeffs, 1985). Sensory characteristics of the fish curry were evaluated by a 7 member trained taste panel on a ten point scale (Vijayan, 1984). Sterility was determined as per IS: 2168 (1971). pH was measured on a homogenate using a digital pH meter.

Results and Discussion

The pouches had heat seal strength 98 N/25 mm along machine direction and 82 N/25 mm along cross direction. No delamination of outer ply and inner ply was noticed during heat processing. The burst strength of the pouch was more than

35 psig/30 sec against a commercial requirement of 20 to 30 psig/30 sec (Lampi, 1980). The overall migration residue was 0.30mg/dm^2, which is below the limits of 10 mg/dm^2 (IS: 9845, 1981; FDA, 1983) for food contact applications. These results indicated that the pouch meets all the requirements as a container for heat processed food products.

Any ready to consume heat processed food must remain palatable and sterile during storage and the pouch should not be affected by the pack-contents. Defects affecting the pouch integrity such as pinholes wrinkles/creases on seal area, staining or rust spots, leakage of fluids and delamination of inner or outer laminates were not detected during storage. This shows the integrity of the pouch for its use as a container for heat processed fish products (Lampi, 1980).

Gopakumar *et. al.* (1992) reported that F_0 of 10 was required for heat processing of sardine in brine packed in pouch of size 200x150 mm with a three layer configuration of 12 μ polyester/9 μ aluminium foil/70 μ polypropylene. In the present study emphasis was on achieving bone softening in addition to sterility. In UK herring in tomato sauce is processed to F_0 of 6 to 8 (Brennan *et. al.*, 1990). A slightly higher F_0 of 11.5 was adopted in this study with a view to obtaining safety while incorporating various ingredients including spices. Tests conducted initially as well as every three months showed that the product remained sterile throughout the storage period and the pH remained practically unchanged.

Table 2. Sensory evaluation of heat processed fish curry during storage

Characteristics	Storage period , months								
	0	3	6	9	12	15	18	21	24
Flavour	8.24	8.20	8.02	7.86	7.82	7.68	7.62	7.24	7.20
Texture									
a. Succulence	8.16	8.22	8.06	7.82	7.44	7.21	7.11	7.08	7.06
b. Fibrosity	7.80	7.64	7.42	7.20	7.11	7.08	7.02	6.88	6.76
c. Toughness	7.75	7.60	7.56	7.11	7.00	6.85	6.75	6.60	6.50
Overall acceptability	8.00	8.00	7.65	7.50	7.50	7.40	7.35	7.30	7.25

The curry was delicious with attractive reddish brown colour. The fish pieces were distinct without breakage. Table 2 presents the sensory characteristics of the curry during storage. The product was very good upto 6th month while it was rated good for the remaining period. The texture was succulent and juicy upto 6 months and moderately succulent and juicy for the remaining period. The slight fibrosity and toughness observed at the early periods of storage may possibly be due to tomato and vinegar. The product was excellent in the first 3 months and it remained good in overall acceptability throughout storage for 24 months.

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