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Studies on Storage Stability of Apricot Incorporated Rice Based Extrudate

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Abstract—*With increasing consumer awareness towards quality of the packaged products, Shelf life studies of foods are gaining momentum. Present investigation was conducted to assess the keeping quality of apricot incorporated rice based snacks. The extruded snack using ingredients: rice flour and apricot powder in the proportion of 90:10 respectively was developed under optimized conditions of 450 rpm screw speed, 170°C barrel temperature and 15% moisture content. The extruded snack was packed in high density polyethylene bags and stored under ambient conditions. The stored sample was evaluated for its moisture content, hardness, water activity at a regular interval of one month for three months. During storage, it was observed that moisture content and water activity of the sample increased while hardness decreased over time.The quality of snacks was acceptable up to three months of storage.*

Keywords*: Apricot powder, Extruded snack, Rice flour, Shelf life, Water activity.*

1. INTRODUCTION

Extrusion cooking is a well-established industrial technique with a number of food processing applications since, in addition to usual benefits of heat processing, extrusion has possibility of changing the functional properties of food ingredients. During extrusion cooking raw material undergoes many chemical and structural transformations such as starch gelatinisation, protein denaturation, complex formation between amylase and lipids and degradation reaction of vitamins and pigments [5]. Nowadays, extrusion is widely used in cooking, forming, mixing, texturizing, and shaping food products under conditions that favour quality retention, high productivity, and low cost. In the past few years, the use of extruders has expanded rapidly in the world's food and feed industries [7, 9]. Extrusion being a HTST process, reduces microbial contamination and inactivates enzymes, main method of extrusion preservation is by the low water activity of product (0.1-0.4) [2].During storage, the foods are exposed to a wide range of environmental conditions such as temperature, humidity, etc., that can trigger several reaction mechanisms leading to food degradation. As a consequence, food may be altered to such an extent that they are either rejected by the consumer or they may become harmful to person consuming them. Therefore, the study was undertaken to evaluate the changes during stoarge of rice based extruded snacks.

2. MATERIALS AND METHODS

Paddy was milled in Division of *Food Science and Technology* using Rubber roller based rice mill. Rice brokens were ground in a lab mill (model 3303 perten, Sweden) to a fineness that passes through 200µm sieve. Dried apricot was ground into powder using grinder (*Black* and Decker *FG 550*). The blend of rice and apricot powder was extruded at pre-optimized conditions i.e. 10% apricot, 15% moisture, 450 rpm screw speed and 170°C barrel temperature and was stored in HDPE for three months. Extruded snacks were studied at an interval of one month for moisture, water activity and hardness.

Moisture was studied as per AOAC 1995 method [1]. Water activity was measured using water activity meter (AQUA LAB, SN: PRE-000197). Hardness was estimated using Texture analyser.

3. EXTRUSION PROCESSING

The extrusion was performed using a co-rotating intermeshing twin screw extruder model BC 21 (Clextral, Firminy, France). The barrel consisted of four zones heated electrically. The temperature distribution inside barrel varied from low at the zone next to the feeding to high at zone next to die. Temperature of the 1st, 2nd, and 3rd was maintained at 20, 30 and 40℃, respectively, throughout the study; while the temperature in last zone (compression and die section) was varied. The extruder was equipped with torque indicator which showed percent of torque in proportion the current drawn by

drive motor. The raw material was fed into the extruder with a single-screw volumetric feeder. The extruder was thoroughly calibrated with respect to combinations of feed rate and screw speed to be used. The feed rate was varied for optimum functioning of extruder barrel corresponding to screw speed. Water pump injected water directly into extruder barrel to achieve desired moisture content of feed material. A cutter with four bladed knives and a die made of stainless steel were used for shaping the extrudates.

4. STORABILITY OF EXTRUDED SNACKS

4.1 Moisture content

Moisture content of extrudates gradually increased during 3 months of storage. The mean moisture content of final product significantly increased from 3.20 to 4.00% during 3 months of storage (Table 1).Migration of water vapour from storage environment into the packaging material occured resulting in increase in moisture content of extrudates due to their hygroscopic nature. Charunuch *et al.* [4] reported an increase in moisture content in Thai riceextruded snack supplemented with mulberry during storage of 4 months. Butt *et al.* [3] observed an increase in moisture content in breakfast cereals during a storage period of six months. They also concluded that there was intermediate gain in moisture through HDPE.

4.2 Water activity

The water activity increased from 0.38 to 0.43 during three months of storage (Table 1). Water activity is an indicator of quality and stability of extruded food products. The increase in water activity of extrudates might be attributed to the humid environmental conditions. These results are in alignment with those of Hussain *et al*. [8].

Table 1: Effect of Storage Period on Moisture, Hardness and water activity of extrudates

Storage period	Moisture content (%)	Hardness (N)	Water activity
0	3.20	50.24	0.38
1	3.42	48.33	0.40
2	3.66	47.05	0.41
3	4.00	45.89	0.43
CD($p \leq 0.05$)	0.018	0.064	0.011

4.3 Hardness

The mean value for hardness of extrudates decreased from initial value of 50.24 N to 45.89 N after 3 months of storage (Table 1). The decrease in hardness might be related to gain in moisture of extrudates and thereby increased starch bonding[6]. Charunuch *et al.* [4] also reported decrease in hardness of extruded Thai rice snacks stored for 4 months.

5. CONCLUSION

All the quality parameters were within acceptable limits. There was a slight decrease in acceptability owing to the texture degradation due to moisture absorption by extrudates. Thus, it can be concluded from the results of present investigation that extrudate remained fit for consumption during storage period of three months.

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