Storage Studies of Indian Fried Snack Food Incorporated with Ivy Gourd

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Abstract: - Coccinia grandis **(Ivy gourd) which is also called as baby watermelon is used for culinary purpose among Indian people. Its health benefits are traditionally used for curing diabetics, urinary tract infection, skin diseases etc. By incorporating ivy gourd fruit powder with pulses we can prepare traditional fried snack food which can be consumed by people of all age groups. Snack food incorporated with 7g ivy gourd powder fried at 190°C was taken for storage studies as it gave best results of 5.3% protein, 85% carbohydrate, and 23.2% of fat, 3% mineral, 0.104 % of antioxidant, 1% moisture content, 0.023% of vitamin A and the colour of the snack food were found to be reddish yellow. The shelf life study was performed with LDPE and metallised polyester. There were not many changes when nutritional parameters were analyzed for 0, 15, 30 and 45 days but there was increase in peroxide value from 37.75±0.012 to 40.63±0.002 meq/kg. Microbial analysis shows that more colonies were present in LDPE compared with metallised polyester but initially less number of microbes was present. Analyzing all the data's we conclude that metallised polyester is suitable for packing this fried snack food incorporated with ivy gourd for a shelf life of 45 days.**

Key Words – Ivy Gourd, Fried Snack Food, Shelf Life Studies, LDPE, Metallised Polyester.

I. INTRODUCTION

Snack foods are playing a vital role in our day to day life. These are the items eaten for pleasure and during relaxation. These include deep fried potato chips, sticks, rings, nuts, fried grams etc. Changes in life-style and eating patterns have led to a gradual increase in demand for snack foods. Health related issues are also increasing among the people. The Indian Snack Market has reached a value of more than 18711 million and it has become one of the largest snacks market in the Asia Pacific region. Despite the warnings issued by nutritionists regarding the consumption of fried foods, which contain large amount of calories, cholesterol and saturated fats, they have a growing popularity, a moderate consumption of fat is a way to ensure a balanced and healthy diet.

Mihaela Ghidurus *et al*., (2010) stated that fried food have unique sensorial properties, which make them very attractive for consumers. There is high demand for snacks which have health benefits in the market. People are diet conscious nowadays. During storage and shelf life studies of various products, it was found that there will not be much loss in the nutritional parameters was confirmed by Saranya K.K *et al*., (2012) in her research work. Other nutrition parameters will have no change upon storage of snack food. The selection of packaging materials and storage conditions are thus justified as there is no gain in the moisture content of the product. G. O. Fetuga *et al*., (2014) explains that an off-smell caused by rancid taste and smell becomes noticeable when the peroxide values are between 20 and 45 meq/kg. Based on the peroxide value, we can determine the shelf life of snack food stored in packaging material. Toktam Mostaghim *et al*., (2013) explains that increase of the frying temperature produced a decrease in L* values and an increase in a* and b* values. Similarly, comparing the frying time effect on colour for each considered temperature, the tendency was a decrease in L* and an increase in a* and b* values, prolonging frying times. But there will not be any change in colour during storage of snack food. However there will be slight changes in texture and flavour in storage of deep fried snack food.

M.M. Molla *et al*., (2009) revealed that the microbiological changes as measured by the total plate count in the flavoured extrudates stored at different conditions of temperature. The microbiological load as measured by the total plate count per gram of sample was generally low in all the samples stored under refrigeration conditions. . The amount of microbial loads is directly attributed to quality of the product for total bacteria and mould plate count claims Isaac Babatunde Oluwalana, (2014).

The storage period of the product depends on the type of products stored, type of packaging and packaging material used for storing the product. Selection of packaging material is important key for extending the shelf life of the products. The selection can be based on the type of products to be stored. Generally for storing deep fried snack food LDPE, metallised polyester, HDPE and Polypropelene are generally used. The order of overall acceptability of the crisps stored in the various packaging materials for the storage period was HDPE (1-3 weeks)>PL (1-3 weeks)>AL (1-2 weeks)>LDPE (1-2 weeks). Crisps stored in AL and LDPE at 3 weeks were the least acceptable (G. O. Fetuga *et al*., 2014). M. M. Molla *et al*., (2009) in his study indicated that chips packed in metalex foil pouch performed the best.

Water activity is an important factor affecting the stability of dry and dehydrated products during storage. The crispness intensity and overall hedonic texture of dry snack food products are a function of aw. Certain organism grows at certain range of water activity based on this we can identify the microbes present in our products (Rockland LB, 1980). This study aims in analyse the suitable packaging material for the Indian fried snack food incorporated with 7g ivy gourd powder for storage period of 45 days .

II. MATERIALS AND METHODS

A. Materials Required

The required ingredients for making fried snack food incorporated with ivy gourd powder are 100g rice flour, 25g green gram, 25g white lentils, 2g salt, 25 ml coconut milk, 2g chilli powder, 7g ivy gourd powder and 75ml water. Refined sunflower oil was used for frying the product. The equipment used for frying was deep fat fryer (NOVA) with varying temperature ranges from 100-190°C, various type of packaging materials like metallised polyester and LDPE, equipments and chemicals required for nutritional analysis and microbial studies.

1. Method

The ingredients were weighed and dough was prepared. The prepared dough was extruded using manually operated extruded into small strips, the strips were fried in deep fryer (NOVA) at 190°C for 3.-4 minutes. Around 100grams of fried snack food (Fig 1) were weighed and packed in two selected packaging materials i.e., LDPE and metallised polyester. The samples were double sealed and stored at room temperature (Fig 3). Nutritional Analysis, water activity and microbial analysis were performed at regular intervals of 0, 15, 30, 45 th day of storage.

B. Nutritional Analysis

1. Moisture Content

Standard procedure (AOAC, 1999) at 105°C for hours until constant weight was obtained was followed to estimate the moisture content of the fried snack food.

2. Protein Analysis

Protein analysis for fried snack food was carried out using Lowry's method (Jakob H. Waterborg, 2002) and the protein content was estimated based on spectrophotometer absorbance at 750 nm.

3. Carbohydrate Analysis

Carbohydrate content present in fried snack food was analyzed by anthrone method (Hansen J, Moller IB *et al*., 1975) and total carbohydrate content was estimated based on spectrophotometer absorbance at 630 nm.

4. Fat analysis

Amount of fat content present in the dal stips was estimated using (AOAC, 1999) Soxhlet apparatus run for 6-8 h using petroleum ether. The solvent was evaporated and the residue was weighed.

5. Ash Content

Total mineral content in the sample was calculated using muffle furnace (AOAC, 1999). Ignited in a muffle furnace at 550+/- 250°C for 4 hrs and the weight of the ash was measured using electronic balance.

6. Colour Analysis

Colour analysis (SOP-PHYS-004 by Sarah Lanning version 1) for snack food was carried out using hunter colorimeter. Based on L*, a*, b* value the colour of the sample was determined.

7. Antioxidant Assay

DPPH assay (Florence Suma Pushparaj *et al*., 2014 and Ma Ma Lay *et al*., 2014) was done to estimate the amount of antioxidant present in fried snack food.

8. Peroxide Value

The amount of peroxide present in the samples was evaluated using DGHS manual procedure.

9. Vitamin A Analysis

Vitamin A present in the sample was analyzed using CML / INS / SOP 31.

10. Microbial Analysis

The aerobic plate count was carried out on the fried snack samples according to methods of AOAC (1990). Serial dilution and pour plate techniques were used for determining the presence or absence of microbes in the stored snack food**.**

III. DESCRIPTION OF FRYER

Deep-frying involves the immersion of food in hot oil or fat to cook it to a crisp golden colour. Meat, fish and poultry are usually coated with crumbs or batter. The popularity of deep-fried food makes it a part of every catering operation. Since the development of good frying compounds and improved deep-fryer design, the responsibility rests with the cook to produce first-class deep-fried food. We have used deep fryer which was purchased from NOVA.

1. Parts of Deep Fat Fryer

900 W Motor**,** Capacity (1L), non stick inner pot, basket and handle for easy operation, temperature selector, cookware set is made of stainless steel, induction compatible (Fig.2).

2. Thermostats

Thermostats are delicate calibrated instruments that may incorporate an on-off switch, but their main purpose is to set and maintain a maximum operation temperature. This temperature can be adjusted by the cook, according to the type of food to be fried and the frying medium being used. It must be understood that setting the thermostat at a high temperature will not make the oil heat faster. On the contrary, in a busy kitchen, the cook is likely to forget to reset it to the correct temperature, with the result that the oil overheats and becomes too hot for frying. When the thermostat calls for heat, all available energy is released into the fryer. The amount of energy available is determined at the time of manufacture of the fryer and cannot be altered later. Therefore it is important to set the thermostat at the correct temperature and wait for the oil to reach the operating temperature you have set.

3. Operation Procedure of NOVA Deep Fat Fryer

Some quantity of frying medium (fat or oil) was poured into the fryer and the medium was melted. The desired temperature between 170-190 ºC was set in the thermostat (Fig 3.2). When the desired temperature was reached, the well-drained and dried food was placed in the frying basket and the basket was immersed gently into the oil. If any foam was seen the basket was immediately lifted up. The food samples were layed onto the oil, in such a way that our hand does not get hurt. When the bubbles stop the basket was taken out, after shaking it to the side walls. The colour of the food was found to be golden brown colour. If we feel the food is not cooked the food is again filled in the basket and immersed in the oil. The scattered food was removed at regular intervals in order to avoid clogging at the bottom.

IV. RESULTS AND DISCUSSIONS

The fried snack food incorporated with 7g ivy gourd powder fried at 190ºC for 3-4 minutes (Fig 4) had 5.3% protein, 85% carbohydrate, and 23.2% of fat, 3% mineral, 0.104 % of antioxidant, 1% moisture content, 0.023% of vitamin A and the colour of the snack food were found to be reddish yellow at 0 th day of packaging. When nutritional analysis was compared between fried snacks food packed in metallised polyester and LDPE for 15, 30, 45th day it was found that both had moreover retained nutritional parameters. It was found that there was slight increase in moisture content when the product storage time was increased. The increase in moisture content may be because the product would have absorbed moisture when the samples were taken regularly for nutritional analysis. There was not much change in other nutritional parameters (Saranya K.K *et al*., 2012). The results which was obtained was similar to the findings of Nishu Mallick *et al*., 2014 and Fetuga.G.O *et al*., 2014 in their snack food sev.

The peroxide value is that measure the content of hydroperoxides and is used as indicators of lipid oxidation. Peroxide Value of the product during storage of 45 days was found to increase with storage period. The peroxide value ranged from 37.75±0.012 to 40.63±0.002 meq/kg in both the packaging material. This may be because of rancidity which has been developed in the product (Uma Tiwari *et al*., 2009) upon time. Moreover the peroxide value range for longer shelf life ranges from 20-40 meq/kg. Moreover the water activity of the product was found to be 0.26 from (Table 1 and Table 2) which is very low for microbial attacks. There was not much change in water activity in both the packaging material.

Total plate count results reveal that not much microbes was present at 0 th day but there was slight increase in the microbial load when the storage time was increased. The microbial loads of the fresh samples were at the recommendation limit of (10^5 cfu/ml) for ready to consume food by International Commission on Microbiological specifications for foods (Adedeji T.O *et al*., 2013). Comparing our sample microbe was very less than the recommended limit shown in (Fig 4.3).There was not much difference comparing the snack food stored in LDPE and metallised polyester. Comparing the nutritional parameters of LDPE with metallised polyester, it was found that nutrient parameters are retained in metallised polyester as compared to LDPE. This may be because it has good barrier property and heat stability (Shukla Saurabh *et al*., 2013). More over the microbial load present in the metallised polyester was less compared to LDPE. Metallised polyester has aluminium coating which will prevent the growth of microbes in food. It was found that after 45 th day the texture of the product was lost due to absorption of moisture content. The snack foods stored in metallised polyester was good even after 45 days up to 48 days but rancidity was formed upon storage period. Analysing all the results we conclude that metallised polyester is best suitable for fried snack food incorporated with 7g ivy gourd powder with shelf life of 45 days.

Table 1. Storage Studies of Snack Food (LDPE).

Nutritional Profile	(0th Day)	(15th Day)	(30th Day)	(45th Day)
Moisture content %	1.16±0.15	1.2±.0.16	1.33±0.05	1.4±0.1
Protein %	5.23±0.09	5.23±0.05	5.23±0.05	5.23±0.01
Carbohydrate, %	84.73±0.41	84.73±0.30	84.73±0.28	84.73±0.28
Fat %	23.33±0.40	23.33±0.31	23.33±0.21	23.33±0.15
L*	53.73±0.03	53.73±0.03	53.73±0.02	53.73±0.01
a*	12.93±0.03	12.93±0.02	12.93±0.01	12.93±0.01
b*	23.52±0.008	23.52±0.005	23.52±0.005	23.52±0.001
Mineral %	3.06±0.15	3.06±0.11	3.06±0.09	3.06±0.47
Antioxidant %	0.103±0.006	0.103±0.002	0.103±0.001	0.103±0.0001
Water activity @ 26.2 °C	0.266±0.0001	0.266±0.0008	0.266±0.0009	0.266±0.0017
Vitamin A, %	0.023±0.001	0.023±0.001	0.023±0.001	0.022±0.001
Peroxide value meq /kg	37.75±0.012	39.80±0.017	40.60±0.012	40.63±0.020
Microbial plate count cfu	19±0.090	346±62.75	536±62.19	748±46.07

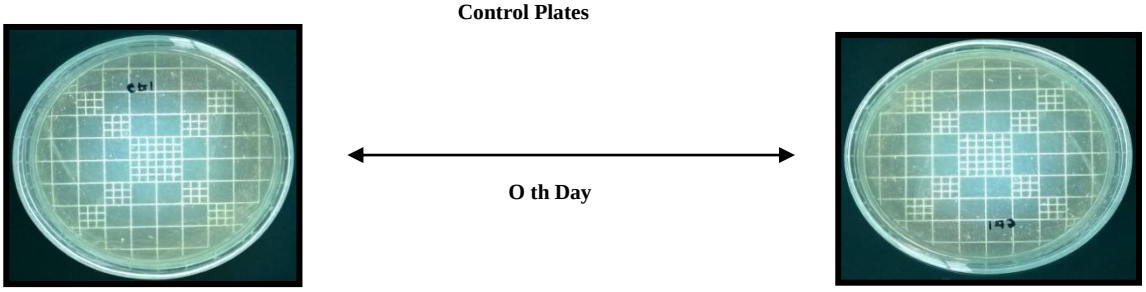
Table 2. Storage Studies of Snack Food (Metallised Polyester).

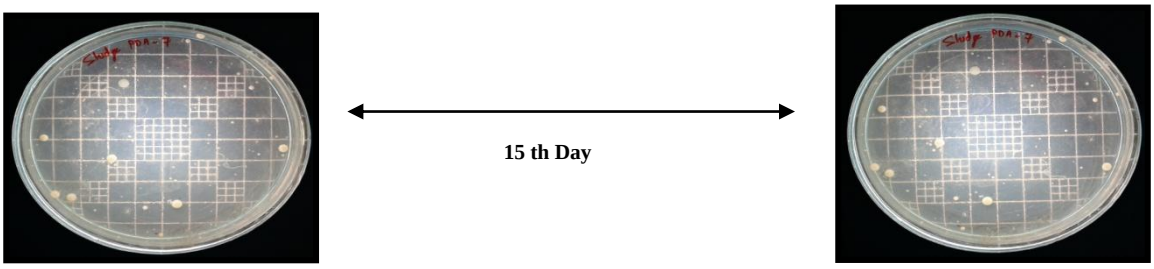
Nutritional Profile	(0th Day)	(15th Day)	(30th Day)	(45th Day)
Moisture content %	1.16±0.15	1.2±.0.08	1.33±0.03	1.4±0.001
Protein %	5.23±0.09	5.23±0.06	5.23±0.06	5.23±0.002
Carbohydrate %	84.73±0.41	84.73±0.30	84.73±0.29	84.73±0.8
Fat %	23.33±0.40	23.33±0.37	23.33±0.29	23.33±0.26
L*	53.73±0.03	53.73±0.03	53.73±0.02	53.73±0.02
a*	12.93±0.03	12.93±0.01	12.93±0.01	12.93±0.001
b*	23.52±0.008	23.52±0.006	23.52±0.005	23.52±0.004
Mineral %	3.06±0.15	3.06±0.11	3.06±0.10	3.06±0.08
Antioxidant %	0.103±0.006	0.103±0.001	0.103±0.001	0.103±0.0001
Water activity @ 26.2 °C	0.266±0.0001	0.266±0.0008	0.266±0.0009	0.266±0.0011
Vitamin A %	0.023±0.001	0.023±0.001	0.023±0.001	0.022±0.001
Peroxide value meq /kg	37.75±0.012	39.80±0.015	40.60±0.009	40.63±0.002
Microbial plate count cfu	19±0.050	263±30.21	353±49.86	526.66±57.34

Fig 1. Fried Snack Food Incorporated with 7g Ivy Gourd Powder.

Fig 2. NOVA Deep Fat Fryer.1

Fig 3. Snack food packed in LDPE and Metallised Polyester.





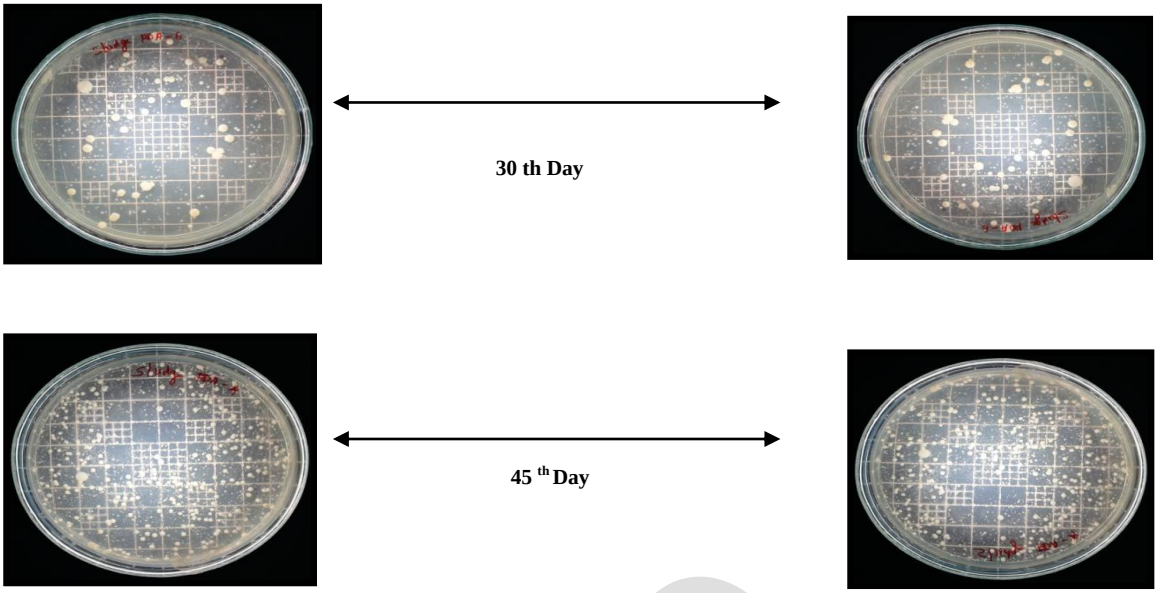


Fig 4.3 Microbial Plate 10^{-2} cfu/ml.

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