Innovative Value added Design and Improved Shelf life with Composite Oxygen-barrier Coating on Polypropylene for Traditional Chikki

Publication History
Received: 06 May 2016
Accepted: 21 June 2016
Published: 1 July 2016

Citation
Innovative Value added Design and Improved Shelf life with Composite Oxygen-barrier Coating On Polypropylene for Traditional Chikki

S.Santhosh velan, S.Deepaveni, Department of Printing Technology, College of Engineering Guindy, Anna University, Chennai, Tamil Nadu, India 600 025.

ABSTRACT

The aim of this project is to promote the Indian traditional chikki in the market with new package design especially to attract the children and also to give good nutritive food to children and to make awareness among parents about chikki and its nutritional importances. When a product is liked by elders it will sustain in market but when a product is liked by the children it forms its own market. Generally chikki is produced in regular square shapes without attractive design and sold in market. In order to emphasis the nutritional value of chikki and to have a market value of chikki to attract children. In order to increase the shelf life of the chikki, it is packed with PP coated film using Hexametyldisiloxane (pp-HMDSO) and silicon oxide(sio2) coating on PP film which has high oxygen barrier performance and not to affect its nutritional value. This package film have an increase in shelflife of above 6 months compared to the normal chikki packing with shelf life of 3 months.

Keywords: Chikki, coating, Hexametyldisiloxane, silicon oxide, composite.

1. Introduction

Chikki is a healthy, delicious traditional Indian candy made of peanuts and sugar. The peanut is grown mainly for its edible oil, where it is produced for grinding into peanut butter (half the harvested crop); for roasted, salted nuts and for use in candy and bakery products. Groundnut has a high calorific value, proteins and vitamins and also possesses numerous health benefits such as Increasing the memory power, prevention of cancer, Prevention of gallstones, controls cholesterol levels and lowers the risk of heart diseases. According to market statistics, the global functional food and nutraceuticals market is increasing with a compound annual growth rate (CAGR) of 7.4% that is outpacing the traditional processed food market and is expected to reach USD 176.7 billion in 2013 (Ahmad et al. 2011).

General chikki are packed and store in local market in gloss, plastic container. It is also packed with plastic film and labeled. It is proposed to make a chikki with attractive design to increase the sale of chikki towards children. And improve the shelflife of chikki using coated polymeric film.

2. Material and methods

PP material was collected from ITC, Chennai. Hexametyldisiloxane (pp-HMDSO) and silicon oxide (sio2) were purchase from Vijay scientific supply. Chikki prepared from Eastern Agro Food Company, Salem and packaging done in same company. Coating solution prepared and coated on treated PP using RK coater in anna university, Chennai.
2.1 Innovative Design for Chikki

Alphabets, numbers were design using AutoCAD software and die prepared using wood and metal material then chikki produces as per die design in alphabets or numbers or gift pack design.

2.2 Water vapour permeability

The water vapour transmission rates (WVTR) of films was measured was measured according to the ASTM F 1249-90 standard at 24°C temperature and 25 ± 1 % relative humidity (RH). Four to five specimens for each film were analyzed and data were recorded as water vapor transmission rate (WVTR) in g/m2.day unit.

2.3 Oxygen permeability

Oxygen transmission rates (OTR) of films were measured according to the ASTM D3985 and OTR were determined at various temperature 15-40°C and 30-85% relative humidity conditions. Four to five specimens for each film were analyzed and data were recorded as water vapor transmission rate (OTR) in cc/m2.day unit.

2.4 Analysis of stored samples

Investigation on quality parameters such as moisture, Protien, fat, color were carried out at each interval period of 0th, 30th, 60th, 90th, 120th, 150th, 180th, 200th days as per standard were studied.

2.5 Physio-Chemical analysis

Moisture was determined by oven method Association of Official Analytical Chemists (AOAC, 1999); protein was by Kjeldahl method (AOAC, 2000). Fat content was determined by the soxhlet apparatus method (AOAC, 2000); The colour of goat meat samples was determined using a Hunterlab colorimeter (HunterLab ColorFlex, Reston, VA.) and reported in the complete International Commission on Illumination (CIE) system colour profile of lightness (L*), redness (a*), and yellowness (b*). Carbohydrate content were calculated by difference.

3. Result and discussion

3.1 Mechanical/ Barrier Properties

Result of packaging material shows good improvement on WVTR and OTR value after coating Oxygen rate reduced as 7 from 11 and water vapour permeability also reduces to 6.2 from 8.12 as shown in below table 3.1.
3.1 Mechanical and barrier properties of PP film

<table>
<thead>
<tr>
<th>Mechanical/ Barrier Properties</th>
<th>Standard</th>
<th>PP Film Without Coating</th>
<th>PP Film After Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>ASTM D882</td>
<td>35 Mpa</td>
<td>35.43 Mpa</td>
</tr>
<tr>
<td>WVTR</td>
<td>ASTM F1249-06</td>
<td>8.12 g/m2/day</td>
<td>6.2 g/m2/day</td>
</tr>
<tr>
<td>OTR</td>
<td>ASTM D1434 ASTM D3985</td>
<td>11 cc/m2/day</td>
<td>7 cc/m2/day</td>
</tr>
</tbody>
</table>

Table 3.1 Mechanical and barrier properties of PP film

3.2 Physio-Chemical Properties

The fat, protein, Moisture, color of chikki stored at room temperature for 6 month and tested for with different packaging material is given in Table 3.2.

<table>
<thead>
<tr>
<th>Temp</th>
<th>Physio-Chemical Properties of Chikki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Days</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Fat</td>
<td>13.85</td>
</tr>
<tr>
<td>Protein</td>
<td>12.86</td>
</tr>
<tr>
<td>Moisture</td>
<td>2</td>
</tr>
<tr>
<td>carbohydrate</td>
<td>68.76</td>
</tr>
<tr>
<td>Energy Kcal</td>
<td>451.19</td>
</tr>
<tr>
<td>Iron mg</td>
<td>4.09</td>
</tr>
<tr>
<td>Hardness</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Table 3.2 effect on physio-chemical properties of chikki

3.3 Product designs

Chikki with attractive design fig:3.1 shows the autoCAD design, original die and finally chikki made to increase the sale of chikki towards children.
CONCLUSION

Several research papers regarding chikki, marking survey regarding consumer buying behaviour of chikki and its uses were collected and studied. To improve sales an innovative design was developed to attract children and parents. To replace the existing packaging materials to extend the shelflife period for chikki, a new material was developed and studied by coating Hexametyldisiloxane (pp-HMDSO) and silicon oxide on PP film. The result shows an increased in shelflife without affecting nutrient value.

Acknowledgement

The authors would like to acknowledge Eastern Agro food company, salem who helped to produce chikki. Thanks to the people who has supported us for marketing survey in local market.

Reference


3. AOCS (1997a) Official method of analysis and recommended practices, 5th edn, Ba 6-84, Cd 8-53 and Ce 2-66, American Oil Chemists Society, Champaign, IL.

4. AOCS (1997b) Official method of analysis and recommended practices, 4th edn, Ca 2a-45, American Oil Chemists Society, Champaign, IL.


Contact person: S.Deepaveni, e mail-deepavenis2004@yahoo.co.in