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DEVELOPMENT AND QUALITY ASSESSMENT OF CHICKEN MEAT CHIPS

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Abstract: The present study was undertaken to develop a shelf-stable, protein-rich chicken meat chips suitable for commercial production. A standard formulation was optimized. The product was processed, dehydrated, and packed. Storage stability was evaluated for 6 months at 30-day intervals based on pH, water activity (a_w), thiobarbituric acid reactive substances (TBARS), microbial counts, and sensory attributes. This research successfully developed a long-lasting, high-protein snack by creating chicken chips from a mixture of chicken meat, starch, fat, spices, and antioxidants. After dehydrating the product, the team tested two packaging methods regular bags with air (Aerobic) and vacuum-sealed bags without air (Vaccum) over a six-month period. They regularly checked the chips for safety and quality, measuring factors like pH, Water activity(moisture), Thio barbituric acid number (oxidative rancidity), bacteria levels, and sensory evaluation (taste). The results strongly favored vacuum packaging, which significantly slowed spoilage, prevented rancidity, and maintained better flavor and texture compared to chips stored with air. The study concludes that vacuum-sealed chicken chips are a viable, nutritious, and stable commercial product that retains its quality safely for extended storage.

Keywords: Chicken meat chips, High-protein snack, Dehydrated snack, Shelf-life evaluation, Storage stability, Vacuum packaging, Aerobic packaging.

1. INTRODUCTION

Chicken is packed with great nutrition, offering top-quality protein, important vitamins, and minerals. Around the world, people are looking more and more for convenient, ready-to-eat snacks made from poultry that can last a long time on the shelf. This is where meat chips come in thin, crispy, dried-out snacks that are gaining popularity because they are tasty, easy to eat, and nutritious. Global trends indicate increased demand for shelf-stable, ready-to-eat poultry-based snacks. Meat chips thin, dehydrated, crispy products have gained market traction due to convenience, palatability, and nutritional value. For a dried meat product to stay good and safe over time, a few things need to be controlled. The fat inside can spoil (oxidation), leading to bad tastes and smells. Bacteria can also slowly grow, causing spoilage or safety issues. We manage these risks by measuring things like pH,Water activity(moisture), Thio barbituric acid number (oxidative rancidity), bacteria levels, and sensory evaluation (taste).

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With all this in mind, the goal of this research was to create a reliable and cost-effective recipe for making chicken chips on a large scale. The study also calculated production costs and then carefully monitored how the chips' quality changed over six months of storage. This was done by checking their physical and chemical properties, testing for any microbial growth, and having people taste them to ensure they stayed safe, stable, and enjoyable to eat.

2. MATERIALS AND METHODS

Fresh boneless chicken meat (breast and thigh portions) was procured from a certified retail outlet, trimmed of visible fat and connective tissue, and minced through a 5-mm plate using a hygienic meat mincer. The formulation consisted of chicken meat mince (72%), corn starch (8%), rice flour (6%), Maize gluten (5%), salt (1.8%), spice mix (2.5%), sugar (1%), chicken fat (2%), and a natural antioxidants (0.2%). All dry ingredients were food-grade commercial materials, while packaging materials included High-density polyethylene (HDPE) pouches for aerobic packaging and vacuum packaging.

The ingredients were blended in a bowl chopper for approximately 6 minutes to obtain uniform distribution and optimum binding. The meat dough was sheeted manually using a rolling pin to a uniform thickness of 2–3 mm, after which 4 × 4 cm chips were cut using a stainless-steel cutter. The chips were dried in a cabinet tray dryer at 65 °C for 6–8 h until the water activity (a_w) reduced below 0.60. Dried chips were cooled to room temperature and packed under two systems: T1 – Aerobic using HDPE pouches and T2 – Vacuum-packed using HDPE pouches. Packaged samples were stored under ambient conditions (28–32 °C) for six months.

Samples from both packaging treatments were drawn at predetermined intervals (0, 15, 30, 45, 60, 90, 120, 150 and 180 days) and evaluated for physicochemical, microbiological and sensory attributes. For pH determination, 5 g of sample was homogenised with 50 ml distilled water and measured using a calibrated digital pH meter. Water activity (a_w**)** was determined at 25 °C using an AquaLab PAWKIT water activity meter (Decagon Devices Inc., Washington, USA; Accuracy: ±0.02 (aw) by following the manufacturer's instructions and readings were recorded once a stable aw value appeared on the display. Lipid oxidation was quantified through the Thiobarbituric Acid Reactive Substances (TBARS) (mg malonaldehyde/Kg) in the pet treat samples were estimated as per the procedure followed by Witte et al. (1970), and results expressed as mg malondialdehyde (MDA)/kg sample. Protein degradation was estimated by the microdiffusion method to determine expressed as mg/100 g. Microbiological quality assessment included total viable count (TVC) using Plate Count

Agar incubated at 37 °C for 48 h, yeast and mould counts using potato dextrose agar incubated at 25 °C for 5 days, coliforms on Violet Red Bile Agar, and Salmonella detection using standard pre-enrichment followed by selective plating. Sensory evaluation was conducted by a panel of ten trained members using a 9-point hedonic scale, scoring attributes such as colour, flavour, crispiness and overall acceptability under controlled sensory laboratory conditions. All analyses were performed in triplicate to ensure statistical reliability.

3. RESULTS AND DISCUSSION

3.1 Physicochemical Stability

pH

Initial pH (6.12) gradually declined to 5.81 by day 180. The reduction was due to mild acid formation from microbial metabolism and lipid hydrolysis. The values remained within acceptable limits, supporting safe storage up to four months.

Water Activity (a_w)

Initial a_w was low (0.42) indicating shelf-stable conditions. Over six months, a_w marginally increased to 0.47, likely due to slow moisture ingress through aerobic packaging. However, values remained below 0.6 the threshold for bacterial growth.

Lipid Oxidation (TBARS)

TBARS increased from 0.48 to 1.92 mg MDA/kg over six months. A sharp rise after 120 days correlated with sensory decline in flavour, indicating onset of rancidity. Chips remained acceptable up to TBARS values of 1.5 mg MDA/kg, suggesting a practical shelf life of 120 days under aerobic packaging.

3.2 Microbiological Stability

TVC increased from 2.1 log CFU/g to 4.3 log CFU/g by day 180. Although growth was slow due to low aw, aerobic packaging allowed gradual proliferation of spoilage organisms. E. coli and Salmonella were absent throughout, indicating adequate hygiene and thermal processing.

Yeast and mould counts rose from <1.0 to 2.4 log CFU/g, crossing sensory threshold by day 150.

3.3 Sensory Evaluation

Sensory scores for chicken meat chips showed a consistent trend over the 180-day storage period. Crispiness and flavour remained high and stable during the first 90 days, with semi trained panelists noting a desirable crunchy texture and characteristic chicken aroma.

However, after 120 days of aerobic storage, noticeable changes were reported. Semi trained panelists observed a gradual loss of crispiness, which corresponded with slight moisture absorption by the product. Alongside textural changes, a faint rancid odour began to develop in samples stored beyond day 120, likely associated with the increasing TBARS values recorded during the same period. These changes contributed to a marked decrease in overall acceptability, which declined from an initial mean score of 8.0 at day 0 to 6.0 at day 180. Overall, chicken meat chips were most preferred within the 0–120-day storage period, and the pattern of sensory deterioration closely reflected the trends observed in lipid oxidation and water-activity changes.

3.4 Shelf Life

Based on physicochemical, microbiological, and sensory findings, chicken meat chips stored under aerobic packaging maintained acceptable quality levels for up to four months. After this period, progressive deterioration became evident. Lipid oxidation increased steadily, as indicated by rising TBARS values, while crispiness declined due to moisture gain. Microbiological counts, particularly yeast and mould, approached the upper limits of the spoilage threshold toward the end of the six-month storage period. These parameters collectively suggest that while the product is stable for approximately four months under aerobic conditions, extending the shelf life to six months requires improved packaging interventions. Vacuum sealing or nitrogen flushing is recommended to reduce oxygen availability, slow oxidative rancidity, and maintain texture and microbiological stability over extended storage durations.

Conclusion

The present study demonstrated that chicken meat chips prepared using a standardized commercial formulation and dried to a low water activity ($a_w < 0.60$) exhibited excellent physicochemical stability, microbiological safety, and consumer acceptability during six months of ambient storage. Both aerobic and vacuum-packaged samples remained within acceptable limits for pH, and TBARS throughout the study, with vacuum packaging consistently offering superior protection against oxidative and protein degradation. Microbial counts remained well below permissible limits, and Salmonella was absent in all samples, confirming the effectiveness of the drying process and hygienic handling. Sensory evaluation showed that vacuum-packed chips retained better colour, flavour, and crispiness scores over time, while aerobic samples showed gradual but expected declines. Overall, the study confirms that properly formulated, dried, and packaged chicken meat chips are a shelf-stable,

safe, and consumer-preferred value-added meat product suitable for commercial-scale production, with vacuum packaging up to 180 days providing a clear advantage for long-term quality retention.

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