www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(9): 1400-1403

www.thepharmajournal.com
Received: 11-06-2023
Accepted: 20-07-2023

Arathy Anil
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

Renuka Nayar
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

Anagha R
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

Kavitha Rajagopal
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

Sathu T
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala, India

Vinod VK
Department of Veterinary Public Health, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala, India

Corresponding Author:
Arathy Anil
Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

Development and quality evaluation of ready-to-cook porridge mix incorporating chicken meat powder

Arathy Anil, Renuka Nayar, Anagha R, Kavitha Rajagopal, Sathu T and Vinod VK

Abstract
A ready-to-cook porridge mix was developed by incorporating dried chicken meat powder, pearl millet flour and jack fruit bulb powder and was compared with control porridge mix containing pearl millet, sorghum and jack fruit bulb powder. Both control and treatment porridge mixes were vacuum packed and analysed for physico-chemical, microbiological and sensory characteristics on days 0, 30, 60 and 90 of ambient temperature storage. Color values such as a* and b* values, proximate principles such as protein, fat, and ash values and scores for sensory attributes were higher for the treatment porridge mix than control. The study showed that the ready-to-cook porridge mix incorporated with chicken powder was shelf-stable for 90 days at ambient temperature. The cost of production of the developed porridge mix was Rs. 653.34 per kg. The ready-to-cook porridge mix with chicken meat powder could be used for the fast and easy preparation of a meal with high nutritive value and with good sensory scores.

Keywords: Ambient temperature storage, chicken meat powder, pearl millet flour, ready-to-cook porridge mix

1. Introduction
Modern food market is built around consumer convenience. In case of food convenience, we have to consider the nutritional worth of the food as well. This can be accomplished by adding nutrient-rich components like millets, cereals, jackfruit, meat etc. in it. Instant meat products are one among them and have gained consumer approval in today's society. Poultry meat, especially chicken meat is preferred in India over other types of meat due to its nutritional significance, low cost and lack of cultural or religious taboos. Millets are gaining much attention among people due to their various health benefits and functional properties. Among millets, pearl millet, which is also known by the name *bajra*, has got characteristics like superior fat digestibility and is rich in unsaturated fatty acids especially omega-3-fatty acids along with ample amounts of energy, vitamins and minerals. Jackfruit is a commonly consumed fruit in India with antioxidant, antidiabetic, anti-inflammatory, immunomodulatory and antineoplastic activities and is rich in many vitamins.
Porridges are generally cereal-based foods consumed by all age groups and their characteristics like easy digestibility, soft texture and consistency make them ideal foods for geriatric people, who need much care in their nutrition. Ready-to-cook porridge mixes are stable at ambient temperature and require only few minutes for cooking. A ready-to-cook porridge mix was developed incorporating chicken meat powder, pearl millet and jack fruit bulb powder and compared for quality characteristics with a control porridge mix.

2. Materials and Methods
Deboned chicken breast meat was procured from local market in Sugandhagiri, Wayanad district and was brought to the Dept. of Livestock Products Technology. The chicken meat was washed and trimmed to remove fat and fascia, then cut into thin strips and dried in a cabinet drier at 60 °C for 14 hours and ground to obtain chicken meat powder. All other ingredients like pearl millet flour, jackfruit bulb powder, salt, spices and condiments were brought from local market and were used in the preparation of mixes.

2.1 Preparation of mixes
The standardisation of the dehydrated porridge mix was carried out after conducting preliminary trials in order to optimise the ingredients used for the preparation. The formulations of control and treatment mixes are given in table 1. The porridge mixes were then

vacuum packaged (Sevana, Quick seal- QS400VS3G, Kochi) using polyester-low density polyethylene pouches and were stored at ambient temperature. The control and treatment mixes were subjected to analysis of physicochemical parameters like pH (AOAC, 2016) [2], water activity (a_w) (Ambrosiadis *et al.,* 2004) [1], thiobarbituric acid reactive substances (TBARS) numbers (Witte *et al.,* 1970) [21], tyrosine value (Pearson, 1968) [14] and L*, a *, b* colour values (Page *et al.,* 2001) [13] and microbiological parameters such as aerobic plate count (APC) (Morton, 2001) [11] and yeast and mold count (YMC) (Beuchat and Cousin, 2001) [4] on days 0, 30, 60 and 90 of storage. Proximate principles like moisture, ash, fat and protein (AOAC, 2016) [2] and sensory attributes (Singh *et al.,* 2011) [18] were also analysed. The cost of production of the mixes was calculated.

Table 1: Formulation of control and treatment mixes

Ingredients	Control mix (g)	Treatment mix (g)
Dried chicken powder	Nil	400
Pearl millet flour	324	368
Sorghum flour	324	Nil
Jackfruit bulb powder	282	162
Salt	27.5	27.5
Pepper	17.5	17.5
Mixed herbs	10	10
Onion powder	7.5	7.5
Garlic powder	7.5	7.5

3. Results and Discussion

3.1 pH

On the progression of storage, a significant reduction in the pH values of both control and treatment was observed. On initial days the decrease might be due to the chemical activity associated with the product and on final days the decrease could be attributed to the microbial activity. Modi *et al.* (2007) observed a slight decrease in the pH of dried chicken *kebab* mix during storage and attributed it to the chemical activity that happened during storage and not due to microbial activity [10].

3.2 Water Activity

The water activity value was higher with control on all days and might be due to the higher moisture content associated with the control mix. There was a significant (p<0.01) increase in the water activity with both the samples across the storage period, with the highest value on day 90, which might be due to an increase in moisture content on that day. However, the water activity values obtained for both the control and treatment mixes were below 0.6 on all days. FSSAI (2018) stipulates a water activity below 0.6 and moisture content below 25% for a food product to be called as low-moisture meat product under dried meat product and the developed porridge mix can be considered under this category [6]. Tilanka *et al*. (2018) observed a water activity value below 0.6 for an instant porridge mixture from *Cassia auriculata* leaves and opined that it suppressed microbial development during storage [19].

3.3 Thiobarbituric Acid Reactive Substances (TBARS) Number

There was a significant (p<0.01) variation in TBARS numbers of control and treatment mixes on all days except day 30, with control showing higher values on days 60 and 90. There was a significant (p<0.01) decrease in TBARS numbers of treatment mix across storage. The decrease might be either attributed to the antioxidant properties associated with the product or due to the formation of the protein-malondialdehyde complex on storage of the product. Akkara *et al*. (2019) observed a decrease in the TBARS value of instant chicken snacks incorporated with Bengal gram flour at various levels stored at room temperature and attributed it to the formation of a malondialdehyde- protein complex on storage [17].

3.4 Tyrosine value

There was a significant difference (p<0.01) in tyrosine value across the storage period and between the treatment and control mixes on each day. The tyrosine value was significantly (p<0.01) lower for control compared to treatment on all days of analysis. It might be due to the absence of meat in control. On storage, tyrosine values of control and treatment mixes significantly (p<0.01) decreased on days 30 and 60 and then increased on day 90. The increase on day 90 might be due to the corresponding microbial proteolysis associated with the samples on that day. Nemade *et al.* (2021) also reported higher tyrosine values in powdered spent hen meat incorporated cookies and attributed that to the initial higher tyrosine values associated with the product [12].

3.5 L* a* b* Colour Values

There was a significant (p< 0.01) difference in the L* value between the treatment and control on each day, with the control showing higher values the higher L* value in the control might be attributed to the presence of a higher concentration of flour without the addition of meat powder in it. Baik *et al*. (1995) reported that as the protein content of flour used in the preparation of oriental noodles increased, it decreased the lightness of noodle dough [3]. There was a significant (p<0.01) difference in b* values between samples on all storage days, with the control having the lowest value on all days. There were no significant variations in the b* value of treatment and control across the storage period. The values of a* were significantly (p<0.01) lower in control compared to treatment, and it might be due to reduced redness due to the absence of meat. Across storage days, there was a significant (p<0.05) decrease in a* values. Jang and Lee (2012) reported a similar decrease in a* value of instant ginseng chicken porridge, and the decrease was attributed to the various physicochemical reactions that occurred with the porridge across the storage [7].

3.6 Microbiological Characteristics

Aerobic plate counts were nil in control and treatment samples on days 0 and 30, and it was noted in samples from day 60 onwards, which showed a substantial (p<0.01) increase on day 90. It might be due to the decrease in moisture content till day 60 and the increase that occurred on day 90, which was also reflected in higher water activity. On day 90, the control showed a significantly (p<0.01) lower count when compared to the treatment porridge mix. Lower values in control might be due to the absence of meat which is a favourable medium for the growth of microbes. Mishra *et al.* (2014) observed that in the shelf-life study of vacuum-packed dehydrated chicken meat rings the control with lean meat got a higher total plate count than the treatment group, where lean meat was replaced with different proportions of flour, and texturised soy granule [9]. Yeast and mold growth was not reported in the samples on any storage day. Sarkar *et*

al. (2020) reported that the traditional *bhujia* formulation did not show yeast and mold count during a storage period of 90 days, and they claimed that it might be due to the reduced moisture content of the product [16].

3.7 Proximate Principles

The moisture content of the control was significantly (p<0.01) higher than the treatment on all days except on the day of preparation. It could be due to the higher concentration of flours in control with more moisture absorbing capacity. Sarkar *et al*. (2019) also found a reduction in the moisture percent of instant soup mix with an increase in the incorporation of chicken shreds [15]. Across the storage period, the moisture level of treatment showed a significant (p<0.01) reduction in value from day 30 onwards and showed a significant (p<0.01) increase on day 90. Cakmak *et al.* (2016) also noticed a spike in the moisture value of crispy bread snacks on day 90 of storage [5]. The dietary fibre content in the control and treatment porridge mixes were 11.2, and 10.4%, respectively and might be due to the high level of flour and jackfruit bulb powder in the control mix. Rajagopal *et al*. (2023) also noticed a higher dietary fibre content in control extruded snack containing rice flour, jackfruit bulb and seed powders when compared to treatment snacks with meat [8]. The treatment mix showed significantly (p<0.01) higher protein level when compared to the control, possibly due to the high protein concentration in dried chicken meat and there was no variation on storage. There was a significant (p<0.01) difference in ash values between the treatment and control on each storage day, with control having significantly (p<0.01) lower values on all storage days. Control had a significantly (p<0.01) lower fat percentage compared to treatment, and in treatment, the fat level significantly (p<0.01) increased across storage. Rajagopal *et al.* (2023) noticed that the extruded chicken snack with a high proportion of chicken meat powder had lower moisture and higher fat contents and also reported a higher ash content in the control snack devoid of meat [8].

3.8 Sensory Attributes

Appearance scores were significantly (p<0.05) different between samples on all days of analysis except day 0, with lower scores for control than treatment. It might be due to the absence of meat in the control group which resulted in a whitish colour to the porridge. There was no significant (p>0.05) difference in the appearance score of treatment and control across the storage period. Flavour scores were significantly (p<0.05) superior for treatment compared to control on all days and could be attributed to the appealing flavour of chicken in the treatment porridge mix. There was a substantial (p<0.05) difference in texture scores between samples on all storage days, with the control showing significantly lower scores. Control porridge had a viscous consistency whereas the treatment with 40% of chicken powder had a more desirable porridge-like consistency. The score for overall acceptability was significantly (p<0.05) higher for chicken meat incorporated porridge mix and on storage, there was a significant (p<0.05) reduction in the score for the control mix on day 90. Akkara *et al.* (2019) noticed that the control ready-to-eat snack devoid of chicken got the least flavour score value when compared to treatment snacks with various levels of chicken [17]. The cost of production was Rs. 397.54 and Rs. 653.34 for one kilogram of control and treatment porridge mixes, respectively.

4. Conclusion

The developed ready-to-cook porridge mix incorporated with dried chicken meat powder and pearl millet flour was superior to the control mix in terms of nutritional and sensory attributes. The developed mix was shelf stable at ambient temperature for 90 days under vacuum packaging with a low water activity value and could be used as an ideal nutrient-rich food, especially for geriatric people. Thirty-five grams of mix was needed for preparing a standard porridge serving which contributed to one tasty meal rich in nutrients.

5. Acknowledgment

The author thanks Kerala Veterinary and Animal Sciences University, Pookode, Wayanad for allotting research fund and facilities needed for the conduct of research.

6. References

1. Ambrosiadis J, Soultos N, Abrahim A, Bloukas JG. Physicochemical, microbiological and sensory attributes for the characterization of Greek traditional sausages. Meat Science. 2004;66:279-287.
2. AOAC [Association of Official Analytical Chemists]. Meat and meat products. In: Official Methods of Analysis of Analytical Chemists. (20th Ed.). Association of Official Analytical Chemists Inc., Rockville, Maryland; c2016. p. 1-34.
3. Baik BK, Czuchajowska ZUZANNA, Pomeranz YESHAJAHU. Discoloration of dough for oriental noodles. Cereal Chemistry. 1995;72:198-204.
4. Beuchat LR, Cousin MA. Yeast and molds. In: Downes, F.P. and Ito, K. (ed.), Compendium of Methods for the Microbiological Examination of Foods. (4th Ed.). APHA, Washington, DC; c2001. p. 209-213.
5. Cakmak H, Altinel B, Kumcuoglu S, Kisla D, Tavman S. Production of crispy bread snacks containing chicken meat and chicken meat powder. Anais da Academia Brasileira de Ciências. 2016;88:2387-2399.
6. FSSAI. Food Safety and Standards Authority of India; c2018. https://www.fssai.gov.in/cms/draftstandards.php.6 August, 2022.
7. Jang DH, Lee KT. Quality changes of ready-to-eat ginseng chicken porridge during storage at 25℃. Meat Science. 2012;92:469-473.
8. Rajagopal K. Development and quality evaluation of shelf-stable extruded snack incorporated with chicken meat. PHD thesis, Kerala Veterinary and Animal Sciences University, Pookode; c2023. p. 156.
9. Mishra BP, Chauhan G, Mendiratta SK, Rath PK. Storage stability of vacuum packaged extended dehydrated chicken meat rings at ambient temperature. Indian Journal of Animal Sciences. 2014;84:1222-1227.
10. Modi VK, Sachindra NM, Nagegowda P, Mahendrakar NS, Narasimha Rao D. Quality changes during the storage of dehydrated chicken kebab mix. International Journal of Food Science & Technology. 2007;42:827-835.
11. Morton RD. Aerobic plate count. In: Downes, F.P. and Ito, K. (ed.), Compendium of Methods for the Microbiological Examination of Foods. (4th Ed.). APHA, USA; c2001. p. 63-67.
12. Nemade AS, Londhe SV, Waghamare RN. Shelf Stability of Cookies Incorporated with Spent Hen Meat Powder in Aerobic Packaging at Ambient Temperature (37±1 °C). International Journal of Livestock Research. 2021;11:65-

71.
13. Page JK, Wulf DM, Schwotzer TR. A survey of beef muscle colour and pH. Journal of Animal Science. 2001;79:678-687.
14. Pearson D. Application of chemical method for assessment of beef quality. Journal of the Science of Food and Agriculture. 1968;19:364-366.
15. Sarkar B, Upadhyay S, Gogoi P, Das A, Hazarika M, Rahman Z, *et al*. Development and quality evaluation of instant soup mix incorporated with spent hen meat shred. International Journal of Livestock Research. 2019;7:24-30.
16. Sarkar BK, Upadhyay S, Hazarika M, Gogoi P, Das A, Choudhury S, *et al*. Development and quality evaluation of bhujia incorporated with spent hen meat powder. Journal of Entomology and Zoology Studies. 2020;8:114-120.
17. Shelcy S Akkara. Development of ready-to-eat chicken snacks for storage under ambient temperature. M.V.Sc. thesis, Kerala Veterinary and Animal Sciences University, Pookode; c2019. p. 96.
18. Singh VP, Sanyal MK, Dubey PC, Mendiratta SK. Quality assessment of vacuum packaged chicken snacks stored at room temperature. Journal of Stored Products and Postharvest Research. 2011;2:120-126.
19. Tilanka Jayasekara NWD, Don Prasanna Priyantha Gunathilake K. Formulation of instant herbal porridge mixtures from ranawara (*Cassia auriculata* Linn) leaves. Annals: Food Science & Technology. 2018;19:684-690.
20. Vijayarani D, Jeevarathinam A, Marieswari S. Development, standardization and evaluation of millet-based food product rich in total phenols and flavonoids. International Journal of Home Science. 2017;3:24-27.
21. Witte VC, Krause GF, Bailey ME. A new extraction method for determining 2-thiobarbituric acid values of pork and beef during storage. Journal of Food Science. 1970;35:582-585.