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Arunkumar A
M.V.Sc. Student, Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India

R Ramani
Associate Professor and Head, Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India

D Thirumeignanam
Associate Professor, Department of Animal Nutrirtion, Veterinary College and Research Institute, Theni, Tamil Nadu, India

R Jayanthi
Assistant Professor, Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India

I Percy Packya
M.V.Sc., Student, Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India

Corresponding Author:
R Ramani
Associate Professor and Head, Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India

Physico-chemical and sensory evaluation of poly-herbs incorporated functional spent hen meat patties

Arunkumar A, R Ramani, D Thirumeignanam, R Jayanthi and I Percy Packya

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Abstract
Spent hen meat patties were prepared by incorporating different levels of poly-herbs like *Cassia auriculata* (Avaram), *Psidium guajava* L. (Guava), and *Moringa oleifera* (Moringa), in different (1.0:1.5:2.5, 1.5:2.5:1.0, 2.5:1.0:1.5) combinations respectively. The best combination among the three was chosen based on the physico-chemical and sensory attributes of the spent hen meat patties. The treated patties were recorded with significantly higher pH, emulsion stability and cooking yield. The patties with the combination of 1.5:2.5:1.0% inclusion levels of poly - herbs, *Cassia auriculata* (Avaram), *Psidium guajava* L. (Guava), and *Moringa oleifera* (Moringa), had the most preferable sensory values. Thus, incorporation of poly - herbs (*Cassia auriculata* (Avaram), *Psidium guajava* L. (Guava), and *Moringa oleifera* (Moringa), at the level of 1.5:2.5:1.0% has the potential to develop spent hen meat patties that would meet consumer preferences for functional properties.

Keywords: Spent hen meat, chicken patties, avaram, moringa, guava, physico, chemical and sensory evaluation.

Introduction
From the backyards of Indian villages, Indian poultry industry has experienced tremendous growth over the past few decades, transforming it into one of the largest and most dynamic segments of the country's agricultural economy. Spent hens are mature laying birds that have completed their egg-laying cycle and although their meat is tougher and less preferred for direct consumption, it can be effectively utilized in processed meat formulations, thus reducing waste and enhancing food sustainability. Hence, the demand and marketability of these spent hens could be increased by processing the tough meat in to a palatable product.

Many researchers have made several attempts to efficiently utilize spent hen meat to develop emulsion based convenience meat products such as sausages, patties and kababs (Kondaiah *et al*. 1988; Anjaneyalu and Sharma, 1991; Rao 1996) [12, 22]. Among these, patties is one which could find predominant position in the food industry, particularly in fast food outlets (Biswas *et al*. 2006) [5].

In recent days, the growing global prevalence of diabetes mellitus, particularly type 2 diabetes, has sparked an urgent need for functional foods that provide not only essential nutrients but also therapeutic benefits. In the wake of this health crisis, researchers and food technologists are increasingly exploring the development of cost-effective, natural and culturally acceptable dietary interventions that can aid in the prevention and management of chronic metabolic disorders. One such emerging approach is the incorporation of medicinal herbs and underutilized animal protein sources into functional meat products. The incorporation of poly - herbs, a synergistic blend of medicinal plant ingredients into meat matrices provides an opportunity to enhance both the nutritional and therapeutic value of the product.

According to the World Health Organization, approximately 21,000 plant species are used globally for medicinal purposes. Of these, nearly 2,500 species are found in India, with several hundred being widely utilized in traditional medical systems such as Ayurveda, Unani, and Siddha (Pullaiah and Naidu, 2003) [21]. In recent decades, the growing demand for natural

products with antidiabetic properties has led to increased research interest in hypoglycaemic agents derived from medicinal plants (Elavarasi *et al.* 2013) [7].

Several medicinal plants traditionally used in Indian and Southeast Asian medicine have shown promise for glycemic control. Notably, the leaves of *Cassia auriculata* (Avaram), *Psidium guajava*.L (Guava), and *Moringa oleifera* (Moringa) have been recognized for their antidiabetic and antioxidant properties. Avaram is a traditional herb widely used in Siddha and Ayurvedic medicine. Being rich in flavonoids, tannin, and polyphenols, its extracts have demonstrated hypoglycaemic and antioxidant effects by modulating carbohydrate metabolism and reducing oxidative stress (Kumar *et al.* 2013) [13].

Guava leaves contain bioactive compounds such as quercetin, flavonoids, and tannins that inhibit α-glucosidase activity, reduce postprandial blood glucose spikes, and improve insulin sensitivity (Ojewole, 2005) [19]. Moringa is known as the "miracle tree" due to its exceptional nutritional and medicinal profile. Its leaves are rich in chlorogenic acid and isothiocyanates, which have shown to improve glucose tolerance and suppress gluconeogenesis (Mbikay, 2012) [15].

When incorporated into spent hen meat products, these herbal ingredients not only enhance the antioxidant and functional value of the final product but also create a novel, affordable and health-promoting meat-based dietary option. Moreover, the synergistic action of poly - herbs in modulating multiple pathways involved in glucose metabolism may provide a more effective dietary intervention than single-compound approaches. It leverages the nutritional density of animal protein with the therapeutic potential of traditional medicinal herbs to offer a product that may support glycemic control in diabetic and pre-diabetic populations. Converting the underutilized animal protein resource into functional meat patties fortified with poly-herbs provides helpful remedy for metabolic related diseases.

This article envisages the utilization of medicinal plant leaves as glycemic control indices and spent hen meat as protein sources in the patties of functional chicken patties. Physico-chemical parameters and sensory attributes such as pH, emulsion stability, cooking yield, appearance, flavour, juiciness, tenderness and overall acceptability of the poly - herbs incorporated spent hen meat patties have been assessed in this study.

Materials and Methods

In order to conduct the experiment, live spent birds (60-70 weeks old) were purchased from the Livestock Farm Complex, Veterinary College and Research Institute, Tirunelveli and slaughtered as per the standard procedure followed in the Department of Livestock Products Technology, VCRI, Tirunelveli. The spent hen carcasses were washed, deboned and placed in deep freezer at a temperature of -18º C for subsequent use.

Preparation of poly-herbs leaves powder

Matured leaves of Avaram (*Senna auriculata*), Guava (*Psidium guajava* L.) and Moringa (*Moringa oleifera*) were collected from the trees available in the VCRI TNI, campus and washed thoroughly with plain portable water. After washing, the leaves were air dried and then dried in the hot air oven also at a temperature of 55ºC for 12 hours, 55ºC for 9 hours and 55ºC for 8 hours respectively. The dried avaram, guava and moringa leaves were then powdered in the mixer. The ground herbal leaves powders were then sieved and packed in sterile PET (Polyethylene Terephthalate) jar for subsequent use.

Preparation of spent hen meat patties

Spent hen meat was partially thawed at refrigerator temperature (4±1º C) and was then cut into small cubes and minced in the meat mincer (Model No. TS 12, Omas Food machinery, Italy) using 8mm plate. Spent hen meat patties were prepared by mixing minced meat with spice mix, salt, refined wheat flour, condiments and vegetable oil for making up the emulsion.

The emulsion prepared was finally incorporated with three different combinations of poly-herbs leaves powder (Avaram, Guava and Moringa) *viz.*, (1.0:1.5:2.5), (1.5:2.5:1.0) and (2.5:1.0:1.5) respectively and in control without addition of poly-herbs leaves powder.

After that, the emulsion was filled into moulds and pressure cooked for 20 minutes. The meat blocks after cooking were cooled and sliced into patties. A total of six trials were conducted for each combination of poly-herbs and subjected to physico-chemical analysis *viz.*, pH, emulsion stability, cooking yield and sensory evaluation to select the optimum level of inclusion of poly-herbs leaves powder in the spent hen meat patties.

Physico-chemical characteristics

pH

The pH of the spent hen meat patties sample was measured using a digital pH meter (Digisun Electronic System, Model: 2001). About 5g of spent hen meat patties sample was homogenised with 45 ml of distilled water in a laboratory blender for about one minute.

The pH was recorded by immersing the combination glass electrode of digital pH meter into the homogenate. The pH meter was pre calibrated using standard solution with pH 7.0 as per the user manual instructions, prior to measurement.

Emulsion stability (%)

The emulsion stability of the sample was determined by using the method outlined by Baliga and Madaiah (1971) [4] and modified by Kondaiah *et al.*, (1985) [11]. Fifteen grams of emulsion was packed in polyethylene bags and heated to 80ºC for 20 minutes in a constant temperature water bath. Then, the fluid released was drained and the sample was weighed. The Emulsion stability is calculated by using the below mentioned formula.

$$\text{Emulsion stability (per cent)} = \frac{\text{Weight of emulsion after heating}}{\text{Weight of raw emulsion}} \times 100$$

Cooking yield (%)

Cooking yield is used to predict the yield of cooked product. It was determined by the method outlined by Verma *et al.* (2012) [25]. The weight of the product was recorded before and after cooking from which the cooking yield was calculated by using the formula,

$$\text{Cooking yield (per cent)} = \frac{\text{Weight of product after cooking}}{\text{Weight of product before cooking}} \times 100$$

Sensory evaluation

The organoleptic qualities of spent hen meat patties were assessed by subjecting the patties samples to a sensory score of appearance, flavour, texture, juiciness and overall acceptability by a trained and semi-trained taste panel drawn

from the Department of Livestock Products Technology, Veterinary College and Research Institute, Tirunelveli on a nine-point hedonic scale as given in the score card.

Statistical analysis

The data was subjected to statistical analysis in SPSS (version 20.0) software as per the standard procedure outlined by Snedecor and Cochran (1994) [23].

Results and Discussion

The results of proximate analysis and sensory evaluation of the different treatments of poly - herbs incorporated spent hen meat patties is presented in Tables 1 and 2.

Physico-chemical characteristics

pH

It was observed that the pH of the spent hen meat patties did not differ significantly with the incorporation of the poly-herbs. The pH of the control patties was 6.07±0.04 which increased marginally but not significantly. The increase in pH could be attributed to the alkalinity of the poly-herbs. Babu *et al*. 1994 [3] attributed the increase in pH to loss of moisture on cooking resulting in increased salt concentration and change in net protein charges due to denaturation.

The results obtained in the present study were in concomitance with that of Hazra *et al.* (2011) [10] who observed that the addition of moringa leaf extract increased the pH values of cooked ground Buffalo meat significantly ($p<0.05$). In Contradiction, Grigelmo-Miguel *et al.* (1999) [9], reported that the addition of dietary fibre in meat product formulation lowered the pH (6.4-5.4) of the solution and thereby of the product pH. Caceres *et al*. (2004) reported that the incorporation of soluble dietary fibre did not affect the pH of cooked sausages.

Wu and Lin (2011) [26] reported that the addition of xylo - oligo saccharides in raw meat did not alter the pH values. Slightly higher pH was observed in cooked patties as compared to raw emulsion in the study of Nitin Mehta *et al*. (2013) [18].

Emulsion stability

There was no significant difference noticed in emulsion stability of poly-herbs included samples of control and of different treatments. Though there was a decrease in emulsion stability of the treatment with 2.5:1.0:1.5% level of inclusion of poly-herbs, the difference was not significant. The emulsion stability was highest in the treatment II (1.5:2.5:1.0), that contained guava (*Psidium guajava* L.) at maximum level of inclusion and the lowest was in treatment III (2.5:1.0:1.5) with avaram (*Senna auriculata*) at maximum level of inclusion. Increase in emulsion stability of spent hen meat patties of treatment III (2.5:1.0:1.5) was attributed to higher dietary fibre in avaram leaf powder.

In a study conducted by Madane *et al.* (2019) [14] with inclusion of moringa leaf powder an increasing emulsion stability was reported. Similar trend was also noticed by Govind *et al.* (2013) [8] and Mounika *et al.* (2021) [16] in oat flour incorporated chicken sausages and meat balls respectively. Nitin Mehta *et al*. 2013 [18] observed that with an increase in level of psyllium husk, a significant ($p<0.05$) increase in the emulsion stability and cooking yield in treated as compared to control patties. They considered that this increase was attributed to the presence of higher amount of soluble dietary fibre entrapping and holding moisture in the form of a gel during application of heat.

Cooking yield

Cooking yield of various treatments ranged from 94.29 ± 0.51% to 95.67 ± 0.51%. There was no significant difference among the control and the treatments, but there was a noticeable increase in the yield of treatment samples than the control samples and the highest was noticed in treatment II (1.5:2.5:1.0). This increase in cooking yield could be due to high amount of dietary fibre in guava leaves. The results of this study are also in line with observations of Al-Juhaimi *et al.* (2016) [1], who found that the inclusion of *Moringa olifera* seed powder at 6% level improved the cooking properties of beef patties.

Sensory evaluation

The spent hen meat patties treated with poly-herbs showed lesser appearance scores than the control, but the difference was not significant. The treatment I (1.0:1.5:2.5) with highest moringa leaf powder had the least appearance score, because of the increased iron & phenolic content of moringa leaves, imparting dark colouration to the product.

There was a highly significant difference in the flavour scores between control and the treatments and treatment II (1.5:2.5:1.0) with maximum guava leaf inclusion which had the highest flavour score. The dominant flavour of guava leaf powder masked the flavour of meat and other ingredients in the spent hen meat patties. Higher flavour score of this treatment might be due to effective inhibition of lipid peroxidation which was also observed by Nath *et al.* (2016) [17].

Tenderness and juiciness of various treatments showed a similar trend. The treated samples differed highly significantly ($p<0.01$) with control. Treatment I samples had the lowest scores & Treatment II had the highest scores for tenderness and juiciness. The increased tenderness and juiceness of treatment II might be attributed to the effect of maximum level of inclusion of guava leaf powder.

The overall acceptability scores of control and treatments differed highly significantly ($p<0.001$). Spent hen meat patties treated with the combination of 1.5:2.5:1.0% poly-herb inclusion showed significantly higher scores than the other two treatments. The lower overall acceptability scores of treatment I (1.0:1.5:2.5)%, might be attributed to slight bitterness of moringa leaf powder and also due to presence of high amount of tannins, polyphenols and flavonoids in moringa leaf. Tyagi *et al.* (2020) [24] also reported a similar effect on flavour and undesirable bitter aftertaste in cookies prepared by incorporating higher levels of giloy stem powder (GSP). In contrast, Hazra *et al.* (2011) [10], observed significantly higher overall acceptability scores in cooked ground meat incorporated with drumstick leaf extract (1,1.5 & 2%).

The research findings concluded that treatment II (1.5:2.5:1.0%), had the highest overall acceptability score. This result was in congruance with Pawar *et al.* (2023) [20], who concluded that upto 2.5% level of incorporation of guava leaves powder in the preparation of cup cake was found to be acceptable level for all the sensory parameters like colour, taste, flavour and overall acceptability

Table 1: Mean ± SE values of physico-chemical characteristics of spent hen meat patties incorporated with different levels of poly-herbs

Parameters	Control	Different levels of Avaram, Guava and Moringa (%)			F value
		1.0:1.5:2.5	1.5:2.5:1.0	2.5:1.0:1.5	
pH	6.07±0.04	6.10±0.04	6.09±0.04	6.10±0.04	0.11^{NS}
Emulsion stability (%)	97.13±0.36	97.15±0.32	97.17±0.38	96.87±0.26	0.17^{NS}
Cooking yield (%)	94.29±0.42	95.54±0.62	95.67±0.51	95.25±0.76	1.08^{NS}

n=6, NS - Not Significant

Table 2: Mean ± SE values of Sensory evaluation of spent hen meat patties incorporated with different levels of poly-herbs

Parameters	Control	Different levels of Avaram, Guava and Moringa (%)			F value
		1.0:1.5:2.5	1.5:2.5:1.0	2.5:1.0:1.5	
Appearance	8.28 ± 0.09	7.82± 0.26	8.06± 0.16	8.16± 0.15	1.121^{NS}
Flavour	7.73 ± 0.11^{b}	6.21 ± 0.35^{a}	7.85 ± 0.23^{b}	7.55 ± 0.16^{b}	10.64^{**}
Tenderness	7.73 ± 0.10^{b}	5.94 ± 0.23^{a}	7.44 ± 0.32^{b}	7.61 ± 0.18^{b}	13.52^{**}
Juiciness	7.63 ± 0.08^{b}	5.54 ± 0.39^{a}	7.63 ± 0.10^{b}	7.49 ± 0.23^{b}	18.43^{**}
Overall acceptability	7.78 ± 0.04^{b}	5.23 ± 0.37^{a}	7.68 ± 0.10^{b}	7.73 ± 0.06^{b}	38.73^{**}

n=6

Means bearing different superscripts (a and b) within rows differ significantly ($P<0.01$)

NS - Not Significant

** - Highly significant ($P<0.01$)

Conclusion

Based on the above findings, it is concluded that spent hen meat being relatively poor in sensory properties was used for the development of functional spent hen meat patties, with incorporation of poly - herbs like avaram, guava and moringa leaves powder in different combinations. Upon physico - chemical and sensory evaluation the spent hen meat patties with inclusion of poly-herbs at 1.5% aavarm: 2.5% guava: 1.0% moringa leaves powder improved the overall acceptability of the spent hen meat for the development of functional spent hen meat patties.

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Conflict of Interest

Not available

Financial Support

Not available

References

1. Al-Juhaimi F, Ghafoor K, Hawashin MD, Alsawmahi ON, Babiker EE. Effects of different levels of *Moringa* (*Moringa oleifera*) seed flour on quality attributes of beef burgers. CyTA J Food. 2016;14(1):1-9.
2. Anjaneyulu ASR, Sharma N. Effect of fat and phosphate on the quality of raw and precooked buffalo meat patties. J Food Sci Technol. 1991;28:157-160.
3. Babu NP, Kowale BN, Rao VK, Bisht GS. Effect of cooking and storage on lipid oxidation and development of cholesterol oxides in chicken meat. Indian J Poult Sci. 1994;29(3):254-262.
4. Baliga BR, Madaiah N. Preparation of mutton sausages. J Food Sci. 1971;36(4):607-610.
5. Biswas S, Chakraborty A, Sarkar S. Comparison among the qualities of patties prepared from chicken broiler, spent hen and duck meats. J Poult Sci. 2006;43(2):180-186.
6. Cáceres E, García ML, Toro J, Selgas MD. The effect of fructooligosaccharides on the sensory characteristics of cooked sausages. Meat Sci. 2004;68(1):87-96.
7. Elavarasi S, Saravanan K, Renuka C. A systematic review on medicinal plants used to treat diabetes mellitus. Int J Pharm Chem Biol Sci. 2013;3(3).
8. Govind V, Prabhakar K, Rao BE, Naga Mallika E. Eating quality and physico-chemical properties of fresh emu meat sausages prepared in comparison with broiler and spent hen meat sausages with oat flour and corn flour. Int J Food Agric Vet Sci. 2013;3(1):247-253.
9. Grigelmo-Miguel N, Abadías-Serós MI, Martín-Belloso O. Characterisation of low-fat high-dietary fibre frankfurters. Meat Sci. 1999;52(3):247-256.
10. Hazra S, Biswas S, Bhattacharyya D, Das SK, Khan A. Quality of cooked ground buffalo meat treated with the crude extracts of *Moringa oleifera* (Lam.) leaves. J Food Sci Technol. 2012;49(2):240-245.
11. Kondaiah N, Anjaneyulu ASR, Rao VK, Sharma N, Joshi HB. Effect of salt and phosphate on the quality of buffalo and goat meats. Meat Sci. 1985;15(3):183-192.
12. Kondaiah N, Panda B, Anjaneyulu ASR, Singh RP. Utilisation of whole meat components from spent hens for chicken sausage production. Indian J Poult Sci. 1988;23:135-141.
13. Kumar P, Kumar S, Tripathi MK, Mehta N, Ranjan R, Bhat ZF, Singh PK. Flavonoids in the development of functional meat products: a review. Vet World. 2013;6(8).
14. Madane P, Das AK, Pateiro M, Nanda PK, Bandyopadhyay S, Jagtap P, Lorenzo JM. Drumstick (*Moringa oleifera*) flower as an antioxidant dietary fibre in chicken meat nuggets. Foods. 2019;8(8):307.
15. Mbikay M. Therapeutic potential of *Moringa oleifera* leaves in chronic hyperglycemia and dyslipidemia: a review. Front Pharmacol. 2012;3:24.
16. Mounika T, Sahityarani M. Development and quality evaluation of oat flour incorporated spent hen meat balls. Pharma Innov J. 2021;10(8):289-291.
17. Nath PM, Kumar V, Praveen PK, Ganguly S. A comparative study of green tea extract and rosemary extract on quality characteristics of chevon patties. Int J Sci Environ Technol. 2016;5(3):1680-1688.

18. Mehta N, Ahlawat SS, Sharma DP, Yadav SY, Arora DA. Development and quality evaluation of chicken patties incorporated with psyllium husk. Haryana Vet. 2013;52:6-11.
19. Ojewole JA. Hypoglycemic and hypotensive effects of *Psidium guajava* Linn. (Myrtaceae) leaf aqueous extract. Methods Find Exp Clin Pharmacol. 2005;27(10):689-695.
20. Pawar S, Pawar V, Lahade K, Warkad P. Sensory evaluation of guava (*Psidium guajava*) leaves powder incorporated bakery products. Pharma Innov J. 2023;12(12):952-956.
21. Pullaiah T, Naidu KC. Antidiabetic Plants in India and Herbal Based Antidiabetic Research. New Delhi (India): Regency Publications; 2003.
22. Rao DN. Assessments of physical, chemical and microbiological attributes in traditional Indian poultry products: Tandoori and Kabab. In: Proc. XX World's Poultry Congress; 1996; New Delhi. 3. p. 57-64.
23. Snedecor GW, Cochran WG. Statistical Methods. 8th ed. Ames (IA): Iowa State University Press; 1994.
24. Tyagi P, Chauhan AK, Singh SN. Sensory acceptability of value-added cookies incorporated with *Tinospora cordifolia* (TC) stem powder: improvement in nutritional properties and antioxidant potential. J Food Sci Technol. 2020;57(8):2934-2940.
25. Verma AK, Banerjee R, Sharma BD. Quality of low-fat chicken nuggets: Effect of sodium chloride replacement and added chickpea (*Cicer arietinum* L.) hull flour. Asian-Australas J Anim Sci. 2012;25(2):291-297.
26. Wu YB, Lin KW. Influences of xylooligosaccharides on the quality of Chinese-style meatball (Kung-wan). Meat Sci. 2011;88(3):575-579.

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