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Effect of different levels of mayonnaise on the physicochemical and sensory attributes of chicken meat spread#

Ann Theres John[1], T. Sathu[2], B. Sunil[3], V.N. Vasudevan[2] and R. Uma[4]
Department of Livestock Products Technology
College of Veterinary and Animal Sciences, Mannuthy, Thrissur- 680651,
Kerala Veterinary and Animal Sciences University, Kerala, India

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Abstract

The study was aimed to optimize the level of mayonnaise in the formulary of spent chicken meat spread. Chicken meat was replaced with different levels of mayonnaise viz., (T_1) 30 per cent meat and 70 per cent mayonnaise, (T_2) 40 per cent meat and 60 per cent mayonnaise, (T_3) 50 per cent meat and 50 per cent mayonnaise, (T_4) 60 per cent meat and 40 per cent mayonnaise. T_4 had significantly ($p<0.001$) higher values for pH and T_1 had significantly ($p<0.001$) lower water activity compared with other treatments. Treatment, T_4 had significantly ($p<0.001$) higher moisture and protein per cent and T_1 had significantly ($p<0.001$) higher fat per cent and calorie value when compared to other treatments. T_2 scored higher values for all the sensory attributes except spreadability and significantly higher values ($p<0.01$) for mouth coating, aftertaste and overall acceptability when compared between each other. Hence chicken meat spread with 60 per cent mayonnaise and 40 per cent spent chicken (T_2) which had significantly higher overall acceptability scores was selected as best product considering the sensory attributes and physicochemical properties

Keywords: *Spent chicken, mayonnaise, meat spread*

Poultry sector is a fastest growing industry among the agriculture and allied sectors in India. Poultry meat production is 4.06 million tonnes, which contributes about 50 per cent of the total meat production and the production has increased by 7.8 per cent over the previous year (DAHD, 2019). The meat from layers is usually considered as a by- product of the egg industry and often fetches lower prices when compared to broiler meat. Spent hen meat is usually coarse, tough and chewy in nature and is not well accepted by consumers. Value addition of meat has been

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1. *MVSc Scholar*
2. *Assistant Professor*
3. *Professor and Head*
4. *Assistant Professor, Department of Veterinary Biochemistry*

**Corresponding author: anntheresjm256@gmail.com, Ph: 9495624469*

considered a potential solution for the utilisation of spent hen meat (Kondaiah and Panda, 1992). Spent hen meat is presently used for the preparation of comminuted meat products and chicken soups. Murugan and Narayanankutty (2002), developed spent chicken meat pickle, a value added product with higher sensory acceptability. Thus value addition of the spent hen meat by better processing technologies will definitely provide economic benefits. Also with the changes in the life style, consumers are moving towards products of a greater variety which are highly palatable and convenient to use. The development of a new product is a challenge to the food industry as this has to comply with consumer satisfaction.

One of the alternatives for the utilization of undervalued spent hen meat is the development of meat spread, a value added product with the incorporation of mayonnaise and seasonings. Spreadable products are that which are generally applied onto foods to enhance the flavour and texture of the product. Meat spread is a convenience product which can be used as a sandwich spread (Poobal *et al*., 2016). Mayonnaise is a semisolid oil in water emulsion made by careful mixing of oil, egg, vinegar and other spices (Depree and Savage, 2001). The addition of seasonings will provide characteristic flavour, intensifies food quality and well accepted by the consumers. Presently, in India, spreadable products like cheese spread and mayonnaise form a part of the market, but meat based spreadable product are very limited. Hence mayonnaise incorporated meat spread is expected to add a new dimension to convenience food processing and marketing.

Materials and methods

Preparation of mayonnaise

The methodology standardised at Department of Livestock Products Technology, CVAS, Mannuthy was used for the preparation of mayonnaise. Ingredients are provided in Table 1. Whole egg was heated in water bath at a temperature of 57 ? for seven minutes and immediately cooled under running water followed by separation of albumen and yolk. The separated albumen was used for the preparation of mayonnaise. The separated albumen weighed and whipped properly in a domestic mixer and after proper whipping of albumen the condiments and other ingredients namely dried ginger, garlic, chilli flakes, salt, sugar and tomato sauce were added according to the formulations. These ingredients were properly whipped in the mixer. Followed by this, glucono-delta lactone and vinegar was added and properly whipped. After proper whipping of the above ingredients glycerol and gelatin were added accordingly. Gelatin was dissolved in warm water and made into gel like consistency before the addition. Following this sunflower oil was added gradually and carefully in small quantities and whipped till the mayonnaise achieved the desired consistency (Fig.1).

Preparation of the chicken meat spread

Spent chicken hygienically slaughtered and dressed was used for the study. Properly dressed chicken after deboning and removal of all connective tissue and separable fat was marinated with sodium nitrite in powder form for antibacterial activity and kept for two hours. The marinated chicken was pressure cooked for about 15 minutes, shredded in a domestic grinder and salt was added at 0.8 per cent level and the prepared mayonnaise was mixed with the shredded meat in the desired ratio *viz.,* (T_1) 30 per cent meat and 70 per cent mayonnaise, (T_2) 40 per cent meat and 60 per cent mayonnaise, (T_3) 50 per cent meat and 50 per cent mayonnaise, (T_4) 60 per cent meat and 40 per cent mayonnaise.

The prepared product (Fig.2) was aerobically packed in food grade polyethylene terephthalate bottles (PET) and stored under refrigerated condition.

Proximate composition

The proximate composition of the chicken meat spread was determined by the standard procedure of AOAC (2016). Protein analysis was carried out in Kel Plus nitrogen estimation system (Pelican Equipment's, Chennai). Fat content was analysed using Soxhlet solvent extraction system (SOX plus, Model SCS 6, Pelican Equipment's, Chennai). Ash content was determined in a muffle furnace

Fig. 1 Mayonnaise

Fig. 2. Chicken Meat Spread

(HF-electric furnace, Hindustan Furnace, Thrissur, Kerala).

Physicochemical characteristics

The pH of the meat spread was determined using a digital pH meter according to AOAC (2016). Water activity was measured as per the procedure of Carbonell *et al.* (2005) with the help of a water activity meter (Lab Swift, Novasina, Switzerland).

Sensory attributes

Sensory evaluation of the meat spread was carried out by semi-trained panel consisting of seven panellists drawn from the Department of Livestock Products Technology, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, using an eight-point Hedonic score card according to Biswas *et al*. (2013).

Results and discussion

Physicochemical characteristics and proximate composition

The effect of different levels of mayonnaise and spent chicken on the physicochemical and proximate composition in the chicken meat spread is presented in Table 2. The level T_4 had significantly ($p<0.001$) higher values for pH when compared to T_1, T_2 and T_3. Treatment T_1 had significantly ($p<0.001$) lower pH values compared to other samples. There was significant increase in pH values from T_1 to T_4. The decreased pH values for T_1 may be attributed to the increased proportion of mayonnaise with added ingredients, Glucono-delta lactone (GDL) and vinegar. This was in accordance with Chang *et al*. (2009) who reported that GDL, a weak acid, converts to gluconic acid in water and dissociates slowly into hydrogen ions. Anamaria (2019) reported that vinegar contributes to low pH and antimicrobial preservation in mayonnaise. Jafari and Emam-Djomeh (2007) observed reduction of pH from 5.8 – 5.4 in hot dogs by the addition of 0.3 per cent GDL.

The treatment level T_1 had significantly lowest water activity compared to other samples. This may be related to the increased proportion of added mayonnaise which in turn contributes to the increased levels of glycerol in the treatment T_1. This can also be related to the decreased proportion of spent chicken meat in the treatment T_1. Singh *et al*. (2014**)** also noted significant reduction in water activity in glycerol added chicken lollipop compared with the control lollipop. Fluhr *et al*. (2005) reported that

Table 1. Formulation of mayonnaise

Ingredients	Level of inclusion (%)
Egg albumen	40.00
Sunflower oil	45.22
Chilli flakes	0.42
Dried ginger	0.42
Garlic	0.82
Salt	0.78
Sugar	0.08
Glycerol	2.55
Gelatin	0.85
Glucono-delta-lactone (GDL)	0.34
Tomato sauce	4.26
Apple cider vinegar	4.26

Table 2. Effect of different levels of mayonnaise and spent chicken on the physicochemical and proximate composition in the chicken meat spread

Parameters	T_1	T_2	T_3	T_4	F value (p value)
pH	5.45 ± 0.004^{d}	5.62 ± 0.008^{c}	5.76 ± 0.003^{b}	5.84 ± 0.031^{a}	928.421** (<0.001)
Water activity ($a_{w)}$	0.969 ± 0.002^{b}	0.980 ± 0.001^{a}	0.984 ± 0.001^{a}	0.985 ± 0.009^{a}	25.337** (<0.001)
Moisture (%)	50.26 ± 0.266^{d}	52.01± 0.28^{c}	53.62 ± 0.25^{b}	55.54 ± 0.35^{a}	59.433** (<0.001)
Fat (%)	44.41± 0.34^{a}	39.72 ± 0.31^{b}	36.02 ± 0.22^{c}	32.96 ± 0.39^{d}	232.797** (<0.001)
Protein (%)	16.04 ± 0.49^{c}	22.00 ± 0.33^{b}	22.81 ± 1.09^{b}	25.65 ± 1.26^{a}	105.799** (<0.001)
Ash (%)	2.65 ± 0.05^{b}	3.11 ± 0.22^{b}	3.64 ± 0.17^{a}	3.73 ± 0.12^{a}	10.174** (<0.001)
Calories (kcal/100 g)	304.11 ± 1.93^{a}	281.26 ± 1.39^{b}	262.24 ± 1.29^{c}	244.45 ± 1.27^{d}	291.945 (<0.001)**

The values are expressed as Mean ± Standard error. Means with same superscript in a row does not differ significantly.

T_1- meat spread with 70 % mayonnaise and 30 % chicken

T_2- meat spread with 60% mayonnaise and 40 % chicken

T_3- meat spread with 50 % mayonnaise and 50 % chicken

T_4- meat spread with 40 % mayonnaise and 60 % chicken

** Significant at 1 % level, (No. of observations = 6)

Table 3. Effect of different levels of mayonnaise and spent chicken on the sensory attributes of chicken meat spread

Attributes	T_1	T_2	T_3	T_4	χ^2- value (p- value)
Appearance and colour	7.11 ± 0.07^{a}	7.19 ± 0.07^{a}	6.74 ± 0.11^{b}	6.11 ± 0.13^{c}	49.55** (<0.001)
Flavour	6.55 ± 0.09^{b}	7.11 ± 0.05^{a}	6.85 ± .09^{a}	6.28 ± 0.13^{b}	24.787** (<0.001)
Spreadability	7.12 ± 0.06^{a}	7.08 ± 0.05^{a}	6.35 ± 0.09^{b}	5.52 ± 0.12^{c}	96.998** (<0.001)
Mouth coating	6.71 ± 0.07^{b}	7.14 ± 0.06^{a}	6.87 ± 0.08^{b}	6.32 ± 0.11^{c}	33.965** (<0.001)
After taste	6.72 ± 0.09^{b}	7.13 ± 0.05^{a}	6.92 ± 0.09^{ab}	6.11 ± 0.14^{c}	36.611** (<0.001)
Overall acceptability	6.63 ± 0.07^{b}	7.39 ± 0.06^{a}	6.82 ± 0.09^{b}	6.21 ± 0.13^{c}	53.469** (<0.001)

Based on eight point hedonic scale (1= extremely undesirable, 8 = extremely desirable)

** - significant at 1 % level; (No. of observations = 48)

Means with same superscript in a row does not differ significantly

The values are expressed as Mean ± Standard error.

T_1- meat spread with 70 % mayonnaise and 30 % chicken

T_2- meat spread with 60 % mayonnaise and 40 % chicken

T_3- meat spread with 50 % mayonnaise and 50 % chicken

T_4 – meat spread with 40 % mayonnaise and 60 % chicken

glycerol is one of the most effective humectant polyols and the moisturisation effect of glycerol is attributed to the capability of its hydroxyl groups to attach and retain water. This was also in accordance with Pavan (2019), who observed increase in water activity values with increase in proportion of chicken in the chicken noodles when compared with control noodles.

The level T_4 (40 per cent mayonnaise and 60 per cent spent chicken meat) had significantly ($p<0.001$) higher moisture per cent among the four treatments and T_1 scored significantly lower values for moisture per cent than the four treatments. Moisture, protein and ash content increased with increase in level of the added chicken meat. Verma *et al*. (2012) also noted a similar increase in moisture, protein and ash content with increase in level of chicken meat in the developed chicken noodles. This was also in accordance with Sharma and Nanda (2002) who observed higher moisture percentage in the chicken chips with higher meat incorporation.

Fat percent had significantly ($p<0.001$) highest value for T_1 (70 per cent mayonnaise) and significantly lowest values for T_4 (40 per cent mayonnaise) when compared to other treatments. The higher fat per cent of T_1 can be attributed to the increase proportion of mayonnaise in the developed combination which in turn is attributed to the increased content of sunflower oil. Similar results were observed by Fernandes and Mellado (2018) who observed lower fat content in the developed mayonnaise with the substitution of oil with chia mucilage.

The total calories (Kcal/100 g) of T_1, T_2, T_3 and T_4 were 304.11 ± 1.93, 281.26 ± 1.39, 262.24 ± 1.29, 244.45 ± 1.27 respectively. T_1 had significantly ($p<0.001$) higher calorie value when compared to other treatments and T_4 had the significantly ($p<0.001$) lowest value among the four treatments. There was significant ($p<0.001$) difference between all the four treatments with respect to total calories. The increase in calorie content with the higher level of mayonnaise incorporation can be attributed to the increase in fat content that contributes most to the calorific value.

Sensory attributes

The effect of different levels of mayonnaise and spent chicken on the sensory attributes of chicken meat spread is depicted in Table 3. Treatment T_4 showed significantly lowest values for appearance and colour scores. The decrease in appearance and colour scores for T_4 may be due to the increase in amount of added spent chicken meat. As the addition of spent hen meat to mayonnaise increases, the colour and appearance values were decreased. This might be due to the coarser texture of the spent hen meat. Similar works were done by Shiby *et al*. (2016) who observed that substitution of mayonnaise with increasing levels of avocado pulp lowered the colour and the appearance values.

Similarly, the lowest values for flavour, after taste, spreadability, mouth coating and overall acceptability attributes were noticed for the treatment T_4, with 60 per cent of spent chicken meat. This can be related to the coarser texture and chewy nature of the spent hen meat.

Lower spread ability of T_4 can be related to the increased proportion of the spent hen meat to the mayonnaise. Flammini *et al*. (2020) also observed lower spread ability when the mayonnaise was incorporated with increased amount of olive leaf extract. T_2 scored higher values for all the sensory attributes except spreadability and significantly higher values ($p<0.001$) for mouth coating, aftertaste and overall acceptability when compared between each other.

Conclusion

The treatment with 40 per cent meat and 60 per cent mayonnaise had higher sensory scores for flavour, after taste, mouth coating and overall acceptability. Hence meat spread, developed with 60 per cent mayonnaise and 40 per cent spent chicken, which had significantly ($p<0.001$) higher overall acceptability scores was selected as the best product considering the sensory attributes, physicochemical properties. The result revealed that mayonnaise could be successfully incorporated in the preparation of chicken meat spread with better spreadability and sensory acceptability.

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Conflict of interest

The authors declare that they have no conflict of interest.

References

Anamaria, M. 2019. The influence of different factors on the quality of mayonnaise. *Annals of the University of Oradea, Fasicle: Ecotoxicology, Animal Husbandry and Food Science and Technology.* pp. 75-83.

AOAC. 2016. Meat and meat products. *Official methods of analysis of official analytical chemists.* (20th Ed.). AOAC, Rockville, International, Maryland, USA.

Biswas, A.K., Beura, C.K., Sachdev, A.K. and Arya, B. 2013. Standardization of meat level and combination of turkey and spent hen meat for the development of shelf-stable meat wafer. *Indian J. Poult. Sci*. **48**: 318-322.

Carbonell, L.A., Lopez, J.F., Perez-Alvarez, J.A. and Kuri, V. 2005. Characteristics of beef burger as influenced by various types of lemon albedo. *Innov. Food. Sci. Emerg*. *Technol.* **6**: 247-255.

Chang, Y.H., Su, H.J. and Shiau, S.Y. 2009. Rheological and textural characteristics of black soybean touhua (soft soybean curd) prepared with glucono-δ-lactone. *Food Chem.* **115**: 585-591.

Department of Animal Husbandry and Dairying. 2019. Basic Animal Husbandry and Fisheries Statistics. Ministry of Agriculture, Government of India. Available:*http://dahd.nic.in/about-us/divisions/statistics/BAHS(Basic AnimalHusbandryStatistics-2019.pdf* [27th December 2019].

Depree, J.A. and Savage, G.P. 2001. Physical and flavour stability of mayonnaise. *Trends Food Sci. Technol.* **12**: 157-163.

Fernandes, S.S. and Mellado, M.D. 2018. Development of mayonnaise with substitution of oil or egg yolk by the addition of chia mucilage. *J. Food Sci*. **83**(1): 74-83.

Flamminii, F., Di Mattia, C.D., Sacchetti, G., Neri, L., Mastrocola, D. and Pittia, P. 2020. Physical and Sensory Properties of Mayonnaise Enriched with Encapsulated Olive Leaf Phenolic Extracts. *Foods.* **9**: 997.

Fluhr, J.W., Bornkessel, A. and Berardesca, E. 2005. Glycerol–just a moisturizer? Biological and biophysical effects. *Dry Skin and Moisturizer. London, CRC Taylor & Francis*, pp.227-244.

Jafari, M. and Emam-Djomeh, Z. 2007. Reducing nitrite content in hot dogs by hurdle technology. *Food Control*. **18**: 1488-1493.

Kondaiah, N. and Panda, B. 1992. Processing and utilization of spent hens. *Worlds Poult. Sci. J.* **48**: 255-268.

Murugan, M. and Narayanankutty, K. 2002. Quality studies on tenderized spent chicken meat pickle. *J. Vet. Anim. Sci*. **33**: 74-77.

Pavan, M. 2019. Development and Evaluation of Functional Chicken Noodles. *Doctoral Thesis,* Kerala Veterinary and Animal Sciences University, Pookode, 151p.

Poobal, P., Vasudevan, V.N., Kuttinarayanan, P., Sathu, T. and Menon, K.V. 2017. Development of spent chicken meat spread incorporating poultry liver. *J. Vet. Anim. Sci.* **48**(2): 20-24.

Sharma, B.D., and Nanda, P.K. 2002. Studies on the development and storage stability of chicken chips. *Indian J. Poult. Sci*. **37**: 155- 158.

Shiby, V.K., Samyukta, S. and Pandey, M.C. 2016. Development of a low cost mayonnaise product containing avocado pulp. *Int. J. Curr. Res.* **8**: 35543-35551.

Singh, V.P., Vikas, P., Nayak, N.K. and Goswami M. 2014. Application of hurdle concept in development and shelf life enhancement of chicken lollipop. *Int. J. Curr*. *Microbiol. Appl. Sci*. **3**: 355-361.

Verma, S.K., Zanjad, P.N., Biswas, S., Kumar, P. and Kumari, B. 2012. Effect of addition of sodium caseinate, whole egg powder on the quality of chicken sausage made with poultry by-products. *J. Anim. Res.* **2**(3): 271-284. ■