DEVELOPMENT OF SPENT CHICKEN MEAT SPREAD INCORPORATING POULTRY LIVER

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Abstract

The present study was carried out to develop spent chicken meat spread incorporating edible poultry offal. Three different treatments were carried out with 5 (T_1), 10 (T_2) and 15 (T_3) per cent incorporation of chicken liver along with cooked cured spent chicken meat and other non-meat ingredients. The optimum level of incorporation of liver was determined by sensory evaluation of the fresh product. Chicken meat spread incorporated with 5 per cent chicken liver (T_1) had significantly higher overall acceptability score than that of T2 and T3. Moreover, T1 had the highest appearance, flavour, spreadability, aftertaste and adhesive ability scores among the three treatment groups. The current study has standardized the development of a spent chicken meat spread with five per cent added chicken liver which had desirable sensory attributes. Further studies are needed to assess the composition and shelf life of the developed product.

Key words: *Spent chicken, meat spread, poultry offal, chicken liver*

Currently, the poultry meat production in our country is estimated to be 2.69 million metric tons (DAHD, 2015). About 70 per cent of the poultry meat produced is from broilers and the rest is from hens, ducks and turkeys (NMPPB, 2013). Thus, the meat from spent birds contributes substantially to the poultry meat production. The meat from these birds is considered to be of low quality because of its age and related less desirable palatability attributes and therefore sold at a lower market price. Meat spread is a convenience meat product that can be used as a sandwich spread.

Most of the spreadable meat products fall into the categories of spreadable raw fermented sausages, liver sausages and liver pates. Spreadable products like cheese spread and mayonnaise form a large component of the

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present market. The literature shows very limited studies on the utilization of spent chicken and its offal in spreads. Hence, the present study was conducted with the objective of standardisation of formulation of spent chicken meat spread incorporating wholesome poultry liver.

Materials and Methods

The formulations of the product containing different levels of chicken liver are presented in Table 1. Spent chicken of 2.5 to 3.0 kg live body weight and 72-80 weeks old (Rhode Island Red male) were procured from All India Co-ordinated Research Project on Poultry (AICRP) for Eggs, Mannuthy, and they were humanely slaughtered and dressed under hygienic conditions at Meat Technology Unit, Mannuthy**.** Deboned spent chicken meat was minced through 9 mm grinder plate in a meat mincer (MADO primus Model MEW 613, Germany). The ground chicken meat was then pre-blended with 2 per cent salt and 150 ppm sodium nitrite and kept under refrigeration for about 12 hours and was then cooked by pressure cooking for 40 - 45 minutes. Gelatin and skim milk powder were dissolved in warm water and the solution was blended with melted chicken fat and washed raw chicken liver for about three minutes in a domestic mixer (Preethi, India). This separately prepared blend of chicken fat and liver in gelatin solution was then mixed with cured, cooked and minced chicken meat, spices and condiments, and blended into a paste like consistency for about six to eight minutes in the mixer. About 500 to 550 g batter was taken in stainless steel boxes under hygienic conditions and pressure cooked for 10-15 min to get the chicken meat spread. The products were cooled and packed in food grade Polyethylene Terephthalate (PET) jars (Durapet, India) and stored at refrigeration temperature (4±1°C) for evaluating the shelf life. The products were evaluated for sensory quality (Keeton, 1983) on the day of preparation and the optimum level of incorporation of liver was standardized.

Results and Discussion

The results of sensory evaluation of different product formulations are presented in Table 2

Appearance

The sensory appearance score of the formulation with 15 per cent added chicken liver (T3) was significantly lower than control and T_1. Lingaiah and Reddy (2001) also reported significantly lower sensory colour scores for chicken meat patties containing 12 to 14 per cent added giblets. They attributed this to the dark brown colour of the giblets. On the other

Table 1. Formulations for the development of spent chicken meat spread with different levels of added liver

Ingredients	Control (%)	T_1 (%)	T2 (%)	T3 (%)
Spent chicken meat	42.5	37.5	32.5	27.5
Skimmed milk powder	2.9	2.9	2.9	2.9
Chicken fat	13.4	13.4	13.4	13.4
Chicken liver	0	5	10	15
Gelatin	2.2	2.2	2.2	2.2
Condiments	5.4	5.4	5.4	5.4
Spice mix	2.4	2.4	2.4	2.4
Salt	2.0	2.0	2.0	2.0
Water	29.3	29.3	29.3	29.3
Sodium nitrite	150 ppm	150 ppm	150 ppm	150 ppm

Table 2. Sensory quality of spent chicken meat spread incorporated with different levels of chicken liver

Parameters	Control	Treatments		
		T1	T2	T3
Appearance	6.87±0.13[a]	6.82±0.11[a]	6.55±0.13[ab]	6.40±0.17[b]
Flavour	6.75 ±0.13[a]	6.62± 0.14[ab]	6.31±0.11[b]	6.27 ±0.13[b]
Spreadability	5.76±0.13[b]	6.41 ±0.11[a]	6.36 ±0.10[a]	6.30±0.12[a]
Texture	6.46±0.17	6.46±0.6	6.50±0.14	6.33±0.13
After taste	6.37±0.17[a]	6.35±0.15[a]	6.16±0.10[ab]	5.83±0.17[b]
Adhesiveability	6.38±0.21	6.60±0.13	6.38±0.19	6.21±0.21
Overall acceptability	6.59±0.14[ab]	6.76±0.14[a]	6.34±0.10[b]	6.33±0.14[b]

[#]Mean ± S.E. with different superscripts in a row differ significantly (P<0.05). n =36, T_1= 5 per cent chicken liver; T_2= 10 per cent chicken liver; T_3= 15 per cent chicken liver. Sensory scores based on 8-point descriptive scale where 1: extremely undesirable and 8: extremely desirable

hand, Rao *et al.* (2011) reported higher mean colour scores for chicken sausages added with 10 per cent edible poultry offal.

Flavour

At 5 per cent level of addition of liver (T1), the flavour score did not differ significantly from that of the control sample. The flavour scores of T_2 and T_3 were significantly lower than control meat spread. This is in agreement with the observations of Lingaiah and Reddy (2001), who reported decreased flavour scores for chicken meat patties containing added giblets. Tirloni *et al.* (2016) also stated that the flavour of liver mortadella was more or less intense depending on the level of liver incorporation. Product had a peculiar smell, with a very strong aroma, in a recipe containing 25 per cent pork liver, which influenced the acceptability of the product in the fresh stage itself.

Spreadability

At all the three levels of incorporation of liver, there was a significant increase in the spreadability of the meat spreads when compared to the control. The highest spreadability score of 6.44±0.11was observed for T_1. The significantly higher spreadability score observed for the three treatments is due to the incorporation of liver in the formulation. Feiner (2006) stated that solubilised liver proteins act as a natural emulsifier along with gelatine derived from meat collagen during thermal treatment. On application of pressure during spreading on to bread, this brittle protein matrix breaks, giving the product good spreadability.

The spreadability did not differ significantly between T1, T2 and T3. The numerical differences in spreadability scores between the treatments could be due to a possible minor reduction in the fat content as liver was incorporated by replacing corresponding proportions of precooked spent chicken meat. Feiner (2006) has also stated that the level of fat in spreadable liver sausages influences the texture and spreadability to a large extent.

Texture

The texture score showed no significant differences between control and all the three treatment groups. This could be due to similar proportions of fat added to the control and treatment groups. Estevez *et al.* (2005), while examining liver pates with different fat content, observed pates to be softer in the presence of higher amounts of fat. With respect to the effect of fat on texture of meats and meat products, it is generally assumed that larger contents of fat are related to less firm and more juicy products (Hughes *et al.,* 1998).

Aftertaste

The aftertaste scores of control, T_1, T_2 and T_3 chicken meat spread samples were 6.37±0.17, 6.35±0.15,6.16±0.10 and 5.83±0.17, respectively. Among the treatment groups, the lowest aftertaste score was reported for T3, which was significantly lower (less desirable) as compared to that of control, T1 and T2. This could be due to the higher liver content in T3, which could be due to the more intense odour and aroma associated with incorporation of higher proportions of liver, as reported by Tirloni *et al.* (2016).

Adhesive ability

The adhesive ability scores of control, T_1, T_2 and T_3 did not differ significantly between all the four groups. Adhesiveness represents the force required to overcome the forces between the surface of food and other materials on which the food comes in contact (Pereira *et al.,* 2011). Jokanovic *et al.* (2014) found no significant influence for added offal on the adhesiveness of experimental sausages.

Overall acceptability

T1 had the highest overall acceptability score which differed significantly from T2 and T3, though there was no significant difference as compared to the control. The overall acceptability score was in the range as reported by Lingaiah and Reddy (2001) for chicken meat patties.

Rao *et al*. (2011) reported highest overall acceptability scores for chicken sausages incorporated with 10 per cent edible offal including heart, liver and gizzard. Kumar *et al*. (2015) reported slightly higher overall acceptability scores for spent chicken meat spreads in which no offal was incorporated.

Thus, T1 (five per cent added liver) had significantly higher overall acceptability score than that of T2 and T3. Moreover, T1 had the highest appearance, flavour, spreadability, aftertaste and adhesive ability scores among the three treatment groups.

The current study has standardized the development of a spent chicken meat spread with five per cent added chicken liver which had desirable sensory attributes. Further studies are needed to assess the composition and shelf life of the developed product.

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