International Food Research Journal 23(3): 1131-1135 (2016)
Journal homepage: *http://www.ifrj.upm.edu.my*

The effect of the fat percentage and liver type in the stability and pH value of locally prepared Liver pate

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Article history

Received: 19 June 2015
Received in revised form: 19 August 2015
Accepted: 12 October 2015

Keywords

Liver Pate
Stability value
pH value

Abstract

The aim of this investigation is to Study of the effect of the fat percentage and liver type in the stability value and pH of locally prepared Liver pate. Twelve pate mixtures with three types of livers (sheep, chicken and calf) and different concentrations of fat and water (30/20%, 35/15% and 40/10%) were prepared. The results showed there wasn't significant difference when adding the calf liver and chicken liver for stability value. The stability value decreased when using the sheep liver (35.21±1.24), but the lowest value was found when using (calf, sheep and chicken) liver (27.76±0.54) with 40/10% f/w. The top value of pH was (5.18±0.03), that when adding chicken liver with 30/20% f/w. Overall, the fat percentage and liver type effect in the stability and pH value.

Introduction

The liver pate is cooked traditionally desirable product by consumers in Europe (Santos *et al.*, 2003; Estevèz *et al*., 2005), which has good taste and sensory qualities,and consumed in many countries (Echarte *et al*., 2004; Vossen *et al*., 2012). Many studies conducted manufacturing methods of Liver pate of different types of animals liver, example pig liver (Dàrrigo *et al.*, 2004; Estevèz *et al*., 2007), liver ostrich (Fernédez *et al*., 2004), duck liver (Abu-salem and Abu-Arab, 2010), fish liver (Aquerreta *et al*., 2002), chicken liver (Polak *et al.*, 2011), and goat liver (Dalmàs *et al*., 2011). The Liver pate is unreal emulsion, which quality linked to good mixing of fat, water and soluble protein (Sarantopoulos *et al*.,1990). The liver which used in the preparation of liver pate mainly were getting from cows, sheep, pigs and poultry (Oswald, 2011). In general, minced meat industry depends on the viability of the meat to form an emulsion the presence of water, fat and other compounds such as starch without separation of fat for the rest of the ingredients (Mc Clements, 2005). Gregg *et al*. (1993) explained that the total fat and water in the sausage must be 40% at least to achieve the stability of the emulsion, and should increase amount of water when you decrease amount of fat to achieve these ratio, Claus *et al.* (1990) pointed to reduce amount of fat in meat products led to an increase hardness and consistency, this problem is solved by increase amount of added water. However the products with few content of fat and high content of water associated with problems in textures by displacement of water from the product during storage of non-thermally treated products (Claus *et al*., 1990). Jiménez *et al.* (2010) explained that fat plays an important role in the quality characteristics of the emulsion meat products, which mainly affects on the texture, mouth feel and ability to extend of the product, Atughonu *et al*. (1998) indicated to reduce the percentage of fat in the emulsion meat products up to 20% resulting bad texture, unacceptable flavor and loss of juiciness. Jiménez (2000) explained that the reduce of fat content or replaced by fat with high unsaturated fatty acids contain in meat products where the fat one of the basic components such as frankovrtr, sausages and liver pate may affect on the sensory and technical characteristics of the product and increases the risk of oxidation in these products. When the pork fat was replaced by olive oil in the liver pate, led to increase unsaturated fatty acids ratio, and reduction of the saturated fatty acids ratio, but it has a negative impact on emulsion stability and sensory characteristics of the product (Martin *et al*., 2008). The pH value is an important factor during the emulsification process, and affect on the functional and physic-chemical properties of the emulsion, when the pH value away from the draw electric point increase shipment proteins, which increases the effect of proteins during the emulsification process

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Table 1. The percentage of used raw materials in the preparation of liver pate mixtures

mixtures	raw materials g/100g of mixture						
	calf liver	Sheep liver	Chicken liver	Chicken skin	Chicken meat	Sheep fat	water
1	30	-	-	5	10	40	10
2	30	-	-	5	10	35	15
3	30	-		5	10	30	20
4	-	30	-	5	10	40	10
5	-	30	-	5	10	35	15
6	-	30	-	5	10	30	20
7	-		30	5	10	40	10
8	-		30	5	10	35	15
9	-		30	5	10	30	20
10	10	10	10	5	10	40	10
11	10	10	10	5	10	35	15
12	10	10	10	5	10	30	20

(Feiner, 2006). Zobra and Kurt (2006) explained that the values of pH, protein and emulsifying ability and stability of emulsion less in beef meat compared with chicken meat, and the chicken meat led to raise the pH value and improve the qualities of the emulsion and form gels compared with beef meat, when added quantity of beef meat to the emulsion was increased led to reduced protein concentration and pH value, while the added quantity of chicken meat was increased, led to raise of the pH value. The addition of beef meat to the emulsion led to reduce the emulsifying ability, the reason for this may the low pH value, when the pH value was decreased to draw electrical point solubility of proteins decreased (Zorba, 1995), also can be caused by the high content of connective tissues in beef meat. Smith (1988) showed that the effect of the devaluation of the pH value the most important role in emulsion stability compared with protein concentration. So the goal of research is to study the effect of liver type and the proportion of fat in the pH value and stability of locally prepared Liver pate.

Materials and Methods

Preparation of Liver pate mixtures from different types of liver

Twelve liver pate mixtures from three types of the liver (calf, sheep and chicken) (Table1) Prepared according to the following: Livers and sheep fat chopped in the cutter (Meissner Machine, Wallan, Germany) speed of 300 rpm For 7 minutes with added of: 2% salt, 2% soy protein, 1% Pate spices and 0.1% sodium pyrophosphate, the mixtures put in metal cans 200 g and heated at 75-80°C. the cans closed and Sterilized at 121°C/50 min, then cooled and stored.

Measuring the stability value

The stability value of the emulsion was measured according to (Choi *et al*., 2009) by taking 25 g of each mixture in tubes, then placed the tubes in a water bath 80°C for 30 minutes, with constant stirring, and then centrifugation for 20 minutes at speed of 4500 r/min. After the separation of watery and fatty phases from each other had been reading the size of each of them, The stability value estimated according to the following:

stability value = Water (ml) + fat (ml)/ sample weight (g) *100

Measuring the pH value

The pH value was measured pH METER (Inolab 720,Germany) by Weight 10 g of the liver pate mixture and mix well with 100 ml of distilled water.

Statistical analysis

Statistical analysis was using test General liner model at a confidence level of 5% using the statistical program SPSS 17.

Results and Discussion

Effect the liver's type in liver pate's stability value(the mixtures 1,4,7 and 10)

The results of the study showed that the stability value of liver pate was effected by the type of liver(Table2). There wasn't significant difference when adding the calf liver and chicken liver for stability value, it was 37.48±1.80 and 37.85±1.03,respectively. The stability value decreased when using the sheep liver (35.21 ± 1.24), while the lowest value was found when using three liver types (calf, sheep and chicken) liver 27.76±0.54, (Karakaya *et al.*, 2006) reported that the stability value and the ability to link the water of the lamb meat was higher than the calf meat, and (Karakaya, 1990) reported that the stability value of calf meat was higher than chicken meat.

Table 2. Effect of The different percentages of f/w in stability value of the liver pate

mixtures	Water (ml)	Fat (ml)	Weight (g)	stability value
1	[a]5.55±0.52	[a]3.83±0.12	25	[a]37.48±1.80
2	[a]5.00±0.13	[a]3.79±0.08	25	[b]35.16±0.57
3	[a]5.53±0.41	[b]2.36±0.16	25	[c]31.56±1.03
4	[a]6.20±0.30	[a]2.62±0.07	25	[a]35.21±1.24
5	[a]6.84±0.22	[a]2.37±0.13	25	[b]36.83±0.42
6	[b]7.07±0.08	[a]2.67±0.12	25	[c]38.96±0.77
7	[a]5.33±0.19	[a]4.13±0.11	25	[a]37.85±1.03
8	[b]4.53±0.31	[a]4.55±0.08	25	[b]36.33±0.17
9	[a]5.32±0.21	[b]3.10±0.19	25	[c]34.56±0.41
10	[a]4.33±0.18	[a]2.60±0.05	25	[a]27.76±0.54
11	[b]5.70±0.22	[a]2.88±0.12	25	[b]34.31±0.55
12	[a]4.69±0.13	[a]2.73±0.13	25	[c]29.71±0.96

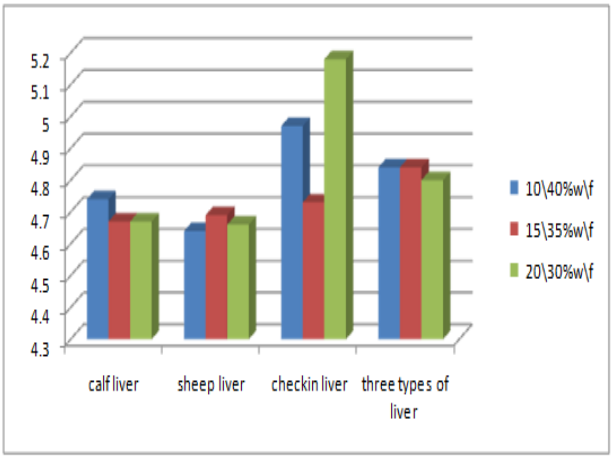

Figure 1. Effect of the liver type and the percentage of fat/ water in the pH value of liver pate

Effect of The different percentages of f/w in liver pate's stability value

The results showed that the stability value of calf liver pate (the mixtures 1, 2 and 3) decreased when the added fat and water percentage increased (Table 2), it was 37.48±1.80, 35.16±0.57 and 31.56±1.03 with 40/10%, 35/15% and 30/20%fat / water. That was also Compatible with (Morrison *et al*., 1971), but when added Sheep liver (the mixtures 4, 5 and 6) the stability value increased when the fat percentage decreased and the water percentage increased (Table 2). The stability value was the lowest by adding 40/10% f/w (35.21±1.24), while was the highest value with 30/20% f/w (38.96±0.77). Wajdzik (1989) explained that the increasing of fat content from 20% to 40% lead to decrease the emulsion stability value. The stability value decreased when the percentage of fat was decreased and the percentage of water was increased in the Chicken liver pate (the mixtures 7,8 and 9)(Table2), it was 37.85±1.03, 36.33±0.17 and 34.56±0.41 with 40/10%, 35/15% and 30/20% fat / water. Morrison *et al*. (1971) explained that the added percentage of water to emulsified meat products should be between 16-20% of the emulsion weight, in order to achieve higher stability, when the percentage of water was under 16% of the total weight of the emulsion leads that resulted to decrease the stability value. With three type of liver (sheep, chicken and calf) (the mixtures 10,11and12) the results showed that the stability value decreased by adding 40/10% f/w (27.76±0.54), it was the lowest stability value (the top stability) for all prepared mixtures. That consistent with Wajdzik (1989) that the increasing of fat content from 20% to 40% lead to decrease the emulsion stability value. The stability value increased by adding 35/15% f/w (34.31±0.55), but it decreased again by adding 30/20% f/w (29.71±0.96) (Table 2).

Effect of liver type and percentage of fat/water in the pH value of liver pate

The results showed differences in the pH values according to the liver type and percentage of fat/ water(Figure 1). When adding 40/10% f/w, the highest pH value was found when used chicken liver, it was 4.97±0.005. The pH values ranged between 4.64 when adding calf liver, and 4.84± 0.005 when adding (sheep, chicken and calf) liver with 35/15% f/w. The top value of pH for all prepared mixtures was 5.18±0.03, that when adding 30/20% f/w and chicken liver. Notes from the previous results that the addition of chicken liver led to increase the pH value of the liver pate (Zobra and Kurt, 2006) showed that the pH value when adding chicken meat to liver pate was greater than The pH of the beef meat.

Conclusions

The lowest value for the stability value of liver pate (highest stability) was (27.76±0.54), that when adding three types of liver (calf, sheep and chicken)

liver with 40/10 % f/w, while the highest stability value (lowest stability) was when using sheep liver with 30/20%f/w. The addition of chicken liver led to increase the pH value of the liver pate, it was the top of the other liver types. According to results, it is advisable to prepare Liver pate with the three liver types, and 40/10% fat/water, it led to a lower value for the stability value (higher stability).

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