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The effect of the addition of vegetable oils in the mass and energy efficiency of meat derived product, low in saturated fat from buffalo meat (Bubalus Bubalus)

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Abstract

The food industry has been designing products with unsaturated fats and is now processing turkey with sunflower oil, sausages with soybean oil and hams enriched with omega 3, which result in a new consumer culture [1]. The buffalo meat is important in this trend, because of its nature, of low fat (± 1%) and high in protein (± 23%), making it nutritionally and technologically appreciated by consumers and industry [2]. For the development of sausage, selected for their high consumption in the country, working with buffalo meat and soybean oil 5% (F1), 10% (F2) and 15% (F3), for a total of three formulations, seeking the best performance in mass and in energy. Get the mass yield and the energy consumption in each of the formulations, is an essential part of the investigation. After standardizing the design and the process of development, we proceeded to determine the mass balance of the product. The overall balance shows that although the efficiency is relatively small each individually formulation has a good performance and efficiency, including the Shaper with losses ranging between 16 and 18%. The drying and blanching have similar yields. F2 is found to have the better results. To establish the energy requirements of the product the principle of conservation of energy was applied, considering that the process is a solid phase intermittent the equation would be Q = m.ΔH = m.Cp.ΔT. To calculate energy inputs or outputs of the process Cp is calculated for an average humidity of 61%, resulting in an average value of Cp = 3.2075 kJ / kg * ° C, the energy lost in the formulations is 27.96 KJ ± 1.01, which on average is 7%. To optimize the cooking time is used the thermal physical properties of water to calculate dimensionless numbers, the properties of water and factors referred to in the physical and thermal properties, we calculated the numbers Gr, Nu, and the value h. After developing the transient equations for determining the optimal blanching time, the new time of 71 minutes was comparable value with the experimental time of 70 minutes.

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Keywords: buffalo meat; mass and energy efficiency; energy consumption; optimize the cooking time

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1. Introduction

It is common to find the heat transfer in many aspects of life and intimately linked to the Food Engineering through heating, blanching or cooking of food. Some examples are related with the domain of electrical appliances or use of gas: conditioning systems, refrigerators, mixers, meat mincers, stoves, all needed in the elaboration of meat products. [3]. Heat is not only involved in equipment used for food processing, is also studied its transference through the food, and also the geometry shape and the liquid. The mechanism of heat transfer applied for meat products processing are heat conduction for the transitory state and natural convection.

2. Materials and Methods

For the development of sausage, were selected for their high consumption in Colombia, buffalo meat and soybean oil 5% (F1), 10% (F2) and 15% (F3), for a total of three formulations, seeking the best performance in mass and in energy. Get the mass yield and the energy consumption in each of the formulations, is an essential part of the investigation. After standardizing the design and the process of development, was determined the mass balance of the product. It was taken 2 kg as the base for calculation.

The specific heat Cp of the product was obtained with the equation for meat products with humidity between 26 and 100%: Cp = 1.675 w 0025 [4]. To calculate the heat interaction in the process, specific heat is calculated using that formula, the humidity of the product was 61.3% , resulting in an average value of Cp = 3.2075 kJ / kg * ° C.

3. Results and Discussion

The results of mass balance in each operation for each formulation is shown in the Table 1.

Table 1. Mass balance results sample 1, Soya oil

Process	F 1al 15%	F2 al 10%	F3 al 5%
Emulsified	2071.4g	2071.4g	2071.4g
Stuffing	1984.0g	1985,0g	1982.0g
Blanching	1637.8g	1674.0g	1625,4g
Drying	1581.9g	1618.2g	1581.2g
Cooling	1557.1g	1594.1g	1555,0g
Total loss	514.3g	477.4g	516.4g
Efficiency	75.2%	77.0%	75.0%

The entry of raw materials with additives is constant for each formulation, in each case reduces the amount of oil, but increases the meat in the same proportion; other materials are in the same amount. The best efficiency could be observed in F2, with the smallest losses but in reality the result is uncertain because it depends essentially on the local management and the operators when is time to remove the emulsified mixture and stuffing. The global efficiency is relatively low, including the stuffer loss (around 16 and 18%). Drying and blanching have very similar yields. It proves once more that the F2 process presents the best results. The Table 2 shows the results of energy balance in each of the formulations.