Chapter 179

Dripping Test analysis of water loss of frozen chicken carcasses in Rio Branco – AC

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ABSTRACT
In 2019, Brazil reached its highest level of production in tons of chicken meat, reaching the mark of 13.245 tons, and registered third place in the world market for chicken meat. In a position of such importance, it is increasingly necessary to standardize and refine the quality of meat and product offered. This project aimed to raise discussion and carry out an analysis of possible frauds regarding the loss of water in chicken carcasses frozen by dripping test, a process that aims to determine whether the meat absorbed excess water during the industrial process, if the carcasses pass the percentage of 6%, allowed by the legislation and by the Ministry of Agriculture, Livestock and Supply (MAPA), they do not follow what is proposed by the legislation. Eighteen samples of frozen chicken carcasses of three different brands were collected. The results obtained through this study indicate that better inspection and control by the Ministry of Agriculture, Livestock and Supply (MAPA) and the agencies responsible for the carcass cooling stage is necessary, given that one of the three brands analyzed was not under what is recommended by the legislation, being subject to notification and fine.

Keywords: Fraud, legislation, meat quality, water absorption.

1 INTRODUCTION

As a result of interventions and technological advances, Brazilian poultry farming has shown great development, consequently increasing its productivity and export gains. This result is achieved through the quality of the product that is offered, from the production process to export and commercialization, as well as the affordable price. Another important point raised by the author is that Brazil is the 2nd most religious country in the world and that there is no restriction on consumption by religions (OLIVEIRA, 2011).

Because of this, poultry farming has developed low-cost alternatives to improve the animal production chain, resulting in better product quality, following the needs and demands of consumers (SILVA et al., 2011).

According to the Brazilian Association of Animal Protein (ABPA), Brazil is the third largest producer of chicken meat in the world with 13,245 thousand tons produced, behind only the United States with 19,941 thousand tons and China with 13,750 thousand tons, maintaining its position among the top three since 2011 (ABPA, 2019).

The consumption of chicken meat in Brazil has increased a lot in the last decade, and following the forecasts, the tendency is only to increase, with that, several factors undergo changes, such as the technical standards of evaluation in poultry, the use of strains that are more productive, modern inputs, mechanization and advantages that imply other factors, such as the climate, which allows the annual creation and planting of corn, resulting in savings, since it is one of the components of the poultry feed (ALMEIDA, 2014).

Among the technical evaluation standards in poultry farming, the theme of quality is applied to industries, according to the Brazilian Institute of Consumer Defense (IDEC, 2005) in a wide and diverse way. And even though there is a tendency to focus on security aspects, all the other features that meet the offer and

Consumer demand, as well as their need and desire for healthy products, count for a lot.

Fraud on the part of the food industries is aimed at achieving greater profit on the products and granting them characteristics such as excess water in the chicken, to increase the weight of the carcass through the incorporation of water, thus generating results outside the established standard. by Ordinance 210 of 1998 and consequently harming the consumer (FRIES, 2017).

A survey carried out by IDEC (2005) concluded that the frozen poultry segment needs urgent inspection and quality control measures, mainly regarding sanitary issues, water limits, labeling, and SAC (Consumer Service) services. , until 2016, inspection by the Ministry of Health issued a warning to consumers about the maximum tolerance limits in the product. In an attempt to inhibit fraud, the superintendence claims to have intensified inspections, but the number of analyzes is still small because of the volume of complaints.

In 2017, IDEC (Brazilian Institute of Consumer Protection) released a list of products targeted by Operation Carne Fraca. Investigations were opened with several companies that contained products with irregularities, among them, frozen chicken.

Conducted by MAPA and DIPOA, audits are carried out in establishments to verify compliance and application of legislation (BRASIL, 2007), following Art. 1 of Resolution No. 4, of October 29, 2002, of Law No. 10,192, of February 14, 2001. Art. 1 informs that the service or Sector of Inspection of Products of Animal Origin - SIPA, of the Federal Superintendence of Agriculture - DFA, in its jurisdiction, is responsible for prosecuting a producing, storing, and retailing establishment, when detected, through the collection of samples, indices of water absorption above that allowed by the legislation in force and follow up with the administrative procedures according to the percentage obtained through the “dripping test” method.

The “dripping test” consists of verifying the difference in weight between the chicken after and before thawing using the methodology established in Ordinance No. 210/98 of MAPA. In this case, the water weight loss considered normal and legal must be less than 6%.

If the result of the "dripping test" is up to 7%, the number of variables that may interfere with the process of taking the samples is taken into account, thus establishing the need to collect new samples, before the verdict is given in respect of tax administrative procedures.

If the seized carcasses do not pass the test, and a violation is determined, the products must be returned to the establishment of origin, or another from the same industrial group so that it is destined for reprocessing (cuts, trimmings, industrialization, and others), which are determined to DIPOA/DAS/MAPA criteria.

After the analysis of the samples has been carried out, if it is contested that the values for the "dripping test" are above what is allowed by law, the offending firm must be fined and warned.

At the second laboratory result is outside the standards, the firm will be assessed and fined up to R$ 25,000.00 (twenty-five thousand reais). For the third non-standard laboratory result, in addition to the assessment, the fine may be doubled. In the fourth laboratory result outside the standards, in addition to the same criteria presented in the third, for the products to be commercialized later, it will be necessary to present a

official results of drip tests in four batches, which are defined by consecutive slaughter shifts (BRASIL, 2014).

The research project aimed to carry out an analysis of possible frauds regarding the loss of water in frozen chicken carcasses by dripping test, a process that aims to find out if the meat absorbed excess water during the industrial process, which could cause damage to the final consumer.

2 MATERIAL AND METHODS

The experiment was carried out at the Food Technology Unit (UTAL), which is a UFAC-integrating body. To carry out this project, six chicken carcasses were used, from the same and different batches, from three different brands (brand A, brand B, and brand C), totaling 18 samples of frozen chickens without seasoning and with viscera, sold in different establishments from the city of Rio Branco – Acre.

2.1 DRIPPING TEST

Following the determination of the Dripping Test by the methodology of Ordinance No. 210/98, which determines and quantifies the volume of water lost during the thawing process of the chicken carcass.

Table 1: Relationship between bird weight and water immersion time

Bird weight with viscera (g)	immersion time (min)
Up to 800	65
801 to 900	72
901 to 1,000	78
1,001 to 1,100	85
1,101 to 1,200	91
1201 to 1300	98
1,301 to 1,400	105
1,401 to 1,500	112
1,501 to 1,600	119
1601 to 1700	126
1701 to 1800	133
1801 to 1900	140
1901 to 2000	147
2001 to 2100	154
2101 to 2200	161
2201 to 2300	168

Source: BRASIL, 1998.

3 RESULTS AND DISCUSSION

According to Ordinance No. 210/98 of MAPA (BRASIL, 1998) after performing the average of samples of six carcasses from the same batch, the amount of water resulting from the Dripping Test cannot exceed the average of 6%.

In the Tables below, the results of each analysis will be presented (an average of six chickens analyzed per brand). An average test was performed between each brand analyzed and a significant difference was observed between the averages of water lost by the carcasses between the three brands.

Carciofi and Laurindo (2007) state that the percentage of water absorption by poultry carcasses during cooling by immersion is influenced by external factors, such as temperature, hydrostatic pressure, water agitation in the tank, and immersion time, among others.

According to Kato et al. (2013), other factors count directly in the result of the Dripping Test, such as the pre-slaughter condition.

The stages that most influence the absorption of water are the pre-cooling and cooling stages, as the chickens are washed several times and submerged in tanks with cold water. Therefore, it is important to respect the permanence time of the carcass in the chiller not exceeding 30 minutes and the water temperature must remain at 4ºC. These are factors that will determine the amount of water that will be absorbed by the poultry carcass during the heating process (CARCIOFI; LAURINDO 2007; BAILONE; ROÇA, 2017).

As observed in the results of the Dripping Test analysis (Table 1), brand 1 obtained an average of 7.03%, a result considered unsatisfactory since average values above 6% of water absorption by the carcass are above what is allowed by law. Therefore, the listed trademark may be notified and prosecuted.

Table 2. Results of the Dripping Test Analysis (%), in samples of frozen chickens referring to brand 1.

BRAND 1		
Chicken 1	**Chicken 2**	**Chicken 3**
Fab: 12/01/20	Fab: 12/01/20	Fab: 12/01/20
Val: 12/01/21	Val: 12/01/21	Val: 12/01/21
Batch: 003	Batch: 003	Batch: 003
M0: 2,530kg	M0: 2,580kg	M0: 2,550kg
M1: 0,005kg	M1: 0,005kg	M1: 0,005kg
M2: 2,330kg	M2: 2,425kg	M2: 2,415kg
M3: 2,692g	M3: 2,554g	M3: 3,743g
% = 7,73 de água	% = 5,83% de água	% = 5,1 de água
Chicken 4	**Chicken 5**	**Chicken 6**
Fab: 12/01/20	Fab: 11/16/20	Fab: 11/16/20
Val: 12/01/21	Val: 11/16/21	Val: 11/16/21
Batch: 003	Batch: 003	Batch: 003
M0: 2,335kg	M0: 2,560kg	M0: 2,390kg
M1: 0,005kg	M1: 0,005kg	M1: 0,005kg
M2: 2,125kg	M2: 2,350kg	M2: 2,230kg
M3: 4,527g	M3: 4,766g	M3: 4,745g
% = 8,8 of water	% = 8,03 of water	% = 6,73% of water

Table 3. Results of the Dripping Test Analysis (%), in samples of frozen chickens referring to brand 2.

BRAND 2		
Chicken 1	**Chicken3**	**Chicken 5**
Fab: 12/08/20	Fab: 12/08/20	Fab: 12/08/20
Val: 12/08/21	Val: 12/08/21	Val: 12/08/21
Batch: 008	Batch: 008	Batch: 008
M0: 2,065kg	M0: 2,010kg	M0: 2,180kg
M1: 0,0072kg	M1: 0,005kg	M1: 0,0057kg
M2: 1,975kg	M2: 1,940kg	M2: 2,095kg
M3: 0,0028kg	M3: 0,0039kg	M3: 0,039
%: 4,04 of water	%: 3,24 of water	%: 3,64 of water
Chicken 2	**Chicken 4**	**Chicken 6**
Fab: 12/08/20	Fab: 12/08/20	Fab: 12/08/20
Val: 12/08/21	Val: 12/08/21	Val: 12/08/21
Batch: 008	Batch: 008	Batch: 008
M0: 2,185kg	M0: 2,060kg	M0: 2,085kg
M1: 0,0057kg	M1: 0,0057kg	M1: 0,0055kg
M2: 2,065kg	M2: 1,975kg	M2: 2,010kg
M3: 0,0028kg	M3: 0,0051kg	M3: 0,005kg
%: 5,25 of water	%: 3,85 of water	%: 3,33 of water

The other two analyzed brands (2 and 3) presented satisfactory results. Brand 2 (Table 2) had an average of 3.89% water and brand 3 (Table 3) had an average of 4.18%, values that show that these brands are within the limit established by the Ministry of Agriculture, Livestock and Supply (MAPA) which recommends the limit as 6% water.

Table 4. Results of the Drip Test Analysis (%), in samples of frozen chickens referring to brand 3.

BRAND 3		
Chicken 1	**Chicken 3**	**Chicken 5**
Fab: 12/04/2020 Val: 12/04/2021 Batch: T1 M0: 2,415kg M1: 0,0077kg M2: 2,320kg M3: 0,0074kg %: 3,34 of water	Fab: 12/10/20 Val: 12/10/21 Batch: L2 M0: 2,185kg M1: 0,0097kg M2: 2,035kg M3: 0,0051kg %: 6,45 of water	Fab: 12/10/20 Val: 12/10/21 Batch: L2 M0: 2,140kg M1: 0,011kg M2: 2,070kg M3: 0,005kg %: 2,78 of water
Chicken 2	**Chicken 4**	**Chicken 6**
Fab: 12/04/2020 Val: 12/04/2021 Batch: T1 M0: 2,460kg M1: 0,0086kg M2: 2,350kg M3: 0,0099kg %: 4,09 of water	Fab: 12/10/20 Val: 12/10/21 Batch: L1 M0: 1,930kg M1: 0,0074kg M2: 1,825kg M3: 0,012 kg %: 4,71 of water	Fab: 12/10/20 Val: 12/10/21 Batch: L2 M0: 2,175kg M1: 0,0096kg M2: 2,085kg M3:0,006kg %: 3,75 of water

When the samples of the frozen carcasses are analyzed individually, it is verified that regarding the water absorption content, through the Dripping Test that 27.77% (5/18) present a result above the recommended by the legislation (6% of water absorption).

According to Brasil (1998), the permanence time of poultry carcasses in the drip line also influences the water absorption, considering that what is recommended by the MAPA is that the permanence time is 3 minutes, as this procedure has the purpose of eliminating the excess water that is absorbed in the pre-cooling and immersion cooling steps.

It should be emphasized that according to Carciofi; Laurindo (2007); Ballet; Roça (2017), the cooling stage is the one that most influence the amount of water absorbed by the carcass, given that this process consists of subjecting the meat to several washes, in which it is submerged in cold water. Then, immersion factors, the water temperature at the initial and final moment of cooling, hydrostatic pressure, and agitation of the water, which determine the final amount of water absorbed, are considered.

The cooling process is intended to promote a decrease in the temperature of the carcasses, thus leading to a reduction in microbial proliferation, however, a negative point is that this process can increase the water content absorbed by the bird carcass (ÇENGEL, 2012. SIMAS et al., 2013, BAILONE; ROÇA, 2017).

Sant'Anna (2008), corroborates saying that in the retention time of the carcass inside the chiller, several variations can occur, since during transport, due to the endless screw system, the chicken can stagnate or even become stuck in parts of the equipment, resulting in more time than the others.

The speed and time of freezing also influence the amount of water that is absorbed by the carcass, considering that if freezing occurs slowly, there will be the formation of water crystals in the extracellular area. A fast freezing process results in better product quality, freezing is considered fast when it lasts around 25 minutes, and the shorter the duration of this step, the smaller the crystals formed inside the food being frozen (PARDI et al. al., 1993; GOULD, 1996)

Souza (2014) also says that fraud within the niche of the food industry was created to obtain greater profitability for the products, however, it is worth mentioning that some companies act in bad faith during the process of incorporating water into the chicken taking advantage of inspection failures, intending to obtain greater profit, through the final weight of the product, thus causing losses to the consumer (GARNICA et al., 2014; SILVA et al., 2017).

4 CONCLUSION

The results obtained through this present study indicate that better inspection and control by the Ministry of Agriculture, Livestock and Supply (MAPA) and the responsible bodies in the carcass cooling stage is necessary, considering that it was evidenced that one of the three brands analyzed was not under the provisions of the legislation, being subject to notification and fine.

In addition, it also generates losses for consumers and inspection agencies, since they are responsible for monitoring the quality and quantity of water retained by frozen chicken carcasses.

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