



Destruction of bacteria using electric stimulation of old Duck and Chicken carcasses

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Abstract: The effect of electric stimulation on some quantitative characters of aged ducks and layers chicken carcasses were the main objectives of the present study. Electric stimulation apparatus of meat tenderness was designed and manufactured at Department of Food Sciences, College of Agriculture, University of Basrah. A total of 36 Ducks and Layers chicken aged 1.5 years. Birds were slaughtered by hand, were de-feathered, and all internal organs were removed. Carcasses were divided into three treatments with different electric stimulation. Control group (no electric stimulation). The second treatment (Electric conductivity 3.67 V/cm) was low voltage of 110 volt and 1% saline solution. The third treatment (7.33 V/cm) was 220V and 1% saline solution. All traits were measured at 25 min, 6 hrs. and 24 hrs. Carcasses stored by freezing for 30 and 60 days. The results showed that the number of proteolysis, lipolysis, Psychrophiles bacteria were affected by electric stimulation, the third treatment revealed the lower number of bacteria. Electric stimulation (especially 220 V) was significantly reduced the number of bacteria in both chicken and duck.

Keywords: Electric stimulation, Microbes, Duck, Chicken.

Introduction

Poultry meat is a very popular food commodity around the world due to its low cost of production, low fat content, high nutritional value, distinct flavor (Patsias *et al.*, 2008). The diverse nutrient composition of meat makes it an ideal environment for the growth and proliferation of meat spoilage micro-organisms, as well as food-borne pathogens (Zhou *et al.*, 2010). Therefore, is essential to apply adequate preservation

technologies to extend the shelf life of perishable meat products which is a major concern for the meat industries (Wang *et al.*, 2004). The study of electrical stimulation as a means of reducing the time required for aging to prevent the meat hardness has newly use commercially. Electrical stimulation improves the tenderness of meat by decrease cutting pieces and increase the length of sarcomere and reduced diameter muscle fiber. In

addition to the possibility of cutting of meat in less than two hours after slaughter with a tenderness similar to that of meat after a period of 4 hours after slaughter, which reduce the storage time to 5% or more, reducing the cost of storage, in addition to reducing the force required for feather removal, and electric stimulation also reduces the microbial load on chicken carcasses (Adeyemi & Sazili, 2014). The current study aims investigated of Electric stimulation on some microbial properties of carcasses in aged ducks and layers chicken.

Materials and Methods:

The present study was conducted at the Department of Animal Production, College of Agriculture, University of Basrah during the period of 20/11/2018 to 20/2/2018.

In this experiment, 36 birds of ducks and layers chicken were used at about 1.5 years old, the birds were slaughtered manually and after the complete depletion of the period of 150 seconds. Then the feathers and internal organs were removed manually. The birds were then divided into three treatments (electric stimulation) with 6 birds per treatment. The study was included three treatments are control, electrical stimulation with low voltage (110 V) with a saline concentration of 1%, and electrical stimulation with high voltage (220 V) with 1% saline concentration. Traits were measured at 25 minutes, 6 hours and 24 hours. Carcasses were stored at 0°C for 30 and 60 days. The tests were performed as follows:

1- Detection of proteolytic bacteria.

This medium was prepared by Nutrient agar, with 10% milk and a pH of 0.2 ± 7.4 , according to Slavik *et al.* (1991)

2- Detection of lipolysis bacteria

This medium was present from Nutrient agar, supplied by Himedia, and 1% Tributryim, pH 7.4 ± 0.2 , as mentioned by Slavik *et al.* (1991).

3- Amid detection of Psychrophiles bacteria

This medium of Nutrient agar, a supplier of Himedia, was present in the calculation of the numbers of homophiles bacteria, incubating the dishes at 7 ° C and calculating the total number of Psychrophiles bacteria according to the method mentioned by Andrew (1992).

Statistical analysis

The results were statistically analyzed using SPSS (2009). The results were compared using the lowest mean difference (R.L.S.D) at the probability level ($p < 0.05$).

Results

Effect of electrical stimulation on Proteolysis Bacteria

Fig. (1) shows the effect of electrical stimulation on the number of proteolytic bacteria. The results showed that the first treatment gave a highest number of Bactria (228.79 CFU/ml) compared with the other treatments for the ducks, While the third treatment (T3) reached (54.33 CFU/ml). In the layers chicken, the first treatment (control) and the second treatment (T2) were higher than the third treatment (T3), which reached (113.68, 175.95, 252.96 CFU/ml) respectively. The figure showed that no significant differences in the average time in ducks. In the layers chicken, the time at 30 days was significantly higher than the rest of the times (373.88). The best time was 24 hours which was (89.80), There is no significant differences in the interaction between the treatments and time in the ducks.. In the layers chicken, the first treatment (standard) at 30 days reached 423.00 CFU/ml. The third (electrical field of 7.33V / cm) at 25 minutes showed the lowest number of proteolytic bacteria, and note that there is no significant difference between ducks and layers chicken. due to the low number of bacteria can encourage the use of electrical stimulation in poultry industry to obtain safer meat. The effect of electrical stimulation on bacteria may be due to mechanical, thermal or chemical effects or the three factors combined (Li *et al.*, 1993). Electrical stimulation may cause damage to bacterial cell and metabolism.

Electrical stimulation is a potentially deadly chemical agent and the effect of electrophysiological stimulation may be induced by the effects of the electric field (Raccach & Henrickson, 1978). The changes in the electrophysiological forces resulting from AC effects. The decrease in the number

of bacteria may also be due to electrical stimulation, and to the heat generated by the flow of the current or the free radicals resulting from a particular chemical reaction (Lin *et al.*, 1984).

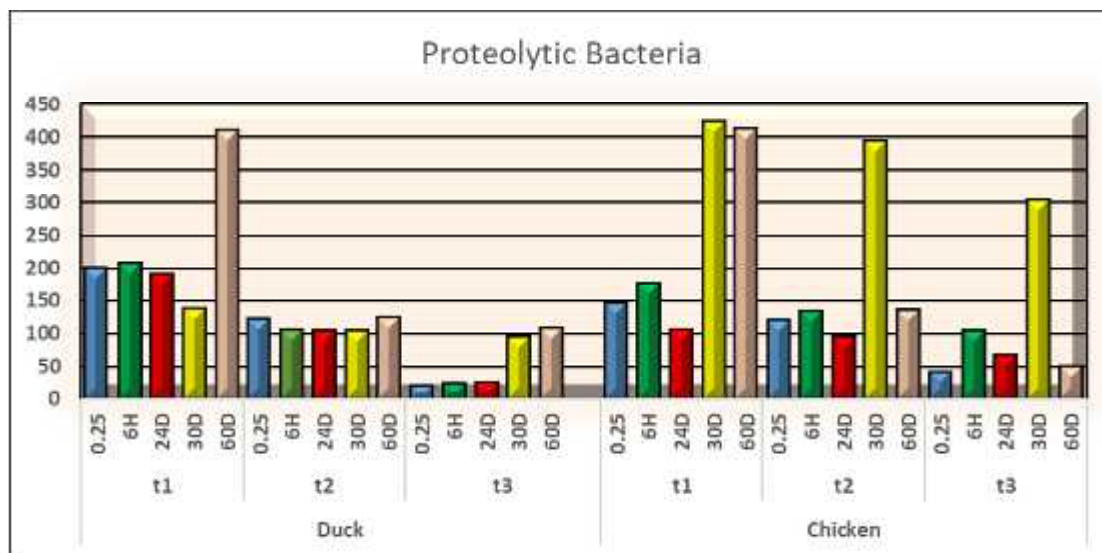


Fig. (1) The effect of electrical stimulation on Number of proteolytic bacteria.

Effect of electrical stimulation on the lipolysis bacteria

Fig. (2) shows the effect of the electrical stimulation on the lipolysis bacteria. The first (control) treatment gave a significant higher ($p < 0.05$) than the rest treatments in the ducks and layers chicken (222.70, 210.20 CFU/ml) respectively. The third treatment (T3) showed a significant increase in the number of bacteria (76.66, 66.26 CFU/ml) for both ducks and layers chicken respectively. The figure showed that the effect of time at 60 days was significant ($p < 0.05$) compared with the rest of other times (173.11, 227.22 CFU/ml) for ducks and layers chicken respectively. The number of bacteria for both ducks and layers chicken decreased after 24 hours (96.33, 106.00 CFU/ml) respectively. It can be seen from results, the number of bacteria reached (250.00 CFU/ml) by using the first treatment (standard) at the time of 60 days, while in the ducks, the third treatment (T3) at the time of 6 hours gave a less count of lipolysis bacteria (15.67 CFU/ml). In the layers chicken, the first treatment (standard) at 60 days led to significantly

increase ($p < 0.05$) in the count of lipolysis bacteria (273.00 CFU/ml), The third treatment at 30 days, gave a lower count of lipolysis bacteria (43.00 CFU/ml). The ducks were significantly higher ($p < 0.05$) than the layers chicken in the count of lipolysis bacteria (127.91 . 146.22 CFU/ml), respectively.

Effect of electrical stimulation on Number of Psychrophiles bacteria

Fig. (3) shows the effect of electrical stimulation on the number of Psychrophiles bacteria, where the figure shows the first treatment (standard) significantly higher than the rest of the transactions in ducks, where it reached (27.67 CFU/ml). The best treatment was (T3), (the number of Psychrophiles bacteria reached 10.13 CFU/ml), while in the layers chicken was the first treatment (standard) gave a higher number of Psychrophiles bacteria (80.13 CFU/ml) compared with the other treatments, The best treatment was the third treatment (T3), which amounted to (29.33 CFU/ml). As for the

meantime, the best time was 60 days (35.89) compared with the other times in the ducks. Another best time was 24 hours (19.11 CFU/ml). In the layers chicken. The time of 25 minutes was significantly higher number of Psychrophiles bacteria (75.11 CFU/ml) compared with the other times while another best time was 30 days (27.67 CFU/ml). The figure shows that the time at 60 days in the first treatment was significantly higher ($p < 0.05$) (44.00 CFU/ml). The best values were at the same treatment at 25.0, 6 and 24

hours, and the number of Psychrophiles bacteria was significantly decrease. In the layers chicken, the first treatment (standard) at 6 hours was significantly exceeded ($p < 0.05$) and reached (130.67 CFU/ml). The best treatment was the second treatment (T2) at the time of 6 hours reached (19.00 CFU/ml). The number of Psychrophiles bacteria in layers chicken was a significantly increased compared with ducks (23.96, 46.87 CFU/ml), respectively.

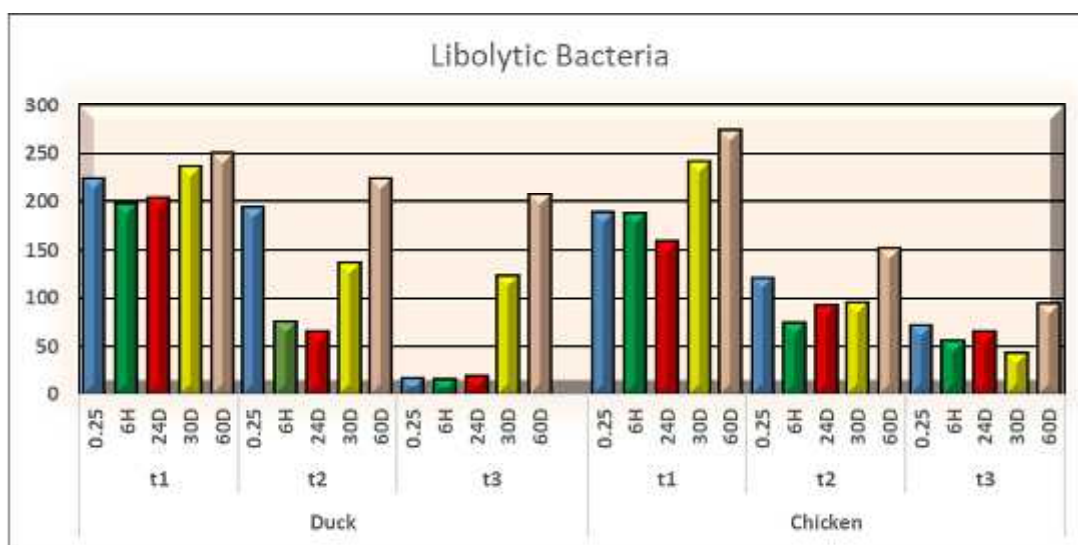


Fig. (2) The effect of electrical stimulation on Number of lipolysis bacteria.

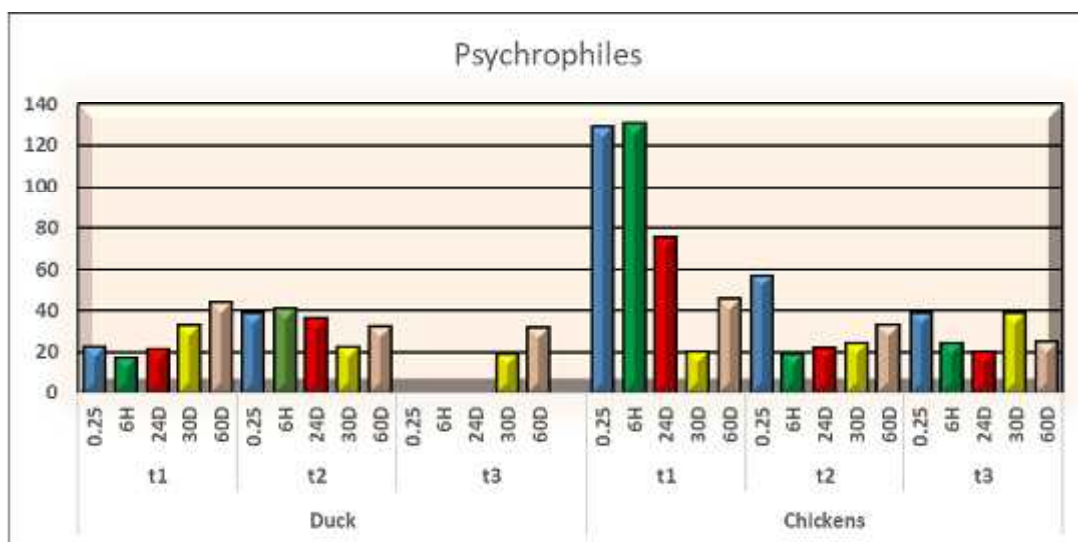


Fig. (3) The effect of electrical stimulation on Number of Psychrophilic bacteria.

Discussion

This may be due to the low number of bacteria that can encourage the use of electrical stimulation in the poultry industry to obtain more microbial safe meat, and the effect of electrical stimulation on bacteria may be due to the effects of mechanical, thermal, chemical or three factors (Li *et al.*, 1993). Electrolysis may causes damage to bacterial cell metabolism and thus prolong the duration of grief (Raccach & Henrickson, 1978). Electrochemistry may be deadly biochemical's. The effect of electrophysiological stimulation may be caused by the effects of the electric field, which is the result of changes in the electrophysiological forces resulting from AC effects. The decrease in the number of bacteria due to electrical stimulation may also be due to the heat generated by the flow of the current or Free radicals resulting from a particular chemical reaction (Lin *et al.*, 1984).

Conclusions

Number of proteolysis, lipolysis, Psychrophiles bacteria were affected by Electric stimulation, the third treatment revealed the lower number of all bacteria. Electric stimulation (especially 220 V) was reduced number of all bacteria of both layers chicken and ducks.

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