

EFFECTS OF ACETIC ACID AND HYDROGEN PEROXIDE ON THE MICROBIOLOGICAL QUALITY AND SKIN APPEARANCE OF POULTRY CARCASSES

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ABSTRACT

The microbiological quality and skin appearance of poultry carcasses were determined after acetic acid and hydrogen peroxide spray. Acetic acid at 1% concentrations showed a significant effect ($P < 0.05$) in reducing total mesophilic bacteria count, total coli form count, *Escherichia coli* count and *Staphylococcus aureus* count when compared with a sample without treatment, 10.50×10^3 , 1.03×10^3 , 7.5×10^1 , 1.05×10^2 and 27.47×10^3 , 2.71×10^3 , 4.41×10^2 , 2.74×10^2 cfu/cm² respectively. No differences were observed in skin appearance due to 1% acetic acid treatment. Hydrogen peroxide at 1% concentrations did not significantly ($P > 0.05$) effect the microbial load when compared with a sample without treatment, 26.33×10^3 , 2.61×10^3 , 3.70×10^2 , 2.63×10^2 and 27.47×10^3 , 2.71×10^3 , 4.41×10^2 , 2.74×10^2 cfu/cm² respectively. The skin of carcasses treated with H₂O₂, was bleached and bloated.

INTRODUCTION

Carcasses are contaminated with various spoilage and pathogenic microorganisms at many stages of poultry processing, even though good manufacturing practices are observed during slaughtering [1]. Since the microorganisms are firmly attached on poultry skin and are localized in the capillary spaces, they are not easily rinsed off and are not completely affected by bactericides [2]. For this reason, foodborne diseases associated with poultry meat consumption are frequently reported and the shelf-life of poultry meat is shorter than red meat [3].

Different methods have been studied for controlling the cross contamination and decontaminate in poultry processing plants. Several chemicals such as organic acids [4], chlorine and chlorine derivatives [5], hydrogen peroxide [6], ozone [7], and other compounds [8], have been applied by dip or spray methods. However, most of them altered the visual appearance of skin and meat. Some of them are even suspicious with regards to public health. In addition to those chemicals, electrical stimulation [9], irradiation [10], sonication [11] and heat treatment [12] have also been used as decontamination methods.

Organic acids such as acetic and lactic acid, and then derivatives were reported as natural alternatives to increase the shelf-life and microbial safety of food products. Acetic acid and lactic acid have been used by adding to scald or chill water during poultry processing and have given relatively reasonable results [13]. Hydrogen peroxide is a well known germicide in the medical field and has been evaluated in various combinations in the poultry industry from the hatchery to the processing plant [14]. This study was performed to investigate the effectiveness of acetic acid and hydrogen peroxide in improving microbiological quality of poultry carcasses.

MATERIAL AND METHODS

Spraying procedures

A total of six poultry carcasses were used. The spraying procedures was done on the thigh(12 thigh)half of them were sprayed with acetic acid, the other half were sprayed with hydrogen peroxide for 10s at concentrations derived from a response surface central compo site design. The area was swabbed using the rinse swab method [7]. The area used for sampling (using metallic template)was 5cm².

Microbiological analysis

After the area was swabbed by sterile swab cotton, decimal serial dilutions were prepared using sterile 0.1% peptone water taking aseptic precautions. In Nutrient Agar and MaCconkey Agar,1ml of each dilution was inoculated in duplicate plate and mixed before solidification. In Mannitol Salt Agar and Eosin Methylen Blue Agar 0.1ml of each dilution were surface plated in duplicate plate. Total mesophilic bacteria in Nutrient Agar incubated for 2days at 32C°,total coli form in MaCconkey Agar incubated for 24h at 32C°,*Escherichia coli* in Eosin Methylen Blue Agar incubated for 2±24h at 1±32C°,*Staphylococcus aureus* in Manitol Salt Agar incubate ed for 24-48h at 37C° following the incubation, the colonies on duplicate plates with 30 to 300 colonies were counted using aplate counter and the number of microbes were expressed as colony-forming units per cm² as recommended by American Public Health Association[15]and all data were analyzed using SPSS statistical software[16]

RESULTS AND DISCUSSION

Treatment of poultry meat in water containing 1% acetic acid resulted in a significant reduction for total mesophilic bacteria count, total coli form count, *Escherichia coli* count and *Staphylococcus aureus* count with 10.50x10³,1.03x10³,7.5x10¹and1.05x10²cfu/cm², respectively but no alteration on appearance and odour were determine (Table1). Similar results were already reported on decontamination with a cetic acid of poultry carcasses[17]. However, some of them observed that carcasses treated with 1% acetic acid exhibited a yellowing or darkening of the skin of carcasses treated after defeathering. contact time of the acetic acid may be determining factor in appearance changes of the carcasses[18].

Hydrogen peroxide at concentrations of 1% had no microbiological effect on the carcass- es. The contact time of 10s used in this study was probably not adequate to reduce microbial numbers. Carcass appearance, had a bleached appearance, very white skin and the skin seemed to be bloated and pliable. These results agree with the data presented by [18] on the appearance of defeathered carcasses.

Table 1: Microbial Count ± SD of Chicken Carcasses Treated with Acetic Acid and Hydrogen Peroxide (cfu/cm²).

Microbial groups	Statistical parameters		
	Without treatment	1% acetic acid	1% H ₂ O ₂
Total mesophilbacteria	27.47± 2.425x10 ³ a	10.50±1.313 x10 ³ b	26.33 ±2.784 x10 ³ a
Total Coliform Bacteria	2.71± 0.261x10 ³ a	1.03±0.131 x10 ³ b	2.61 ±0.276 x10 ³ a
<i>Escherichia coli</i>	4.41± 1.03x10 ² a	7.5±0.5 x10 ¹ b	3.70 ±0.52 x10 ² a
<i>Stphylococcus aureus</i>	2.74±0.24x10 ² a	1.05 ± 0.13 x10 ² b	2.63 ± 0.72x10 ² a

a, b denote significant difference at P < 0.05

CONCLUSIONS

The data from the present study suggested that the treatment of poultry meat with water containing 1% acetic acid was more effective to decontaminate and to prevent the cross contamination of carcasses without altering the colour and appearance of the skin than hydrogen peroxide

تأثير حامض الخليك وبيروكسيد الهيدروجين على المحتوى الميكروبي ومظهر الجلد لذبائح الدواجن

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الخلاصة

تم استقصاء تأثير المعاملة الكيميائية باستخدام حامض الخليك وبيروكسيد الهيدروجين على النوعية الميكروبية ومظهر الجلد لذبائح الدواجن، وقد اظهرت النتائج تأثير معنوي في معدلات العد البكتيري الكلي، عد بكتريا القولون ، بكتريا الاشيريشيا القولونية والمكورات العنقودية الذهبية المعاملة بحامض الخليك بالمقارنه مع العينه الغير معاملة $10^3 \times 10.5$ ، $10^3 \times 1.03$ ، $10^3 \times 7.5$ ، $10^2 \times 1.05$ و $10^3 \times 27.47$ ، $10^3 \times 2.71$ ، $10^2 \times 4.41$ ، $10^2 \times 2.74$ و.ت.م/سم² على التوالي ، لم يلحظ اختلاف على مظهر الجلد للعينه المعاملة بحامض الخليك. كما اوضحت النتائج ان اضافته بيروكسيد الهيدروجي الى ماء لم يؤثر على النوعية الميكروبيه للذبيحه بالمقارنه مع العينه الغير معاملة $10^3 \times 26.33$ ، $10^3 \times 2.61$ ، $10^3 \times 3.70$ ، $10^2 \times 2.63$ و $10^3 \times 27.47$ ، $10^3 \times 2.71$ ، $10^2 \times 4.41$ ، $10^2 \times 2.74$ و.ت.م/سم² على التوالي . جلد الذبيحة المعاملة ببيروكسيد الهيدروجين اصبح مبيض ومنتفخ المظهر.

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