PRE-SLAUGHTER HANDLING OF CATTLE AND ITS INFLUENCE ON THE FINAL COLOR OF MEAT

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Abstract – One of the factors that can affect the final color of beef carcass and therefore the quality of the final product is stress. Different studies show how the final color of the carcasses varies according to the pre-slaughter handling given to the animals, as well as breed, age or sex of the slaughtered animals. The main objective of the present work was to study differences in the final color of the meat of animals slaughtered in different climatic conditions and of different origins. For this purpose, management factors prior to slaughter that could influence the final meat quality were identified and instrumental color measurements (CIE $L*$, $a*$, $b*$) were determined on June, July and September slaughters. The results obtained show how the pre-slaughtering management is the key for the final carcass color.

Key Words – animal welfare, animal management, meat quality.

I. INTRODUCTION

The present has focused on the aspects that influence the quality of the meat and that influences the decision of the consumer to choose one product or another. We will emphasize the influence of pre-slaughter handling and consequences on the final meat color, analyzing the relationship of animal management, the stress produced to animals, and the carcass darkness. The objective was to identify those management factors that have a direct relationship with the meat darkness, to detect possible improvements in the animal management, reducing animal stress prior to slaughter, and to establish intervention measures in the slaughter line to obtain a high quality product. All of this was done across the implementation of analysis steps tools of PDCA cycle, finding root causes which could give an answer to satisfy the specifications of the costumers.

II. MATERIALS AND METHODS

Different management observation studies related to the handling during the unloading of animals, handling in pens and during the slaughter of the animal were carried out at a local slaughterhouse from June to September of 2015. Each study included data from animals of different origin, breed, age, sex, in order to verify the influence (or not) of pre-slaughter management on the final color of meat.

Several check lists were produced to data collect, which were used both for the arrival of the animals to the slaughterhouse after the transport, and at process of slaughter. There were records of waiting time, parameters related to the handling and every event that happened in the slaughtering process. Each check list was accompanied by a section of observations, to list possible undesirable events both in the discharge of animals and at process of slaughter. Instrumental color measurements (CIE $L*$, $a*$, $b*$) were done using a colorimeter Konica Minolta Chromameter CR-400.

III. RESULTS AND DISCUSSION

First, a comparison between the trials carried out on June 2015 (n=204) and July 2015 (n=217) was made. The results from July slaughter, when the pre-slaughter conditions of animals were not the most adequate, both in the density of the animals per pen and in the temperature of the pens, showed lower values of both luminosity ($L*$) and a different tone (h) respect those from June, when the temperatures were somewhat milder and the stay conditions of animals in pens were correct. In addition, saturation (C) was higher in animals slaughtered on July than in animals slaughtered on June. Also, the origin of the calves seems to affect directly the meat color obtained.

An additional sampling was carried out on September 2015, and the stay and temperature conditions of the animals before the slaughter were improved. The stay conditions in pens and the handling of the animals were more favorable. The results show that the animals slaughtered on September have a higher luminosity ($L*$) as well as a

lower chroma or saturation (C) than the animals slaughtered on July. In fact, the carcasses observed during the month of September were clearer than those observed in the previous months. This evaluation process confirms the relation between the hypothesis done and the root causes of the problem, so continuous with the next steps of the PDCA cycle will be necessary to board them and solve the differences in colour.

Table 1. Mean values of instrumental color, CIE L^*, a^*, b^*, chroma (C) and tone (h) coordenates, corresponding to the different observations performed, sorted by month and origin.

	June (n = 204)				July (n=217)				September (n=72)	
	AR	CTT Alc	CTT Alm	SM	AR	CTT Alc	CTT Alm	SM	AR	CTT Alc
L*	46.25	44.35	43.63	40.96	43.83	41.10	42.14	42.62	45,42	44,41
a*	11.06	11.89	14.07	15.89	20.1	22.18	17.29	19.35	11,73	14,29
b*	4.00	8.25	5.64	5.88	12.71	12.12	7.80	10.66	5,72	7,14
C	13.37	16.80	16.50	17. 91	23.92	25.35	19.01	22.15	13,18	16,19
h	30.86	44.52	29.16	21.32	31.5	27.81	24.43	28.13	23,02	24,20

* Origins: Alto Ruecas (AR), Cebadero Alcaracejos (CTT Alc), Cebadero Almadenejos (CTT Alm), San Miguel Coop. (SM)

IV. CONCLUSION

Stay and slaughter conditions of animals in slaughterhouse affect directly the meat color obtained, with higher average values of luminosity (L*) and lower red values (a*) in the less stressful sacrifices. The conditions of handling in slaughterhouse seem to affect the tone (h) and saturation (C) of meat color. The origin of the calves seems to affect directly the meat color obtained. Meat from some farms was somewhat darker than the rest. Therefore, additional studies, both in farms and slaughterhouse to clarify and correct possible incidences and negative factors affecting meat color, will be necessary.

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