STUDY ON THE DETERMINATION OF TENDERNESS AND JUICENESS OF FROZEN BEEF

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The pressing method for the determination of tenderness and free water of meat, originally introduced by Ham and Grau, as it was modified by Solov'ev, was used in the case of frozen beef.

The results were compared with taste panel trials for tenderness and juiceness. Also, free and bound water estimations were compared with taste panel trials for juiceness.

Corelation coefficient values did not indicate to existe statistically significant relationships between the above paremeters.

ETUDE SUR LA DÉTERMINATION DE LA TENDRETE ET LA SUCULENCE DE LA VIANDE CONGELÉE

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La méthode de pression, pour la détermination de la tendreté et de l'eau libre, initialement proposée par Ham et Grau et modifiée par Solov'ev, a été utilisée dans le cas de la viande bovine congelée.

Les résultats obtenus ont été comparés a ceux de la méthode de dégustation pratiquée par un groupe de dégustateurs qui ont déterminée la tendreté et la suculence de la viande. Les déterminations de l'eau libre et de l'eau liée, ont ausi été comparés aux résultats du groupe de dégustateurs en ce qui concerne la suculence de la viande.

Les valeurs du coefficient de corrélation, n'ont pas indiqué qu'il existe, au point de vue statistique des corrélation significatives entre les paramètres cités ci-dessus.

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STUDIE ZUR BESTIMUNG DER ZARTHEIT UND SAFTIGKEIT VON GEFRORENEM RINDFLEISCH

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Die Pressmethode zur Bestimmung der Weichheit und des erlaubten Wassergehaltes von Fleisch, im Original vorgestellt von Ham und Grau, wie diese von Solov'ev modiefiziert wurde, wurde im gefrorenen Rindfleisch verwendet.

Die Resultaten waren gleichgestellt mit Geschmackproben für Zartheit und Saftigkeit. Auch, erlaubten und verundet Wassergehaltes estimationen wurde vergleicht mit den ergebnissen von " taste panel" fur Saftigkeit.

Korrelationkoeffizient wurde kein Vorhandensein von bedeutsamer Verwandschaft zwischen den obigen Parametern gezeigt.

ИССЛЕДОВАНИЕ ПО ВОПРОСУ ОПРЕДЕЛЕНИЯ МЯГКОСТИ И СОЧНОСТИ ЗАМОРРЖЕННОГО ГОВЯЖЬЕГО МЯСА

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Метод отжимания для определения мягкости и содержания свободной воды в мясе, первоначально введенный Гамом и Грау и усовершенствованный затем Соловьевым, был использован для определения мягкости и свободной воды в замороженном говяжьем мясе. Результаты сравнивались с результатами, полученными при взятии проб на определение мягкости и сочности мяса. С результатами проб на сочность мяса сравнивались также результаты определения содержания свободной и связанной воды в мясе. Коэффициент корреляции при сопоставлении не показал какого либо заметного соотношения между упомянутыми параметрами.

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INTRODUCTION

Tenderness and juiceness are the two major characteristics of eating quality of meat. Both of them are affected by freezing and storage. We were interested in determining these characteristics in frozen beef, imported in quarters in Greece from Latin American countries, at the point of importation.

Since in these cases, due to organisational problems, the use of a taste panel is potentially difficult, and usually a laboratory is not available, the need had been risen for measuring tenderness and juiceness with a simple method using the least possible laboratory facilities. Hence, we attempted to compare taste panel scores for tenderness and juiceness, with values obtained by the pressing method technique for tenderness and free water evaluation.

MATERIALS AND METHODS

The study was concerned with 50 front quarters of beef imported from Colombia and stored for about 18 months. From each quarter a 2,5 cm thick piece of longissimus dorsi muscle, at the hight of the 10^{th} vertebra, was excised by means of an electric saw.

Laboratory examinations took place in 15-20 g samples of the muscle. The rest were cooked under constant conditions. Tenderness, juiceness and overall acceptability were evaluated by a 10 person taste panel using a 5 point hedonic scale.

The pressing method of Grau and Hamm (Grau and Hamm, 1953, 1957; Hamm, 1960) as it is presented after modifications by Solov'ev (1968) was used for measurements of tenderness and free water content. Water, fat and ash content determinations took place. Total nitrogen content was calculated from the above examinations. Bound water was calculated from the determinations of total and free water. Tenderness was estimated by applying the formula $\frac{SX100}{0.3N}$ cm^2/g total nitrogen of the meat (Solov'ev, 1968), where S is the area occupied by the pressed meat in cm^2 and measured by a planimeter, and N is the total nitrogen content of the meat in %. Free water content was estimated in % by weighing the filter paper before and after pressing the meat. In addition, pH values were determined.

Correlation coefficient r values were calculated between taste panel results for tenderness and values for tenderness obtained with the pressing method and pH; also, between juiceness and free, bound and total water, and pH values. Overall acceptability was compared with all the above mentioned parameters. r values were tested for significance limits for zero population correlation coefficient.

RESULTS

Table 1 shows the results obtained from the chemical analysis and the taste panel trials.

Table 1

	Water %			Fat %	Ash %	Prot. %	Total N %	pH	Press. Meth. Tend. value	Taste panel results		Overall Acceptab.
	Free	Bound	Total							Tend.	Juic.	
Mean	42.15	30.81	73.01	3.25	1.56	22.19	3.55	5.74	180.59	2.91	3.03	3.72
Standard Deviat.	4.19	4.72	2.19	1.60	0.84	1.55	0.25	0.28	31.24	0.48	0.36	0.41
Standard Error	0.59	0.67	0.31	0.23	0.12	0.22	0.03	0.04	4.46	0.07	0.05	0.06

Correlation coefficient r values between the scores from the taste panel and tenderness values obtained with the pressing method and pH are not significantly different from 0. The same was observed between taste panel scores for juiceness and pH, free, bound and total water. Also, this was true for scores of taste panel for overall acceptability. Consequently, no linear correlation exists between any of the tested paires of parameters.

DISCUSSION

The difficulties of measuring objectively tenderness cannot be overstressed. The variety of methods and instruments which have been proposed for this measurement are suggestive of these difficulties (Szczesniak et als, 1965; Stanley, 1972). Hence, it seems that the subjective methods are the best approach to the problem. However, this is not always easy to be applied in routine measurements.

On the other hand, instrumental techniques usually measure a certain aspect of tenderness and this is probably why they are not usually in good agreement with taste panel scores. However, according to Solov'ev (1968) the pressing method, suggested by Grau and Hamm (1953) is capable of yielding approximate information on the changes in the tenderness of raw meat when the need arises for studying the dynamics of these changes and of obtaining relative, comparative values. In addition, a similarity has been reported by Sokolov and El-Dashluty (1963), between the results obtained with shear value measurements and the pressing method in raw mutton.

In our work we did not know anything about the original tenderness of the samples. We, simply, were interested in getting approximate informations about the state of meat at importation point. The lack of laboratory facilities, on the spot, forced us to try the simplest possible way, having in mind the possibility of practical applications. Our results were not encouraging. Although Sokolov and El-Dashluty (1963) found a positive correlation, in mutton, between the pressing method and shear force values, and not taste panel trials, our results do not seem to be in agreement with theirs.

On the other hand, we rather agree with Fredeen et als (1972), who reported that absolute pH values and post mortem pH changes do not correlate with tenderness, then Laakkonen (1973) who suggested that tenderness is influenced by the water-holding capacity and pH of the muscle.

Again according to Solov'ev (1968) if the difference between the total area of the stain and the area occupied by the compressed meat in square centimeters will be multiplied by the coefficient 8.4, will give the free water content. We tried this method and we, also determined the free water content by weighing the filter paper before and after pressing the meat. Statistically significant differences ($p < 0.001$) were found between the two methods. According to our results the coefficient 8.4 should be 7.71.

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