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Relationship between meat quality and cooking losses

Gy. Gantner - L. Körmendy - Maria Losonczy - F. Lörincz
Hungarian Meat Research Institute Budapest, IX., Gubacsi ut 6/b.

Although the method of cooking has been recognized as a factor influencing the cooking losses of cured meat products the quality of the raw meat plays also a definite role. In this respect one of the most common deficiencies is the exudative character of meat /Goutefongea, 1963/, /Briskey, 1964/, Bendall and Lawrie, 1964/. A considerable amount of information on pale, exudative muscle has been accumulated in recent years. Karmas and Thompson /1963/ found a definite relationship between color and percentage jelly of cured hams .

As it is well-known, there are 2 simple methods for determining the exudative character of meat. One of them is the measurement of pH 45 min. after slaughter /Briskey and Wismer Pedersen, 1961/, /Charpentier and Goutefongea, 1963/. The other is the sensory color test and assessment of general appearance 12-24 hours after slaughter.

This paper deals with the relationship between exudative appearance and the cooking loss of cured meat products.

Experimental

The intensity of watery appearance is not of the same extent with different muscles of ham and shoulder, though, more or less- all muscles may affect the cooking loss of the cured meat. It is also evident that only these muscles may be taken into consideration which are on the surface of the dissected ham and shoulder - if subjective scoring. On the basis of Kermas and Thompson's / 1963/ observations the gluteus medius was used for sensory tests in our investigations 24 hours after slaughter. The general appearance judged by colour and structure of the shoulders was also assessed. The watery structure is easily detectable with chilled meat by the pale colour and the lack in firmness. The surface of such hams is two-toned. The muscles next to the bone are darker, those farther from it / gluteus medius/ are lighter. The other "counter-point" is the uniformly dark ham, with firm structure/ Fig. 1./. Between these structures there are several intermediate tapes too, those are, in fact, the most frequent ones.

In the course of our experiments the sensora test and selection took place closely before curing. Two categories were distinguished: the exudative and the normal / non exudative/ pieces. The normal category included the DFD /dark, firm, dry/ and the intermediate types. Both of these categories are well distinguishable by appearance and the quick

classification makes possible to select a great amount of ham and shoulder in a short time. The setting up of 3 or even 4 quality groups would make selection difficult from practical point of view. The selected exudative and normal hams and shoulders were marked, then processed in the usual manner: pumping with curing brine, adding of cover brine, dripping and canning without addition of phosphates /Lörincz et al., 1961/. The cans were given a heat treatment in water at 78C°, until the centre reached a temperature of 69 C°. Determination of the /gross/ cooking loss was made after 10 days of cold storage.

$$\text{Percentage of cooking loss} = 100 \left[1 - \frac{\text{net weight after cooking}}{\text{gross weight}} \right]$$

Results and discussion

With the selection of hams and shoulders two distinct distributions in cooking losses were obtained / fig. 2. and 3./. The distribution of exudative meat, as shown in fig. 2. and 3. is shifted towards the greater losses.

Parameters of the distribution of shoulders are shown in table 1.

G 1

Table 1.

Parameters of the distribution of the cooking loss of shoulders.

Shoulders of 4,7 - 4,8 kg, in oblong cans			
Percentage of cooking loss	normal	exudative	significant difference
$\bar{x}$	21,4 %	22,5 %	+ +
s	1,27	1,6	-
R	5,3	7,9	
n	34	62	
above 22%	36,4%	67,8 %	+ +
above 23%	17,7%	40,3 %	+
above 24%	2,9%	29,o %	+ +
Shoulders of 4,1 - 4,2 kg, in oval cans			
$\bar{x}$	22,7	24,9	+ +
s	1,83	2,46	+
R	7,7	6,1	
n	36	14	
above 24%	27,8%	64,5%	+
above 25%	11,1%	57,2%	+ +
above 26%	5,55%	35,8%	+

$\bar{x}$ = mean, s= standard deviation, R = range

n = number of observation /items/

+ = significant

+ + = highly significant

+ + + = very highly significant differences

The difference in means is highly significant.
The standard deviation of exudative shoulders / in oval cans/ differed significantly from "normal" ones.

Essentially the same results were obtained with hams / fig.3 / confirming the findings of Karmas and Thompson / 1963/ and of Wismer - Pedersen / 1960/. McLean and Kidney/1965/ noted a good correlation between pH45 and percentage jelly in small cans, however, they did not evaluate the structure before curing. The average cooking loss was greater with exudative hams / the difference in means is 1.9%; very highly significant/; the standard deviations of the two distributions are, on the other hand, practically the same, /table 2./.

Table 2

Parameters of the distribution of the cooking loss of hams
/5,6 - 5,7 kg, oval cans/

Percentage of cooking loss	normal	exudative	significant difference
$\bar{x}$	25,o	26,85	+ + +
s	2,21	2,05	-
R	11,9	13,1	
n	102	129	
above 28%	8,8 %	27,1 %	+ + +
above 29%	2,9 %	15,5 %	+ +
above 30%	0,98%	8,5 %	+

The legend is the same as with table 1.

Incidence of exudative hams is significantly higher above cooking losses of 28, 29 and 30 % / table 2/, as well as with shoulders above 22, 23, 24 resp. 24, 25, 26 % / table 1. /.

The efficiency of classification is depending naturally on proportion of exudative hams in the raw meterial to be processed.

Distributions characterizing the production may be obtained by pooling the original distributions of cooking losses of normal and exudative hams or shoulders. If the frequency of exudative pieces is less than 15 %, the efficiency of selection is little; if thefrequency is at least 40 %, the selection is significantly more efficient. The incidence of watery pork is highly variable /Bendall et al., 1965 /, Logtestijn, 1965,/ /McLoughlin, 1965/, /Maria Losconczy, 1967/. Thus selection of meat before curing may be useful in decreasing cooking loss and improving uniformity of production.

Summary

On the basis of exudative appearance assessed visually, hams and shoulders were divided into two categories before curing: the "normal" and the exudative ones. The "normal" category included the DFD and the intermediate types having significantly lower average cooking loss.

Both distributions are well discernible, thus, a preliminary selection is rather efficient. The efficiency of selection depends on the incidence of exudative meat to be processed. In case of high incidence selection may improve uniformity of pork products by decreasing cooking losses.

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Zusammenfassung.

Auf Grund organoleptischer Beurteilung können die zur Pökelung gelangenden Schinken und Vorderschinken in zwei Gruppen geteilt werden: in eine "normale" Gruppe mit geringerem Kochverlust und in eine exsudative Gruppe mit einem grösseren Kochverlust. Beide sind leicht zu unterscheiden, kann also das Rohmaterial von zweierlei Qualität gut abgesondert werden. Der Wirkungsgrad der Sortierung hängtdavon ab, in welcher Proportion exsudative Schinken, bezw. Vorderschinken im zu verarbeitenden Rohmaterial vorkommen. Falls exsudative Stücke in grösserem Masse vorkommen, so kann die Sortierung in die technologische Linie im Interesse einer bezonderen Homogenität des Fertigproduktes erwünscht sein.

Abbildung 1. Exsudativer und "trockener" Schinken.

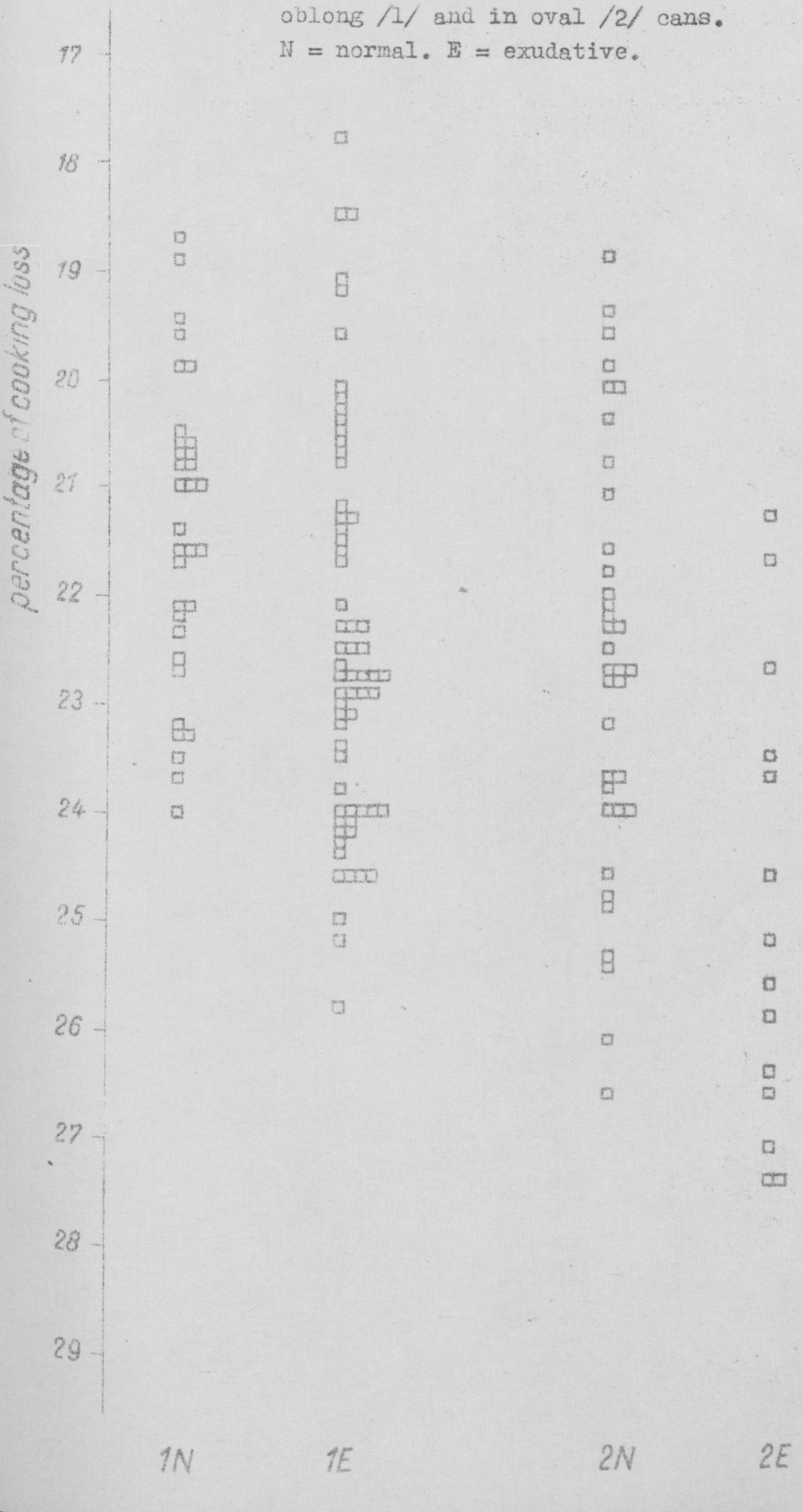
Abbildung 2. Verteilung des Kochverlustes bei 4,7-4,8 kg wiegenden, in oblongen Dosen gefüllten und bei 4,1 - 4,2 kg wiegenden in ovalen Dosen gefüllten Vorderschinken.

Abbildung 3. Verteilung des Kochverlustes bei 5,6-5,7 kg wiegenden, in ovalen Dosen gefüllten Schinken.

Tabelle 1. Gestaltung des Kochverlustes bei "normalen" und exsudativen Vorderschinken.

Tabelle 2. Gestaltung des Kochverlustes bei "normalen" und exsudativen Schinken.

Fig. 2. Distribution of cooking loss of shoulder in oblong /1/ and in oval /2/ cans.
N = normal. E = exudative.



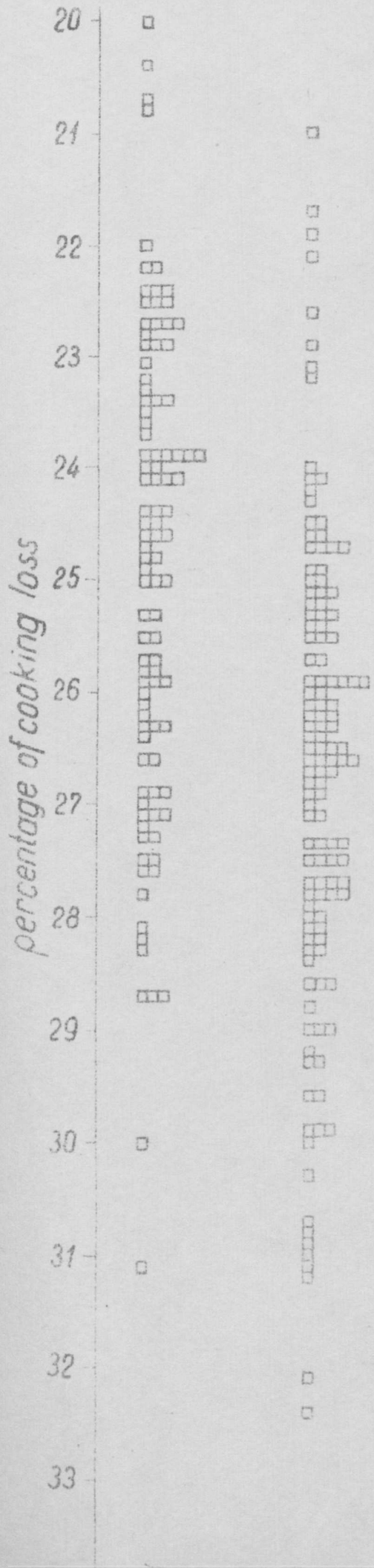


Fig. 3. Distribution of cooking loss of ham in oval cans. N = normal. E = exudative.