

CONTROL OF THE QUALITY AND PRODUCTION PROFITABILITY OF MEAT PRODUCTS

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SUMMARY

New systemizing and characterizing principles of raw materials are presented based on the composition of animal tissues. The functional properties of raw materials are divided into three main groups : nutritional characteristics, technological applicability and influence on the sensoric properties of endproducts. The predominance of functional properties and the value in use are expressed with the help of a scale of "effective values", defined by the authors.

For this reason, several tests were organized with expert's panels, and adequate algorithms were elaborated for calculations and evaluation.

The scale of "effective values" has been compared to the different quality characteristics of raw materials and conclusions have been drawn. The concept of "effective value" can be used for the correction of prices, optimization of the production and for different economical or technological studies.

INTRODUCTION

In the development of the quality characteristics and sensory properties of meat products the quality of raw materials has a primary importance. A considerable part of costs is coming from the prices of raw materials in the formulas. In this respect the following considerations are to be taken into account :

- The quality of raw materials should be homogeneous, accurate and reproducible
- A rational use of raw materials has to take into account the prescribed quality - and the costs have to be set at a minimum.
- The price of raw materials should reflect their effective value : their functionality and quality for a real optimization of formulas and production.

So, a more precise description of the characteristics of raw materials is needed, including the use of a concept of "effective value" of meat. Raw materials and their preparatory processes have been studied and systematized for this purpose. Steering and controlling operations, eg. control of yield, on-line control of composition and standardization are very important too.

CHARACTERISTICS OF RAW MATERIALS

The three main groups of properties are the following :

- nutritional properties
- technological applicability
- influence on the sensoric properties of the end-products

We call the above mentioned groups of properties essential or functional properties of raw materials (fig. 1). Beside these, hygienic properties are also important in the evaluation of the quality.

FUNCTIONAL PROPERTIES

The BEFFE* value seems to be the most important among the nutritional characteristics (eg. biological value, proximate composition, vitamine content etc.)

Technological applicability is depending on the type of raw materials and of the transformation process. These properties are either measurable or can be estimated by an expert panel (emulsifying and water-binding capacity, consistency of the blend etc.). The raw material may have considerable influence on the sensoric properties of the end-products, which highly affect the consumer acceptance. The colour, flavour, odour of the meat, the tenderness and juiciness after frying etc. are all influenced by the quality of raw materials.

THE COMPONENTS OF RAW MATERIALS

With the help of cutting and deboning, muscle groups are divided step by step into different groups, according to the tissue types. The functional properties of these tissue types become visible more and more distinctly (fig. 2). The raw materials of meat industry can be characterized by different tissue types, their common appearance and distribution. The basic tissue types being the main components of raw materials, are considered like "building units" of these. Apart from the biological-anatomical details these are the following :

- "pure" muscle tissue,
- "pure" fatty tissue,
- "pure" connective tissue,

so, the property of a given raw material depends on the type of components of raw materials, on their proportions, on their structure, and on their size. All these factors are jointly characterizing the raw material, determining its functional properties, technological applicability and value in use (fig. 3). Consequently the components of raw materials give firstly the quality and economical value, which is superposed by further economical and quality effects in the meat products. The composition

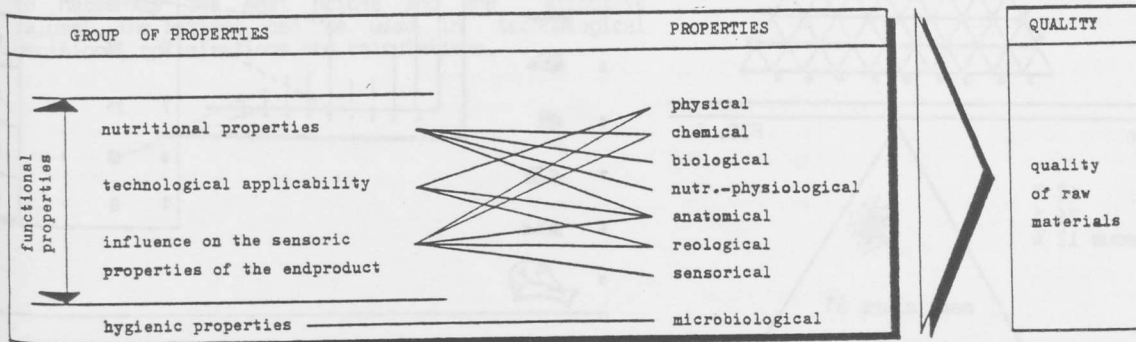


FIG. 1.

* connective tissue protein free muscle protein

of raw materials can be presented this way with the indication of the rate of tissue components which is shown in a triangle (fig. 4). By knowing the proximate composition of the raw materials, the proportions of components of a given raw material can be calculated accordingly. This is, of course, a rough estimate only. This procedure can be easily computerized with the help of a simple algorithm. Fig. 5. shows an example for the practical use of it. The rate of the components of raw materials is the starting point for the calculation of the "effective value".

FIG. 2.

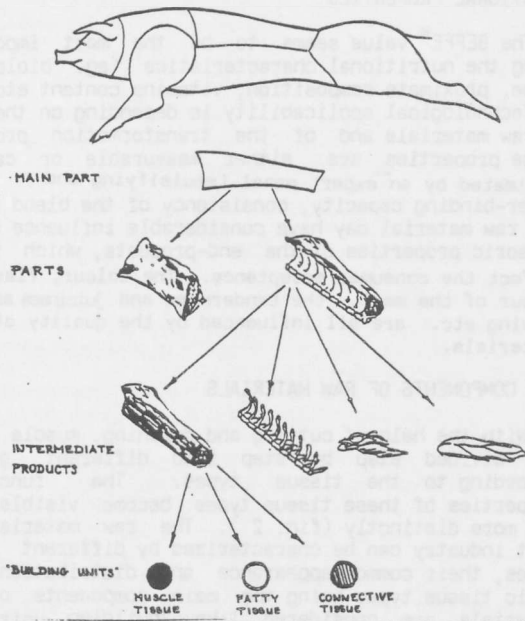


FIG. 3.

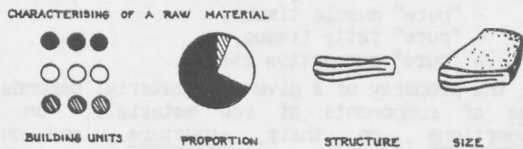


FIG. 4.

PORK LEG
 muscle tissue 68 %
 fatty tissue 19 %
 connective tissue 13 %

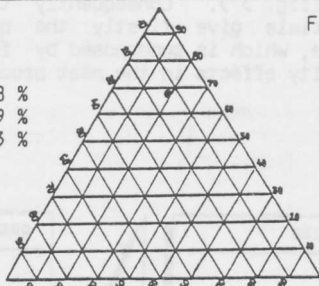
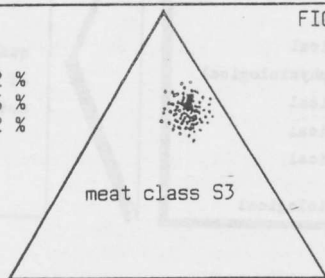


FIG. 5.

average of the composition :
 muscle tissue 62 %
 fatty tissue 26 %
 connective tissue 12 %



THE CONCEPT OF THE "EFFECTIVE VALUE" OF MEAT

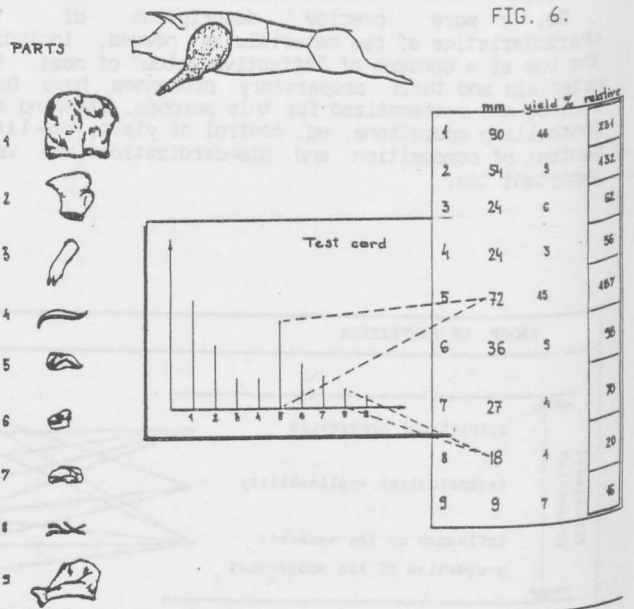
For a common study of the problems of quality and economy, i.e. to characterize the relationship between the real value and the quality of raw materials, it is practical to introduce the concept of "effective value". The "effective value" should numerically characterize the functional properties of a given raw material, compared to the others. It has to combine the quality characteristics and economy. However, the "effective value" is not influenced by purchase prices and marketing. It implies a relative scale given to the "average meat" (eg.pork carcass with skin), a score of 100, and the different raw materials have a score which is different from 100.

DETERMINATION OF THE "EFFECTIVE VALUE"

The "effective value" of meat is characterized by its functional properties. These properties can be placed on some numerical scale which is a quality index. However, it is very difficult to form a weighted average, a resultant index. So, the scale of the "effective value" has been estimated by the help of an expert panel. The tests were carried out in 10 Meat Packing Plants with groups of 5-10 experts. Firstly the relative values of the main parts of the pig carcass have been estimated. Hereupon, these procedures have been continued with different raw materials obtained by further cutting and deboning. The evaluation was carried out graphically with a help of histograms. No limiting values have been prescribed (Fig. 6). After discarding outliers, the scores were standardized to give a weighted mean of 100. The weighted means were determined according to the percentage of yield of raw materials related to the carcass mass. These values are called "relatives" (Fig. 7).

A combined procedure of iterations and panel consultations have been used to adjust the scores adequately. For this purpose, an iteration algorithm has been applied. Sometimes it was necessary to modify the scores of some raw materials, generally, 3 - 4 iterations and panel consultations were sufficient to obtain the primary scale of effective values which is shown in Fig. 8.

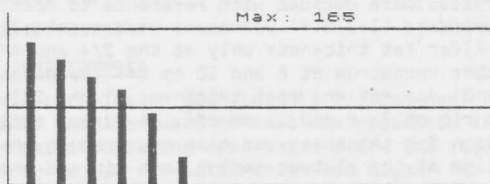
FIG. 6.



GYÖRI

A FENTI ANYAGOK ÁTLAGAI :
1 2 3 4 5 6 7 8 9

GYÖR 1 Belf.pác.alapesetes felv.



ANYAG	ÁTLAG
1 Kizsak. cs. karaj	LOIN 149
2 comb	LEG 132
3 lapocka	SHOULDER 113
4 tarja	SPARE RIB 100
5 császár	SIDE 76
6 Fej + toka	HEAD 29

FIG. 7.

RESULT AND DISCUSSION

As expected, the range of the scale of the "effective values" is much larger than the range of Hungarian meat prices. A comparison of properties has been made with different meat classes (from S1 to S10), concerning functional properties. Taking into account the protein content, an "effective value" scale between 23 and 175 should represent the differences. However the range of the prices lies between 40 and 154, being smaller than the "effective value" scale.

Technological applicability and sensory properties are related to the components of raw materials. The rate of "pure" muscle tissue is characterized indirectly by the BEFFE content. By forming the scale of meat classes according to the BEFFE content, a range between 24 and 185 is obtained which is larger than the scale related to the protein content. The latter has been compared with the scale of "effective value" obtained by the panel, the range lied between 18 and 183. This means that the panel scores are very close to the values expected from the functional properties of the components. The "effective values" of meat class S1, the lean meat of leg and loin are 183, 201 and 253, however their protein contents are very similar. These results show clearly that beside the protein content, structural characteristics, size and dimensions of the raw materials play a considerable role in the "effective value". The S1 class contains small pieces contrary to the leg and loin with extended muscle tissue components. The above considerations help in the development of a calculated, "synthetic" scale of "effective values", based on the components of raw materials.

USE OF THE SCALE OF THE "EFFECTIVE VALUE"

The price and the value of use are not sufficiently synchronized in Hungary. A correction of meat prices should be reached by the help of the above considerations. Even, if it is not completely possible to harmonize the meat prices and the "effective values", the latter can be used in technological decisions, optimizations and calculations.

4. ITERACIO FIG. 8.

