QUALIMETRIC MODEL FOR MEAT RAW MATERIALS QUALITY EVALUATION

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SUMMARY: A developed qualimetric model for evaluation of meat raw material quality is made on the basis of the data published here and abroad, and the results of experiments con-ducted in VNIKIMP. The main purpose of the model is quality evaluation of meat raw materials from industrial feeding comp-lexes. For qualimetric model construction lexes. For qualimetric model construction an approach is used on the basis of diserable function utilization for single parameters as well as for a complex parameter of meat raw materials quality. Such an approach allows to relate, in a quite simple way, the results of expert evaluation of raw material quality to the data obtained with the instrumental methods. Model soft ware is developed.

INTRODUCTION: All over the world great attention is being paid to products quality improvement. The problem is of a par-ticular importance for this country and especially for the meat industry.

For scientific maintenance of quality increase programm it is necessary to develop practical procedures for products quality evaluation.

The aim of the work was to develop a qualimetric model for quality evaluation of raw materials from industrial feeding complexes.

Intensive technologies of cattle producing and feeding, used nowdays and planned for the perspective, presuppose a wide range of maintenance conditions, feeding raions and other factors, however, it is not possible to exclude negative inf-luence on metabolism and therefore, meat quality, hypodymamia and increased stress load. The situation is being complicated by the use of breeds with a unileteral selection for meat pro-ductivity that led to decrease of stress productivity that led to decrease of stress resistance.

As the result meat industry gets cattle with the meat of quality defects (PSE and DFD), It is found that the amount of

beef and pork considered as normal meat is no more than 8%. Meat and Meat products by their physico-chemical nature are heterogenic multicomponent systems. So, their quality should be considered as hierarchically organized complex of parts properties or qualities, i.e. as a multilevel system.

Qualimetric methods are used for this system description getting of quality quantitative ratings.

Algorythm of meat products quality evaluation is given in a simplified form. It includes 3 main stages: I - preparatory; II - choice of a mathematic model for

evaluation; III - analysis of a chosen model.

For model construction an approach based on Harrington's desirability functions use is taken (Kalinina et al., 1989; Harrington, 1965). This generalized function is constructed on the basis of the idea of personal responces' natural values transformation into personal responces. transformation into nondimensional scale of desirability and preference.

MATERIALS AND METHODS: For construction of a model for meat raw material quality evaluation the following operations were used:

- selection of meat quality characteristics;
- construction of correspondance tables of quality parameters' values to personal scales of desirability; - composing of algorythm for meat quality evaluation;
- development of soft ware;
- numerical realization of a model.

Numerical realization of a model.
Quality parameters were determined on model samples of
L.dorsi on the level of 9-12th thoracic vertebra for cattle
and 6-12th for pigs.
For quality parameters selection the following approach
Was used: to make the primary information on raw material quality more complete and significant. Analysis of here and abroad literature data (Ivashov et al., 1989; Hofman K., 1987;
Molnar P., 1986) allowed to chose the following parameters determined by the common procedure:

- pH value 24h post-mortem;
- depth of subcutaneous fat layer;
- marble level;
- fat;
- moisture;
- protein;
- oxyproline level;

- colour (by total content of haem pigments); - colour number(L,a,b); - waterholding capacity; - muscle fiber diameter; For the model development DVK-3 computer was used; for programm construction Baysick language was used.

RESULTS: Quality parameters values, that may be used for construction of personal scales of desirability, were determined by the results of studies at the Institute (1988-89), Literature data (Ivashov et al., 1989; van der Wal, 1989) and expert inquest of specialists.

There were composed correspondance tables between persoal responses values, preference relations in an empiric system and personal desirabilities in a numerical system.

The all chosen parameters were divided into parameters With unilateral and bylateral limits (Tables 1-4). The average values are given.

The model for meat quality evaluation is based on single Parameters evaluation and recommendations on the way of its utilization.

Desirability	Marks on de-	Marks on sca-	Parameters			
	sirability scale	le of nondi- mensional Y	prote- in,%	oxypro- line, mg%		
Very good	1.00-0.80	3.000	22.5	68.5		
Good	0.80-0.63	1.600	20.0	78.5		
Satisfactory	0.63-0.37	0.772	17.5	92.5		
Bad	0.37-0.20	0.006	15.0	105.0		
Very bad	0.20-0.00	-0.476	13.5	115.0		

Table 1. Correspondence of quality parameters to unilateral limits to marks on desirability scale (pork)

Model's description, as a block-scheme, is given in Fig.1. After tables composing the algorythm for raw material quality evaluation includes the following processes: 1. The chosen parameters characterizing carcasses quality

for cattle, pigs, etc. are measured with the instruments.

2. Values of measuring parameters are introduced into a - if there is interface between measuring devices and a

- computer and a corresponding programme for a received signal treatment then the data are being introduced as electrical signal into the computer itself;
- if there is no interface then the measurements are tabulated and introduced into the computer from a control panel.

3. The measured values are being compared to the limits of significance for the parameters with unilateral (yi < ymax or yi > ymin) and bylateral (ymin ≤ yi ≤ ymax) limits. If all yi parameters are in the limit range than a carcass

is considered as suitable for further processing. If one or several parameters are beyond the limit range than a carcass is considered as nonsuitable for further processing, and it is necessary to start the next carcass quality evaluation.

4. For nonrejected carcasses their quality integral evaluation is made through a concentration of the second secon tion is made through a generalized function of dewirability (a corresponding subprogramme is being called for).

5. Carcasses grading (by grades) is fulfilled according to the developed scale of correspondence between desirability function value and meat category.

Desirability	Marks oh desirabi- lity sca- le	Marks on scale of nondimen- sional Y	PARAMETERS							
			<u>р</u> н ₂₄	mois- ture,%	fat, %	bright- ness	Pink- ness	yello-WHC, wness %		
Very bad	0.20-0.0	-1.45	4.75	62	0.65	36.5	3.5	7.5	49.0	
Bad	0.37-0.20	-1.1	5.10	66	0.95	39.5	4.25	9.0	54.5	
Satisfactory	0.63-0.37	40.85	5.35	70	1.25	45.5	5.6	11.5	57.0	
Good	0.80-0.63	-0.75	5.55	74	1.65	51.0	5.75	12.5	59.0	
Very good	1.00-0.80	0	5.70	77	2.15	53.0	6.5	13.5	61.5	
Good	0.80-0.63	0.75	6.00	79	2.7	56.0	7.5	15.0	68.0	
Satisfactory	0.63-0.37	0.85	6.40	81	3.2	59.5	8.5	17.5	78.0	
Bad	0.37-0.20	1.1	6.80	83	3.6	63.0	9.5	19.5	84.5	
Very bad	0.20-0.00	1.45	7.30	87	4.0	66.5	10.5	21.0	90.0	

Table 2. Correspondence of quality parameters ... (bylateral limits) to marks on desirability scale (pork)

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Table 3. Correspondence of quality parameters with unilateral limits to marks on desirability scale(beef)

Desirability	Marks on desi-	Marks on sca	- Para	Parameters		
	rability scale	le of nondi- mensional Y	prote- in,%	oxypro- line, mg%		
Very good	1.00 - 0.80	3.000	23.0	77.5		
Good	0.80 - 0.63	1.500	20.0	87.5		
Satisfactory	0.63 - 0.37	0.772	17.5	102.5		
Bad	0.37 - 0.20	0.006	15.0	120.0		
Very bad	0.20 - 0.00	-0.476	13.5	145.0		
	and the second					

Results on this part of algorythm allow, on the one hand, to pay suppliers on the basis of a more complete analysis of raw material quality and to show, on the other nad, what quality parameters should be improved may be due to a certain decrease of other parametes.

decrease of other parametes. The second part of the developed algorythm is directed to a more rational, from technological point of view, way of raw materials processing.

As different requirements are made to various types of meat raw materials than for each possible way of processing their own correspondence tables are being composed with a more narrow range of parameters changes.

narrow range of parameters changes. 6. Desirability function is calculated for each raw matetial batch taking into account every possible way of its processing.

7. The obtained desirability functions are being sorted in order of decrease, and a priority of processing way for certain raw material is determined.

Distribution of raw material flows for further processing and selection of product assprtment are independent tasks for which technological as well as economic and social aspects are of great importance.

Enlarged block-scheme of meat quality evaluation algorythm is given in Fig.2.

There are also developed meat quality evaluation algorythm subprogramme for personal deirabilities calculation and summarized functions of desirabilities for parameters with uniand bylateral limits. An instruction for programme users is composed.

Qualimetric model for quality evaluation was preliminary tested.

Desirability	Marks on desirabi- lity sca- le	Marks on scale of nondimen- sional Y	PARAMETERS							
			^{pH} 24	mois- ture, %	fat,%	brigh- tness	pink- ness	yel- low- ness	WHC, %	subcuta- neous fat layer, cm
Very bad	0.20-0.00	-1.45	5.25	62	0.65	26.0	11.0	2.75	47.5	0.13
Bad	0.37-0.00	-1.1	5.6	66	0.90	28.5	13.5	4.00	52.5	0.17
Satisfactory	0.63-0.37	-0.85	5.95	70	1.15	32.5	17.5	6.50	59.0	0.25
Good	0.80-063	-0.75	6.25	74	1.40	36.5	21.0	9.00	64.0	0.35
Very good	1.00-0.80	0	6.4	77	1.75	40.0	23.0	10.50	65.5	0.40
Good	0.80-0.63	0.75	6.6	79	2.15	43.0	24.5	11.75	69.5	0.45
Satisfactpry	0.63-0.37	0.85	7.05	81	2.65	47.0	26.5	12.75	79.0	0.55
bad	0.37-0.20	1.1	7.6	83	3.25	51.5	29.0	13.75	86.5	0.65
Very Bad	0.20-0.00	1.45	7.8	87	3.65	54.0	31.0	14.25	91.5	0.80

Table 4. Correspondence of quality parameters with unilateral limits to marks on desirability scale (beef)

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Fig. 1. A model of meat raw materials quality evaluation

CONCLUSIONS: As a result of studies a qualimetric model for

raw materials quality evaluation has been developed. For practical use of the mentioned model it is necessary: in each case, to detail initial data for calculation desirabi-lity curves and to determine a possible direction of further raw material use(evaluation aim) that supposses a partial change of parameters and model structure. In relation to meat use (for cooked sausage, canned meats, etc.) the evaluation model with be corrected, however an approach and model type will be the same.

The developed model use in conjunction with a method of experiment planning will allow to recommend feeding complexes scientifically substantiated requirements to animals feeding that will promote an increase of raw material quality and level of meat products.

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