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INVESTIGATIONS ON THE ACCORDANCE OF CHEMICAL COMPOSITION OF DAIRY PRODUCTS WITH STANDARD SPECIFICATIONS

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The following data were estabilished on the basis of the composition of cheese, butter and milk powder exhibited in 1976 standard deviation of the composition of these products from the Polish Standard, the level of statistical agreement of the products composition with the Polish Standards. Also calculated was a guarantee reserve ensuring statistical agreement of the composition of the exported products with Polish Standards.

INTRODUCTION

Our earlier publications [1, 3, 4] dealt with the agreement of the dairy products with the appropriate Standards.

In this study three dairy products in 1978, namely: manufactured cheese, skimmed milk powder and butter were subjected to an analysis which covered eight kinds of cheese coming from 21 plants, skimmed milk powder from 4 plants and export butter from 8 plants.

Chemical composition of these products has been characterised, the average chemical composition of the products has been compared with the Polish Standard (PN) specifications, statistical agreement of chemical composition with PN specifications has been established as well as the amount of the "guarantee margin" which makes it possible to ensure the statistical agreement of the chemical composition of products with PN specifications, at 95% confidence level.

AVERAGE CHEMICAL COMPOSITION OF THE INVESTIGATED PRODUCTS

DETERMINATION OF MEAN VALUE AND STANDARD DEVIATION

On the basis of statistical data illustrating the chemical composition of the products under analysis, the average (x) and standard (s) deviations have been calculated for them [2, 6]:

CONDITIONS CHARACTERIZING THE CHEMICAL COMPOSITION OF THE PRODUCTS

Cheeses

The chemical composition of cheese is affected by a great number of factors. The simultaneously occurring microbiological, physico-chemical, biochemical and technical processes must be directed appropriately to obtain the required chemical composition of cheese [5].

In the characteristic of the chemical composition of cheese the total solids content of water, fat in dry substance and salt have been taken into account. Table 1 specifies the kinds of cheese, the number of batches, production series from which the exported cheese were coming and the average values and standard deviation of cheese ingredients. The analysis of the salt content in cheese covers a smaller number of batches (war) and kinds of cheese analyzed (Table 8). The absolute content of fat in cheeses was not recorded, but it was calculated as a mean value from water and fat content in dry matter. The mean values and the average standard deviations characteristic of the chemical composition of cheeses under analysis show great differences. For example the difference between the highest and lowest average water content in the "solan" cheese was $2.81^0/o$ (49.10-$49.29^0/o$) — Table 1; for fat in dry matter $2.46^0/o$; for salt $0.22^0/o$ (Table 8) and for absolute fat content $2.24^0/o$.

Standard deviation in the "solan" cheese was: for water content from $1.03^0/o$ to $1.59^0/o$; for fat in dry substance from 0.87 to $1.45^0/o$; for salt from 0.35 to $0.58^0/o$.

Also the mean values and standard deviations of the chemical composition of the Cheddar cheese produced in 3 plants and of the Edam cheese produced in 7 plants show considerable differences — Table 1.

Skimmed milk powder

The chemical composition of skimmed milk powder is characterised by such parameters as: water content and fat content in dry substance (matter). The batches of skimmed milk powder came from 4 plants; Table 2 shows the number of batches analysed and standard deviations of the estimated values.

T a b l e 1. Mean value ($\bar{x}$) and standard deviations (s) of chemical composition of cheeses

Cheese — dairy plant	Number of cheese batch analysed	Water, %		Fat in dry substance, %		Absolute fat content ($\bar{x}$) %
		$\bar{x}$	s	$\bar{x}$	s	
Solan — Śrem	437	46.95	1.59	48.51	1.45	25.73
Solan — Morąg	1462	48.26	1.37	46.49	0.87	24.05
Solan — Giżycko	339	49.10	1.03	47.42	1.08	24.13
Solan — Łowicz	210	46.29	1.46	48.55	1.26	26.29
Cheddar — Kurów	756	37.27	0.98	49.85	0.85	31.27
Cheddar — Przasnysz	947	38.05	0.71	49.20	0.86	30.47
Cheddar — Chorzele	1796	37.16	1.04	49.58	1.01	31.15
Edamski — Biała Podlaska	231	40.41	0.87	45.88	0.72	27.33
Edamski — Żuromin	90	39.37	0.98	45.45	0.42	27.55
Edamski — Wysokie Mazowieckie	116	41.98	0.90	45.44	0.50	26.36
Edamski — Ostróda	61	41.14	0.91	45.85	0.71	26.98
Edamski — Białystok	39	42.48	0.55	45.54	0.35	26.19
Edamski — Górowo Iławieckie	139	40.73	0.74	45.60	0.44	27.02
Edamski — Grudziądz	139	41.22	0.90	46.03	0.84	27.05
Podlaski — Kolno	73	41.08	0.94	45.39	0.49	26.74
Podlaski — Suwałki	133	40.88	0.97	45.77	0.75	27.05
Podlaski — Łomża	58	41.62	0.71	45.77	0.64	26.72
Gouda — Luban	110	39.25	0.88	45.96	0.88	27.92
Trapistów — Toruń	115	44.74	0.51	40.77	0.71	22.52
Mazurski — Jeziorany	441	40.38	0.64	50.80	0.84	30.28
Tylżycki — Lidzbark Warmiński	230	42.04	1.03	45.77	0.64	26.52

T a b l e 2. Mean value ($\bar{x}$) and standard deviations (s) of chemical composition of skimmed milk powder

Dairy plants	Number of lots analysed		Water, %		Fat in dry matter, %	
	water	fat in dry matter	$\bar{x}$	s	$\bar{x}$	s
Końskie	257	64	3.76	0.45	0.79	0.44
Żnin	120	26	3.52	0.55	1.02	0.47
Skierniewice	218	170	4.35	0.50	0.79	0.41
Wąbrzeźno	62	64	3.65	0.46	0.84	0.31

The difference between the highest and lowest average water content in skimmed milk powder was 0.31% (3.76%-3.45%). The difference between the highest and lowest standard deviation was 0.1% (0.55%-0.45%). The highest and lowest average content of fat in dry matter amounted to 0.23% (0.02%-0.79) and in the standard deviation 0.16% (0.47%-0.31%).

Butter

The chemical composition of the butter was characterised by its water content. The names of the butter producing plants, the number of butter batches analysed and the mean values and standard deviations of the water content are given in Table 3.

T a b l e 3. Mean value ($\bar{x}$), standard deviations (s) and water content in butter

Dairy plants	Number of batches analysed	Water %	
		$\bar{x}$	s
Lubawa	334	15.31	0.22
Ostróda	415	15.90	0.21
Lipno	456	15.71	0.41
Rypin	371	15.74	0.30
Nowy Tomyśl	439	15.76	0.28
Węgorzewo	275	15.84	0.30
Pasłęk	795	15.83	0.22
Garwolin	413	15.78	0.39

The differences between the highest and lowest average water content in butter was 0.2% (15.91%-15.71%), and in standard deviation 0.2% (0.41%-0.21%).

A COMPARISON OF AVERAGE CHEMICAL COMPOSITION OF PRODUCTS WITH POLISH STANDARD SPECIFICATIONS

CHEESE

The specifications of the Polish Standard (PN-68/A-86230) concerning the chemical composition of cheese analysed are illustrated by data in Table 4. These specifications are defined as: "not more than" as regards water and salt content and "not less than" as regard the fat content in dry matter and absolute fat content.

T a b l e 4. Specifications for cheeses of the Polish Standard (PN-68/A-86230)

Kind of cheese	Content acc. to PN, in %			
	water (no more than)	fat in dry matter (no less than)	absolute fat content (no less than)	salt (no more than)
Solan	52.0	45.0	21.60	6.5
Cheddar	39.0	48.0	29.28	2.2
Podlaski	43.0	45.0	25.65	2.5
Mazurski	41.0	50.0	29.50	3.0
Edamski	43.0	45.0	25.65	2.5
Gouda	43.0	45.0	25.65	2.5
Trapistów	45.0	40.0	22.00	3.0
Tylżycki	44.0	45.0	25.60	3.5

Table 5 illustrates the deviations from average water content, fat content in dry matter and absolute fat content in cheeses, from values specified in the Polish Standard PN.

The highest deviation in the average water content in the case of the Solan cheese was 5.71%, the lowest — 2.90%, in the case of the Cheddar — 1.84% and 0.95%: in the case of the Podlaski — 2.12% and 1.38%, and in the case of the Edam — 3.63% and 0.52%.

The deviation from the PN specifications of the average water content was for the Mazurski 0.62%, the Gouda — 3.75%, the Trapistow — 0.26% and the Tilsit — 1.96%.

The highest and lowest deviations in average fat content in dry matter and in the average content of fats in analysed compared with PN specifications was as follows: for cheeses Solan — 3.45% and 1.49% and 4.69 and 2.45%; for Cheddar — 1.20% and 1.85%, and 1.19% and 1.99%; for Podlaski — 0.77% and 0.39%, and 1.40% and 1.07%; for Edam — 1.03% and 0.44%, and 1.90% and 0.54%. The deviation of the average fat content in dry matter and of the absolute fat content, compared with PN specifications was: for Mazurski — 0.80% and 0.76%; for Gouda — 0.96% and 2.27%; for Trapistow — 0.77% and 0.52% and for Tilsit — 0.77% and 0.42%.

T a b l e 5. Deviations of the average composition from the Polish Standard specifications, the statistical margin of guarantee and the level of statistical agreement of the cheese chemical composition with the PN Standard specifications

Cheese	Water, %			Fat in dry matter, %			Absolute fat content, %	
	deviation in composition $\overline{x}$ — PN	margin of quarantee	level of agreement with Standard	composition deviation $\overline{x}$ — PN	margin of quarantee	level of agreement with Standard	composition deviation $\overline{x}$ — PN	margin of quarantee
Solan	5.05	2.62	99.99	3.51	2.43	99.22	4.13	2.41
Solan	3.73	2.26	99.68	1.49	1.43	95.64	2.45	1.74
Solan	2.90	1.69	99.76	2.42	1.77	98.75	2.53	1.64
Solan	5.71	2.40	99.99	3.95	2.07	99.90	4.69	2.12
Cheddar	1.73	1.61	96.08	1.85	1.39	98.54	1.99	1.64
Cheddar	0.95	1.16	90.99	1.20	1.41	91.92	1.19	1.43
Cheddar	1.84	1.71	96.16	1.98	1.66	94.06	1.87	1.86
Podlaski	1.92	1.51	97.93	0.39	0.80	78.81	1.09	1.15
Podlaski	2.12	1.59	98.57	0.77	1.24	84.85	1.40	1.44
Podlaski	1.38	1.16	97.38	0.77	1.05	88.49	1.07	1.13
Mazurski	0.62	1.05	83.40	0.80	1.38	82.89	0.78	1.35
Edamski	2.59	1.43	99.86	0.88	1.18	88.88	1.68	1.33
Edamski	3.63	1.61	99.98	0.45	0.69	85.77	1.90	1.13
Edamski	1.02	1.48	87.08	0.44	0.82	81.06	0.71	1.15
Edamski	1.86	1.49	96.93	0.85	1.16	88.49	1.33	1.35
Edamski	0.52	0.90	82.89	0.54	0.57	93.82	0.54	0.74
Edamski	2.27	1.21	99.90	0.60	0.72	91.31	1.37	0.96
Edamski	1.78	1.48	97.62	1.03	1.38	89.17	1.40	1.47
Gouda	3.75	1.44	99.99	0.96	1.44	86.21	2.27	1.49
Trapistów	0.26	0.83	69.50	0.77	1.16	85.99	0.52	0.98
Tylżycki	1.96	1.69	99.86	0.77	1.07	76.12	0.92	0.97

The highest and lowest deviation of the average salt content from PN specifications in Solan was 1.43% and 0.68%, in Gouda and Trapistow — 0.15% and 0.83% — Table 8.

SKIMMED MILK POWDER

Table 6 shows a comparison of the average water content and fat content in dry matter of skimmed milk powder produced in 4 plants, with the PN Standard specifications. The highest deviation of the average water content in milk powder compared with PN requirements was 0.55%, the lowest — 0.28%.

The highest average deviation of fat content in dry matter from PN specifications was 0.71%, the lowest 0.48%.

T a b l e 6. Deviations of average composition from PN Standard, statistical margin of guarante and level of statisitcal agreement with PN for skimmed milk powder

Plant	Water, %				Fat in dry substance, %			
	content acc. to PN (no more than)	compo-sition deviations $\bar{x}$ — PN	margin of guarantee	level of agreement with Standard	content acc. to PN (no more than)	compo-sition deviations $\bar{x}$ — PN	margin of gu-aran-tee	level of agreement with Standard
Końskie	4.4	0.28	0.74	73.24	1.5	0.71	0.72	94.63
Żnin	4.0	0.48	0.90	80.79	1.5	0.48	0.77	84.61
Skierniewice	4.0	0.55	0.82	86.43	1.5	0.71	0.67	95.82
Wąbrzeźno	4.0	0.35	0.75	77.64	1.5	0.66	0.50	98.34

T a b l e 7. Deviations of average water content in butter from PN specifications, statistical margin of guarantee and level of agreement with PN

Plant	Composition deviation $\bar{x}$ — PN, %	Margin of guarantee, %	Level of agreement with standard, %
Lubawa	0.09	0.36	65.91
Ostróda	0.10	0.34	68.44
Lipno	0.29	0.67	76.12
Rypin	0.26	0.49	80.79
Nowy Tomyśl	0.24	0.46	80.51
Węgorzewo	0.16	0.49	70.19
Pasłęk	0.17	0.36	77.84
Garwolin	0.22	0.64	71.23

BUTTER

A comparison of the average water content in butter coming from 6 plants with the PN specifications is illustrated in Table 7. The highest deviation of the average water content in butter from PN specifications was 0.29%, the lowest — 0.09%.

STATISTICAL AGREEMENT OF PRODUCT COMPOSITION WITH PN SPECIFICATIONS

METHOD OF CHECKING COMPOSITION OF THE PRODUCTS WITH PN SPECIFICATIONS

The chemical composition of dairy products may be regarded, because of the variable character of conditions as a result of certain random events. The mass production, however, ensures a relatively high statistical uniformity of production.

The factors which decide about the chemical composition of dairy products may be regarded as random variables [1, 4, 5, 6] and the parameters which characterise these products, i.e. water content, fat content in dry matter, absolute fat content and salt content have a form of distribution close to the normal distribution [3].

The estimated parameters of the chemical composition $\bar{x}$ and the confirmed form of normal distribution enable the stastistical agreement of the product chemical composition with PN specifications to be determined.

The determination of the statistical agreement of the chemical composition of the products with the PN specifications was made according to the following procedure:

a) the value of the standarised variable was calculated from equation:

$$u = \frac{(PN - \bar{x})}{s} \tag{1}$$

where u — is the standarised variable

PN — is the content of the given ingredient according to Polish Standard specifications

$\bar{x}$ and s — are the parameters of the composition of the product under analysis, which are to be determined ($\bar{x}$ — mean value and s — standard deviation)

b) for the calculated value of "u" the probability value was read from the normal standard distribution tables.

CHEESE

The level of the statistical agreement of water and salt content in cheeses, from the plants under investigation, with the standard specifi-

cations was determined by means of the equation:
where:

$$p = P(X \leqslant PN) \tag{2}$$

P — is the level of statistical agreement
X — is the random variable
PN — are the Standard (PN) specifications

The level of statistical agreement of the fat content in the cheese dry matter with PN specifications was calculated from the following equation, using the same symbols, as above:

$$p = 1 - P(X < PN) \tag{3}$$

The level of statistical agreement of the water and fat content in the dry matter with PN specifications is illustrated in Table 5, and of the salt content — in Table 8.

T a b l e 8. Average salt content ($\bar{x}$), standard deviations (s), deviations from PN specifications margin of quarantee and level of statistical agreement between PN and cheese composition

Kind of cheese — dairy plant	Number of war analysed	$\bar{x}$ %	s %	Level of agreement with Standard, %	Deviation in composition $\bar{x}$ — PN, %	Margin of quarantee, %
Solan — Śrem	437	4.75	0.42	99.99	1.75	0.69
Solan — Morąg	1335	4.83	0.57	99.83	1.67	0.94
Solan — Giżycko	339	4.62	0.35	99.99	1.88	0.57
Solan — Łowicz	86	4.35	0.58	99.98	2.15	0.95
Edamski — Biała Podl.	231	1.82	0.29	99.04	0.68	0.47
Edamski — Żuromin	78	1.07	0.40	99.98	1.43	0.65
Gouda — Lubań	110	2.35	0.31	68.44	0.15	0.50
Trapistów— Toruń	115	2.17	0.07	99.99	0.83	0.11

In case of the Solan cheese, the lowest level of agreement between water content and the PN Standard was 99.68%, the highest — 99.99%; for fat content in dry matter these figures were 95.64% and 99.90%, and for salt content 99.83% and 99.99%.

In case of the Cheddar cheese the lowest level of agreement of water content with PN Standard specifications was 90.99%, the highest — 96.16%; for fat content in dry substance the same values were 94.06% and 98.54%.

For Podlaski cheese the level of agreement for water content was 97.38% in the lowest case and 98.57% in the highest case; for fat content in dry substance these figures amounted to 78.81% and 88.43%, respectively.

In case of Edam cheese, this level for water content was from 82.89% in the lowest case to 99.98% in the highest case; for fat content in dry

substance — 81.06⁰/o and 93.82⁰/o, for salt content — 99.94 and 99.98⁰/o respectively.

For the Mazurski cheese the level of agreement of water content with the PN Standard was 83.40⁰/o, of fat content in dry matter — 82.89⁰/o.

In case of the Gouda cheese the figure for water content was 99.99⁰/o, for fat content in dry matter — 86.21⁰/o, for salt content — 68.44⁰/o.

In case of Trapistów cheese, the level of agreement with the PN Standard for water content was 69.50⁰/o, for fat in dry matter content — 85.99⁰/o, for salt content — 99.99⁰/o.

For the Tilsit cheese the same figures were: for water content 99.86⁰/o, for fat in dry matter content — 76.12⁰/o.

SKIMMED MILK POWDER

The data in Table 6 show the level of statistical agreement with the Standard for water and fat in dry matter content in skimmed milk powder from 4 plants.

The level of statistical agreement with the Standard for water content was 73.24⁰/o in the lowest case, and 86.43⁰/o in the highest case; the same figures for fat in dry matter content were 84.61⁰/o and 98.34⁰/o, respectively.

BUTTER

Table 7 shows the data illustrating the level of statistical agreement with the Standard specifications for water content in butter. The lowest level of agreement was 65.91⁰/o, the highest 80.79⁰/o.

GUARANTEE MARGIN NECESSARY TO ENSURE STATISTICAL AGREEMENT BETWEEN PRODUCT COMPOSITION AND PN STANDARD SPECIFICATIONS

DETERMINATION OF GUARANTEE MARGIN

The degree of agreement of the composition of products with the PN Standard specifications, determined by the normal distribution, depends on the value of "u".

The difference $(PN - \bar{x})$ calculated from equation (3) expresses the deviation from the average composition of the given ingredient in the product from the PN specifications. This difference makes a suigeneris margin of the content of the given ingredient; it determines the amount of this ingredient necessary to guarantee the statistical agreement of the product composition with the PN Standard specifications. Equation (3) describes the relationship between value „u" and the value of standard deviation (s), i.e. a measure which characterises dispersion.

The standard deviation (*s*) of the content of individual ingredients in products, and the form of the normal distribution have been used to determine the average content of individual product ingradients at which the assumed probability of agreement between product composition and PN Standard specification would take place. To calculate it, use was made of the following equation:

$$P\left(\frac{(PN-\bar{x})}{s} \leqslant u_{1-\alpha}\right) = 1-\alpha \qquad (4)$$

where:

$u_{1-\alpha}$ — is the normal distribution quanil

α — is the level of significance

Equation (6) makes it possible to determine the amount of the margin of guarantee of individual ingredients at the Standard requirements level. This margin is determined by: the assumed level of agreement between product and Standard (e.g. 95%) and the standard deviation (*s*) for the individual ingredients of the product. The statistical margin of guarantee at a 95% probability of agreement between the product and the Standard is determined by the following inequalities:

— water or salt content

$$PN - \bar{x} > 1.6447 \cdot s \qquad (5)$$

fat in dry matter content (e.g. in cheese)

$$\bar{x} - PN > 1.6448 \cdot s \qquad (6)$$

for $\alpha = 0.05$ $u_{1-\alpha} = 1.6448$

MARGIN OF GUARANTEE OF INGREDIENTS AT AN ASSUMED 95% AGREEMENT BETWEEN PRODUCT AND STANDARD SPECIFICATIONS

Cheese

The margin of guarantee of water and of fat in the dry matter of cheese according to PN specifications, calculated from equations (7) and (8), is given in Tables 5 and 8. The guarantee margin of absolute content was calculated using the earlier estimated content of water and of fat in dry cheese matter.

In case of the Solan cheese — the level of the guarantee margin of water content as envisaged by PN specifications should be from 1.69%; of fat in dry substance — from 1.43% to 2.43% above the level specified in the PN Standard; similarly, the absolute fat content should be from 1.64% to 2.41% and of salt content — from 0.57% to 0.95%; for Cheddar cheese — the guarantee margin of water content should be from 1.16% to 2.71%; fat in dry substance content — from 1.39% to 1.66% and absolute fat content — from 1.43% to 1.86%: for Podlaski cheese — water content

from 1.16% to 1.59%, fat in dry substance content from 0.80% to 1.23%, absolute fat content from 1.13% to 1.44%; for Mazurski — water from 1.05%, fat in dry substance 1.38%, absolute fat 1.35%, for Edam — water from 0.90% to 1.61%, fat in dry substance from 0.57% to 1.38%, absolute fat from 0.74% to 1.47% salt from 0.47% 0.65%, for Gouda water 1.44%, fat in dry substance 1.44%, absolute fat 1.49%, salt 0.50%, for Trapistow and Tilsit cheeses — water 0.83% and 1.69%, fat in dry matter 1.16% and 1.05% absolute fat 0.98% and 0.97%, salt 0.11%.

Skimmed milk powder

For the skimmed milk powder the level of the guarantee margin of water and fat in dry substance contents according to the PN Standard are specified in Table 6. Water content should be from 0.74% to 0.90% below the upper specifications of the PN for this product, whereas fat in dry substance content should be from 0.50% to 0.77% below the Standard requirements.

Butter

The margin of guarantee of water content in butter according to PN specifications is given in Table 7. For butter the average water content should be from 0.34% to 0.67% below the upper value permissible by the Standard (i.e. below 16.0%).

CONCLUSIONS

1. Considerable differences in the average composition of cheeses as compared with the Polish Standard PN specifications were found to exist. Deviation from water content as specified by the PN varied from 0.26% for Trapistow cheese in the lowest case, to 5.71% for the Solan in the highest case; the respective figures for fat in dry substance content varied from 0.39% in Podlaski and 3.95% in Solan cheese to absolute fat content of 0.52% in Trapistow and 4.69% in the Solan cheese.

2. A lack of statistical agreement between the composition of the cheese and that specified in the PN standard was found to exist. The lowest level of statistical agreement for water content was shown by the Trapistów cheese (69.50%), the highest by the Solan (99.99%).

The lowest level of statistical agreement of fat in dry matter content with PN specifications was in the Tilsit cheese — 76.12%, the highest in the Solan — 99.9%.

3. Considerable variations in water content in butter were observed. Deviations from PN specifications for butter from plants under analysis

varied from 0.10⁰/₀ to 0.29⁰/₀. The lowest and highest levels of agreement varied from 65.91⁰/₀ to 80.79⁰/₀.

4. Big variations in chemical composition and in the level of agreement with the PN Standard specifications were shown by skimmed milk powder. Water content in milk powder from plants covered by the analysis showed deviations from PN specifications within 0.28⁰/₀ — 0.55⁰/₀. The lowest level of statistical agreement with PN Standard was 73.24⁰/₀, the highest — 86,43⁰/₀; the content of fat in dry substance in milk powder varied from 0.48⁰/₀ to 0.71⁰/₀. The lowest level of statistical fat in dry substance content for milk powder was 84.61⁰/₀, the highest level — 98.34⁰/₀ compared with PN Standard specifications.

5. The composition of the dairy products supplied in 1976 was not in a statistical agreement with PN Standard specifications. This indicates to the need to standarise the raw material and to apply a stricter process discipline in the production plants.

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BADANIA NAD ZGODNOŚCIĄ SKŁADU CHEMICZNEGO PRODUKTÓW MLECZARSKICH Z WYMAGANIAMI POLSKIEJ NORMY

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Streszczenie

Omówiono zgodność składu produkowanych w 1976 r. produktów mleczarskich. Badaniem objęto 8 rodzajów serów (solan, cheddar, edamski, podlaski, gouda, trapist, mazurski, tylżycki) z 7922 warów w 21 zakładach; 3498 partii masła z 8 zakładów i 657 partii proszku z mleka odtłuszczonego.

Ustalono: a) odchylenia średniego składu serów, tj. wody, tłuszczu w suchej masie od wymagań PN oraz poziom statystycznej zgodności zawartości wody i tłuszczu w suchej masie serów z wymaganiami PN; b) odchylenia średniej zawartości wody w maśle oraz poziom statystycznej zgodności wody w maśle z wymaganiami PN; c) odchylenia średniego składu wody i tłuszczu w suchej masie proszku oraz poziom statystycznej zgodności tych składników proszku z wymaganiami PN. Wyliczono wielkość zapasu gwarancyjnego, pozwalającego na zapewnienie statystycznej zgodności składu produktów z wymaganiami PN na poziomie ufności 95%.