Director
Metrology service Ltd.

Nataliia BOZHKO
April 3rd 2026


# PROFICIENCY TESTING PT.UA.2.4.2017
# MEAT PRODUCTS PROPERTIES
# PROFICIENCY TESTING REPORT –
# ROUND 9 MARCH 2026

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| Status: | Final |

Kyiv-2026

# 1. TABLE OF CONTENTS

## 2. SUMMARY

2.1. The purpose of proficiency testing in meat products testing is to demonstrate the laboratory's competence (as described in ISO/IEC 17043:2023[1]) and improve the reliability of test results.

2.2. This proficiency testing involves the use of inter-laboratory comparisons to confirm the performance of individual laboratories' abilities and/or identify areas of improvement. Current PT scheme is registered in the EPTIS database.

2.3. This is the final report on the PT.UA.2.4.2017 Round 9 held in March 2026. This report is issued according to ISO/IEC 17043[1] and PT.UA.2.4.2017 Round 9 Programme. The report is issued in two languages – Ukrainian and English. English should be considered as the basic language of the report. Both versions of this report can be found at: http://www.metrologyservice.com.ua

2.4. A total of 12 participants reported. Their results are presented in the next clauses.

2.5. Technical experts list and/or subcontractors for this round can be provided to the Participant by request.

2.6. Any calculations, formulas, raw and intermediate data used in this round can be provided to the Participant by request, except confidential information about other participants and information that may contain commercial secret.

2.7. If the Participant does not agree with the proficiency testing results or has any comments on the Provider's work, one can submit a complaint or appeal within 10 days starting from the publication date. More information on the complaint procedure can be found at https://www.metrologyservice.com.ua/ or by contacting the Provider.

## 3. GENERAL PROTOCOL FOR PROFECIENCY TESTING

### 3.1. MANAGEMENT SYSTEM.

3.1.1. The functioning management system of Metrology Service Ltd. (further - Provider) complies with ISO/IEC 17043[1] requirements and covers all aspects of proficiency testing (further - PT) for all proficiency tests.

### 3.2. SAMPLES PREPARATION, HOMOGENITY AND STABILITY

3.2.1. Provider has used a validated procedure and appropriate technical experts and contractors for the samples' selection, production, homogenization and division designs that is proved to be satisfactory for the purposes of PT programme PT.UA.2.4.2017 Round 9. Details of test material preparation and homogenization are not published in the report, though can be provided to the Participant by request. Tests, required to prove (validate) homogeneity and stability of samples were performed by competent contracting laboratories according to [1]. These results with statistics are published in the report.

3.2.2. Participants may contact the Provider to request details of test material selection, preparation, homogenization and division of those test material samples, for which they tested in PT. Such information can be provided to the Participant in confidence and only if it cannot compromise other Participants and/or is not a commercial secret.

## 3.3. DISPATCH AND RECEIPT OF SAMPLES

3.3.1. Samples of test material – **homogenized chicken meat** were dispatched 03.03.2026 according to schedule of proficiency testing programme PT.UA.2.4.2017 Round 9.

3.3.2. Each produced and identified sample was hermetically sealed in a foil and additionally plastic bag and sent in a thermo box with refrigerant.

3.3.3. A total of 12 participants received one sample. Results were accepted from 12 participants.

## 3.4. FOLLOW-UP SERVICES

3.4.1. If a participant wishes to obtain advice/consultation on any aspect of their performance, one should contact the Provider. Provider can (with agreement with Participant) pass on the Participant's inquiry to a technical expert and/or contracting laboratory.

3.4.2. Surplus samples from this round are available for sale as certified reference materials (CRM) with the certified values and uncertainties. Please e-mail Provider for details.

## 3.5. PERFORMANCE ASSESMENT

3.5.1. Provider expressed Participant's results as traditional z-scores according to [1].

3.5.2. The assigned value for each analyte was calculated as the robust mean of the trial data using Huber H15 method [2] or Algorithm A variation, Annex C.3 [4].

3.5.3 The target standard deviation for each analyte was chosen from either the appropriate form of the Horwitz equation, method trial standard deviation (if stated in the method from inter-laboratory comparisons), standard deviation from the previous trials (PT rounds), or the robust trial standard deviation, after the removal of outliers. The choice was made using current industry practices used in other collaborative trials and proficiency testing schemes.

3.5.4. z-Scores were deemed satisfactory if $|z| \leq 2$. z-Scores were deemed questionable if $2 < |z| \leq 3$ (marked yellow in tables). If $|z| > 3$, the results were considered to be unsatisfactory (marked red in tables). The calculations were made according to [1,3,5]. Provider recommends corrective actions if $|z| > 3$ and preventive actions if $2 < |z| \leq 3$.

3.5.5. Only 6.58% (5 results) of all results in this round were considered to be unsatisfactory There were 1.92% (1 result) of all results in this round were considered to be unsatisfactory in Round 8.

3.5.6 The robust mean of the parameters «Carbohydrate content, %» and «Energy, kcal/100g» was calculated based on the results of all robust mean parameters what included to formula: «Mass fraction of protein, % (conversion factor of nitrogen content to protein content 6.25)», «Mass fraction of fat, %», «Mass fraction of moisture, %», «Total ash, %», that were assessed as satisfactory.

3.5.7. Participants №4 and №5 stated results for «Chloride content, %» as «Менше 0,25». According to the robust mean and PT SD, that was chosen for the round, these results were assessed by the Provider as "Satisfactory (S)".

3.5.8. Participants №3 provided an additional result for «Chloride content, %» in the notes according to the method «ДСТУ ISO 1841-1:2004» as «0,117». This result was assessed by the Provider as №13.

3.5.9. Participant №6 stated results for: «Fat content, %» according to the method «ДСТУ 8380:2015» instead of the «ISO 1443:1973/ ДСТУ ISO 1443:2005» proposed by the Provider, «Chloride content, %» according to the method «МВВ 9957 (ГОСТ 9957 - 2015) Визначення

вмісту хлориду натрію у м’ясі та м’ясних виробах методом Мора» instead of the «ДСТУ ISO 1841-2:2004» proposed by the Provider, «Bone residue content, %» according to the method «ДСТУ 4436:2005 (додаток В)» instead of the «ГСТУ 46.070-2003, Додаток В». proposed by the Provider. These results were assessed by the Provider but were not taken into account when calculating robust mean and robust SD.

3.5.10. Participant №12 stated for «Carbohydrate content, %» as «<0.1». According to the robust mean and PT SD, which was chosen for the round, this result was assessed by the Provider as “Satisfactory (S)”.

## 4. HOMOGENITY AND STABILITY ASSESMENT

4.1. Samples were assessed for homogeneity and stability after blending and packing by selecting three samples of material at random from all those produced. Samples were tested in duplicate under repeatability conditions as only 18 samples were produced according to [6].

4.2. Statistical analysis of the resulting data for homogeneity and stability was carried out using the industry standard Cochran’s ‘C’ test and analytical variance test for ‘sufficient homogeneity’ according to [3] or Annex B.2[4].

4.3. Produced samples were found to be sufficiently homogeneous and stable for every analyte according to programme.

4.4. Moisture content, % (factor for converting nitrogen content to protein content – 6.25) (ISO 1442:2023/ ДСТУ ISO 1442:2005)

| Moisture content, % | | | ISO 1442:2023/ ДСТУ ISO 1442:2005 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Дослідження гомогенності/Homogenity test | | | | | | | | | | |
| Аналіз викидів за тестом Кохрана(C -тест)/Cohran's C test for outliers | | | | | | Аналіз на 'достатню однорідність'/Test for 'sufficient homogenity' | | | | |
| | | | | | | | | | | |
| Номер зразку/ Sample number | Результат/ Result A | Результат/ Result B | Average | SD² | | Номер зразку /Sample number | Результат/ Result A | Результат/ Result B | SUM | Difference² |
| 1 | 70,480 | 70,380 | 70,430 | 0,0050 | 0,00 | 1 | 70,48 | 70,38 | 140,86 | 0,0100 |
| 2 | 70,440 | 70,060 | 70,250 | 0,0722 | 0,00 | 2 | 70,44 | 70,06 | 140,50 | 0,1444 |
| 3 | 70,730 | 70,600 | 70,665 | 0,0085 | 0,00 | 3 | 70,73 | 70,60 | 141,33 | 0,0169 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | 0,1713 |
| Mean | 70,448 | | Worst pair | 0,0722 | | Mean | 70,448 | | | |
| Max | 70,73 | | SUM of SD² | 0,0857 | | Max | 70,73 | | | |
| Min | 70,06 | | C | 0,8430 | | Min | 70,06 | | | |
| | | | Ccr, 5% | 0,9669 | | | | | | |
| | | | Ccr, 1% | 0,9933 | | Analytical variance S²an | 0,0286 | SD | 0,2275 | |
| | | | Conclusion | | | Sanal | 0,1690 | RSDR | 0,3230 | |
| | | | 5% | PASS | | Ssums | 0,1732 | | | |
| | | | 1% | PASS | | MSb | 0,0866 | | | |
| | | | | | Between sample variance S²sam | | 0,0290 | | | |
| Remarks | | | | | | | | | | |
| 1. Cohran's C test is described in ISO 5727-2 and ISO 13528:2022 | | | | | | | | | | |
| 2. Test for 'sufficient homogenity' is performed according to Annex B ISO 13528:2022 | | | | | | | | | | |

| Source of σp value to use Use(write '1') | Source | σp |
|---|---|---|
| 1 | C>13.8%, HORWITZ | 0,8393 |
| | 120ppb<C<13.8%, HORWITZ | 1,4852 |
| | C<120 ppb | 15,4986 |
| MASS NEGATIVE POWER FOR HORWITZ EQUATION(%=2, ppb=9,ppm=6) | | 2 |
| | SD | 0,2077 |
| | Trial SD | 0,8400 |
| | | |
| | Target SD chosen | 0,8393 |
| | σ²all | 0,0634 |
| | Replicates | 3 |
| | F1 | 2,996 |
| | F2 | 4,276 |
| | Critical value | 0,3120 |
| | Between sample variance S²sam | 0,0290 |
| | Sufficient homogenity test | PASS |

## 4.5. Data for all analytes

| | ISO 937:2023/ ДСТУ ISO 937:2005 | ISO 1443:1973/ ДСТУ ISO 1443:2005 | ISO 1442:2023/ ДСТУ ISO 1442:2005 | ISO 1841-1:1996/ ДСТУ ISO 1841-1:2004 | GOST 46.070-2003, Annex B | ДСТУ ISO 936:2008 | ДСТУ ISO 2917-2001 |
|---|---|---|---|---|---|---|---|
| | Protein content, % (factor for converting nitrogen content to protein content - 6.25) | Fat content, % | Moisture content, % | Chloride content, % | Bone residue content, % | Total ash , % | pH |
| **Homogenity and stability (Гомогенність та стабільність)** | | | | | | | |
| **Cohran's 'C' test (С-тест "Кохрана")** | | | | | | | |
| Crtitical value (5%,3pairs)=0,9669 | 0,6933 | 0,8244 | 0,8430 | 0,6531 | 0,8000 | 0,5952 | 0,8621 |
| Mean Result | 17,5250 | 10,5917 | 70,4483 | 0,1933 | 0,4483 | 1,4367 | 6,4057 |
| Conclusion (Висновок) | PASS | PASS | PASS | PASS | PASS | PASS | PASS |
| **Analytical variance test (тест аналітичної дисперсії)** | | | | | | | |
| $S^2$anal | 0,0127 | 0,0034 | 0,0286 | 0,0000 | 0,0001 | 0,0007 | 0,0000 |
| Sanal | 0,1128 | 0,0585 | 0,1690 | 0,0040 | 0,0091 | 0,0265 | 0,0044 |
| $S^2$sample | 0,0119 | 0,0025 | 0,0290 | 0,0000 | 0,0000 | 0,0000 | 0,0009 |
| $\sigma_p$ | 0,4186 | 0,2970 | 0,8393 | 0,0099 | 0,0202 | 0,0544 | 0,1180 |
| $\sigma_p$ source | Horwitz | Horwitz | Horwitz | Horwitz | Horwitz | Horwitz | Trial SD |
| $\sigma^2$all | 0,0158 | 0,0079 | 0,0634 | 0,0000 | 0,0000 | 0,0003 | 0,0013 |
| Critical value | 0,1016 | 0,0384 | 0,3120 | 0,0001 | 0,0005 | 0,0038 | 0,0038 |
| Conclusion (Висновок) | PASS | PASS | PASS | PASS | PASS | PASS | PASS |

# 5. DATA SUMMARY

| Method | ISO 937:2023/ ДСТУ ISO 937:2005 | ISO 1443:1973/ ДСТУ ISO 1443:2005 | ISO 1442:2023/ ДСТУ ISO 1442:2005 | ISO 1841-1:1996/ ДСТУ ISO 1841-1:2004 | GOST 46.070-2003, Annex B | ДСТУ ISO 936:2008 | ДСТУ ISO 2917-2001 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Protein content, % (factor for converting nitrogen content to protein content - 6.25) | Fat content, % | Moisture content, % | Chloride content, % | Bone residue content, % | Total ash , % | pH | Carbohydrate content, % | Energy, kcal/100g |
| No of Results | 10 | 11 | 11 | 11 | 10 | 7 | 6 | 5 | 5 |
| No of Results \|z\|>3 or NS | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| No of Results \|z\|>3, % or NS,% | 0,000 | 18,182 | 9,091 | 9,091 | 0,000 | 0,000 | 0,000 | 0,000 | 20,000 |
| Mean | 17,629 | 9,859 | 70,311 | 0,229 | 0,460 | 1,404 | 6,315 | 1,515 | 161,537 |
| Min | 16,790 | 6,780 | 67,300 | 0,030 | 0,330 | 1,210 | 6,100 | 0,000 | 142,420 |
| Max | 18,540 | 10,670 | 71,660 | 0,670 | 0,610 | 1,570 | 6,450 | 3,780 | 168,570 |
| SD | 0,471 | 1,202 | 1,125 | 0,184 | 0,087 | 0,116 | 0,132 | 1,853 | 10,807 |
| Median | 17,605 | 10,500 | 70,560 | 0,194 | 0,455 | 1,400 | 6,370 | 1,141 | 165,220 |
| Robust mean (assigned value) | 17,620 | 10,303 | 70,543 | 0,172 | 0,440 | 1,410 | 6,323 | 0,124 | 163,705 |
| Robust SD | 0,320 | 0,411 | 0,383 | 0,096 | 0,059 | 0,101 | 0,118 | 1,853 | 3,166 |
| SD from method (Tr.SD) | N/A | N/A | 0,565 | N/A | N/A | 0,072 | N/A | N/A | N/A |
| SD from Horwitz eq. | 0,420 | 0,290 | 0,840 | 0,009 | 0,020 | 0,054 | N/A | 0,035 | N/A |
| Target SD | 0,420 | 0,465 | 0,840 | 0,096 | 0,059 | 0,072 | 0,118 | 1,853 | 3,166 |
| Source of target SD of PT | Horwitz | Trial SD | Horwitz | Trial SD | Trial SD | Method Tr SD | Trial SD | Trial SD | Trial SD |

## 6. RAW DATA

| Method | ISO 937:2023/ ДСТУ ISO 937:2005 | ISO 1443:1973/ ДСТУ ISO 1443:2005 | ISO 1442:2023/ ДСТУ ISO 1442:2005 | ISO 1841-1:1996/ ДСТУ ISO 1841-1:2004 | GOST 46.070-2003, Annex B | ДСТУ ISO 936:2008 | ДСТУ ISO 2917-2001 | | |
|---|---|---|---|---|---|---|---|---|---|
| Laboratory number | Protein content, % (factor for converting nitrogen content to protein content - 6.25) | Fat content, % | Moisture content, % | Chloride content, % | Bone residue content, % | Total ash , % | pH | Carbohydrate content, % | Energy, kcal/100g |
| 1 | 16,79 | 9,81 | 69,54 | 0,03 | 0,33 | - | 6,38 | - | - |
| 2 | 17,41 | 10,62 | 70,54 | 0,194 | 0,46 | 1,43 | 6,39 | 0,00 | 165,22 |
| 3 | 17,75 | 10,67 | 70,189 | 0,18 | | 1,39 | 6,36 | 0,001 | 167,034 |
| 4 | 17,25 | 10,50 | 70,70 | менше 0,25 | 0,42 | | | | |
| 5 | 17,47 | 10,59 | 70,47 | Менше 0,25 | 0,45 | | | | |
| 6 | 18,07±0,26 | 6,78±0,05 | 71,66±0,5 | 0,24±0,05 | 0,575±0,05 | 1,21±0,2 | - | 2,28±0,15 | 142,42±7,12 |
| 7 | 17,55 | 10,58 | 70,86 | | 0,42 | 1,33 | | | |
| 8 | | 10,59 | 70,56 | 0,23 | 0,47 | | | | |
| 9 | 17,80 | 9,20 | 71,00 | 0,30 | не досліджували | 1,50 | 6,21 | не досліджували | не досліджували |
| 10 | | | | | 0,36 | | | | |
| 11 | 18,54 | 8,81 | 67,30 | 0,67 | 0,61 | 1,57 | 6,10 | 3,78 | 168,57 |
| 12 | 17,66 | 10,30 | 70,60 | 0,10 | 0,50 | 1,40 | 6,45 | <0,1 | 164,44 |
| 13 | | | | 0,117 | | | | | |

## 7. Z SCORES

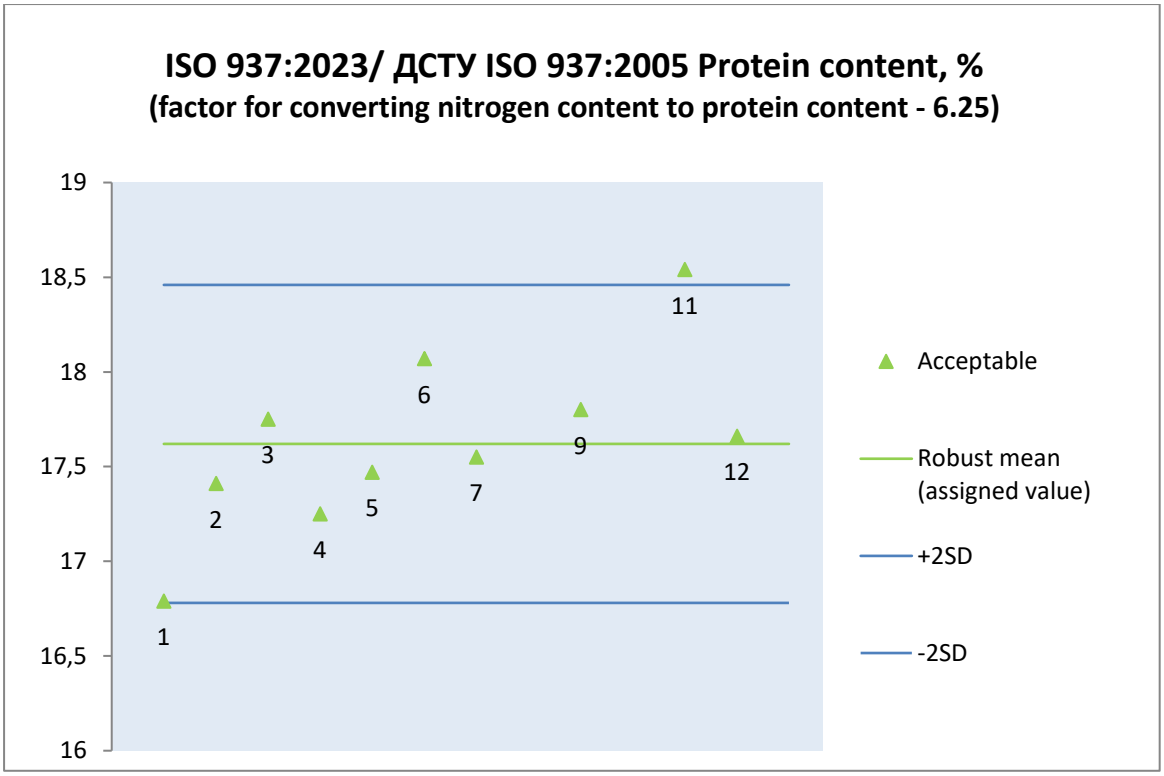
| Method | ISO 937:2023/ ДСТУ ISO 937:2005 | ISO 1443:1973/ ДСТУ ISO 1443:2005 | ISO 1442:2023/ ДСТУ ISO 1442:2005 | ISO 1841-1:1996/ ДСТУ ISO 1841-1:2004 | GOST 46.070-2003, Annex B | ДСТУ ISO 936:2008 | ДСТУ ISO 2917-2001 | | |
|---|---|---|---|---|---|---|---|---|---|
| Laboratory number | Protein content, % (factor for converting nitrogen content to protein content - 6.25) | Fat content, % | Moisture content, % | Chloride content, % | Bone residue content, % | Total ash , % | pH | Carbohydrate content, % | Energy, kcal/100g |
| 1 | -1,98 | -1,06 | -1,19 | -1,49 | -1,86 | | 0,49 | | |
| 2 | -0,50 | 0,68 | 0,00 | 0,23 | 0,34 | 0,28 | 0,57 | -0,07 | 0,48 |
| 3 | 0,31 | 0,79 | -0,42 | 0,08 | | -0,28 | 0,32 | -0,07 | 1,05 |
| 4 | -0,88 | 0,42 | 0,19 | S | -0,34 | | | | |
| 5 | -0,36 | 0,62 | -0,09 | S | 0,17 | | | | |
| 6 | 1,07 | -7,58 | 1,33 | 0,71 | 2,29 | -2,77 | | 1,16 | -6,72 |
| 7 | -0,17 | 0,60 | 0,38 | | -0,34 | -1,11 | | | |
| 8 | | 0,62 | 0,02 | 0,60 | 0,51 | | | | |
| 9 | 0,43 | -2,37 | 0,54 | 1,34 | | 1,25 | -0,96 | | |
| 10 | | | | | -1,35 | | | | |
| 11 | 2,19 | -3,21 | -3,86 | 5,21 | 2,88 | 2,21 | -1,89 | 1,97 | 1,54 |
| 12 | 0,10 | -0,01 | 0,07 | -0,76 | 1,02 | -0,14 | 1,08 | S | 0,23 |
| 13 | | | | -0,58 | | | | | |

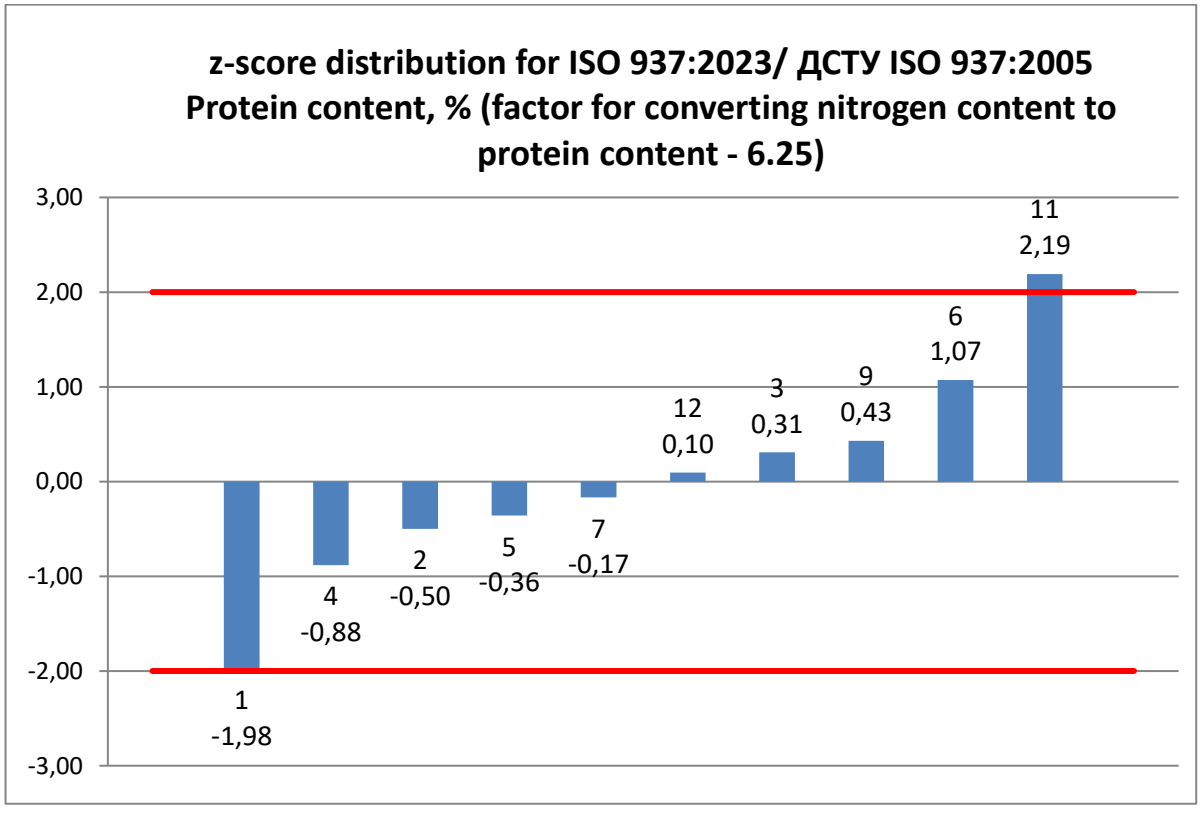
**Remarks**

1. Green colored cells contain results that are considered to be satisfactory.
2. Red colored cells contain results that are considered to be not satisfactory.
3. Results that are considered to be questionable are marked by yellow colored cell.
4. Blank cell – results were not reported by the Participant

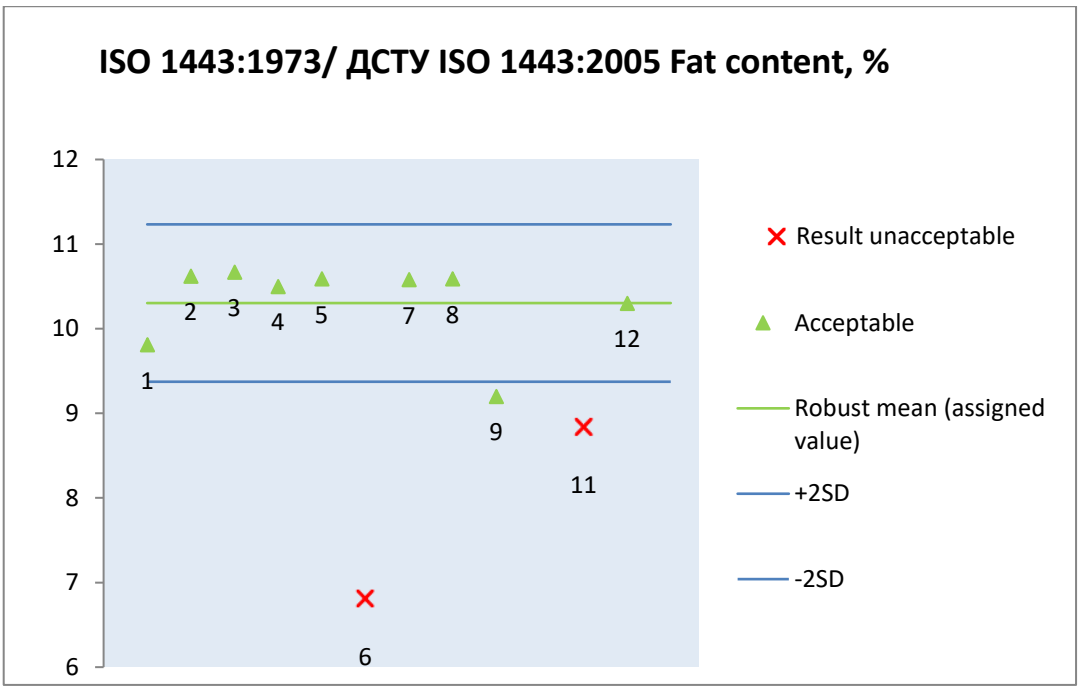
## 8. Z SCORE PLOTS AND RESULTS CHARTS.

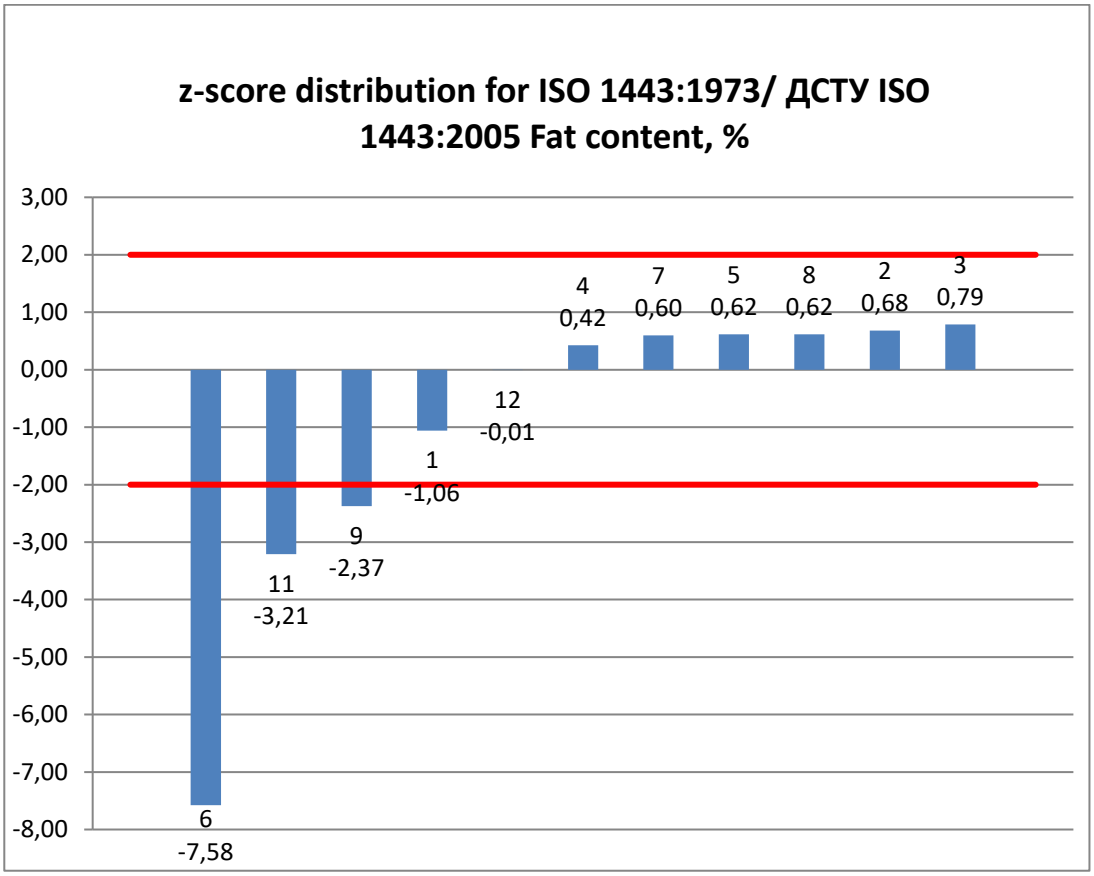
### 8.1. ISO 937:2023/ ДСТУ ISO 937:2005 Protein content, % (factor for converting nitrogen content to protein content – 6.25)



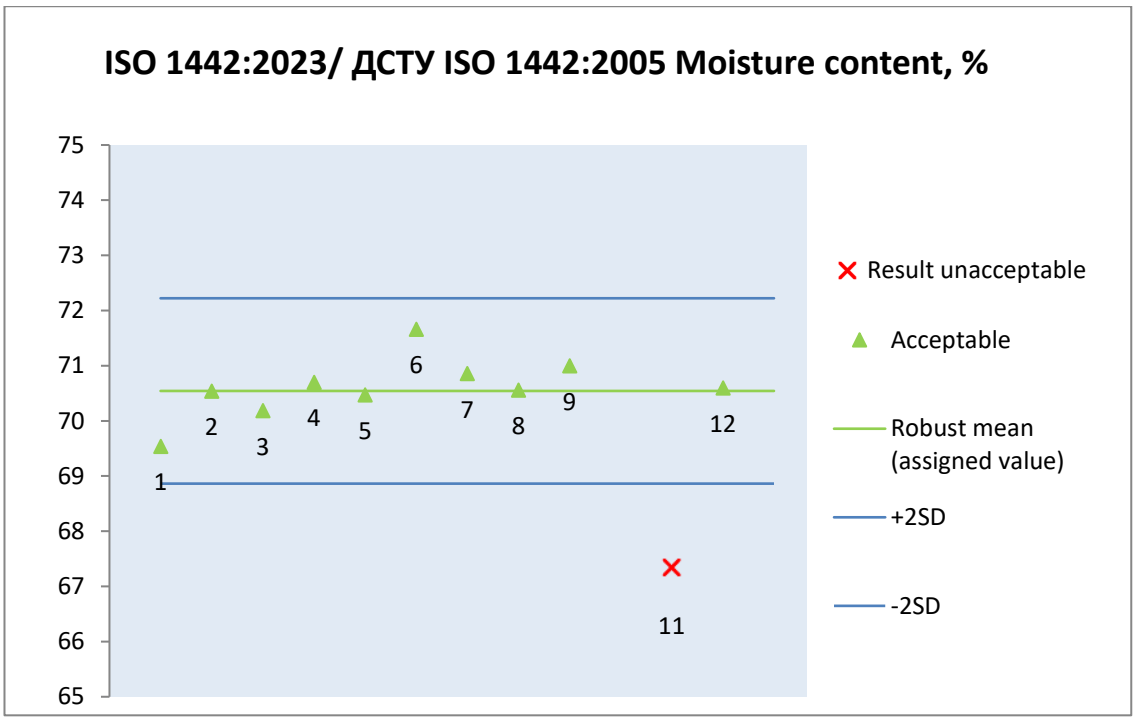



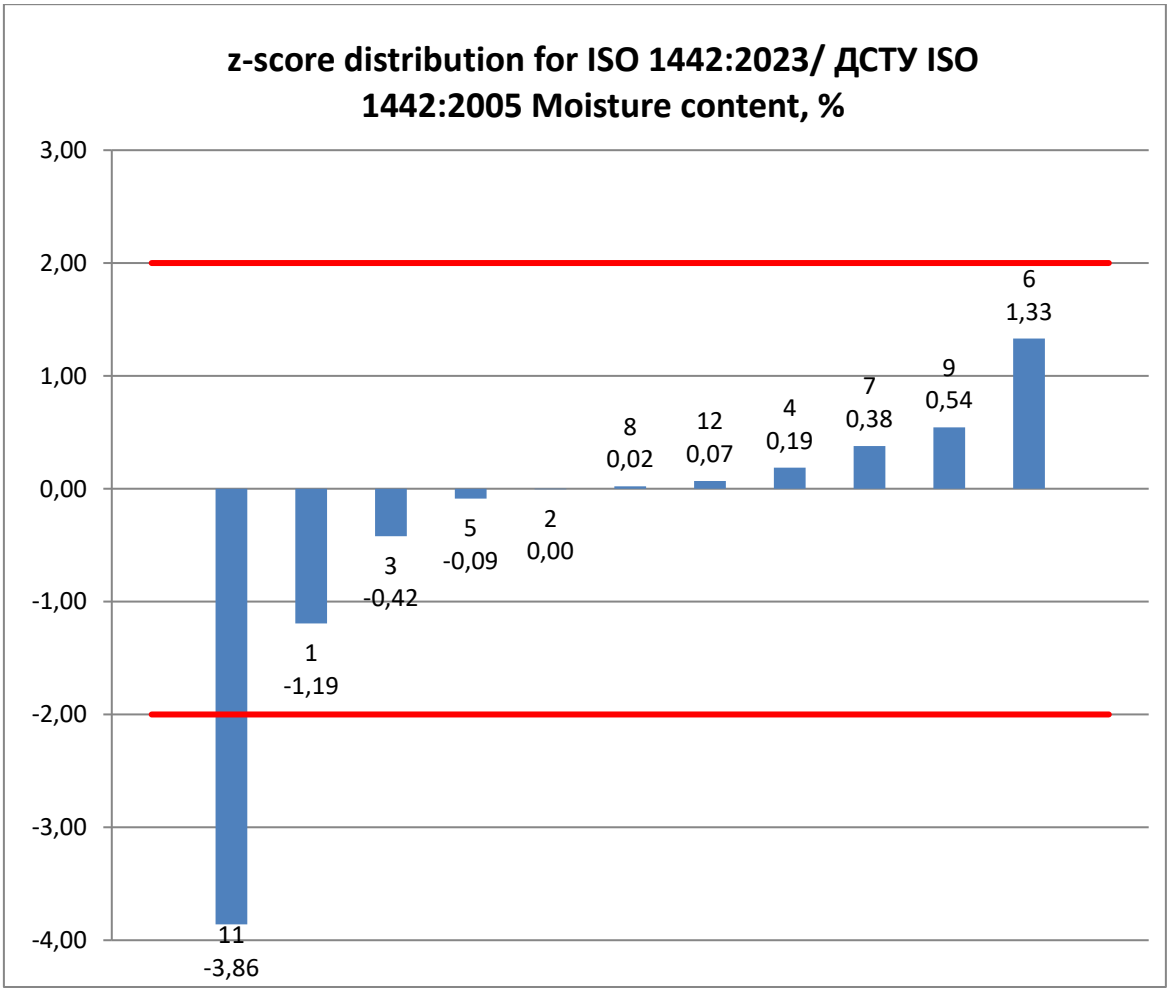
## 8.2. ISO 1443:1973/ ДСТУ ISO 1443:2005 Fat content, %



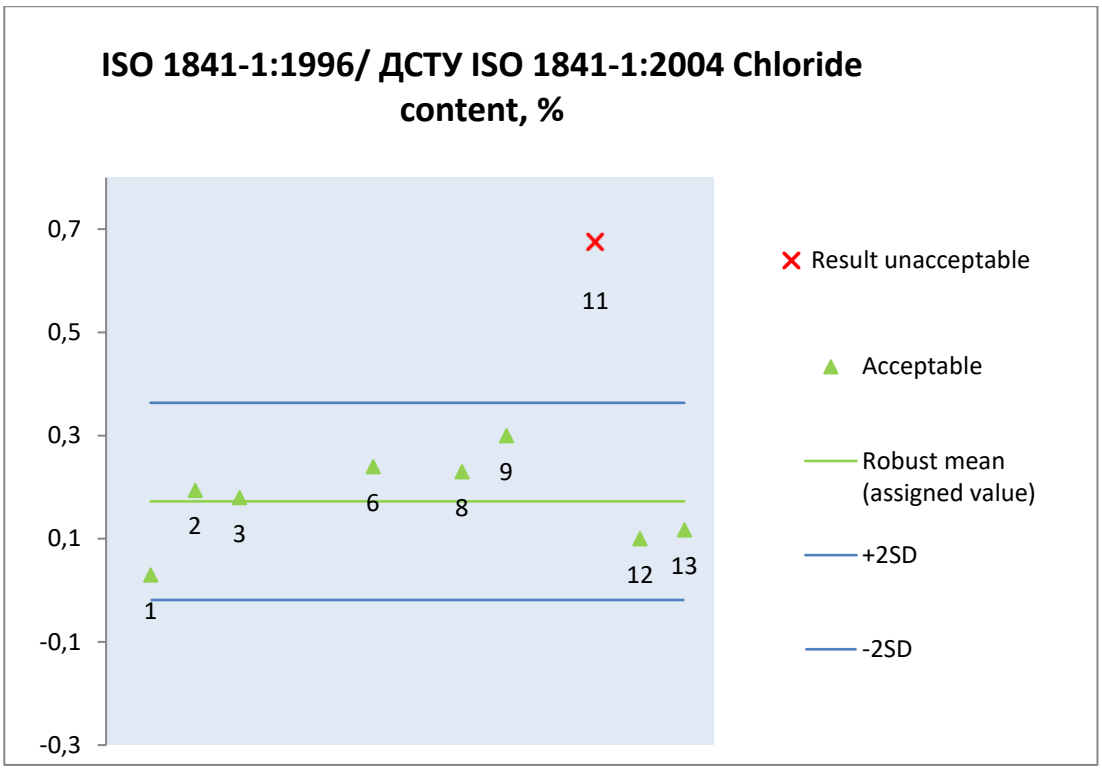



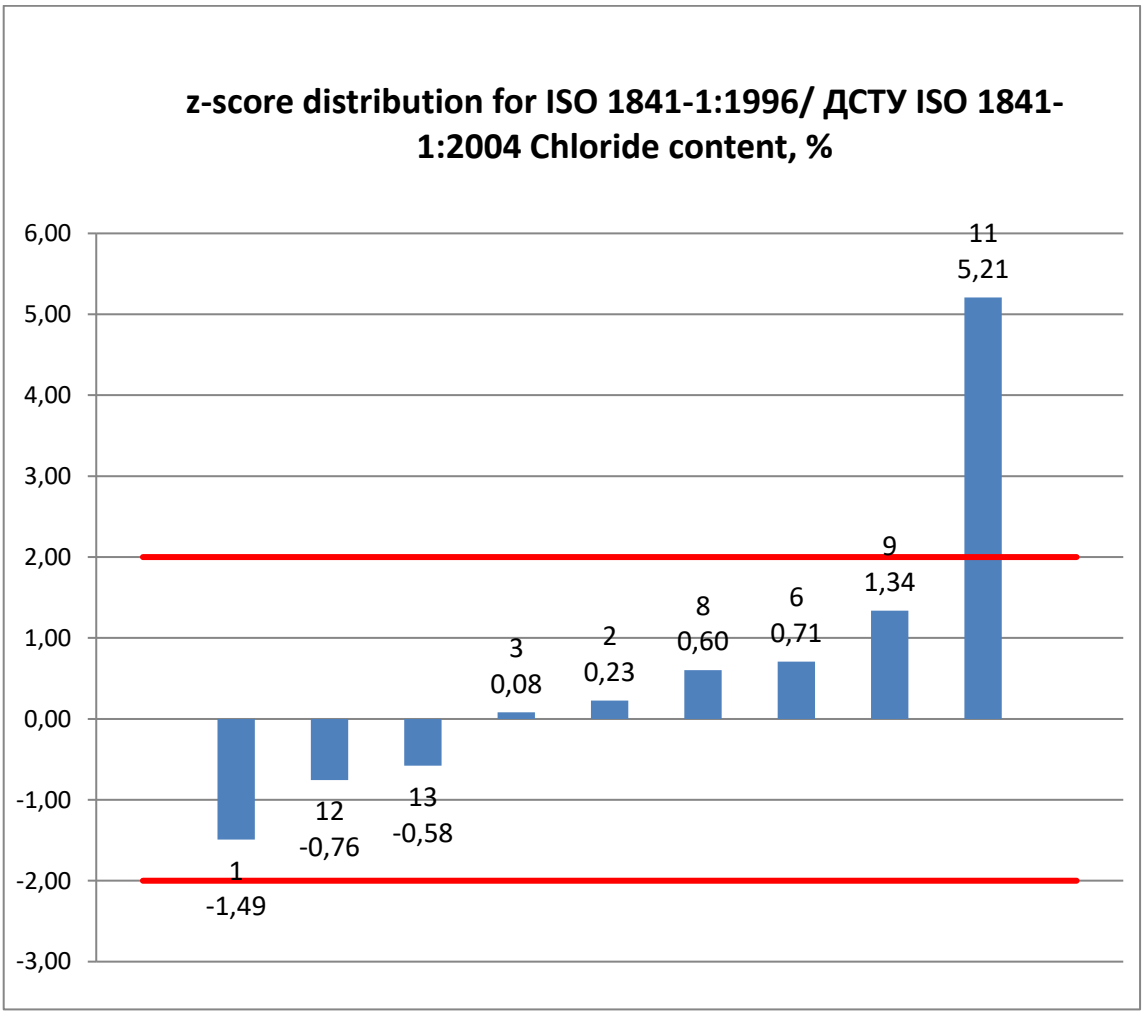
## 8.3. ISO 1442:2023/ ДСТУ ISO 1442:2005 Moisture content, %



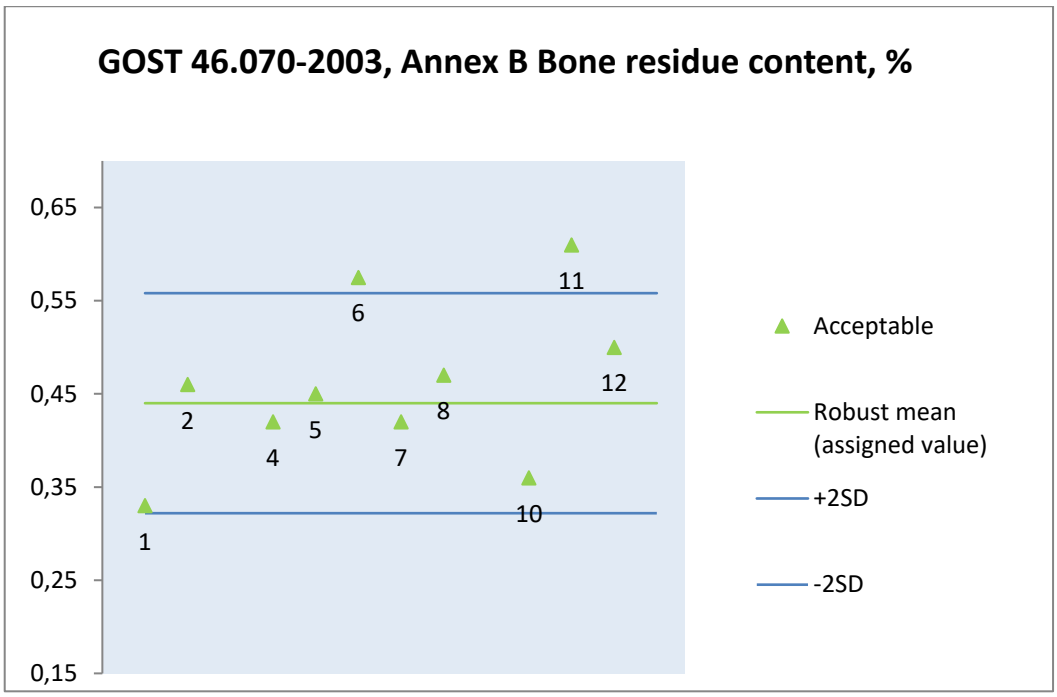



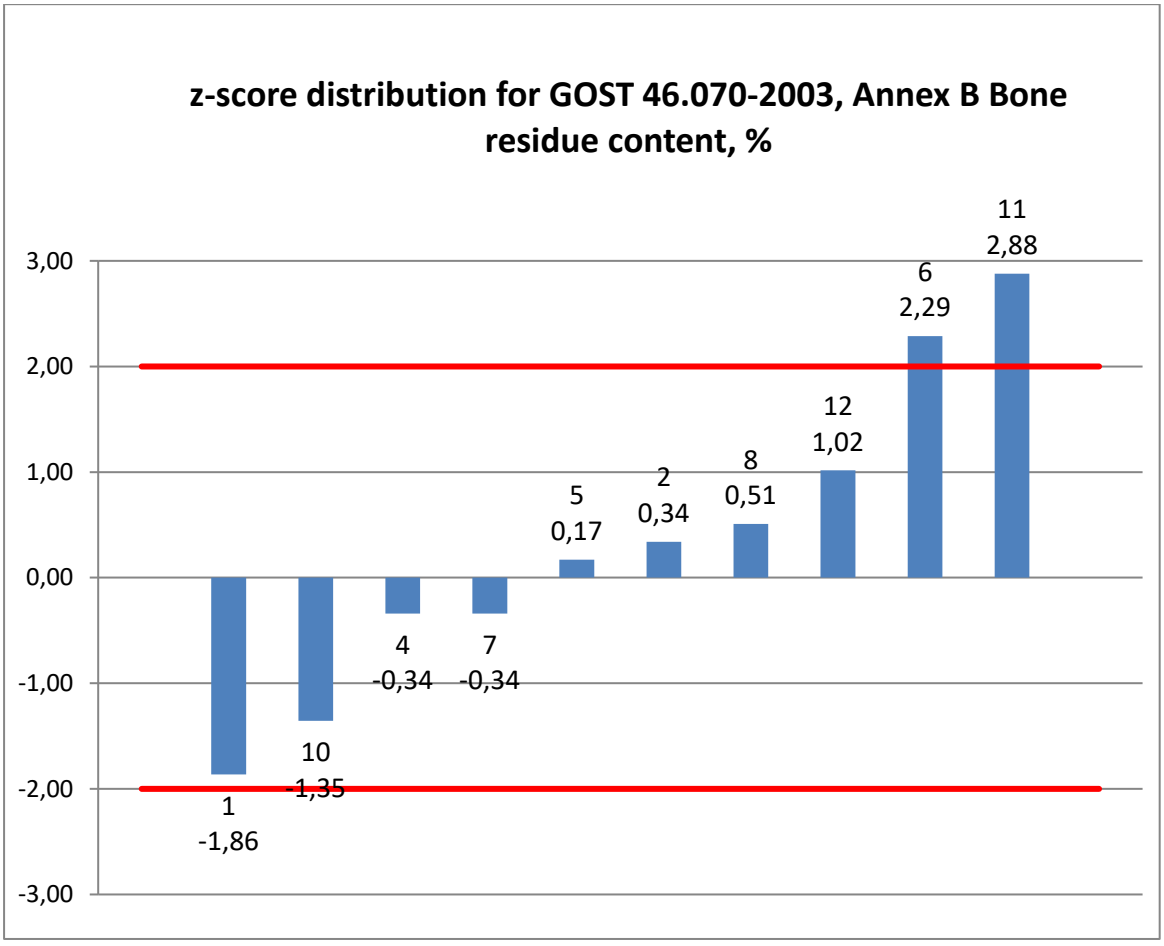
## 8.4. ДСТУ ISO 1841-2:2004 Chloride content, %



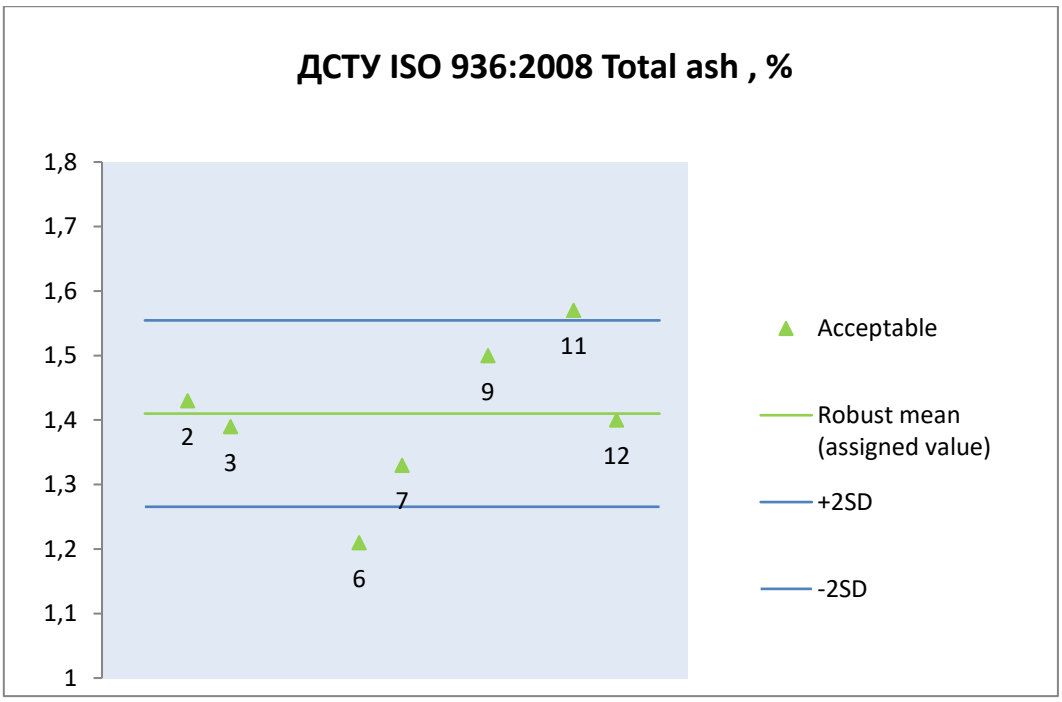



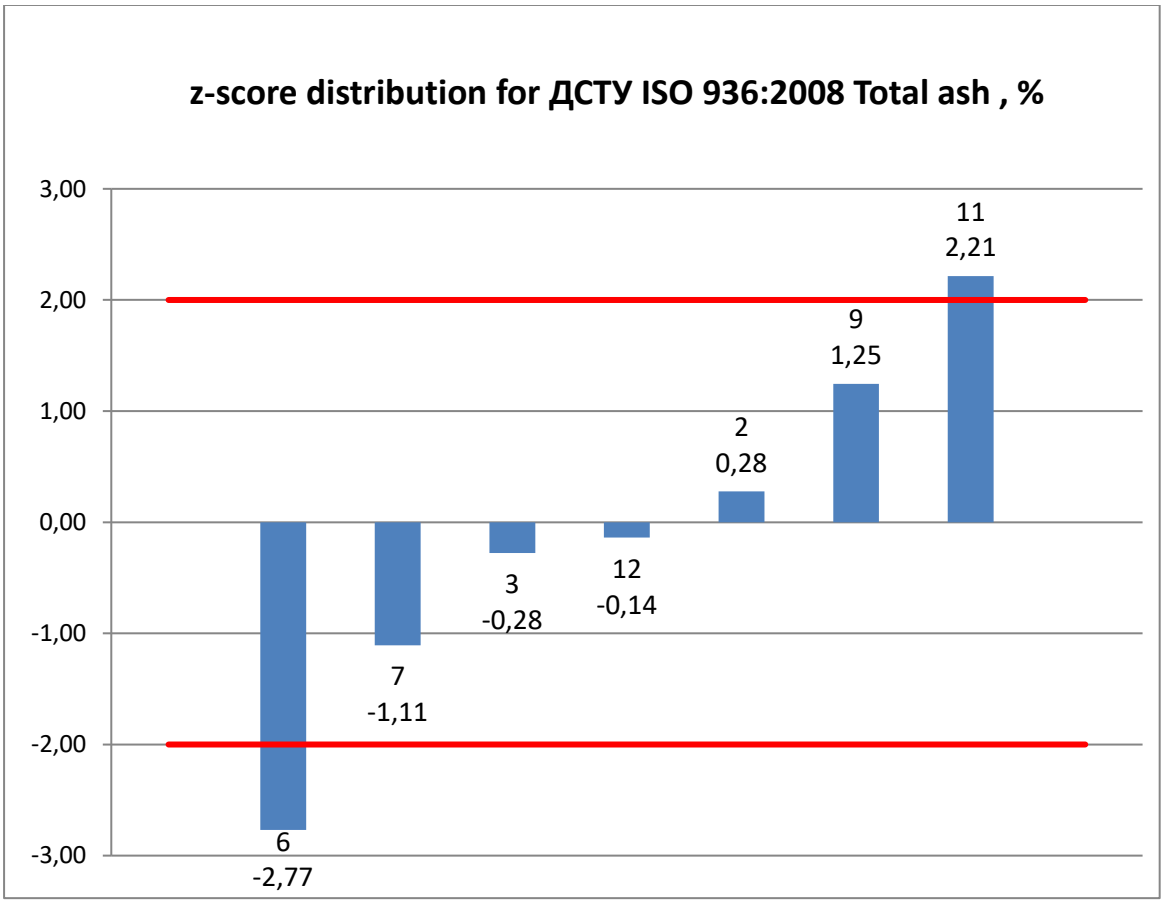
## 8.5. GOST 46.070-2003, Annex B Bone residue content, %



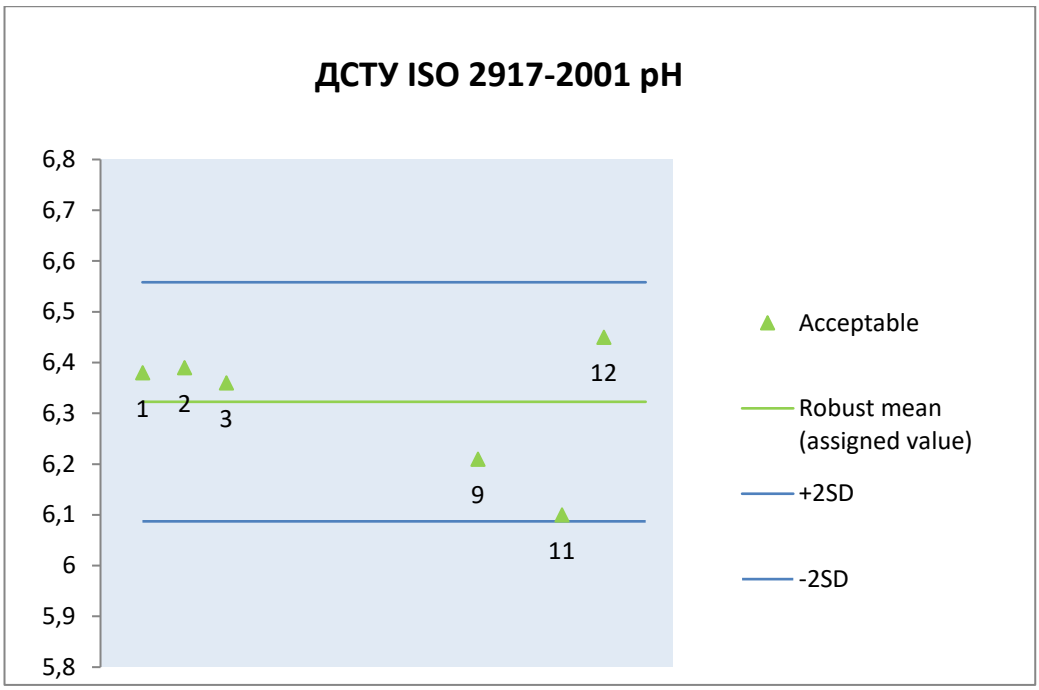



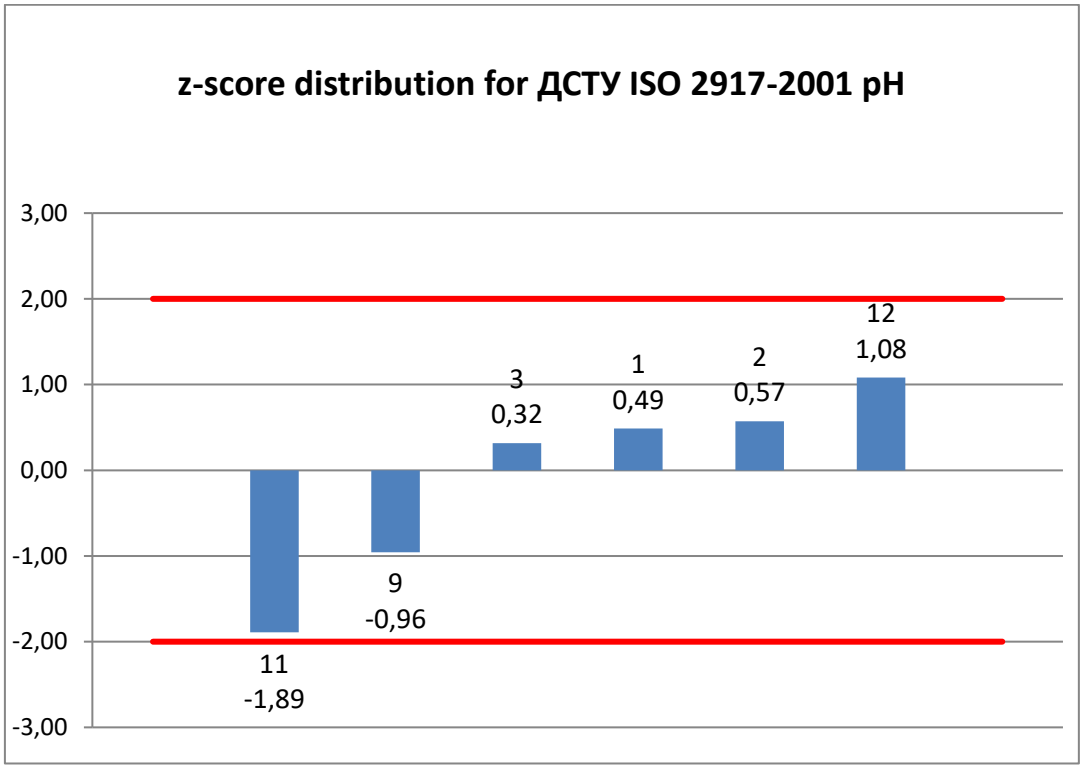
## 8.6. ДСТУ ISO 936:2008 Total ash, %



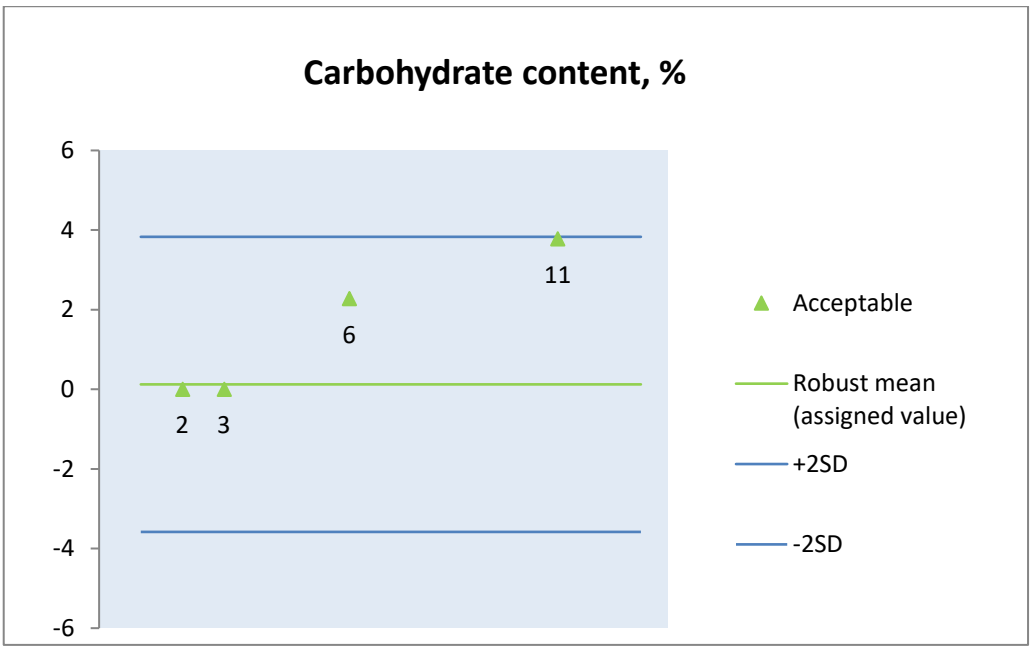



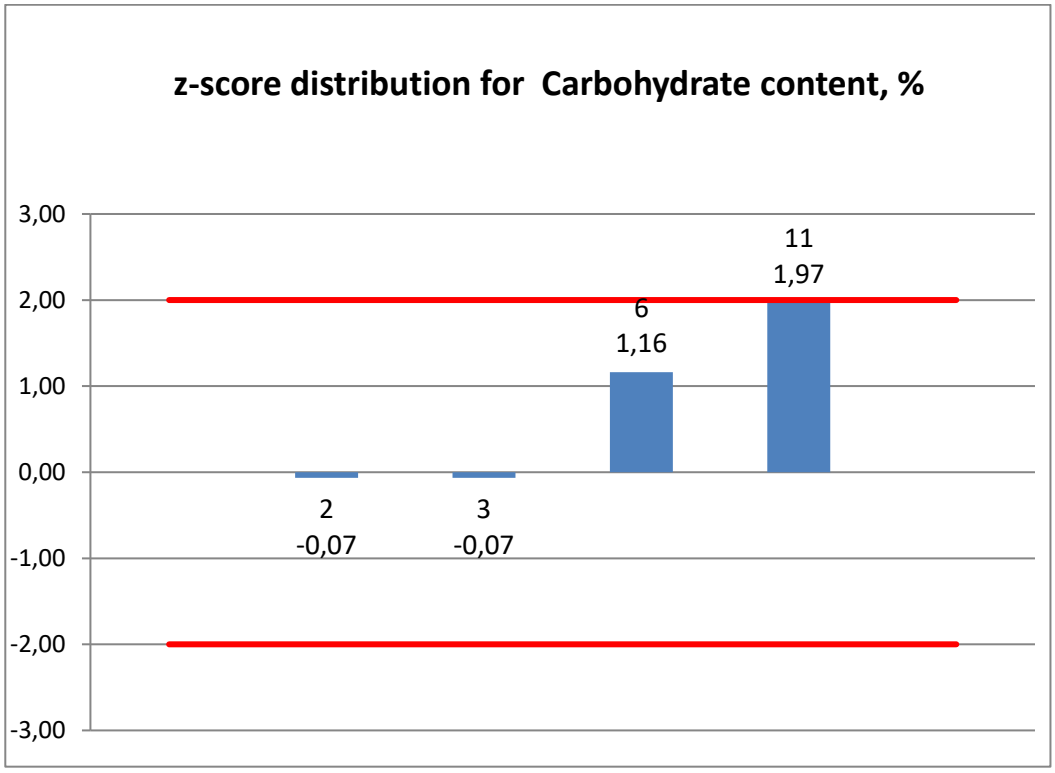
## 8.7. ДСТУ ISO 2917-2001 pH



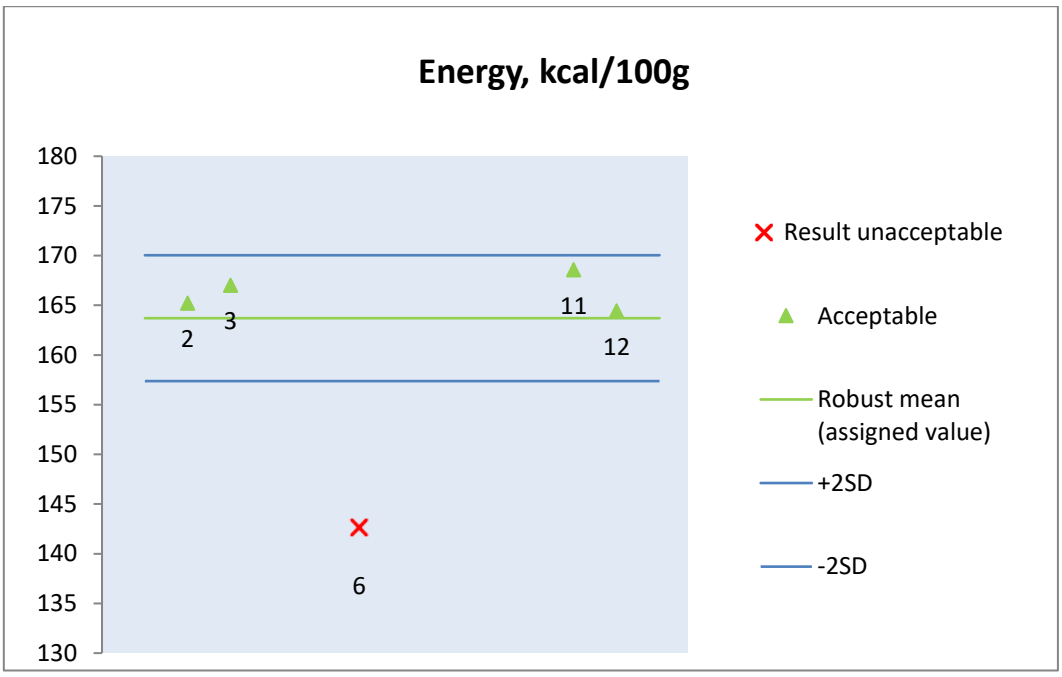



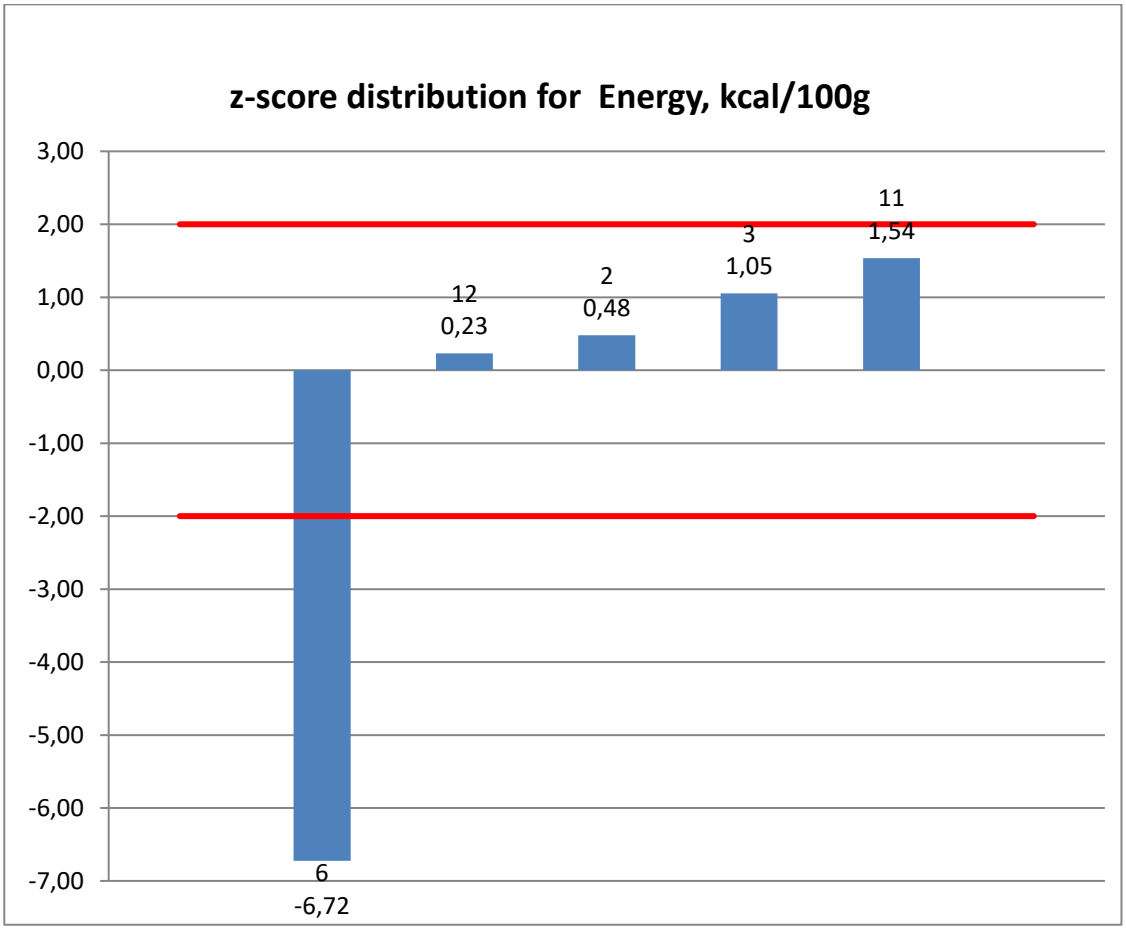
## 8.8. Carbohydrate content, %



## 8.9. Energy, kcal/100g



## 9. NORMATIVE REFERENCE

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5. ISO 33405:2024 Reference materials — Approaches for characterization and assessment of homogeneity and stability.

6. ILAC Discussion Paper on Homogeneity and Stability Testing, April 2008.