Director
Metrology service Ltd.

Bozhko Nataliia
February 23th 2022

PROFICIENCY TESTING PT.UA.1.2.2016
MAIZE ANALYSIS (QUALITY)
PROFICIENCY TESTING REPORT
ROUND 6 FEBRUARY 2022

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2. SUMMARY

2.1. The purpose of proficiency testing in maize testing is to determine the characteristics of the operation (as described in ISO/IEC 17043:2010[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.

2.3. This is the final report on the PT.UA.1.2.2016 Round 6 held in February 2022. This report is issued according to ISO/IEC 17043[1] and PT.UA.1.2.2016 Round 5 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 51 participants have 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.

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 are proved to be satisfactory for the purposes of PT programme PT.UA.1.2.2016 Round 6. 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 [2-7]. 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 – **Maize (*Zéa máys*)** were dispatched 24.01.2022 according to schedule of proficiency testing programme PT.UA.1.2.2016 Round 6.

3.3.2. Each produced and identified sample was hermetically sealed.

3.3.3. A total of 51 participants in 4 countries received one sample. Results were returned from 51 participants.

The countries involved in this round were as follows:

Ukraine	46
Russian Federation	2
Moldova	2
Turkey	1

3.4. FOLLOW-UP SERVICES

3.4.1. If a participant wish 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 [2,3]

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 0.75% (4 results) of all results in this round are considered to be unsatisfactory. In Round 5, there were 1.49% (8 results) unsatisfactory results.

3.5.6. Participant №27 stated «Moisture content, %» by «ГОСТ 13586.5-2015» instead of «ГОСТ 13586.5-93». These results were assessed by the Provider.

3.5.7. The result for «Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)» was provided only by the participant № 1. This result was not assessed by the Provider.

4. HOMOGENITY AND STABILITY ASSESMENT

4.1. Samples were assessed for homogeneity and stability after blending and packing by selecting seven samples of material at random from all those produced. Four of these samples were tested in duplicate under repeatability conditions as only 79 samples were produced according to [7]. Three other samples for stability tests were stored in appropriate conditions for the period of preparation and test submission for this round. They were also tested in duplicate.

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 [3,4].

4.3. Produced samples were found to be sufficiently homogeneous and stable for every analyte according to programme, except for those that can be considered equivalent or homogeneity can be assumed from other analyte homogeneity.

4.4. ISO 6540:1980/ ДСТУ ISO 6540:2007 Moisture content, %

	Moisture,content, %	ISO 6540:2021/ ДСТУ ISO 6540:2007									
	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'				
	Sample number	Результат/ Result A	Результат/ Result B	Average	SD²		Номер зразку /Sample number	Результат/ Result A	Результат/ Result B	SUM	Difference²
	1	14,45	14,30	14,38	0,0112	0,00	1	14,45	14,30	28,75	0,0225
	2	14,61	14,66	14,64	0,0013	0,00	2	14,61	14,66	29,27	0,0025
	3	14,36	14,48	14,42	0,0072	0,00	3	14,36	14,48	28,84	0,0144
	4	14,60	14,62	14,61	0,0002	0,00	4	14,60	14,62	29,22	0,0004
	5	14,52	14,60	14,56	0,0032	0,00	5	14,52	14,60	29,12	0,0064
	6	14,54	14,52	14,53	0,0002	0,00	6	14,54	14,52	29,06	0,0004
	7	14,56	14,57	14,57	0,0000	0,00	7	14,56	14,57	29,13	0,0001
											0,0467
	Mean	14,528		Worst pair	0,0112		Mean	14,528			
	Max	14,66		SUM of SD²	0,0233		Max	14,66			
	Min	14,30		C	0,4818		Min	14,30			
				Ccr, 5%	0,7271						
				Ccr, 1%	0,8376		Analytical variance S²a	0,0033	SD	0,1018	
				Conclusion			Sanal	0,0578	RSDR	0,7005	
				5%	PASS		Ssums	0,0371			
				1%	PASS		MSb	0,0185			
						Between sample variance S²sam		0,0076			
	Remarks										
	1. Cohran's C test is described in ISO 5727-2 and FAPAS protocol, sixth edition, 2002										
	2. Test for 'sufficient homogenity' is performed according to FAPAS protocol, sixth edition, 2002										

Source of σp value to use		
Use(write '1')	Source	σp
2	C>13.8%, HORWITZ	0,3812
	120ppb<C<13.8%, HORWITZ	0,3884
	C<120 ppb	3,196129
MASS NEGATIVE POWER FOR HORWITZ EQUATION(%=2, ppb=9,ppm=6		2
	SD	0,0981
	Trial SD	3,9800
	Target SD chosen	0,3812
	σ²all	0,013075
	Replicates	7
	F1	2,1
	F2	1,43
	Critical value	0,0322
	Between sample variance S²sam	0,0076
	Sufficient homogenity test	PASS

4.5. Data for all analytes

Method	Test weight ,g/l	Moisture,content, %	Crude protein content, %	Ash yield, % (Expressed on dry matter)	Crude fibre content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Starch content, %	Volatile nitrogenous basis, %	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %
Laboratory number	ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT)	ISO 6540:2021/ ДСТУ ISO 6540:2007	ISO 20483:2013/ ДСТУ ISO 20483:2016	ISO 2171:2007/ ДСТУ ISO 2171:2010	ISO 6865:2000/ ДСТУ ISO 6865:2004	ISO 11085:2015	ISO 6493:2000	GAFTA 7.0:2018	EN 16378:2013	EN 16378:2013	EN 16378:2013
Homogenity and stability (Гомогенність та стабільність) Cohran's 'C' test (С-тест "Кохрана")											
Crtitical value (5%,7pairs)=0,7271	0,2667	0,4818	0,6686	0,2573	0,4807	0,4187	0,5344	0,3731	0,5932	0,5507	0,3530
Mean Result	709,7857	14,5279	8,5393	1,2436	2,2971	3,3429	60,9693	0,0147	2,4407	1,1007	1,5864
Conclusion (Висновок)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
ariance test (тест аналітичної дисперсії)											
S^2anal	1,0714	0,0033	0,0072	0,0002	0,0005	0,0083	0,0030	0,0000	0,0069	0,0081	0,0098
Sanal	1,0351	0,0578	0,0850	0,0128	0,0231	0,0909	0,0548	0,0002	0,0833	0,0900	0,0990
S^2sample	0,369	0,0076	0	0,000	0,0020	0	0,0115	0,0000	0,0242	0,0112	0,0146
σ_p	6,0330	0,3812	0,1400	0,0330	0,0811	0,1115	1,3137	0,0003	0,4510	0,0434	0,0592
σ_p source	Trial SD	Horwitz	Method Tr Sd	Method Tr Sd	Horwitz	Horwitz	Horwitz	Horwitz	Trial SD	Horwitz	Horwitz
σ^2all	3,2757	0,0131	0,0018	0,0001	0,0006	0,0011	0,1553	0,0000	0,0183	0,0002	0,0003
Critical value	8,4112	0,0322	0,0140	0,0004	0,0020	0,0142	0,3305	0,0000	0,0484	0,0119	0,0147
Conclusion (Висновок)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

5. DATA SUMMARY

Method	EN 16378:2013	EN 16378:2013	EN 16378:2013	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 7971-3:2019	ISO 6540:2021/ ДСТУ ISO 6540:2007	ISO 20483:2013/ ДСТУ ISO 20483:2016	ISO 12099:2017	ISO 2171:2007/ ДСТУ ISO 2171:2009	ISO 6492:1999/ ДСТУ ISO 6492:2003	ISO 11085:2015	ISO 12099:2017	ISO 6865:2000/ ДСТУ ISO 6865:2004	ISO 12099:2017
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	Bulk density, kg/hl (use of Nilema litre apparatus)	Moisture content, %	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Ash yield, % (Expressed on dry matter)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)
No of Results	20	20	20	10	10	10	10	11	23	15	8	15	13	7	7	13	4
No of Results |z|>3 or NS	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
No of Results |z|>3, or NS %	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	13,333	12,500	0,000	0,000	0,000	0,000	0,000	0,000
Mean	2,515	0,900	1,203	2,407	0,794	0,064	1,093	73,530	14,101	8,576	8,366	1,252	3,315	3,334	3,354	1,834	2,015
Min	2,080	0,370	0,720	1,880	0,220	0,020	0,640	70,830	13,650	8,000	7,500	1,200	3,170	3,170	3,170	1,290	1,350
Max	3,060	1,990	1,860	2,910	1,180	0,100	1,640	75,000	14,380	9,140	8,860	1,280	3,480	3,470	3,500	2,450	2,500
SD	0,297	0,409	0,258	0,307	0,332	0,025	0,327	1,581	0,182	0,277	0,393	0,022	0,101	0,096	0,103	0,348	0,509
Median	2,485	0,890	1,145	2,395	0,820	0,065	0,975	74,300	14,100	8,600	8,425	1,250	3,300	3,330	3,380	1,810	2,105
Robust mean (assigned value)	2,508	0,869	1,175	2,410	0,809	0,065	1,084	73,719	14,116	8,584	8,428	1,254	3,311	3,340	3,362	1,828	2,015
Robust SD	0,286	0,341	0,148	0,266	0,305	0,023	0,312	1,260	0,140	0,195	0,162	0,018	0,094	0,083	0,074	0,320	0,307
SD from method (Tr.SD)	0,740	1,140	0,800	0,622	0,728	0,105	0,576	N/A	N/A	0,140	N/A	0,033	0,199	N/A	N/A	N/A	N/A
SD from Horwitz eq.	0,087	0,036	0,046	0,084	0,033	0,004	0,043	N/A	0,376	0,248	0,245	0,048	0,111	0,111	0,112	0,067	0,073
Target SD	0,451	0,512	0,336	0,266	0,381	0,098	0,312	1,260	0,376	0,140	0,245	0,033	0,138	0,111	0,112	0,245	0,307
Source of target SD of PT	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Horwitz	Method Tr SD	Horwitz	Method Tr SD	Trial SD	Horwitz	Horwitz	Trial SD	Trial SD

Method	ISO 6493:2000	GAFTA 7.0:2018	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	ДСТУ ГОСТ 10840:2019 (ГОСТ	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 13586.5-93	ДСТУ 4117:2007	ДСТУ 7169:2010	ГОСТ 10847-74	ГОСТ 13496.15-97	ДСТУ 8844:2019	ГОСТ 10845-98	ГОСТ 10967-90	ГОСТ 10967-90
Laboratory number	Starch content, %	Volatile nitrogenous basis, %	Broken Corn, %	Foreign Material, %	Damaged kernels, %	Test weight, lbu/bu	Test weight, g/l	Foreign impurities, %	Grain impurities, %	Moisture content, %	Moisture content, %	Mass fraction of crude protein, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.0.)	Ash content, % (Expressed on dry matter)	Mass fraction of crude fat, % (Expressed on dry matter)	Mass fraction of crude fibre, % (Expressed on dry matter)	Starch content, % (Expressed on dry matter)	Odour	Colour
No of Results	5	4	11	11	11	8	29	45	45	49	26	11	6	10	9	5	15	15
No of Results |z|>3 or NS	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
No of Results |z|>3, or NS %	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	10,000	0,000	0,000	0,000	0,000
Mean	62,776	0,012	2,750	0,755	1,534	56,449	712,038	1,185	3,682	13,776	13,888	8,313	1,235	3,845	2,111	72,030		
Min	59,070	0,005	2,190	0,650	0,420	55,030	702,000	0,740	2,640	13,200	13,550	8,020	1,190	3,620	1,260	64,230		
Max	65,000	0,015	3,200	1,000	2,710	57,900	722,000	1,690	6,200	14,100	14,100	8,720	1,270	4,390	2,900	77,220		
SD	2,626	0,004	0,301	0,104	0,764	1,034	5,168	0,186	0,739	0,186	0,148	0,216	0,030	0,236	0,508	5,589		
Median	63,900	0,013	2,770	0,720	1,440	56,565	712,170	1,170	3,530	13,800	13,900	8,300	1,240	3,780	1,910	74,600		
Robust mean (assigned value)	62,776	0,012	2,762	0,741	1,530	56,449	711,907	1,177	3,570	13,794	13,900	8,301	1,235	3,795	2,120	72,030		
Robust SD	2,626	0,004	0,266	0,074	0,757	1,034	4,290	0,096	0,429	0,139	0,097	0,194	0,030	0,133	0,454	5,589		
SD from method (Tr.SD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,300	1,000	0,700	N/A	N/A	N/A	N/A	N/A	N/A		
SD from Horwitz eq.	0,792	0,001	0,095	0,031	0,057	N/A	N/A	0,046	0,118	0,372	0,374	0,241	0,048	0,124	0,076	0,849		
Target SD	2,626	0,004	0,322	0,112	0,565	1,387	6,033	0,300	1,000	0,372	0,374	0,241	0,048	0,124	0,454	5,589		
Source of target SD of PT	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Method Tr SD	Method Tr SD	Horwitz	Horwitz	Horwitz	Horwitz	Horwitz	Trial SD	Trial SD		

6. RAW DATA

Method	EN 16378:2013	EN 16378:2013	EN 16378:2013	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 7971-3:2019	ISO 6540:2021/ ДСТУ ISO 6540:2007	ISO 20483:2013/ ДСТУ ISO 20483:2016	ISO 16634-2:2016	ISO 12099:2017	ISO 2171:2007/ ДСТУ ISO 2171:2009	ISO 6492:1999/ ДСТУ ISO 6492:2003	ISO 11085:2015	ISO 12099:2017	ISO 6865:2000/ ДСТУ ISO 6865:2004	ISO 12099:2017
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	Bulk density, kg/hl (use of Nilema litre apparatus)	Moisture content, %	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Ash yield, % (Expressed on dry matter)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)
1	2,48	1,12	1,67	2,46	1,10	0,0200	1,55		14,38	8,54	8,68		1,25		3,34		2,27	
2	2,34	1,12	1,18					74,10	14,05	8,60			1,23	3,30				
3	2,75	0,88	1,06					75,00	13,65									
4																		
5	2,90	0,48	1,04						14,10	8,40			1,28	3,48			1,70	
6																		
7	2,54	1,25	1,14						14,00			7,50				3,33		2,50
8																		
9																		
10																		
11																		
12	2,12	0,90	1,00	2,60	0,87	0,04	0,90	71,30	13,98	8,64		8,86	1,28	3,43	3,42	3,50	1,81	1,90
13																		
14																		
15																		
16																		
17	3,06	0,70	1,13						14,20									
18																		
19																		
20	2,80	0,87	1,24	2,75	0,77	0,06	1,29	74,8	14,27	8,50		8,45	1,24	3,35	3,33	3,40	1,54	
21	2,08	1,03	1,37	1,88	0,97	0,05	1,00	74,10	14,26	8,00		8,35	1,25	3,48	3,47		2,45	
22	2,80	0,70	1,51	2,91	0,76	0,07	1,64		14,10									
23	2,30	1,10	1,20	2,33	1,15	0,09	0,95	74,3	14,07	8,64			1,25	3,28	3,28		1,95	
24	2,25	1,10	1,12	2,20	1,18	0,10	0,86	74,30	14,10	8,71			1,25	3,17	3,17	3,17	1,97	
25																		
26																		
27																		
28																		
29																		
30									14,05									
31																		
32	2,14	0,37	1,05	2,22	0,33	0,09	0,64	70,83	13,77	8,20		8,28	1,27	3,22		3,30	1,29	1,35
33																		
34	2,89	0,38	0,72						14,27	9,14				3,21			1,34	
35	2,41	1,24	1,37					74,40	14,35			8,48				3,40		
36	2,49	1,34	1,86					71,20	13,87	8,86		8,40	1,28	3,31		3,38	1,90	2,31
37																		
38													1,20					
39																		
40																		
41	2,69	0,43	0,90	2,55	0,22	0,07	0,84		14,20	8,69			1,26					
42	2,16	1,99	1,15						14,20									
43																		
44									14,00									
45										8,86			1,26	3,22			2,23	
46	2,73	0,41	1,13						14,15	8,42			1,25	3,36			1,64	
47																		
48																		
49									13,98									
50																		
51	2,36	0,58	1,22	2,17	0,59	0,05	1,26	74,50	14,33	8,44		8,61	1,23	3,29	3,33		1,75	

Method	ISO 6493:2000	GAFTA 7.0:2018	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT)	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 13586.5-93	ДСТУ 4117:2007	ДСТУ 7169:2010	ГОСТ 10847-74	ГОСТ 13496.15-97	ДСТУ 8844:2019	ГОСТ 10845-98
Laboratory number	Starch content, %	Volatile nitrogenous basis, %	Broken Corn, %	Foreign Material, %	Damaged kernels, %	Test weight, lbu/bu	Test weight, g/l	Foreign impurities, %	Grain impurities, %	Moisture content, %	Moisture content, %	Mass fraction of crude protein, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.0.)	Ash content, % (Expressed on dry matter)	Mass fraction of crude fat, % (Expressed on dry matter)	Mass fraction of crude fibre, % (Expressed on dry matter)	Starch content, % (Expressed on dry matter)
1	61,01	0,015	2,74	0,82	2,59		710,00	1,69	3,38	14,10		8,17	1,21	3,89	2,47	75,96
2																
3							717,70	0,96	3,04	13,63	13,60					
4								1,26	3,56	13,86	13,96					
5							712,00	1,12	3,84	13,68		8,05				
6							707,00	1,20	3,17	13,80	13,90					
7	64,90		2,46	1,00	0,42		705,00	1,48	3,82	13,80	14,00	8,72	1,19		2,90	64,23
8								1,27	4,17	13,90						
9								1,11	4,20	13,50						
10								1,13	4,10	13,70						
11							704,00	1,54	3,01	13,50						
12							716,00	1,10	3,50	13,75	13,85	8,35	1,27	3,83	1,90	
13								1,24	3,84	13,78	13,90					
14								1,20	3,75	13,80	13,80					
15								1,15	3,70	13,90						
16								0,96	3,58	14,00						
17							713,00	1,30	3,50	14,00	14,10					
18								1,20	3,86	13,86	13,90					
19								1,27	3,65	13,85	13,80					
20	65,0	0,013	2,77	0,73	1,64	56,3	709	1,20	3,01	13,82	13,89	8,12	1,24	3,76	1,77	
21			2,19	0,67	0,97	57,58	706,00	1,19	3,05	13,73						
22							713,00	1,14	3,21	13,80						
23		0,013	2,90	0,70	1,40	56,9	709			13,60						
24			2,92	0,65	1,44	56,83	710,00			13,72						
25								1,20	6,20	13,90						74,60
26							722,00	0,74	2,94	13,60	13,90					
27							712,17	1,27	3,33	13,68	13,90					
28							712,00	1,46	3,48	13,78	13,60					
29								1,41	4,54	13,60						
30								1,10	3,95	13,90						
31								1,16	3,30	13,90	13,90					
32			2,58	0,66	0,56	55,03	708,30	1,17	2,64	13,44	13,55	8,02	1,26	4,10	1,83	
33							722,00	1,08	3,65	13,84						
34							712,78	0,99	4,69	14,00						77,22
35							706,00	1,39	3,35	13,90	14,00					
36			3,20	0,84	2,20	55,57	720,24	-	-	13,57	13,80	8,50		3,80	2,34	
37							717,00	1,10	3,20	13,90	14,10					
38							702,00	0,85	3,09	13,20		8,30		3,69	2,62	
39										14,04		8,42		3,62	1,91	
40								1,16	3,45	13,84	13,90					
41			3,02	0,72	1,06	55,48	714,00	1,17	3,14	13,90	13,90					
42			2,46	0,80	2,71		709,00	1,57	4,04	14,00	13,75					
43								1,24	3,53	14,00	13,90					
44							713,00	1,20	5,95	13,70	14,10					
45	59,07									13,31		8,51	1,24	3,72		68,14
46								1,06	3,90	13,75						
47								1,14	3,46		14,00					
48							715,00	0,83	2,86	13,80				4,39		
49							715,90	0,98	4,05	13,70						
50								1,16	5,29	13,70						
51	63,90	0,005	3,01	0,71	1,88	57,90	716,00	1,20	2,74	14,01	14,10	8,28		3,65	1,26	

Method	ГОСТ 10967-90 Odour	ГОСТ 10967-90 Colour
Laboratory number	Odour	Colour
1	Властивий нормальному зерну	Властивий нормальному зерну
2		
3		
4		
5		
6	Властивий нормальному зерну	Властивий нормальному зерну
7		
8		
9		
10		
11		
12	Властивий нормальному зерну	Властивий нормальному зерну
13		
14		
15		
16	Властивий нормальному зерну	Властивий нормальному зерну
17		
18		
19		
20	Властивий здоровому зерну	Властивий здоровому зерну
21		
22		
23		
24		
25	Властивий нормальному зерну	Властивий нормальному зерну
26		
27		
28		
29		
30		
31	Властивий нормальному зерну	Властивий нормальному зерну
32	Властивий нормальному зерну	Властивий нормальному зерну
33		
34	Typical of normal grain	Typical of normal grain
35		
36		
37	Властивий нормальному зерну	Властивий нормальному зерну
38	Властивий нормалному зерну	Властивий нормалному зерну
39		
40		
41	Властивий нормальному зерну	Властивий нормальному зерну
42	Властивий нормальному зерну	Властивий нормальному зерну
43		
44	Властивий нормальному зерну	Властивий нормальному зерну
45		
46		
47		
48		
49		
50		
51	Typical of normal grain	Typical of normal grain

7. Z SCORES AND DATA SUMMERY FOR ASSESSMENT

Method	EN 16378:2013	EN 16378:2013	EN 16378:2013	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 7971-3:2019	ISO 6540:2021/ ДСТУ ISO 6540:2007	ISO 20483:2013/ ДСТУ ISO 20483:2016	ISO 12099:2017	ISO 2171:2007/ ДСТУ ISO 2171:2009	ISO 6492:1999/ ДСТУ ISO 6492:2003	ISO 11085:2015	ISO 12099:2017	ISO 6865:2000/ ДСТУ ISO 6865:2004	ISO 12099:2017
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	Bulk density, kg/hl (use of Nilema litre apparatus)	Moisture content, %	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)	Ash yield, % (Expressed on dry matter)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Fat content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)	Crude fibre content, % (Expressed as a mass fraction of the product as received)
1	-0,06	0,49	1,47	0,19	0,76	-0,46	1,49		0,70	-0,31		-0,11		0,00		1,80	
2	-0,37	0,49	0,02					0,30	-0,18	0,11		-0,72	-0,08				
3	0,54	0,02	-0,34					1,02	-1,24								
4																	
5	0,87	-0,76	-0,40						-0,04	-1,31		0,79	1,22			-0,52	
6																	
7	0,07	0,74	-0,10						-0,31		-3,80				-0,29		1,58
8																	
9																	
10																	
11																	
12	-0,86	0,06	-0,52	0,71	0,16	-0,26	-0,59	-1,92	-0,36	0,40	1,76	0,79	0,86	0,72	1,23	-0,07	-0,37
13																	
14																	
15																	
16																	
17	1,22	-0,33	-0,13						0,22								
18																	
19																	
20	0,65	0,00	0,19	1,28	-0,10	-0,05	0,66	0,86	0,41	-0,60	0,09	-0,42	0,28	-0,09	0,34	-1,18	
21	-0,95	0,31	0,58	-1,99	0,42	-0,15	-0,27	0,30	0,38	-4,17	-0,32	-0,11	1,22	1,17		2,54	
22	0,65	-0,33	1,00	1,88	-0,13	0,05	1,78		-0,04								
23	-0,46	0,45	0,08	-0,30	0,89	0,26	-0,43	0,46	-0,12	0,40		-0,11	-0,23	-0,54		0,50	
24	-0,57	0,45	-0,16	-0,79	0,97	0,36	-0,72	0,46	-0,04	0,90		-0,11	-1,02	-1,53	-1,71	0,58	
25																	
26																	
27																	
28																	
29																	
30									-0,18								
31																	
32	-0,82	-0,97	-0,37	-0,71	-1,26	0,26	-1,42	-2,29	-0,92	-2,74	-0,61	0,49	-0,66		-0,55	-2,20	-2,17
33																	
34	0,85	-0,96	-1,35						0,41	3,97			-0,73			-1,99	
35	-0,22	0,72	0,58					0,54	0,62		0,21				0,34		
36	-0,04	0,92	2,04					-2,00	-0,66	1,97	-0,12	0,79	-0,01		0,16	0,29	0,96
37																	
38												-1,63					
39																	
40																	
41	0,40	-0,86	-0,82	0,53	-1,55	0,05	-0,78		0,22	0,76		0,19					
42	-0,77	2,19	-0,07						0,22								
43																	
44									-0,31								
45										1,97		0,19	-0,66			1,64	
46	0,49	-0,90	-0,13						0,09	-1,17		-0,11	0,35			-0,77	
47																	
48																	
49									-0,36								
50																	
51	-0,33	-0,56	0,13	-0,90	-0,58	-0,15	0,56	0,62	0,57	-1,03	0,74	-0,72	-0,15	-0,09		-0,32	

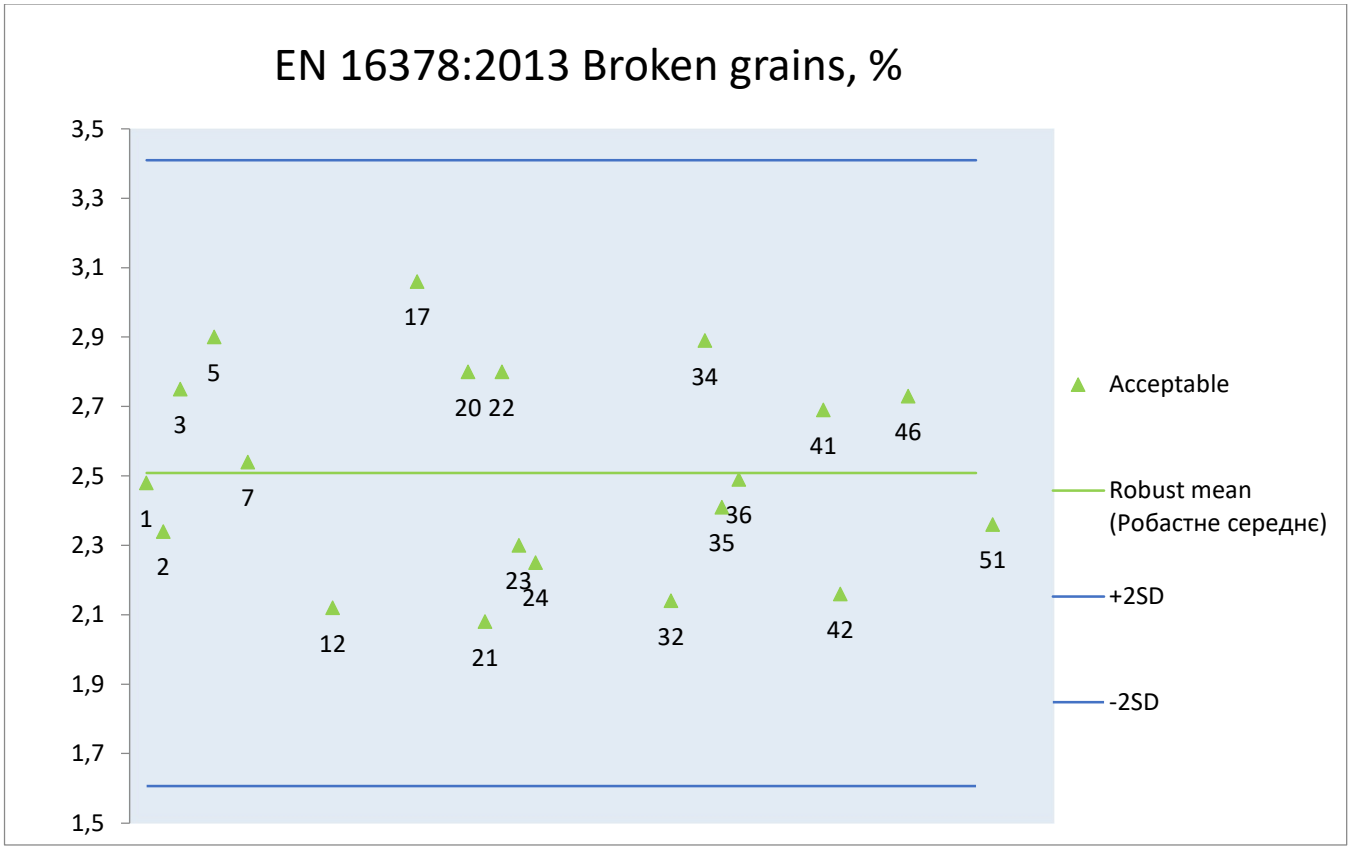
Method	ISO 6493:2000	GAFTA 7.0:2018	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	USDA (Grain Grading Procedures,	ДСТУ ГОСТ 10840:2019 (ГОСТ	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 30483-97/ ДСТУ 4525:2006	ГОСТ 13586.5-93	ДСТУ 4117:2007	ДСТУ 7169:2010	ГОСТ 10847-74	ГОСТ 13496.15-97	ДСТУ 8844:2019	ГОСТ 10845-98	ГОСТ 10967-90	ГОСТ 10967-90
Laboratory number	Starch content, %	Volatile nitrogenous basis, %	Broken Corn, %	Foreign Material, %	Damaged kernels, %	Test weight, lbu/bu	Test weight, g/l	Foreign impurities, %	Grain impurities, %	Moisture content, %	Moisture content, %	Mass fraction of crude protein, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.0.)	Ash content, % (Expressed on dry matter)	Mass fraction of crude fat, % (Expressed on dry matter)	Mass fraction of crude fibre, % (Expressed on dry matter)	Starch content, % (Expressed on dry matter)	Odour	Colour
1	-0,67	0,79	-0,07	0,70	1,88		-0,32	1,71	-0,19	0,82		-0,54	-0,52	0,76	0,77	0,70	S	S
2																		
3							0,96	-0,72	-0,53	-0,44	-0,80							
4								0,28	-0,01	0,18	0,16							
5							0,02	-0,19	0,27	-0,31		-1,04						
6							-0,81	0,08	-0,40	0,02	0,00						S	S
7	0,81		-0,94	2,31	-1,96		-1,14	1,01	0,25	0,02	0,27	1,73	-0,94		1,72	-1,40		
8								0,31	0,60	0,29								
9								-0,22	0,63	-0,79								
10								-0,16	0,53	-0,25								
11							-1,31	1,21	-0,56	-0,79								
12							0,68	-0,26	-0,07	-0,12	-0,13	0,20	0,73	0,28	-0,49		S	S
13								0,21	0,27	-0,04	0,00							
14								0,08	0,18	0,02	-0,27							
15								-0,09	0,13	0,29								
16								-0,72	0,01	0,56							S	S
17							0,18	0,41	-0,07	0,56	0,53							
18								0,08	0,29	0,18	0,00							
19								0,31	0,08	0,15	-0,27							
20	0,85	0,34	0,02	-0,10	0,20	-0,11	-0,48	0,08	-0,56	0,07	-0,03	-0,75	0,10	-0,28	-0,77		S	S
21			-1,78	-0,64	-0,99	0,82	-0,98	0,04	-0,52	-0,17								
22							0,18	-0,12	-0,36	0,02								
23		0,34	0,43	-0,37	-0,23	0,33	-0,48			-0,52								
24			0,49	-0,81	-0,16	0,27	-0,32			-0,20								
25								0,08	2,63	0,29						0,46	S	S
26							1,67	-1,46	-0,63	-0,52	0,00							
27							0,04	0,31	-0,24	-0,31	0,00							
28							0,02	0,94	-0,09	-0,04	-0,80							
29								0,78	0,97	-0,52								
30								-0,26	0,38	0,29								
31								-0,06	-0,27	0,29	0,00						S	S
32			-0,57	-0,72	-1,72	-1,02	-0,60	-0,02	-0,93	-0,95	-0,94	-1,16	0,52	2,46	-0,64		S	S
33							1,67	-0,32	0,08	0,12								
34							0,14	-0,62	1,12	0,56						0,93	S	S
35							-0,98	0,71	-0,22	0,29	0,27							
36			1,36	0,88	1,19	-0,63	1,38			-0,60	-0,27	0,82		0,04	0,49			
37							0,84	-0,26	-0,37	0,29	0,53						S	S
38							-1,64	-1,09	-0,48	-1,60		0,00		-0,85	1,10		S	S
39										0,66		0,49		-1,41	-0,46			
40								-0,06	-0,12	0,12	0,00							
41			0,80	-0,19	-0,83	-0,70	0,35	-0,02	-0,43	0,29	0,00						S	S
42			-0,94	0,53	2,09		-0,48	1,31	0,47	0,56	-0,40						S	S
43								0,21	-0,04	0,56	0,00							
44							0,18	0,08	2,38	-0,25	0,53						S	S
45	-1,41									-1,30		0,87	0,10	-0,60		-0,70		
46								-0,39	0,33	-0,12								
47								-0,12	-0,11		0,27							
48							0,51	-1,16	-0,71	0,02				4,79				
49							0,66	-0,66	0,48	-0,25								
50								-0,06	1,72	-0,25								
51	0,43	-1,47	0,77	-0,28	0,62	1,05	0,68	0,08	-0,83	0,58	0,53	-0,09		-1,17	-1,90		S	S

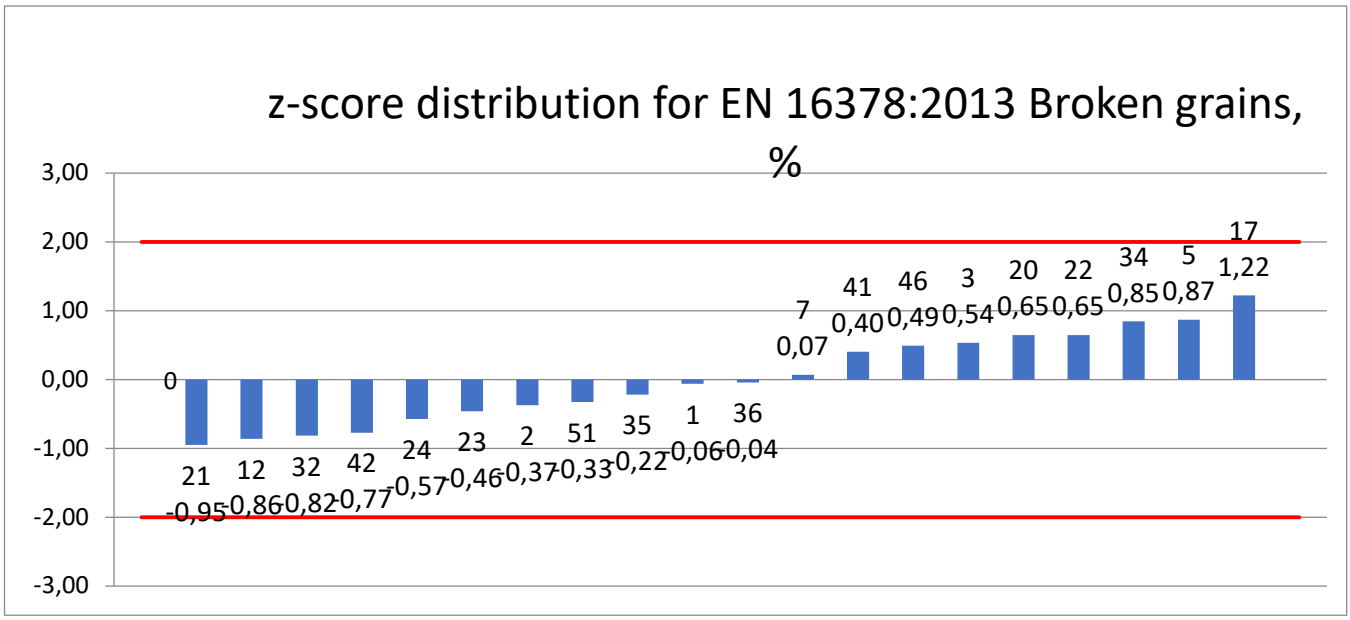
Remarks

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

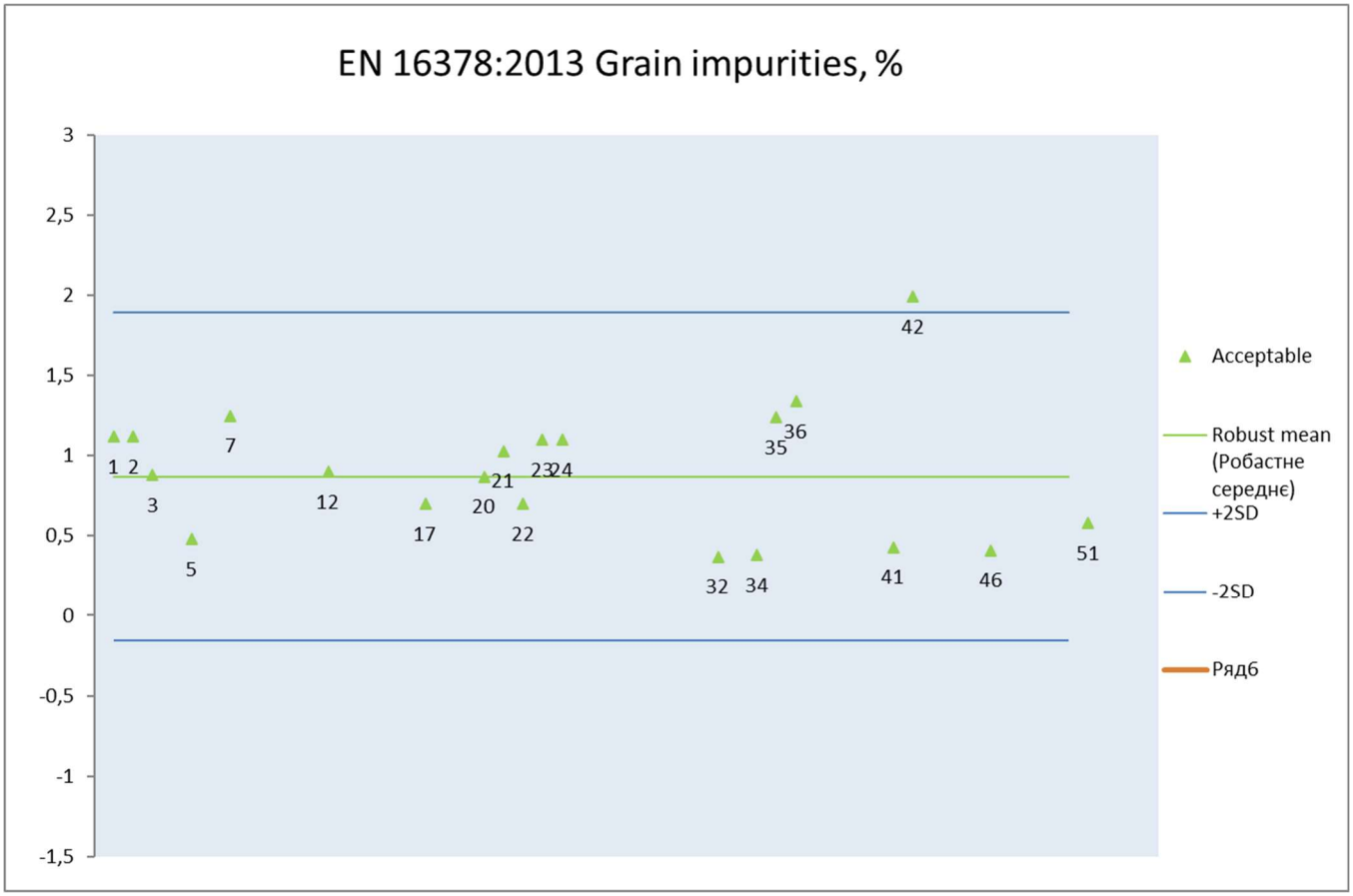
8. Z SCORE PLOTS AND RESULTS CHARTS.

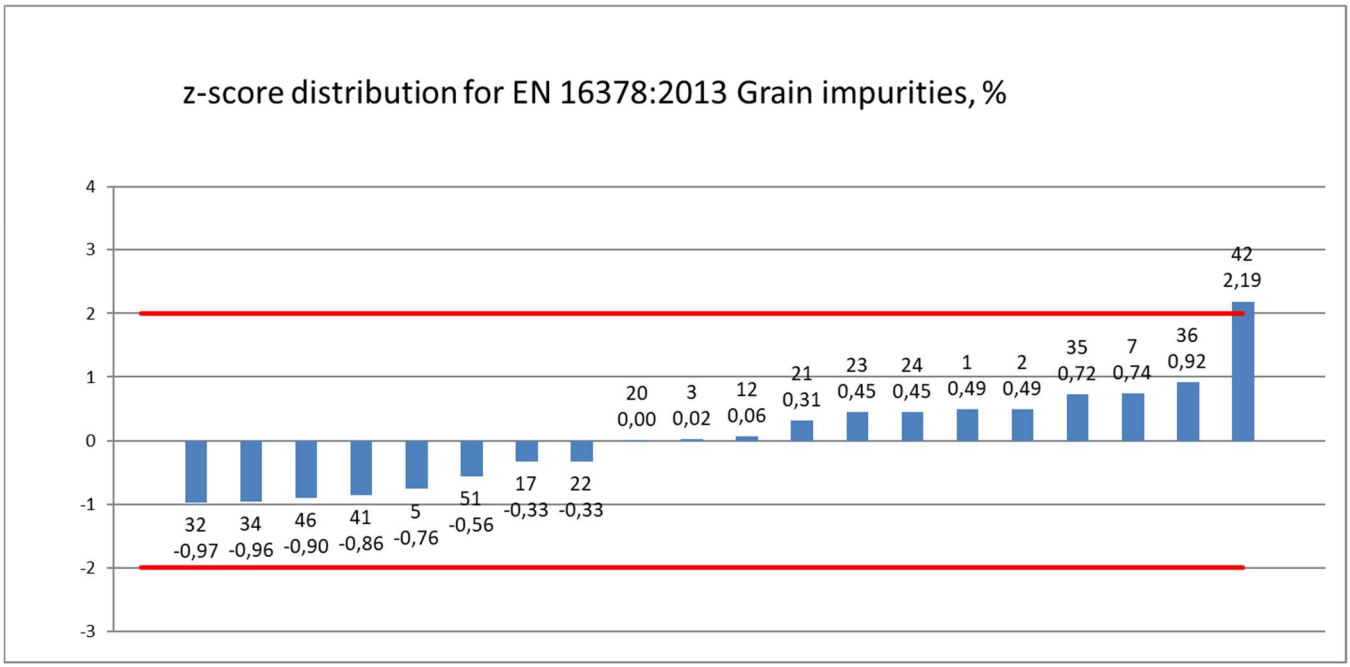
8.1. EN 16378:2013 Broken grains, %



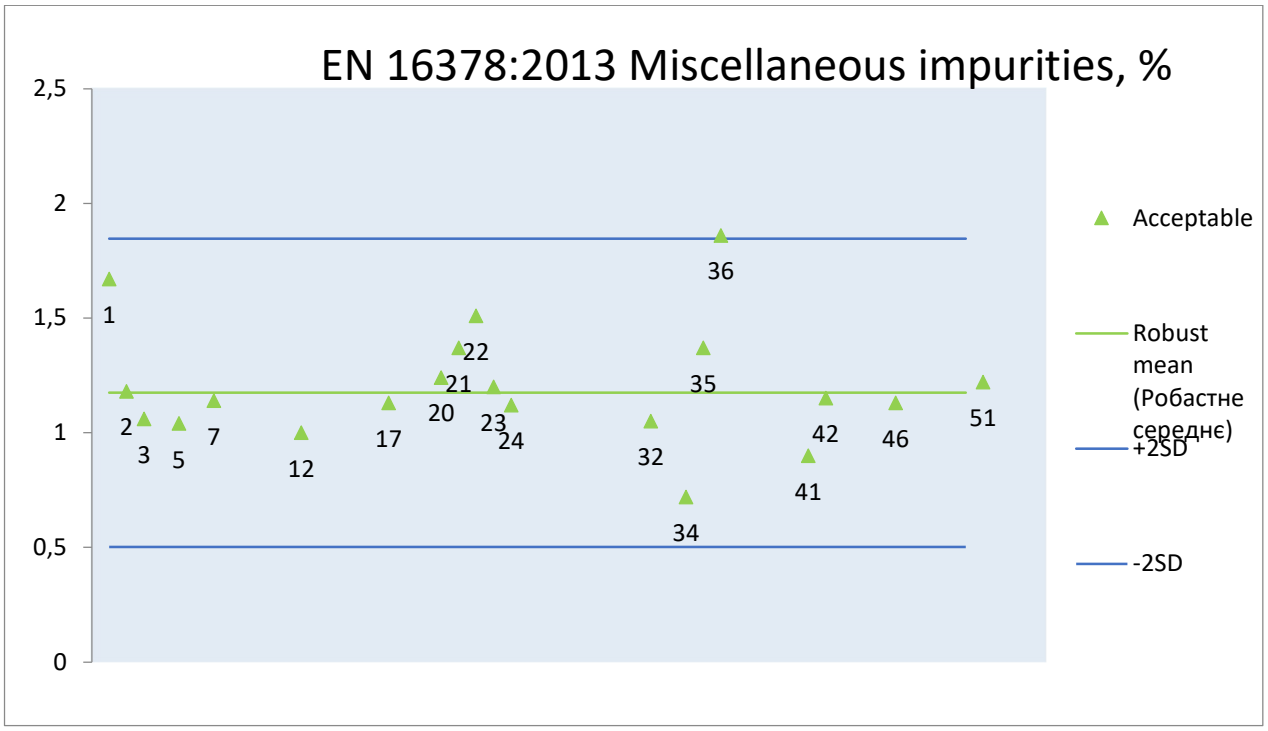


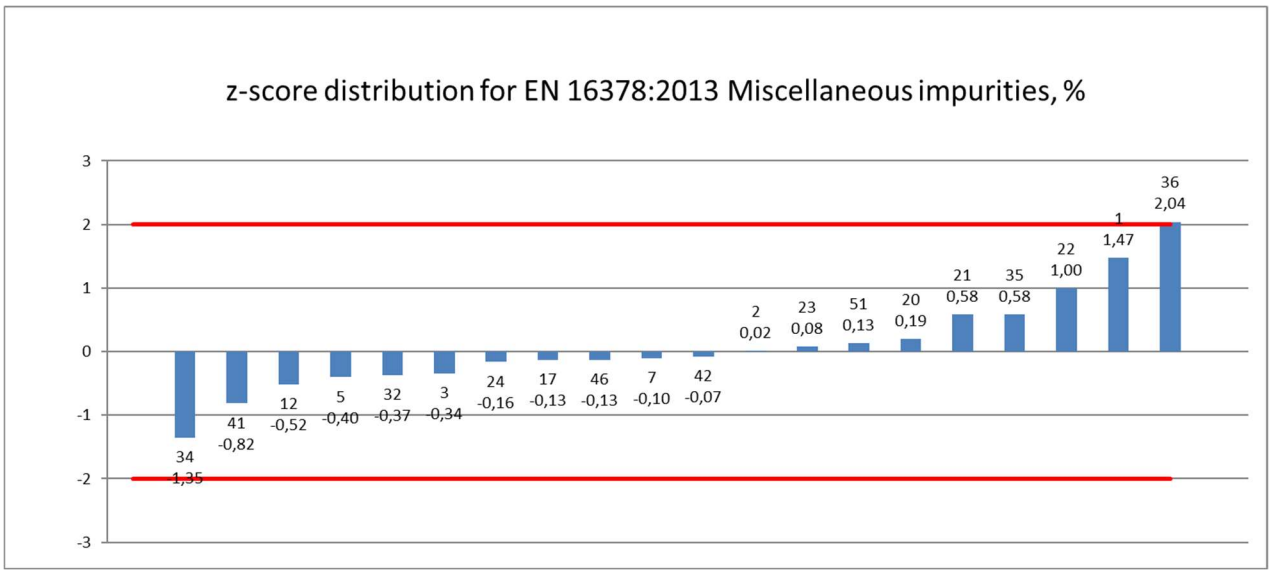
8.2. EN 16378:2013 Grain impurities, %



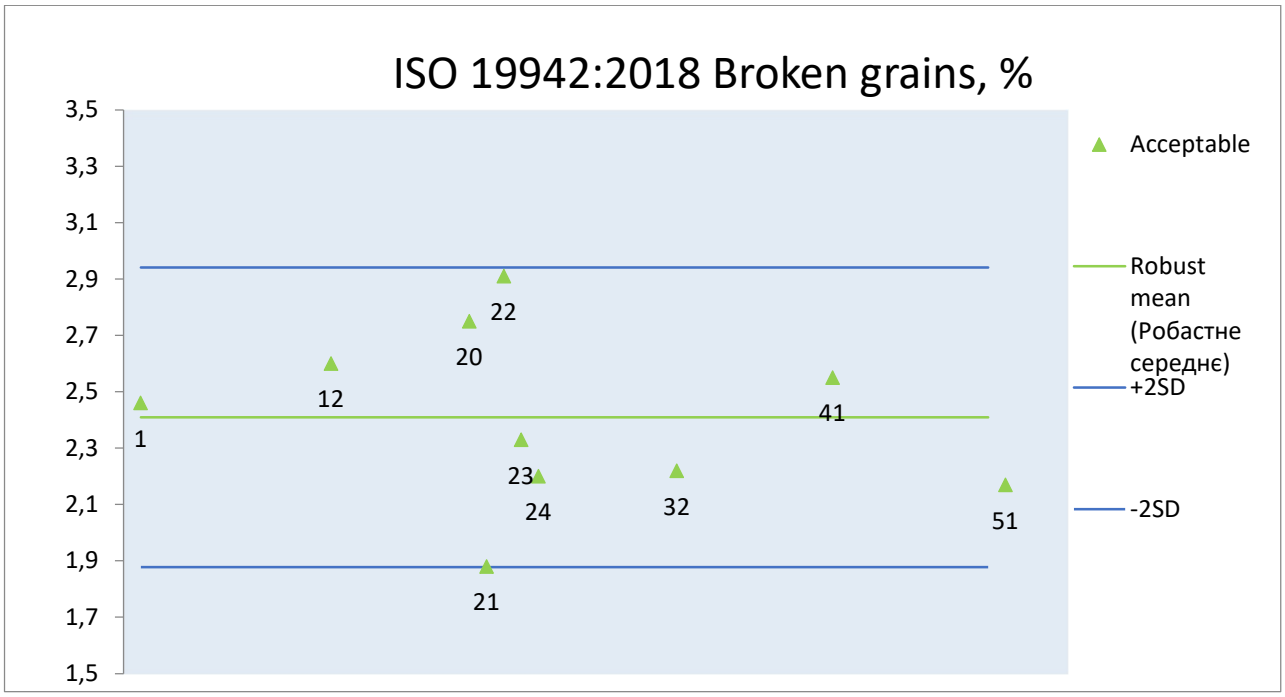


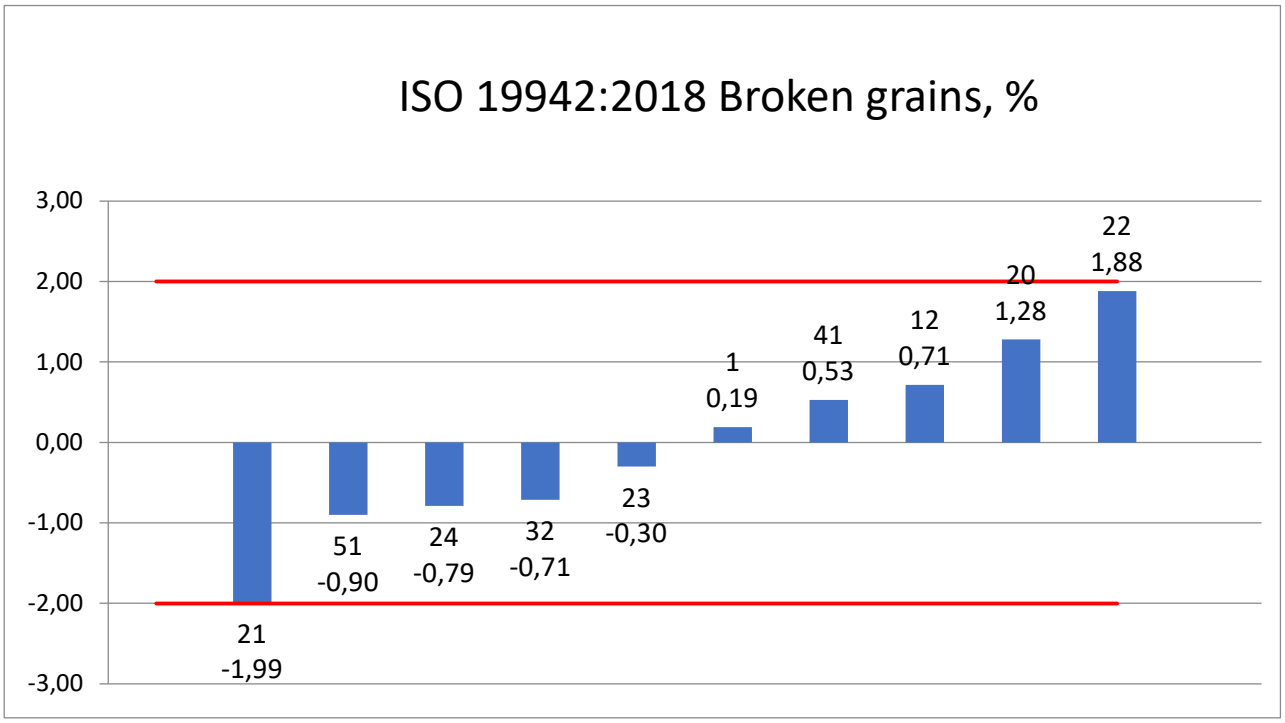
8.3. EN 16378:2013 Miscellaneous impurities, %



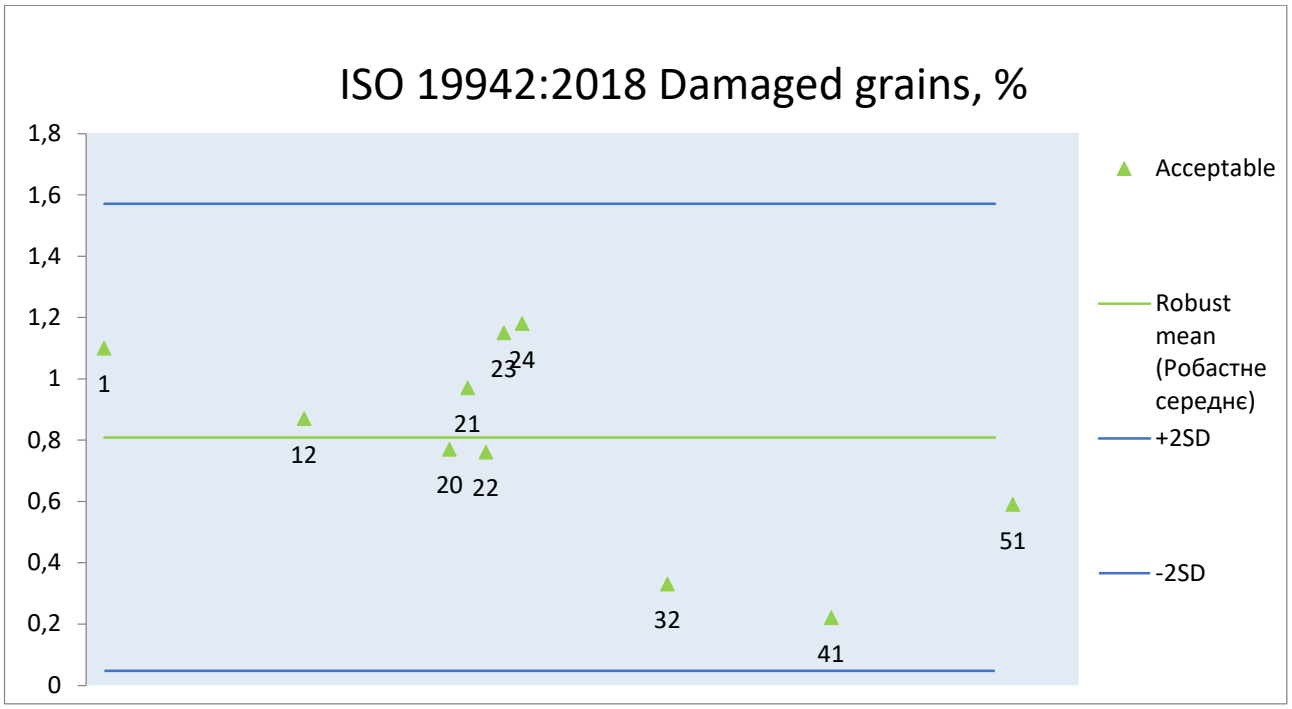


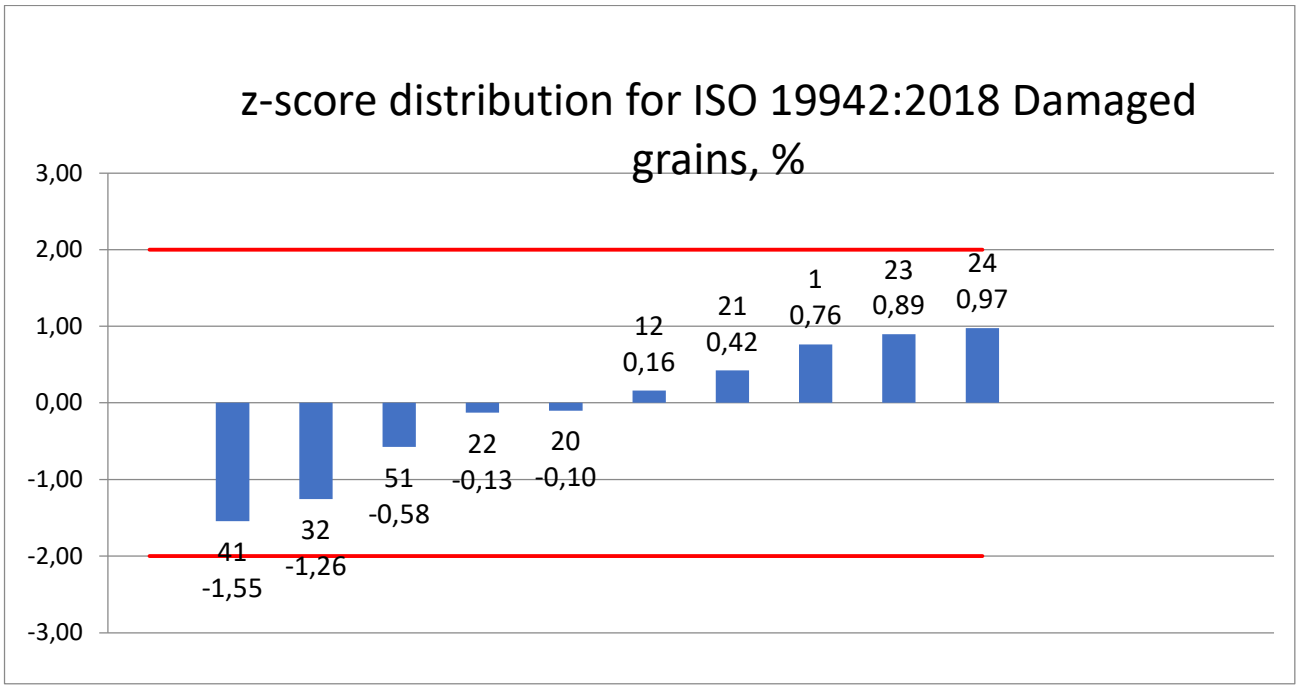
8.4. ISO 19942:2018 Broken grains, %



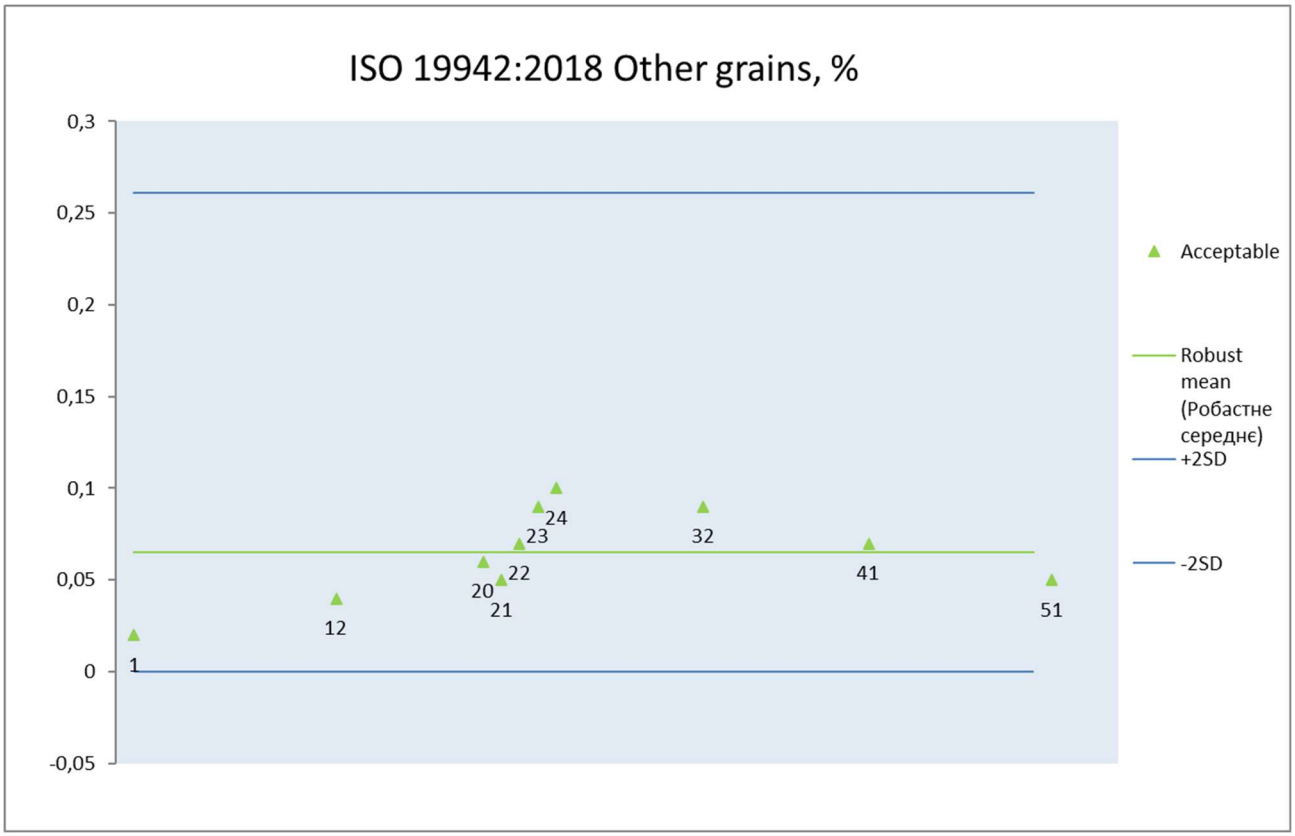


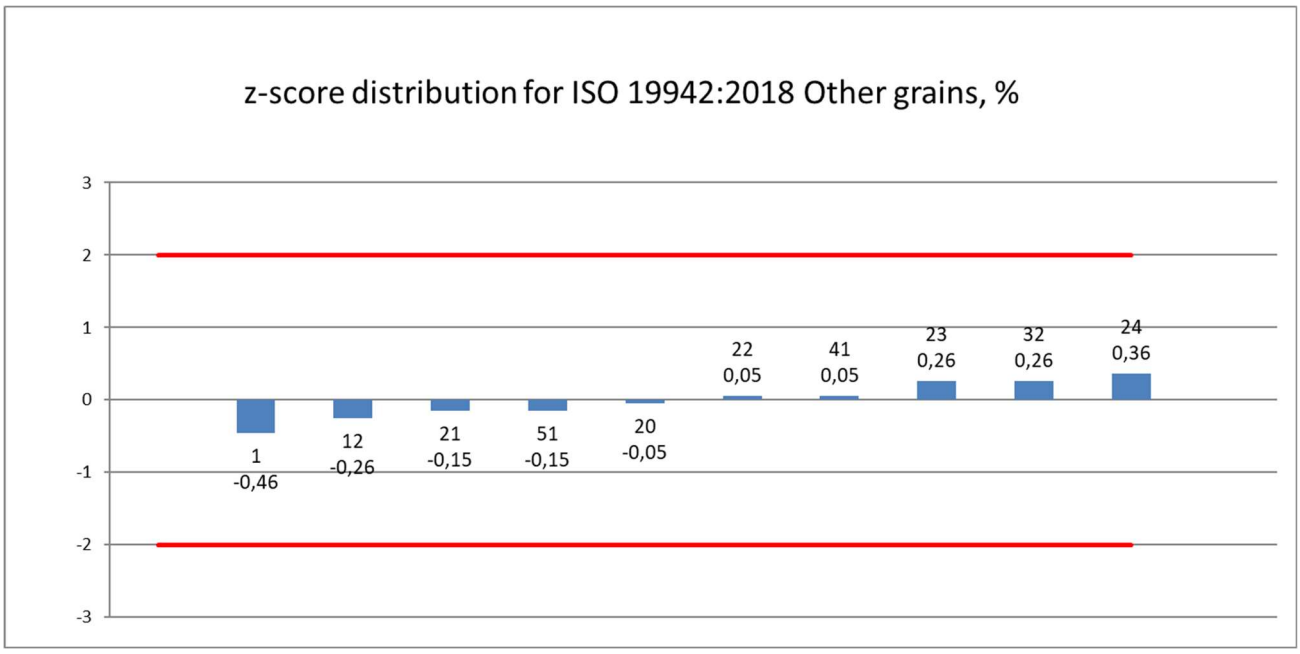
8.5. ISO 19942:2018 Damaged grains, %



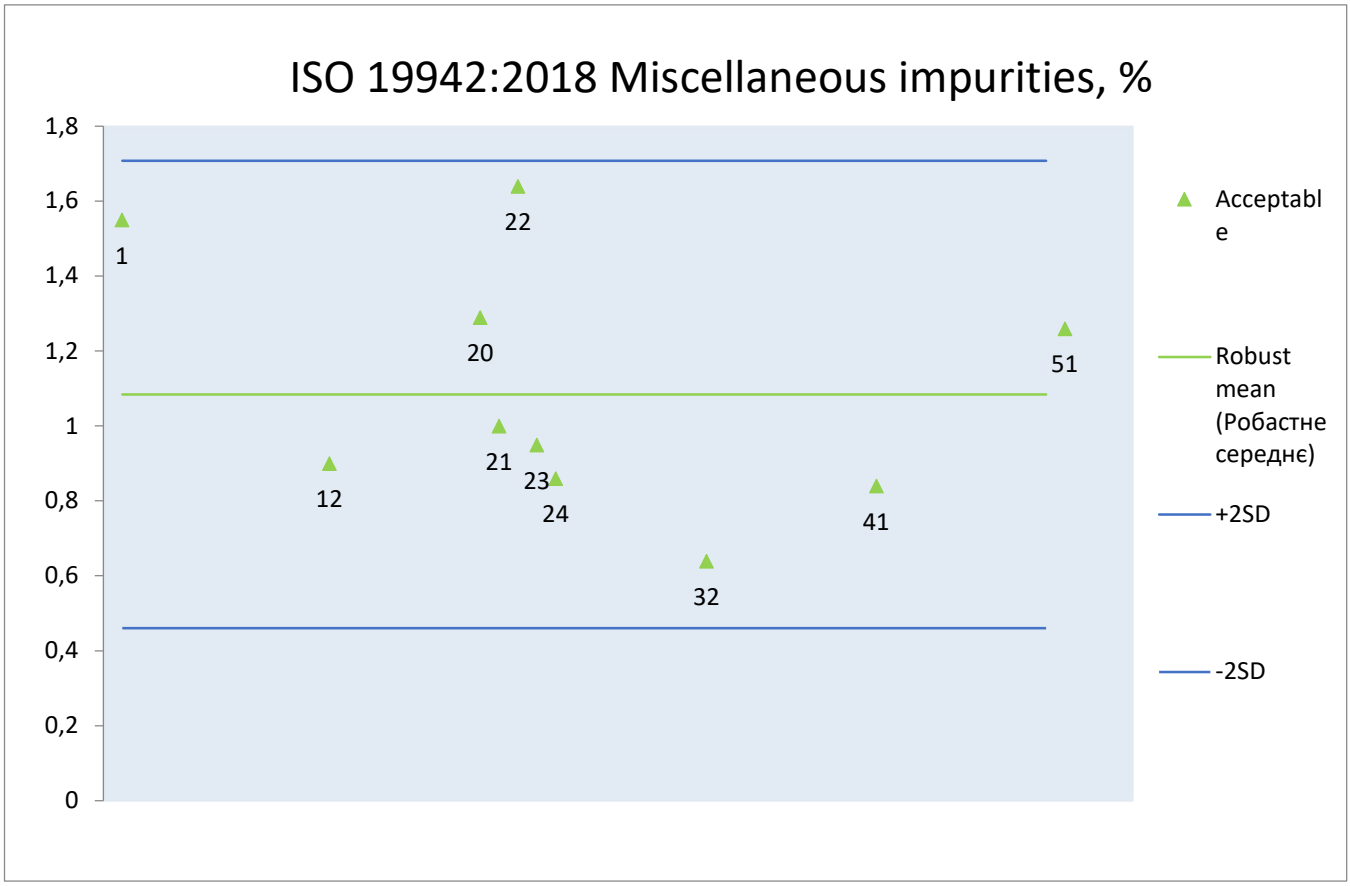


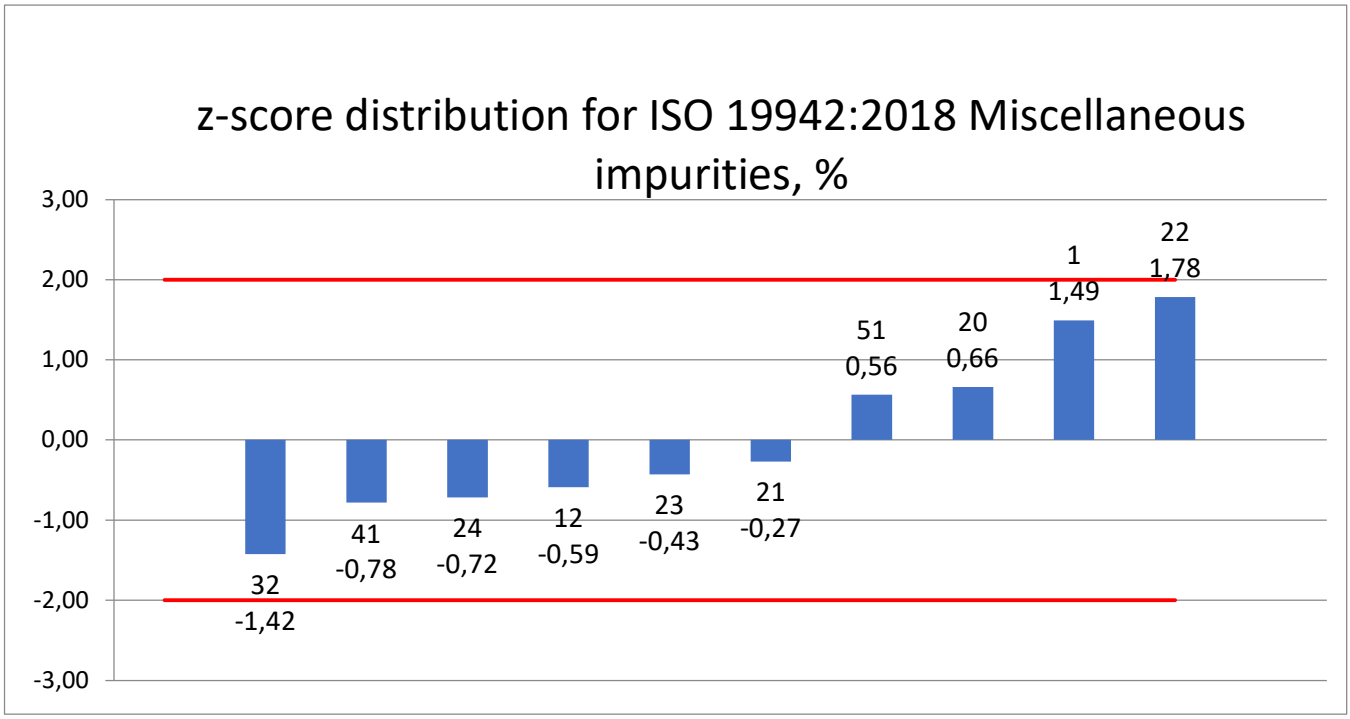
8.6. ISO 19942:2018 Other grains, %



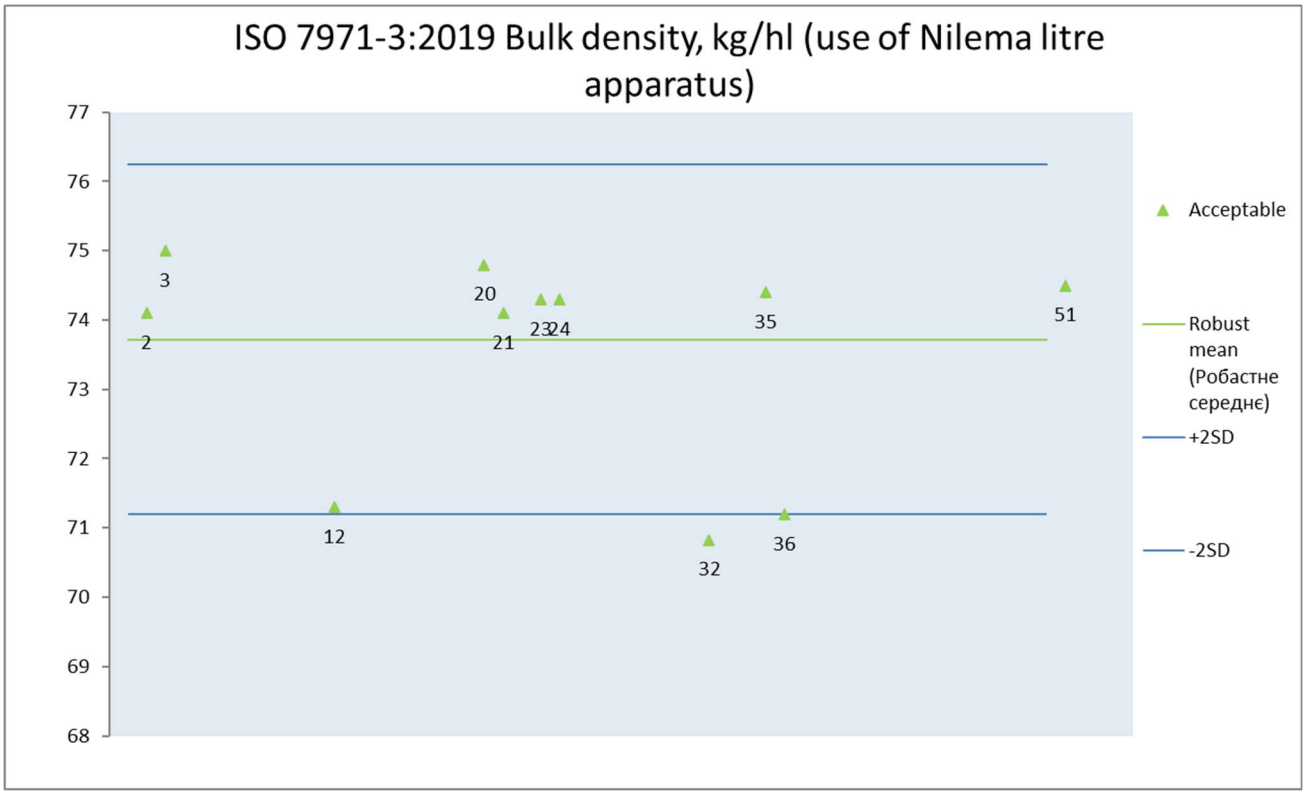


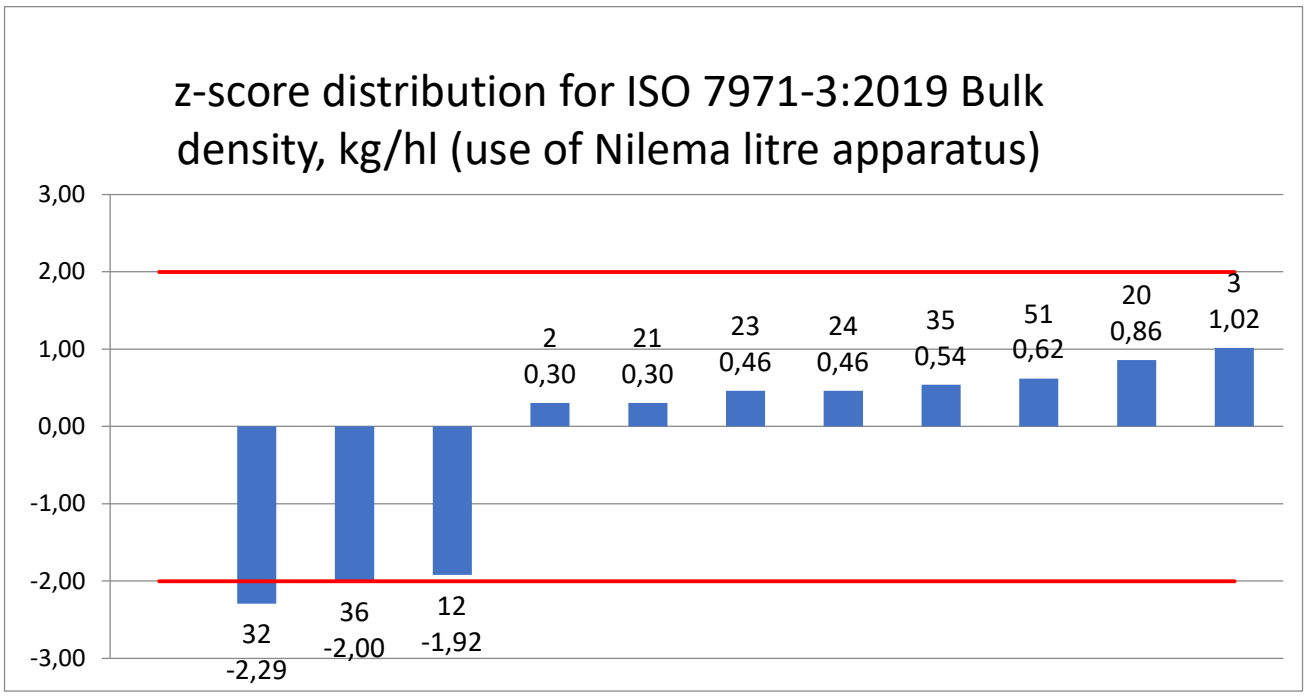
8.7. ISO 19942:2018 Miscellaneous impurities, %



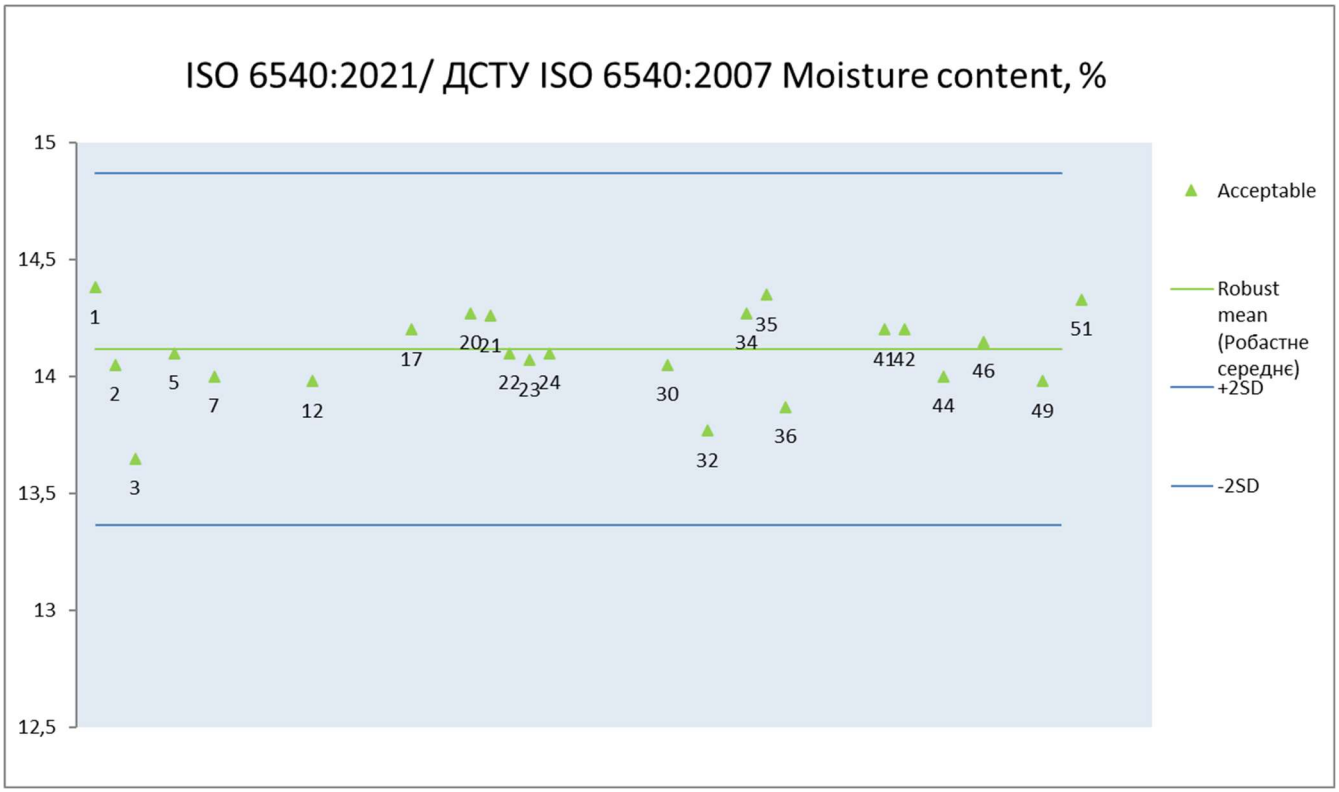


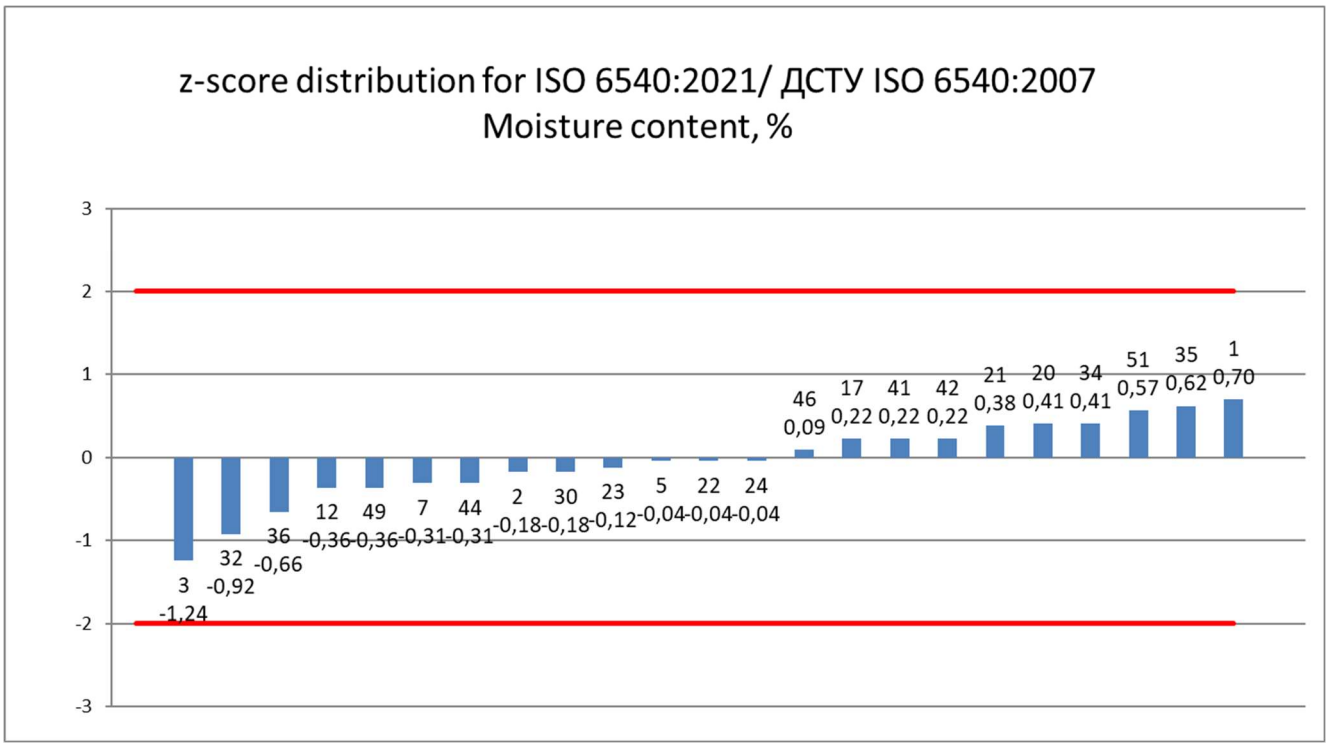
8.8. ISO 7971-3:2019 Bulk density, kg/hl (use of Nilema litre apparatus)



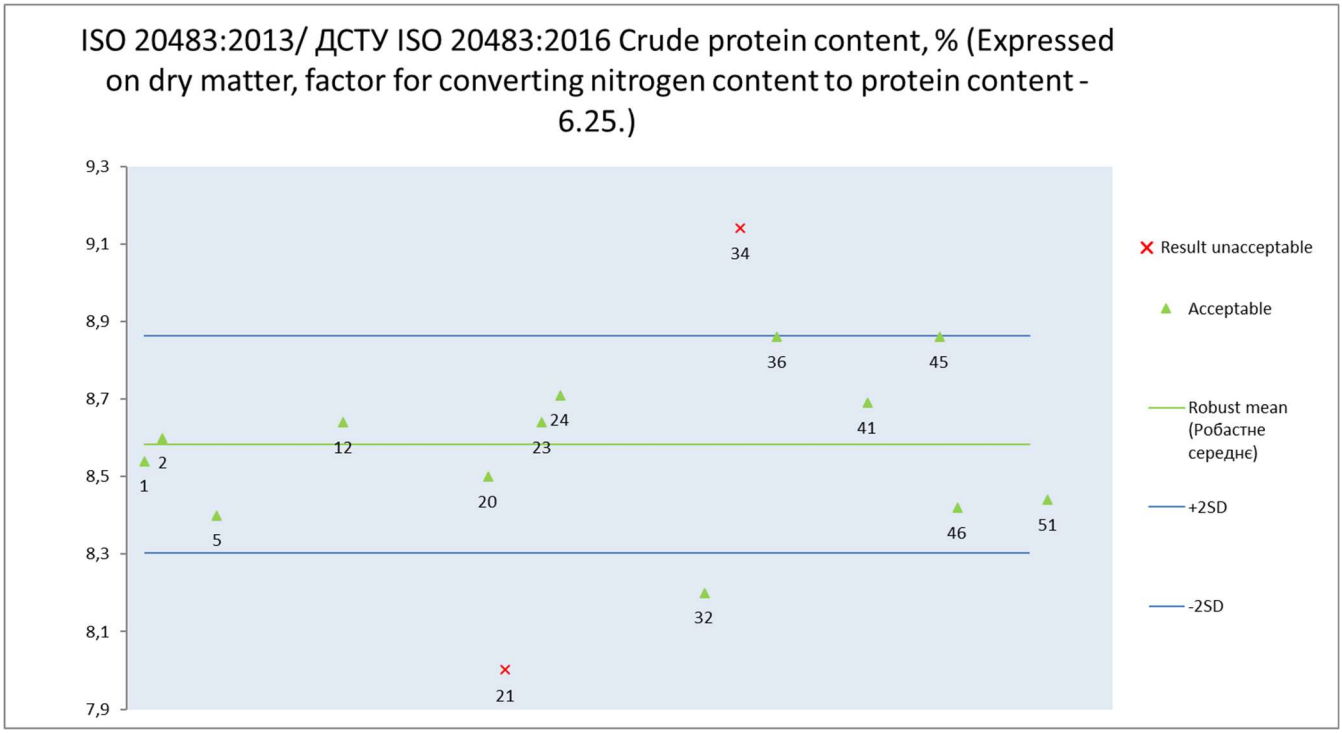


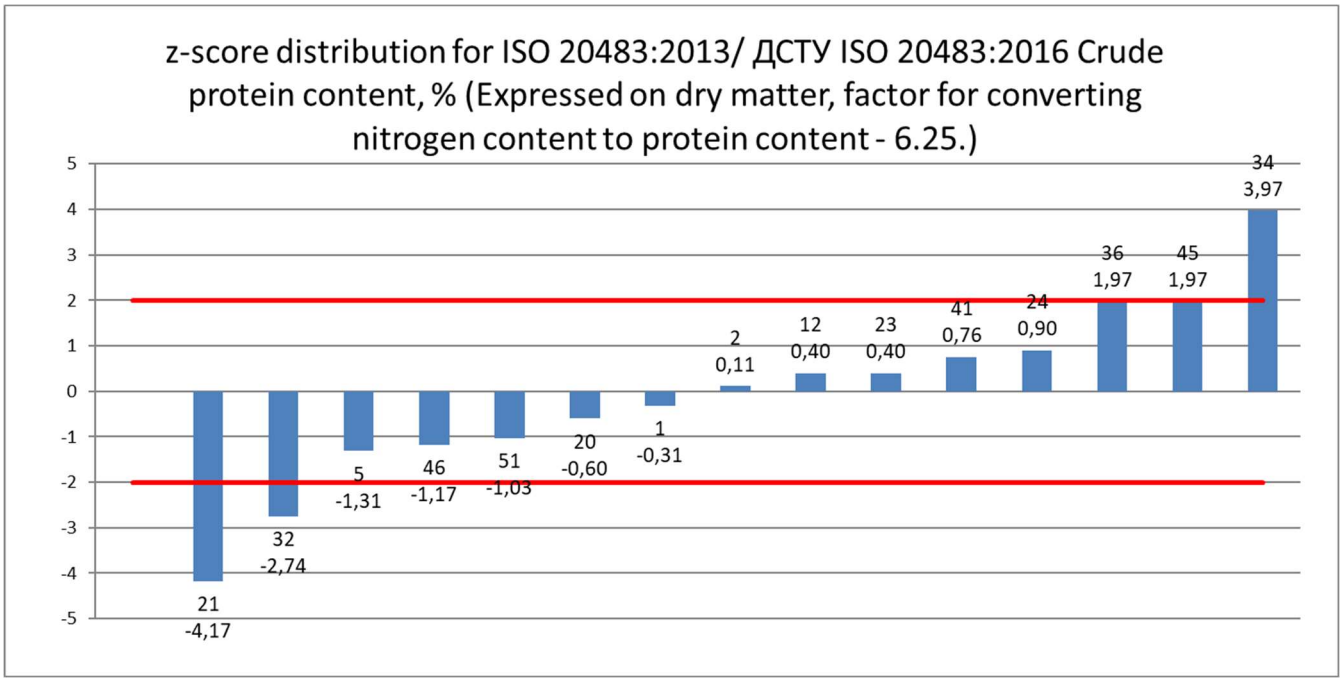
8.9. ISO 6540:2021/ ДСТУ ISO 6540:2007 Moisture content, %



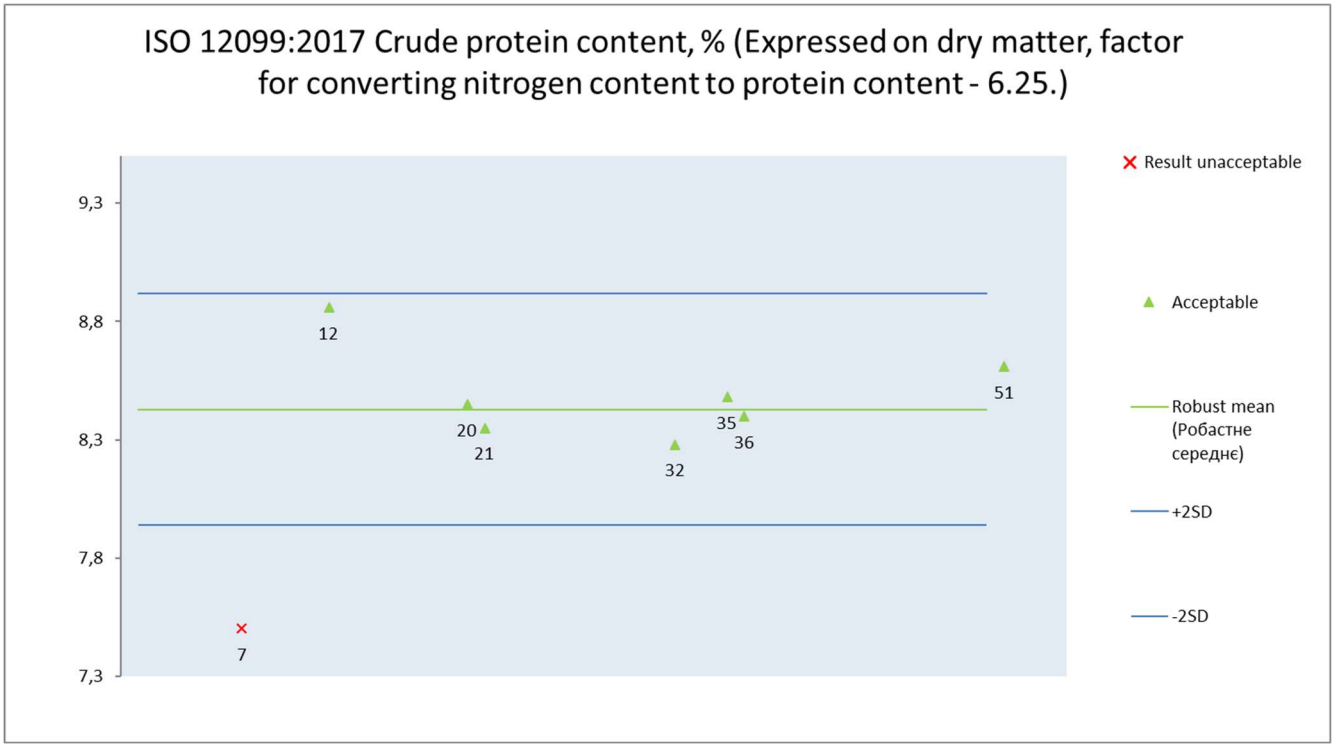


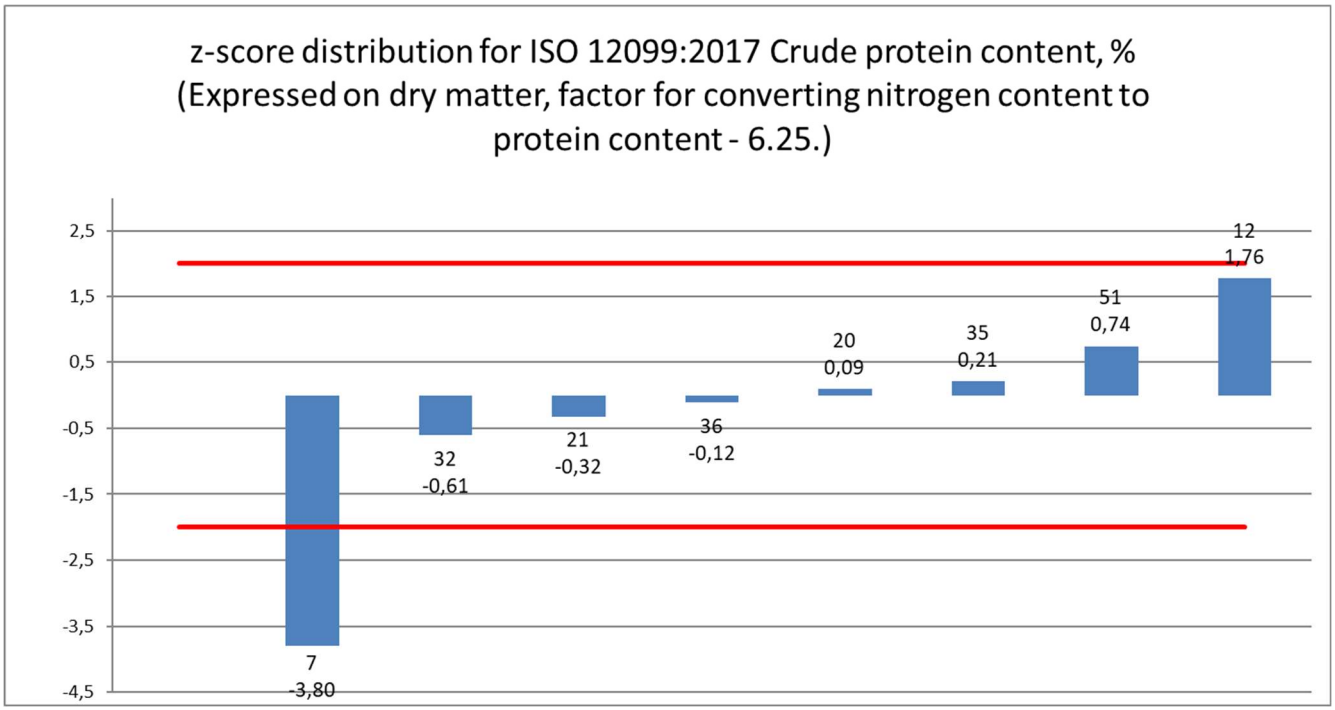
8.10. ISO 16634-2:2016 Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)



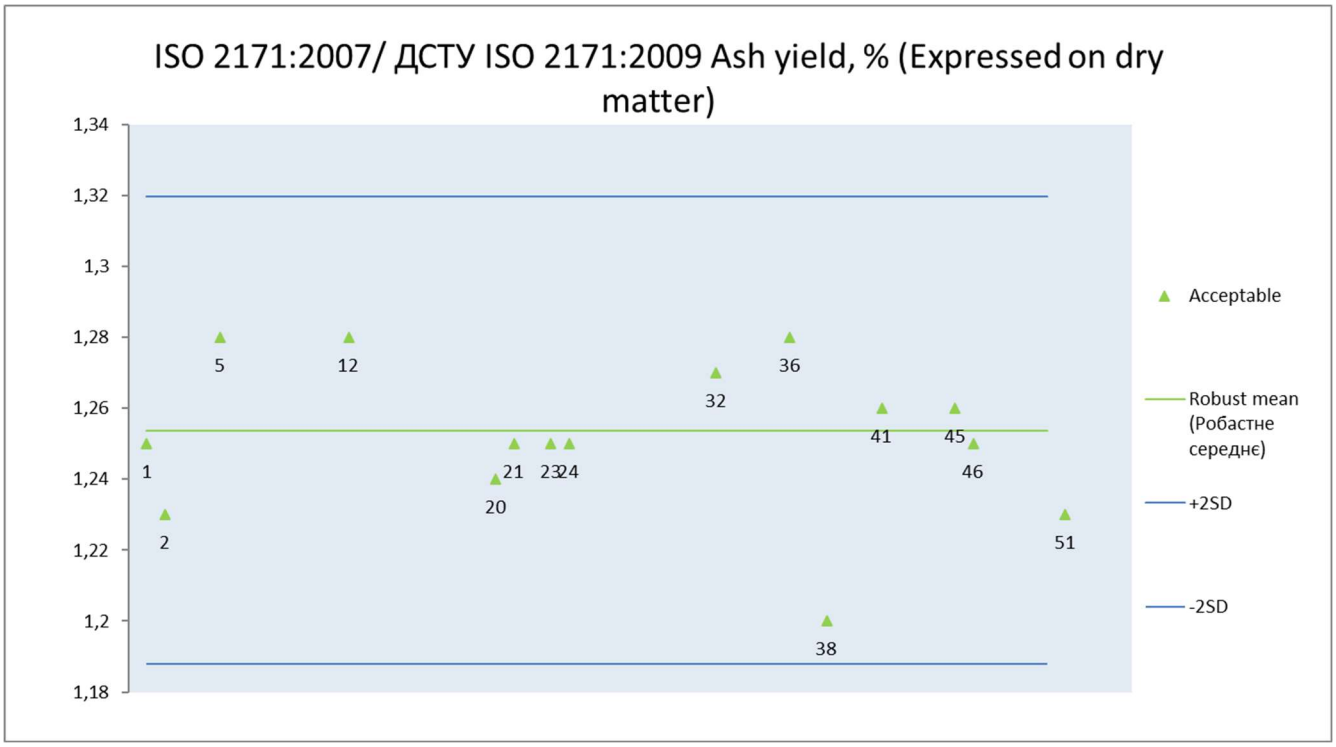


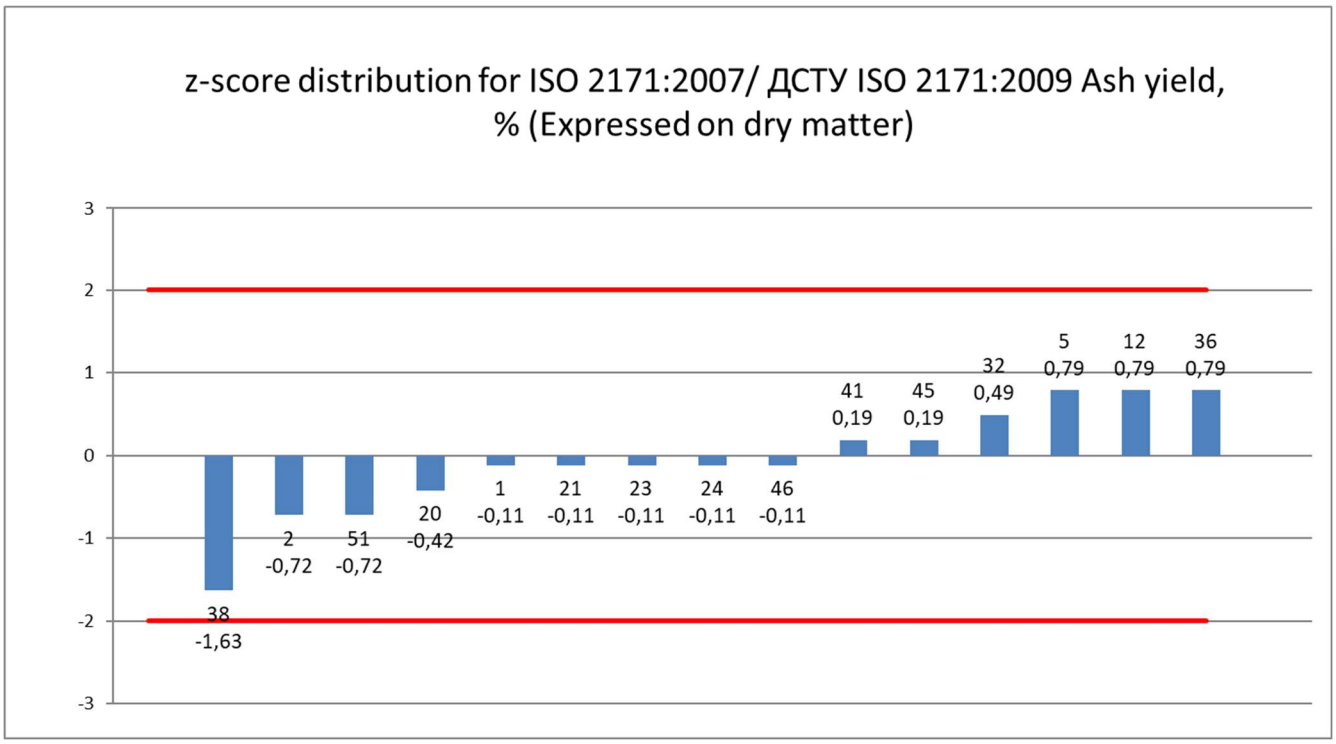
8.11. ISO 12099:2017 Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)



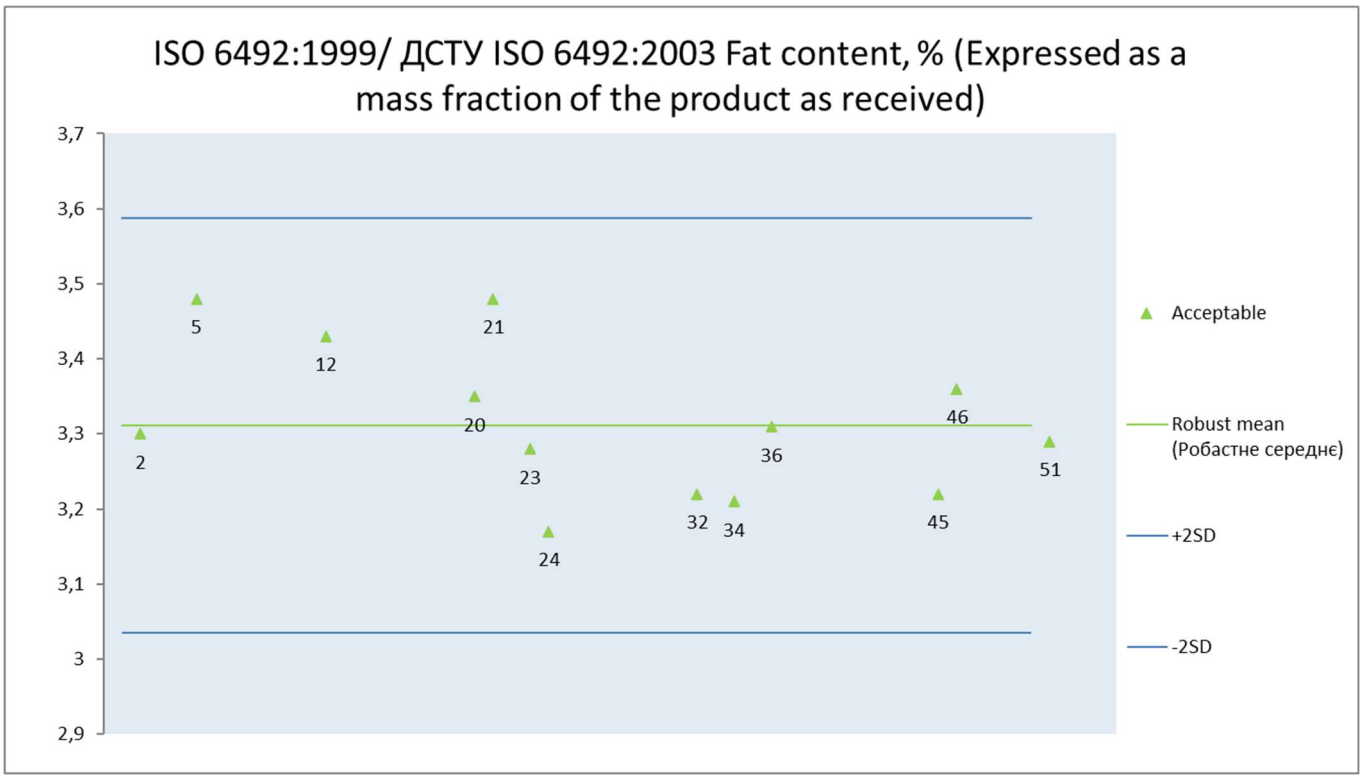


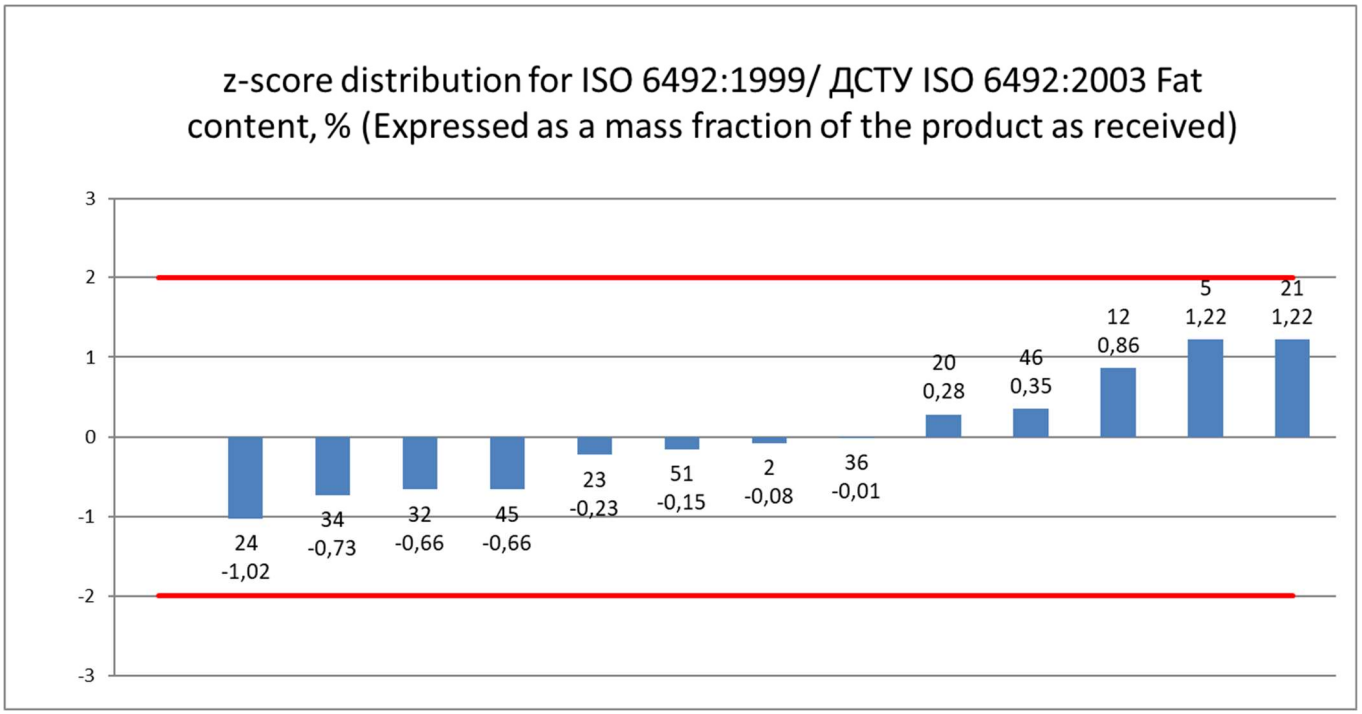
8.12. ISO 2171:2007/ ДСТУ ISO 2171:2009 Ash yield, % (Expressed on dry matter)



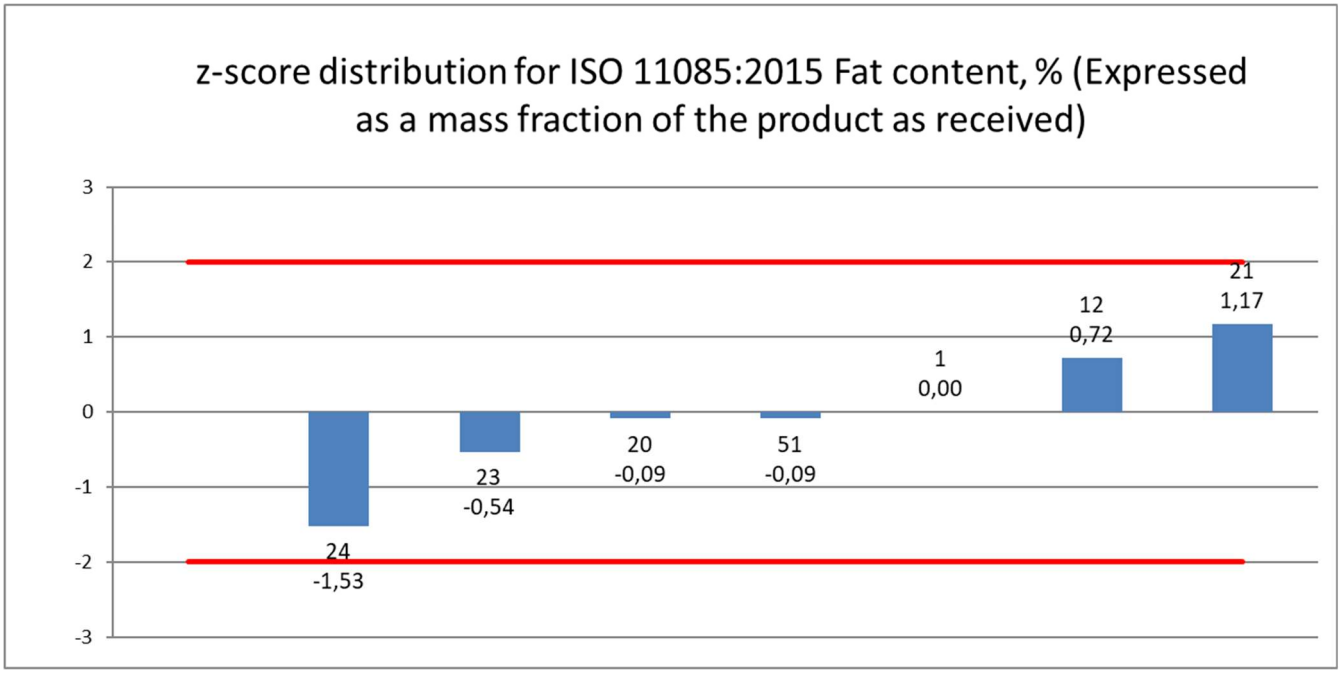


8.13. ISO 6492:1999/ ДСТУ ISO 6492:2003 Fat content, % (Expressed as a mass fraction of the product as received)

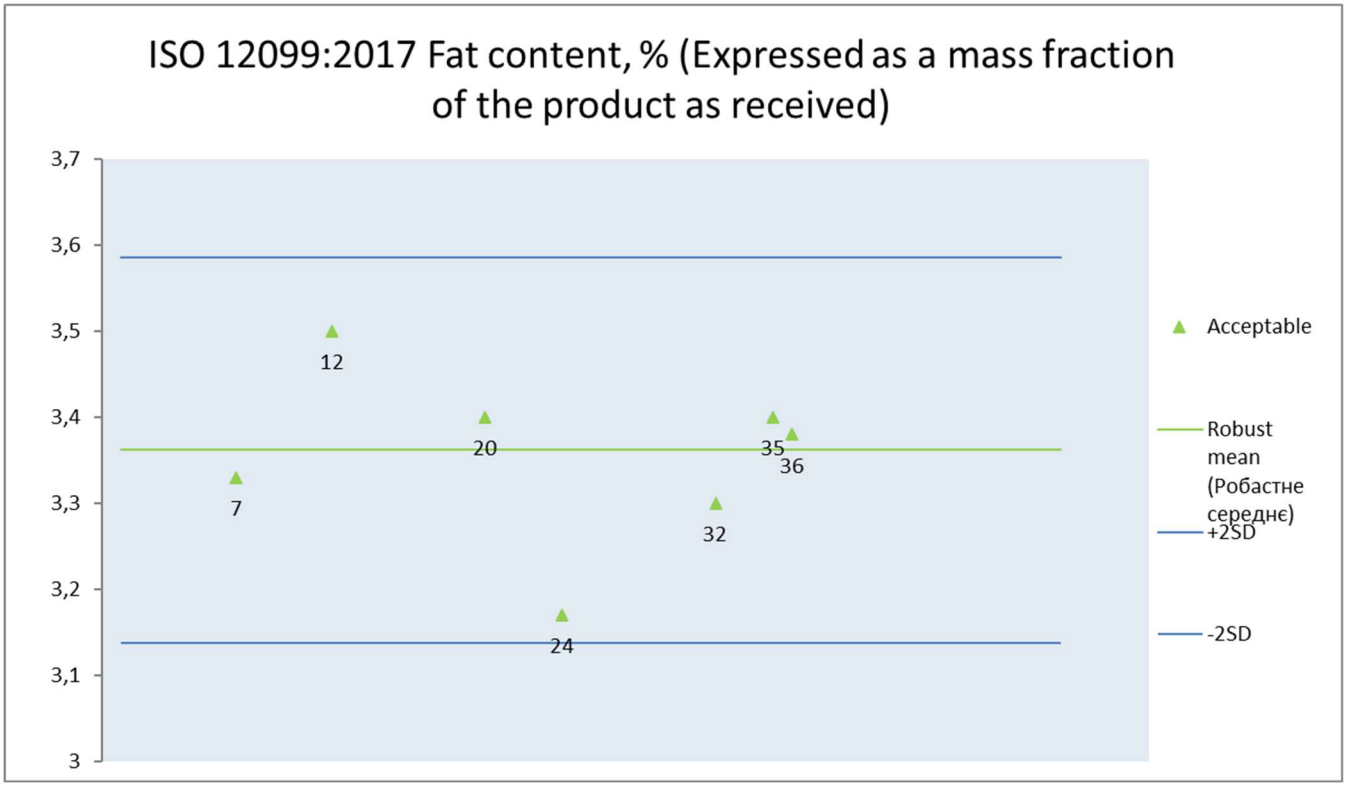


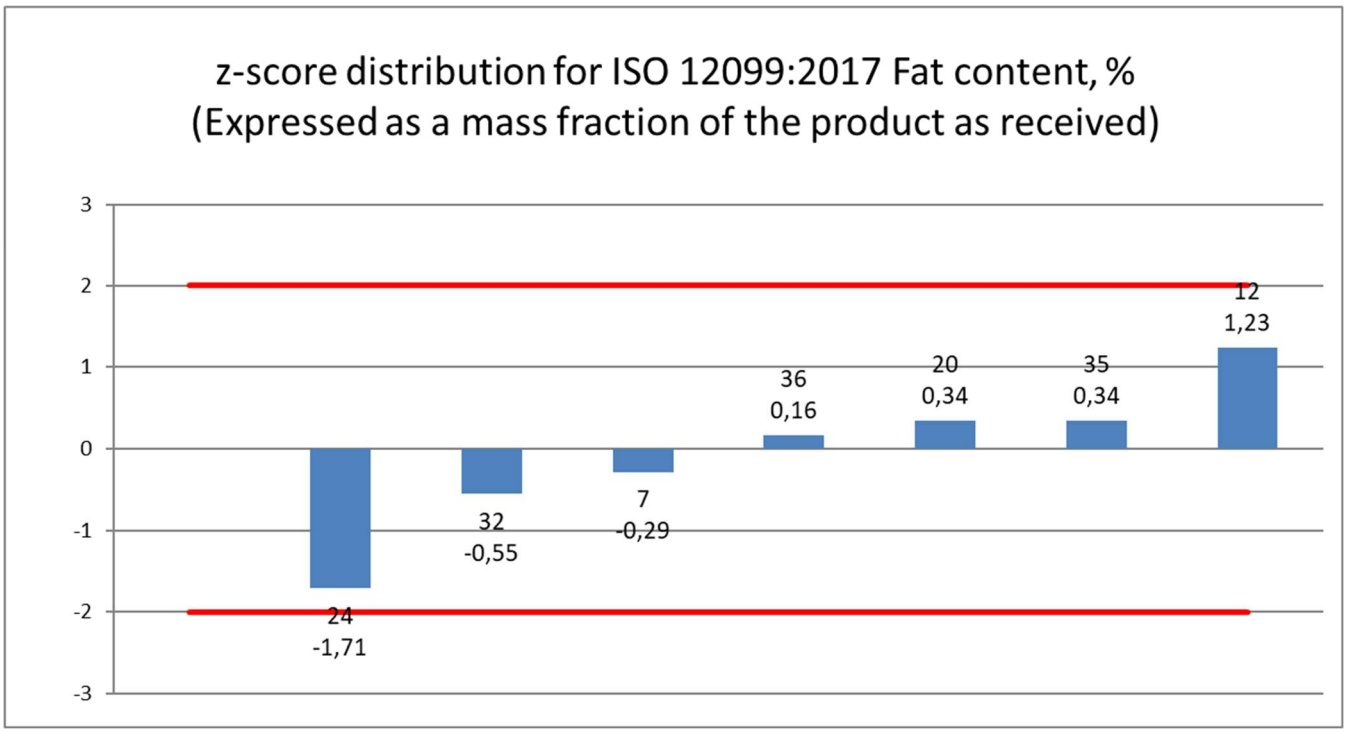


8.14. ISO 11085:2015 Fat content, % (Expressed as a mass fraction of the product as received)

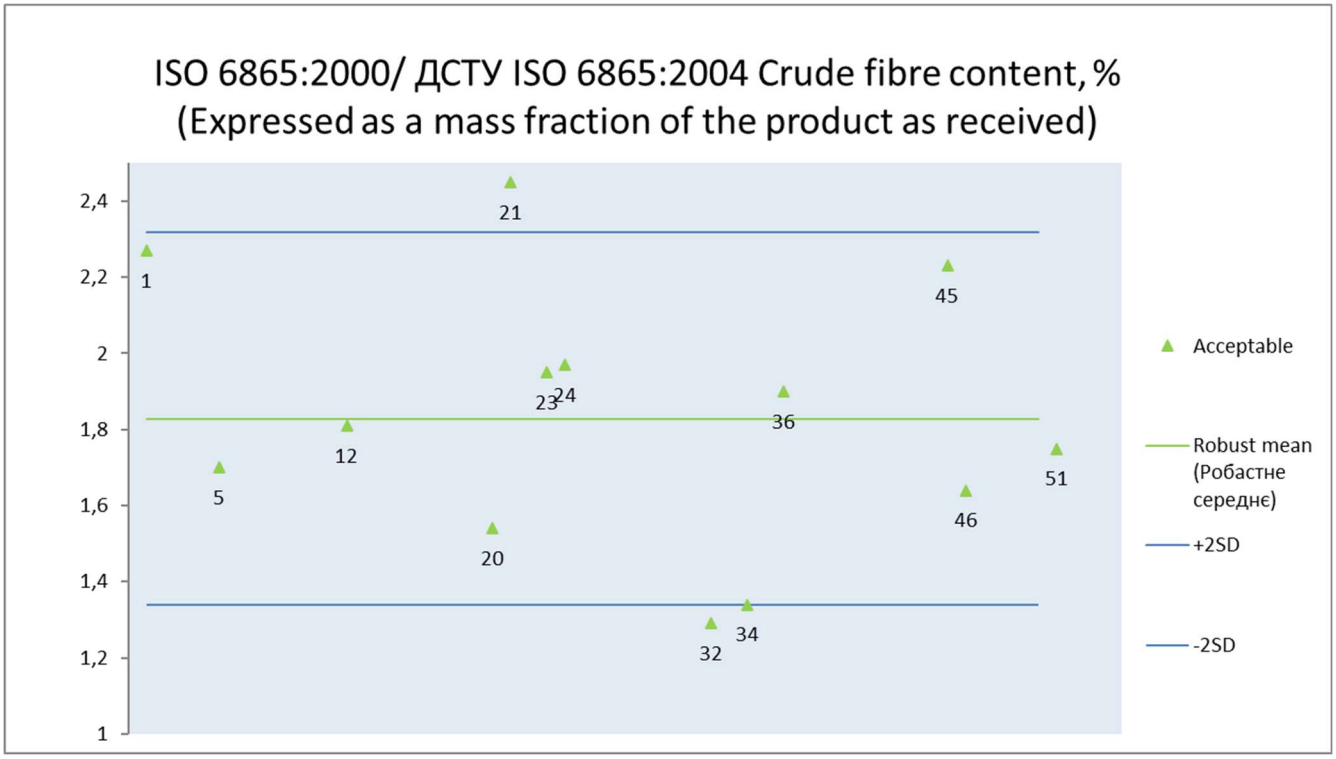


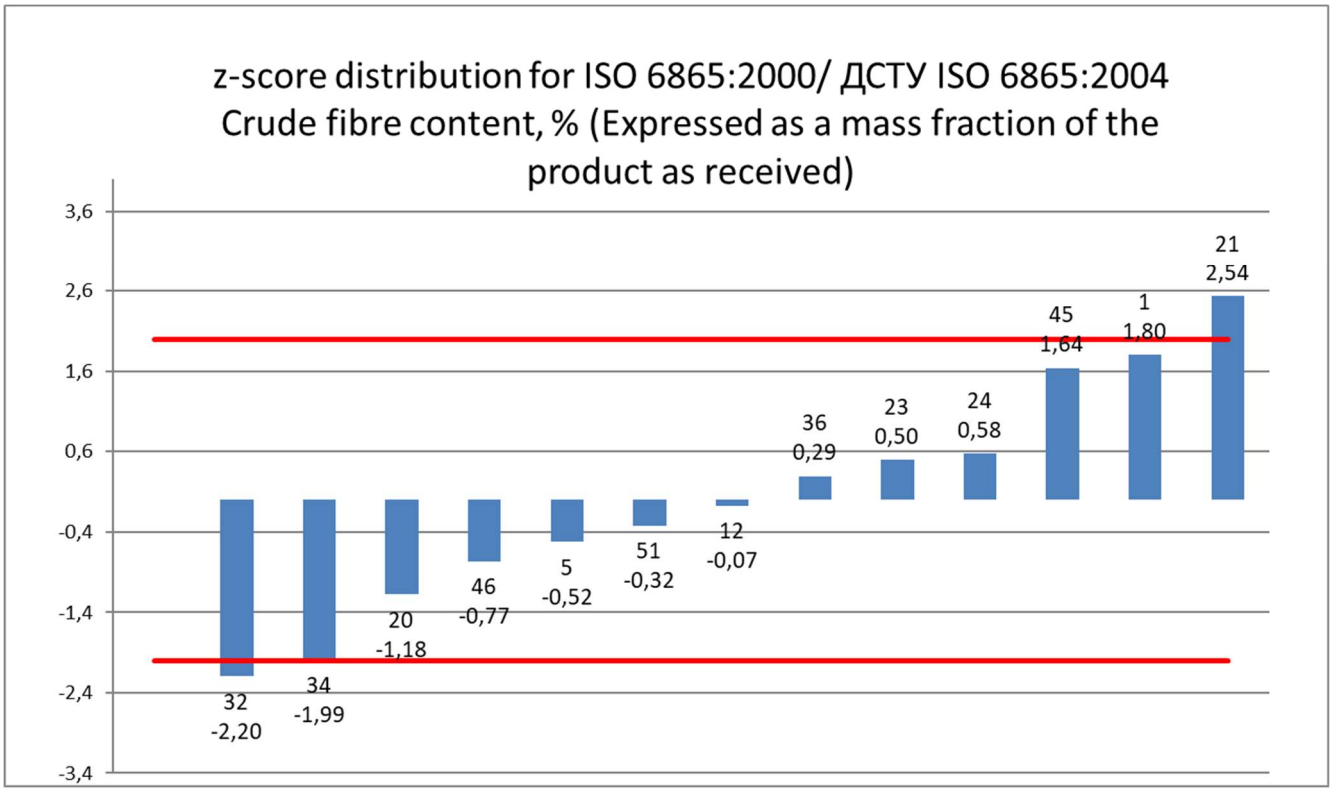
8.15. ISO 12099:2017 Fat content, % (Expressed as a mass fraction of the product as received)



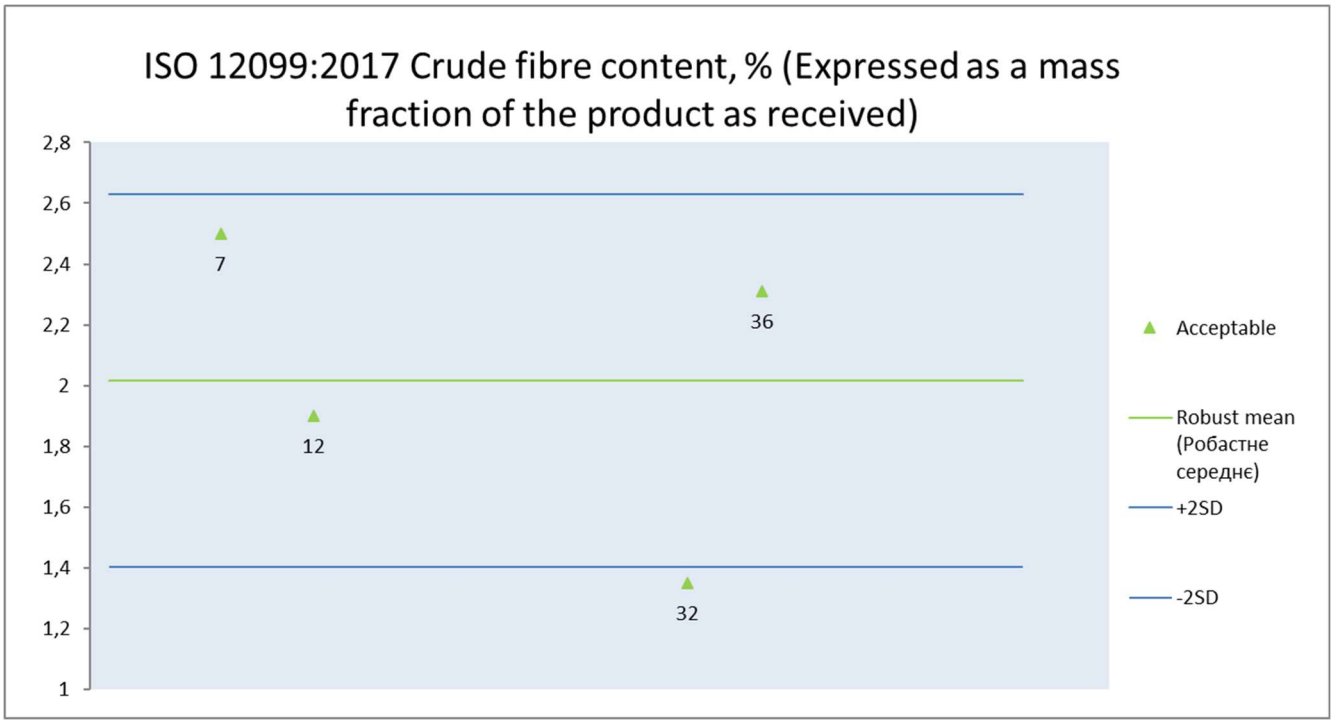


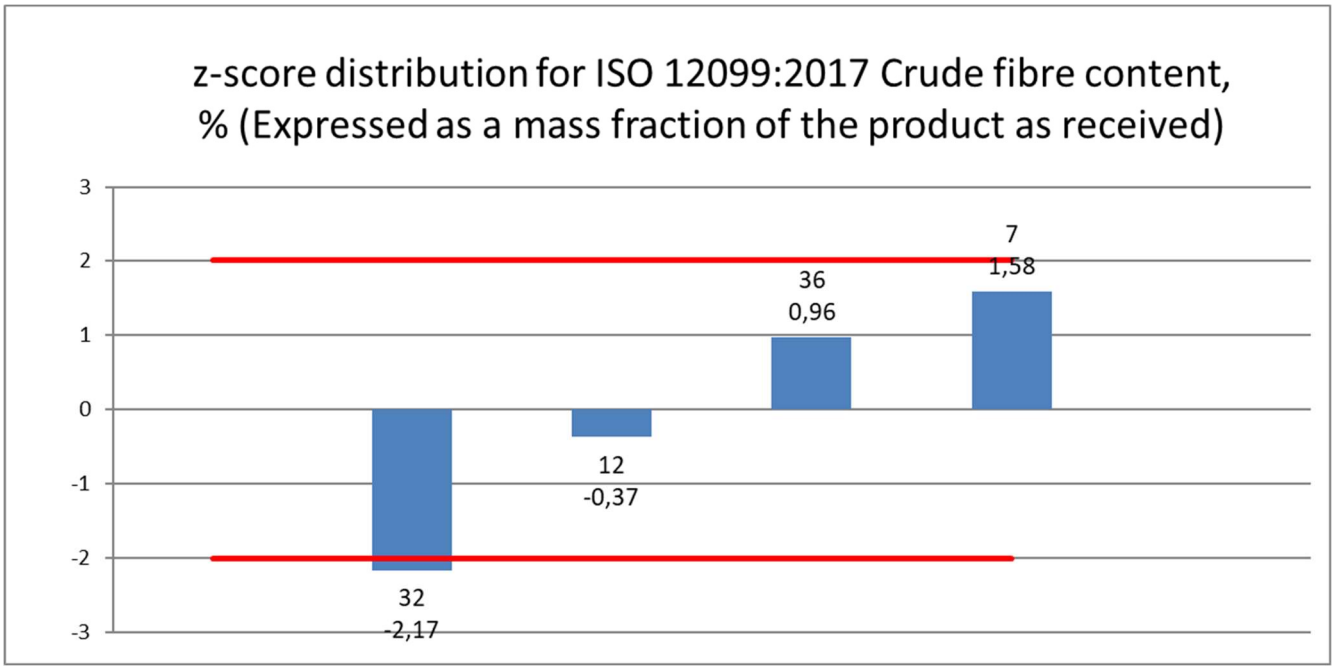
8.16. ISO 6865:2000/ ДСТУ ISO 6865 Crude fibre content, % (Expressed as a mass fraction of the product as received)



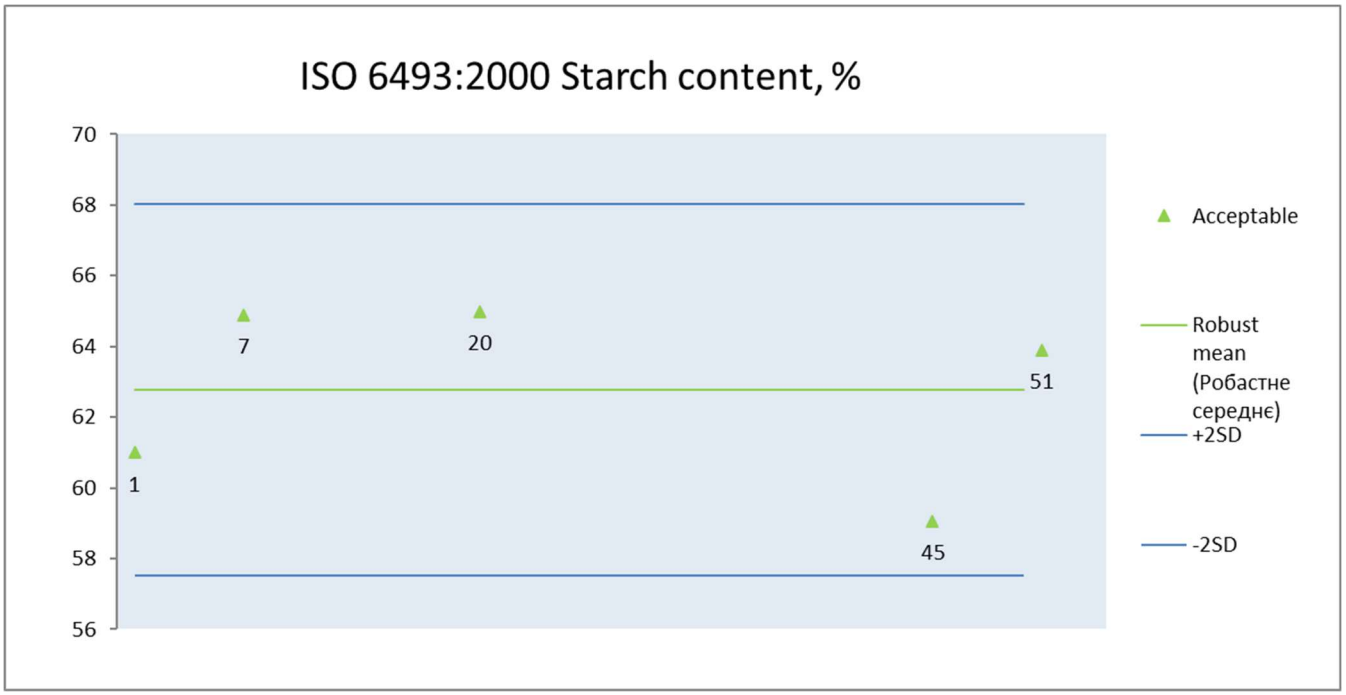


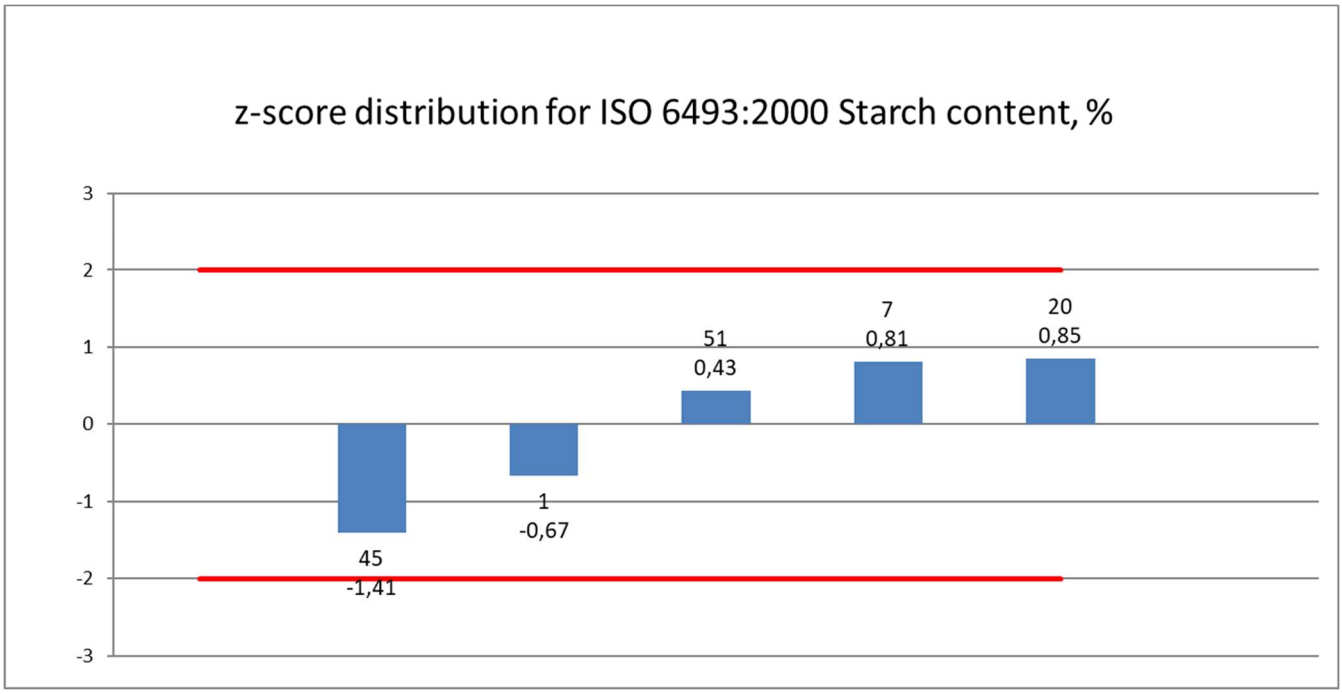
8.17. ISO 12099:2017 Crude fibre content, % (Expressed as a mass fraction of the product as received)



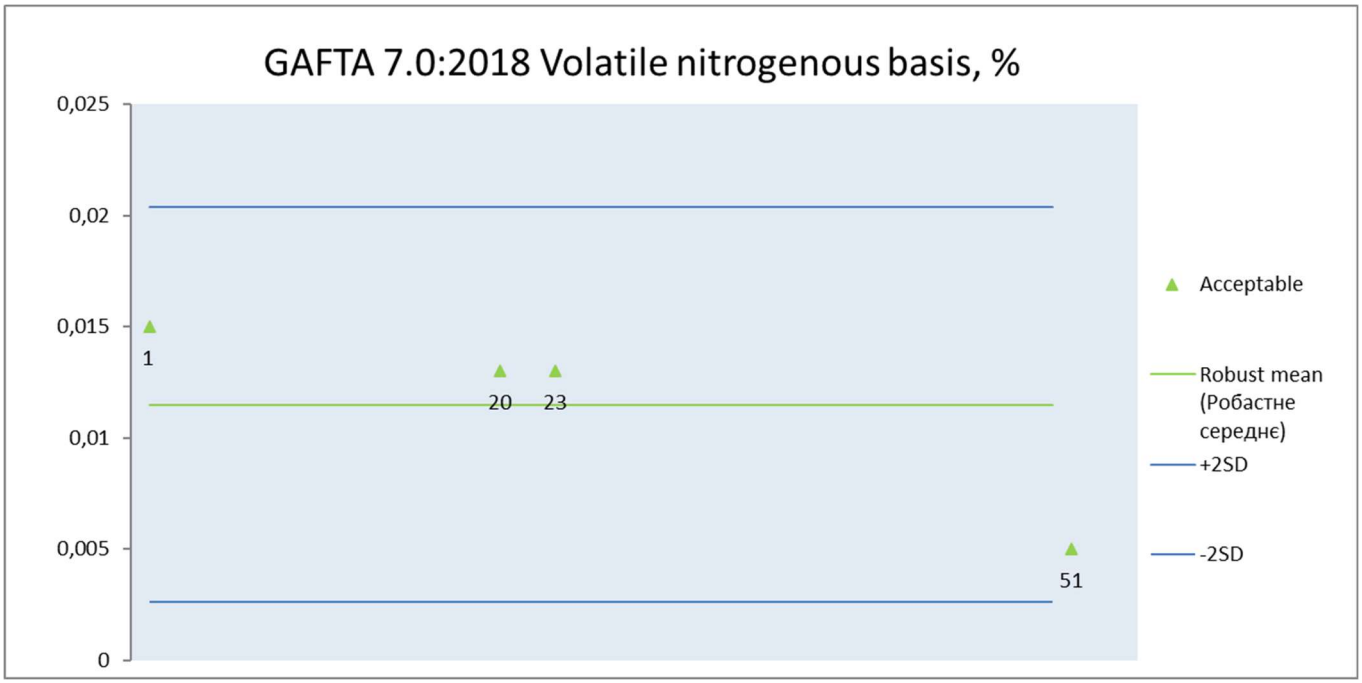


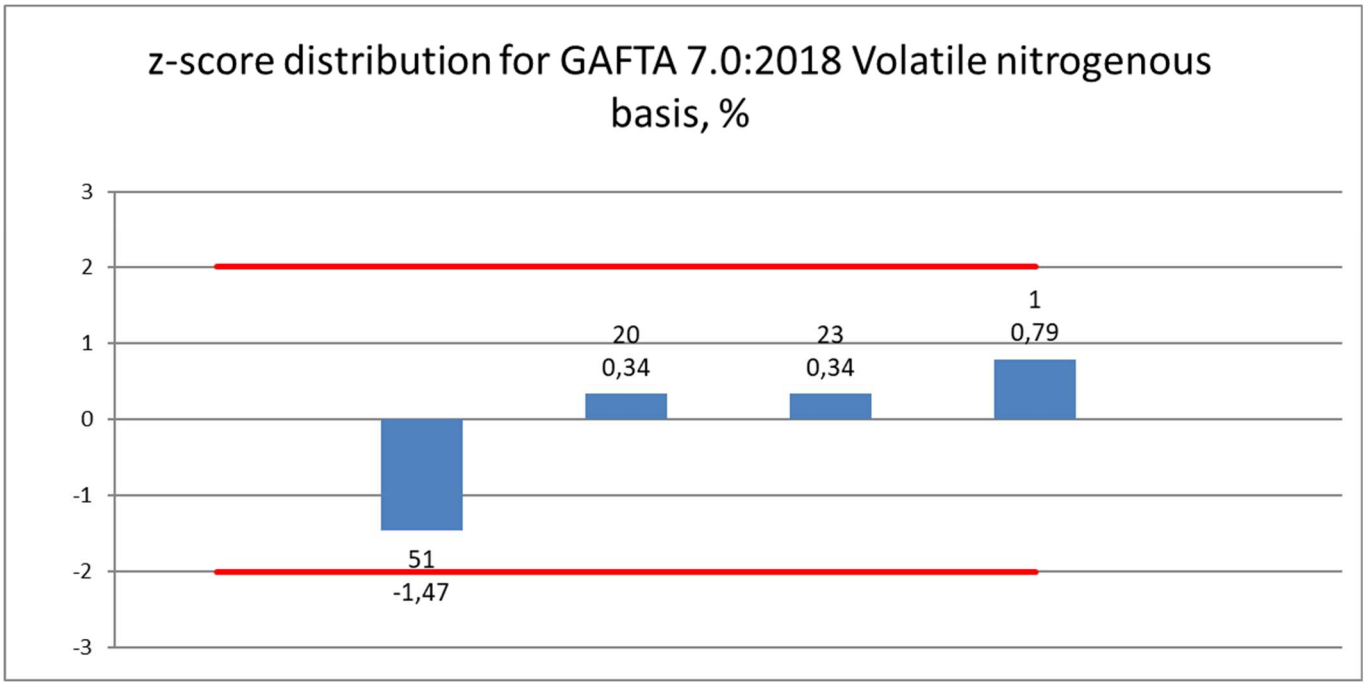
8.18. ISO 6493:2000 Starch content, %



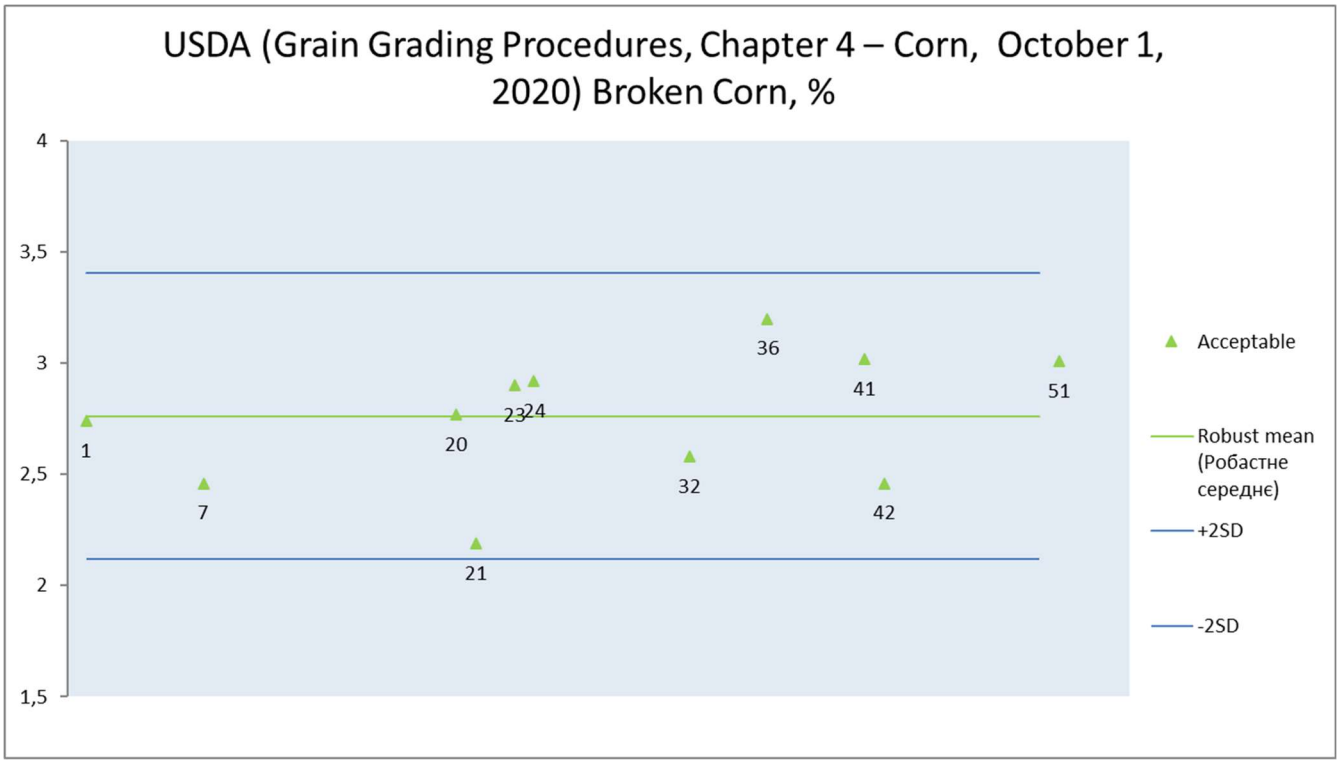


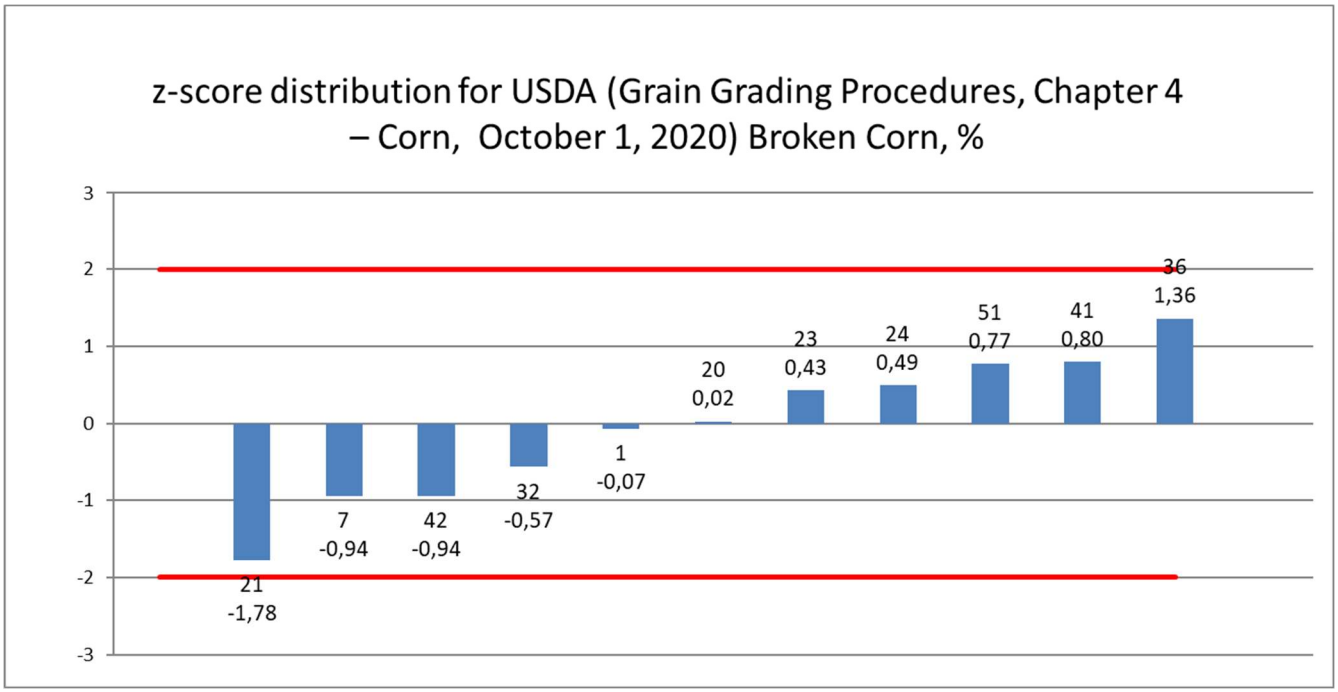
8.19. GAFTA 7.0:2018 Volatile nitrogenous basis, %



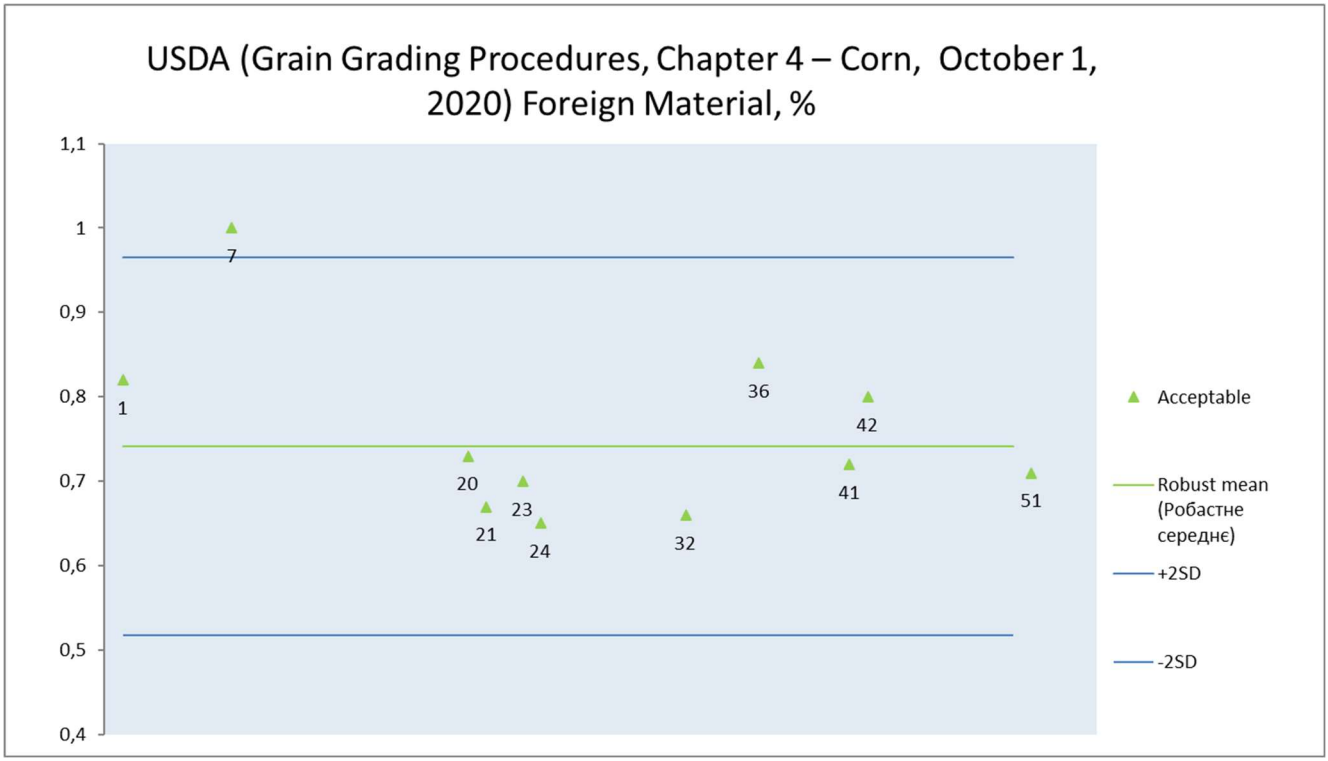


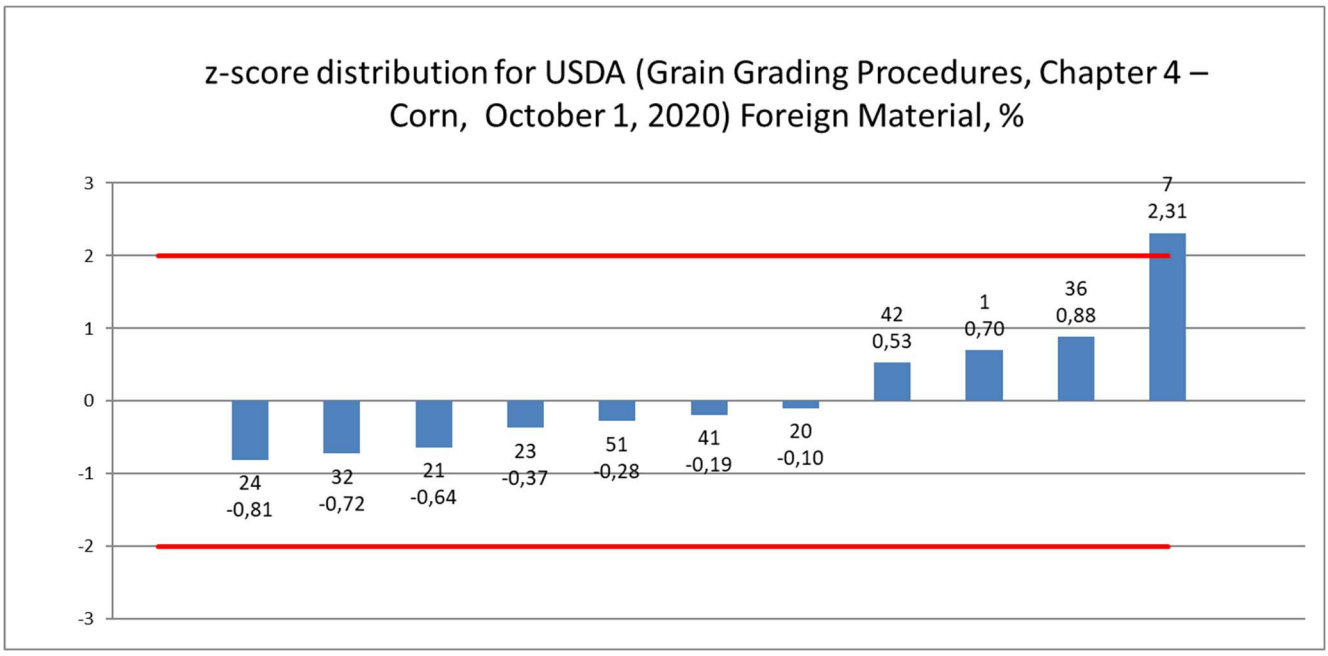
8.20. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Broken Corn, %



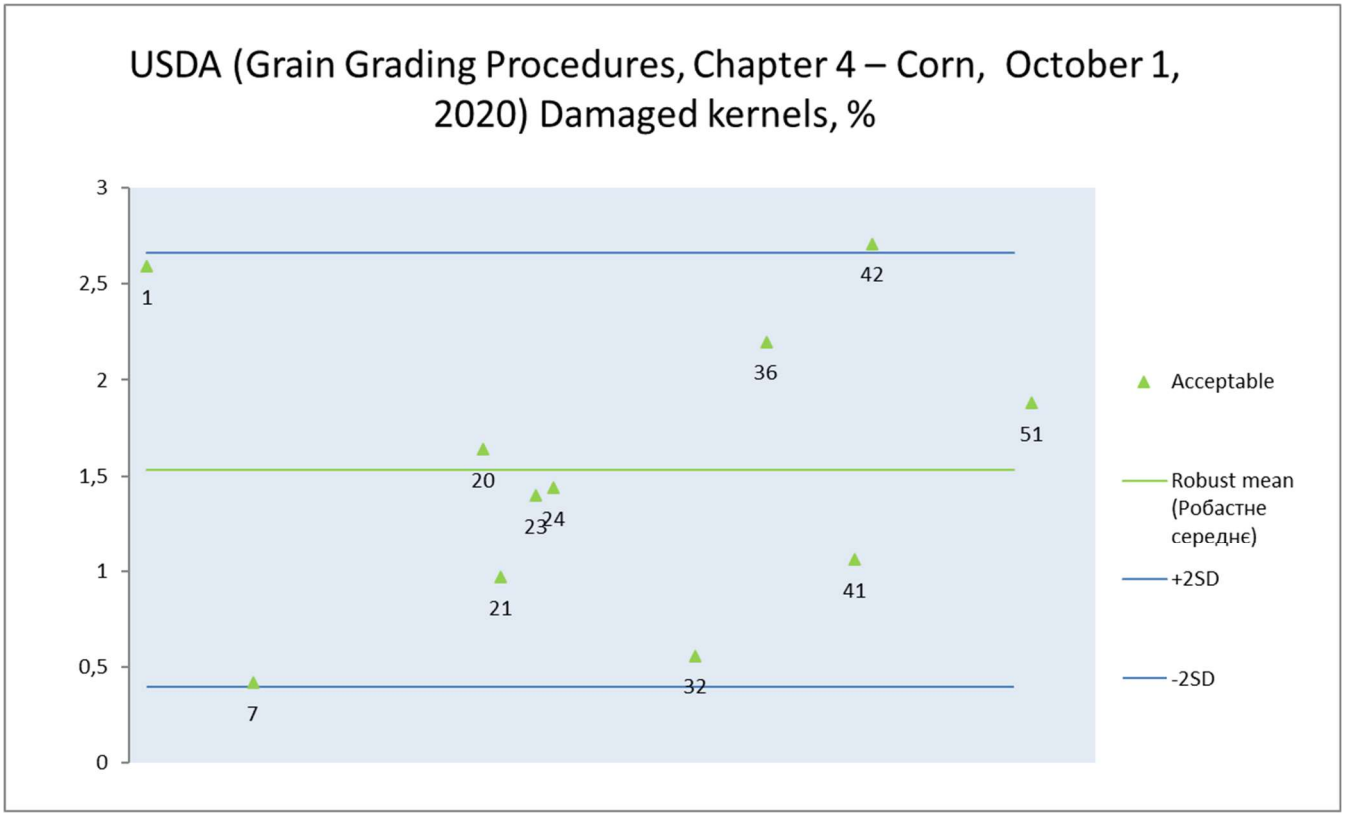


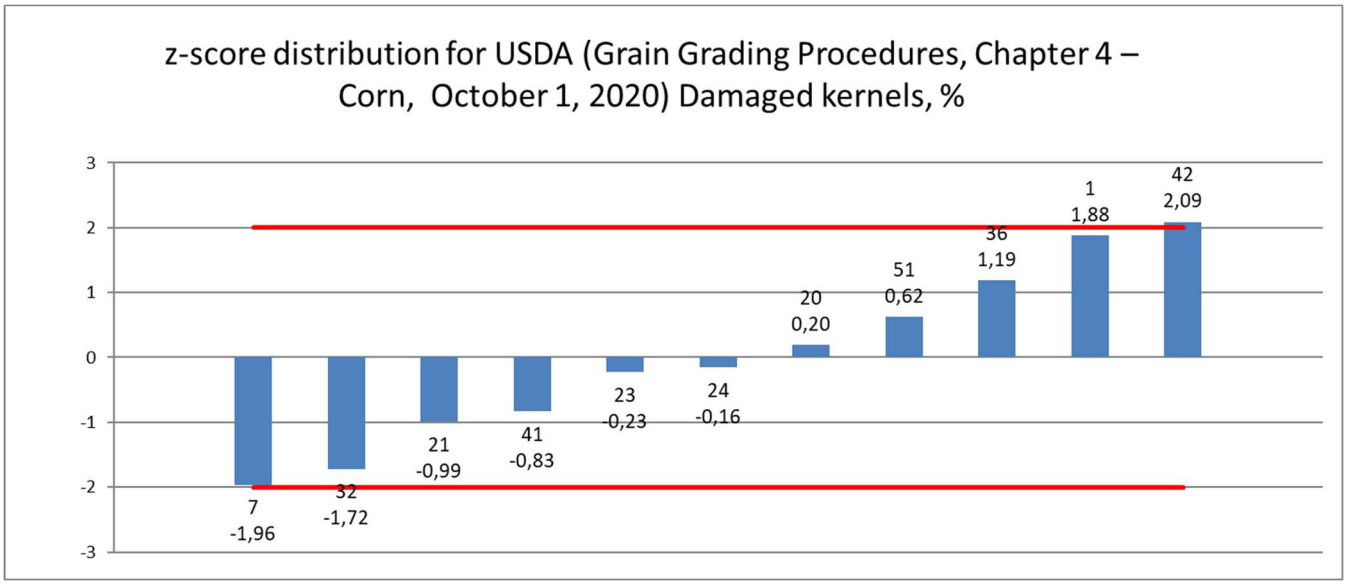
8.21. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Damaged kernels, %



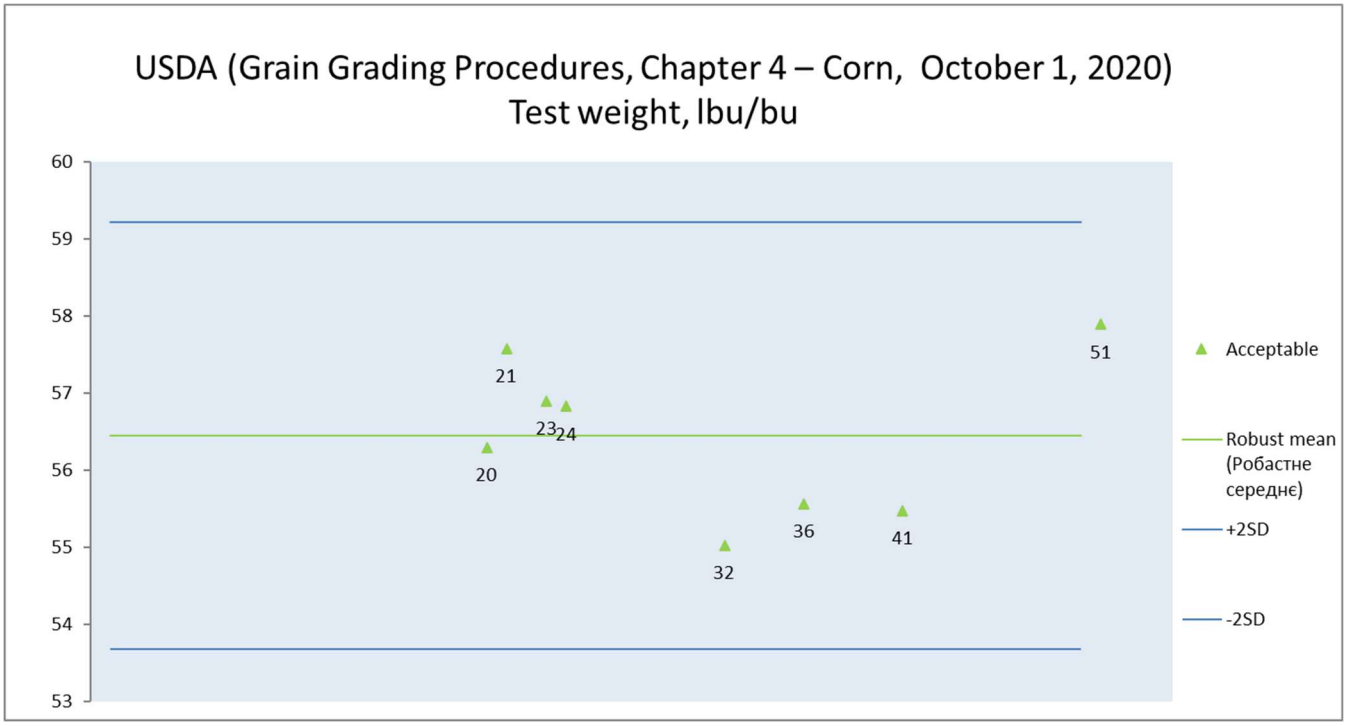


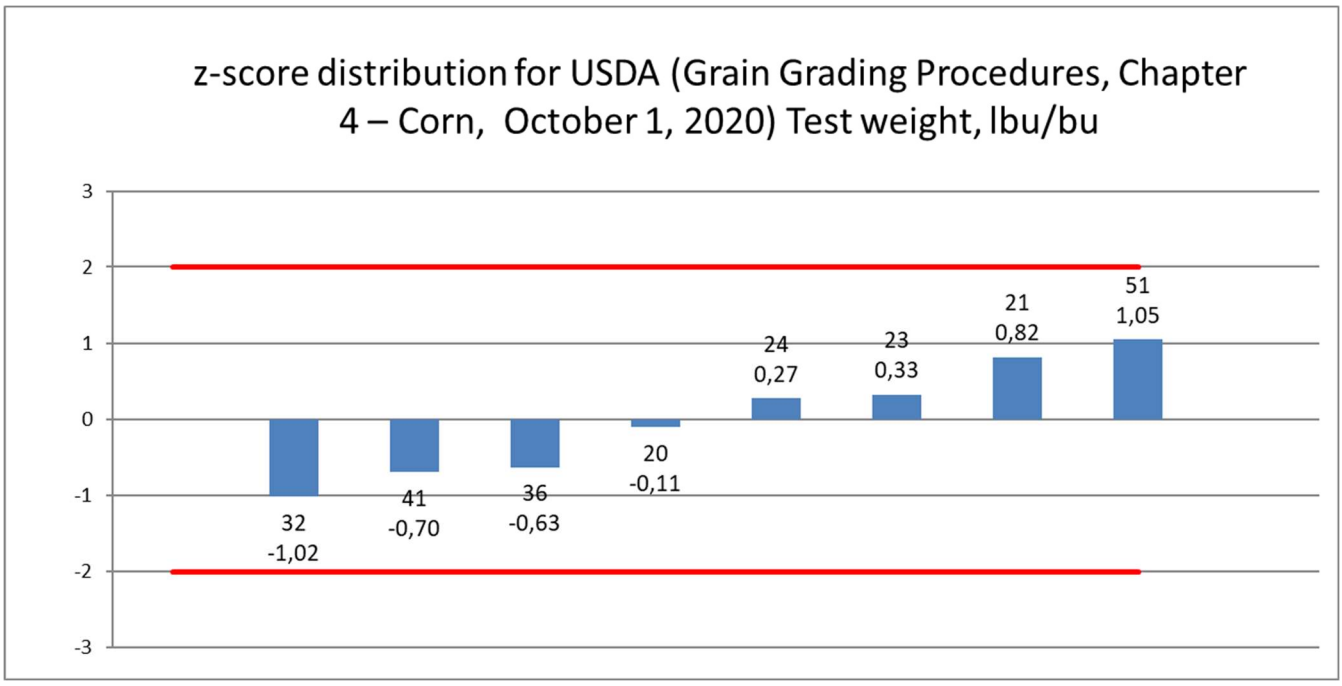
8.22. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Test weight, lbu/bu



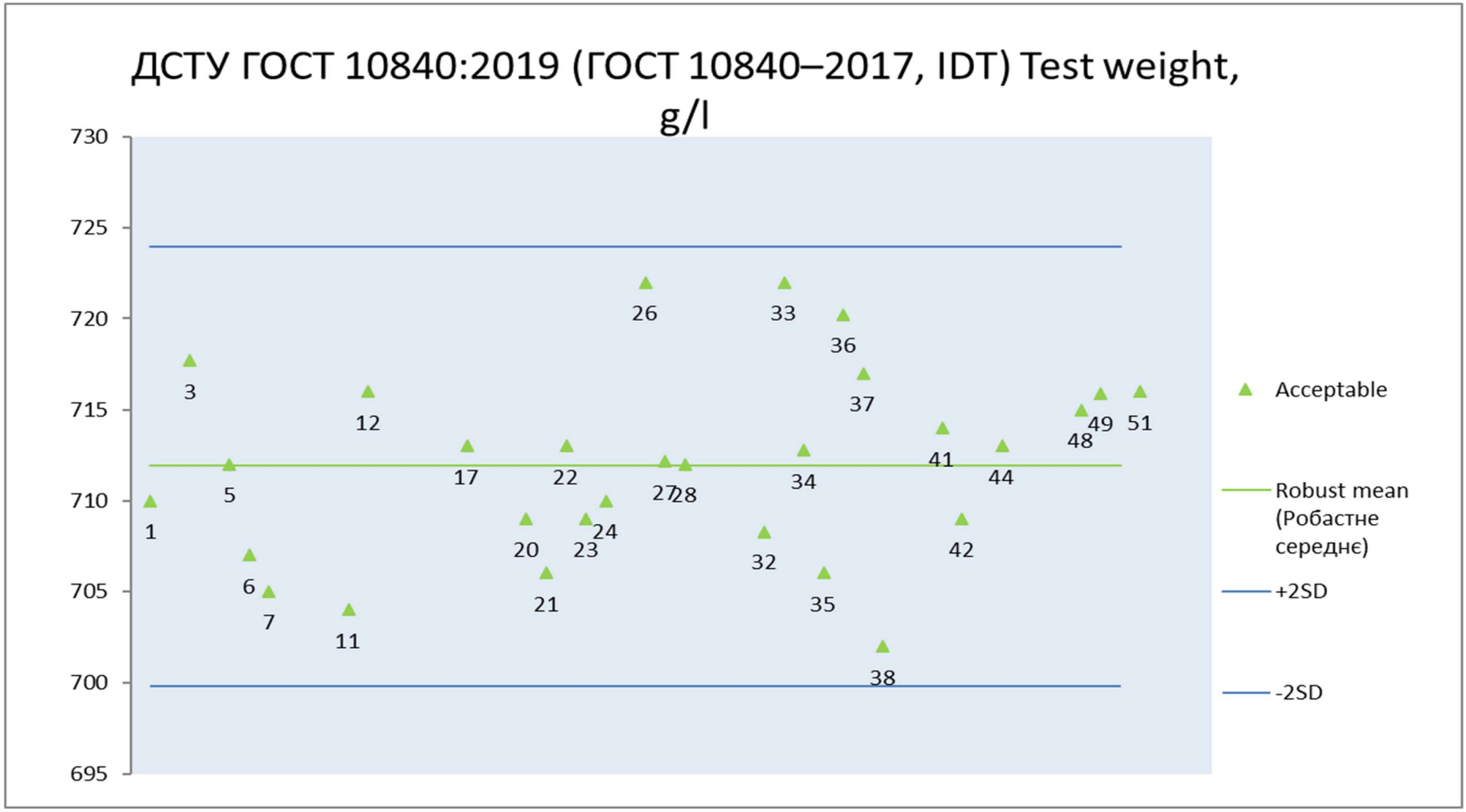


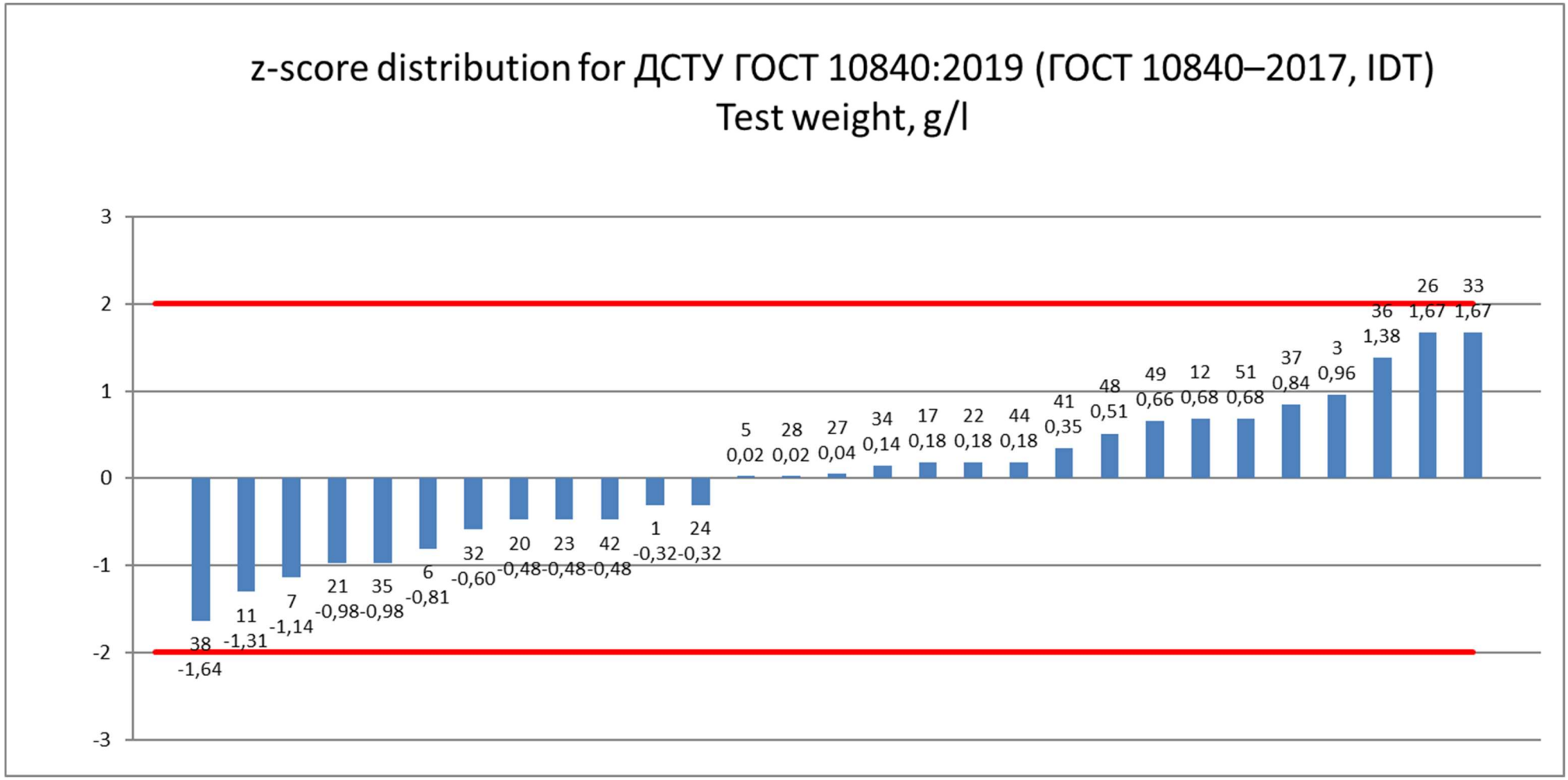
8.23. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Test weight, lbu/bu



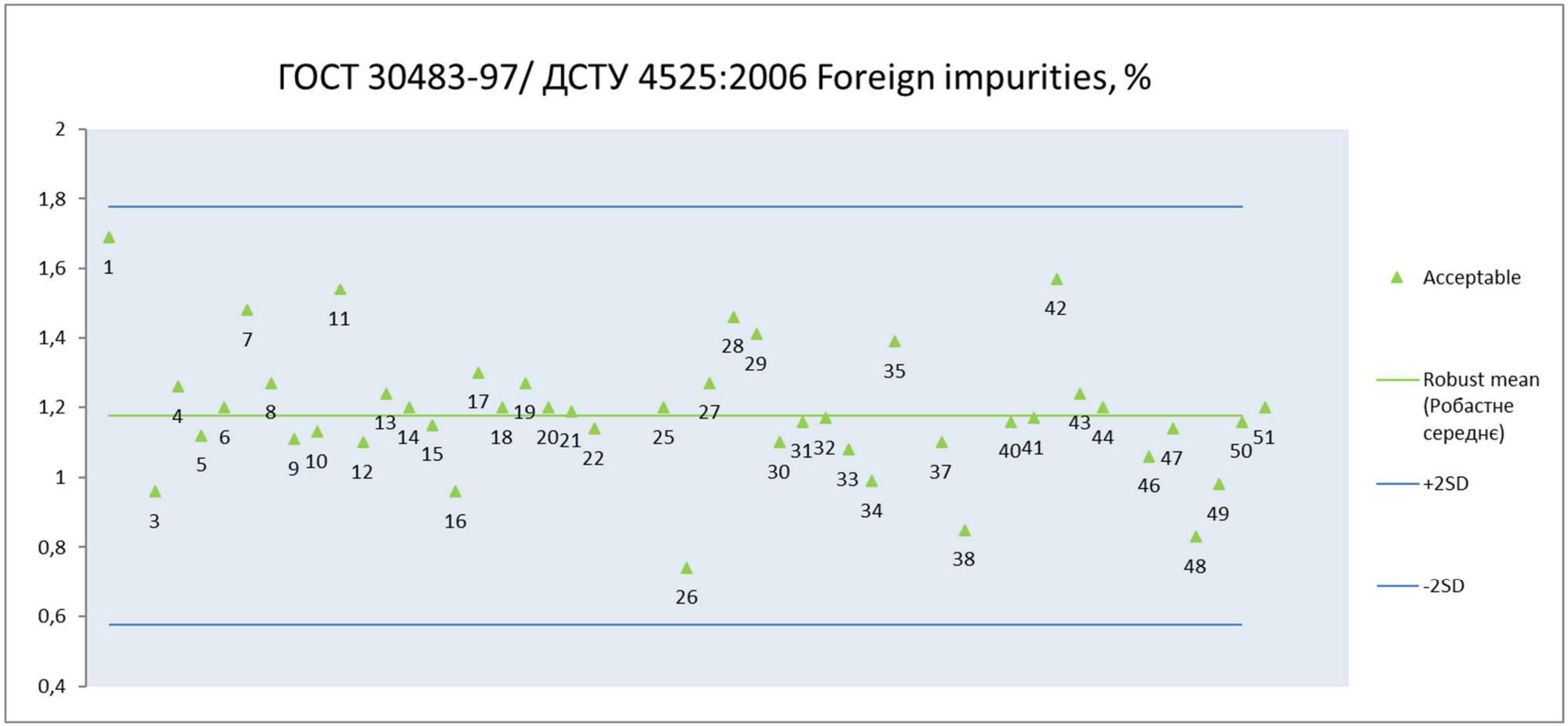


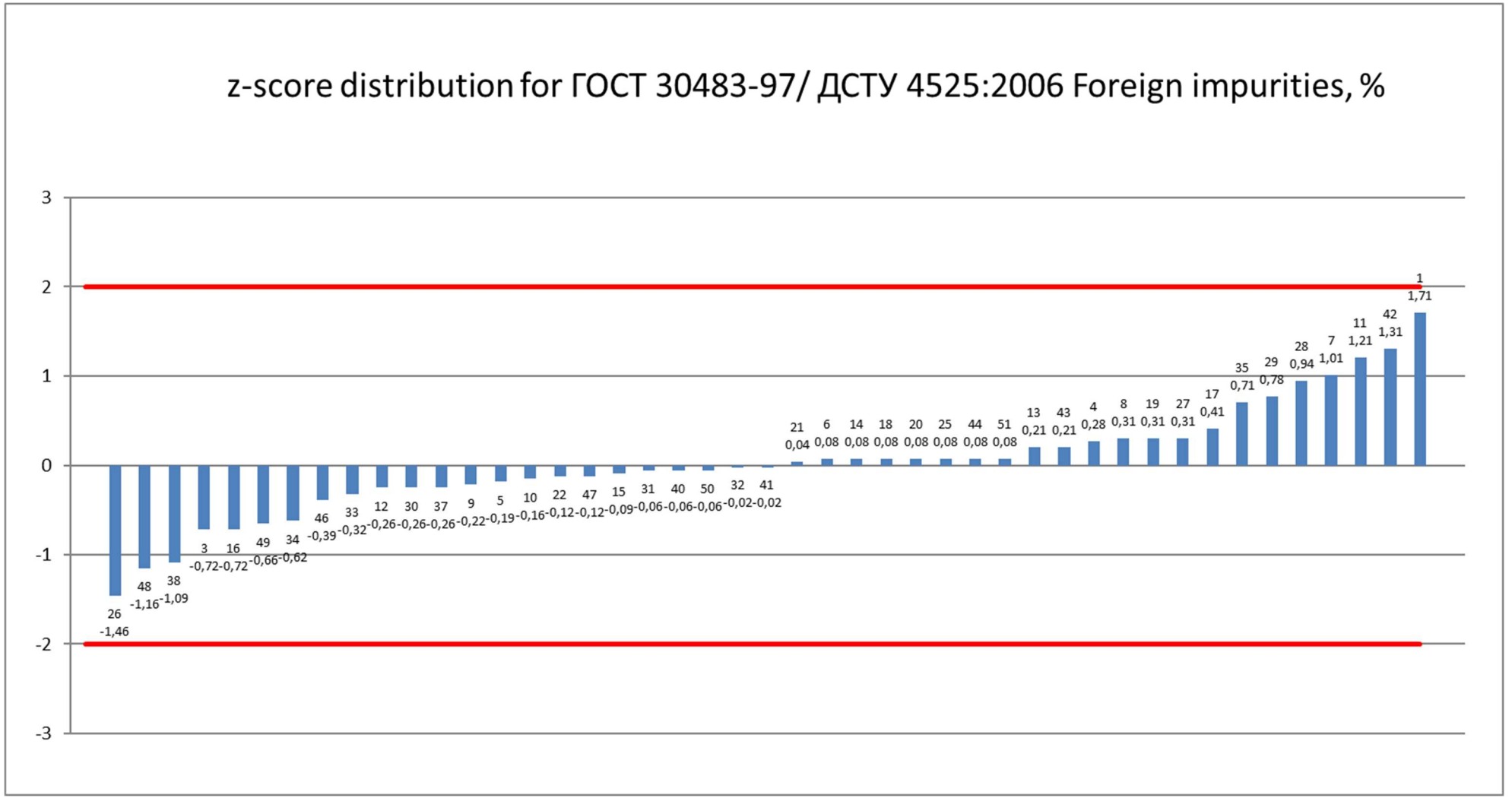
8.24. ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT) Test weight, g/l



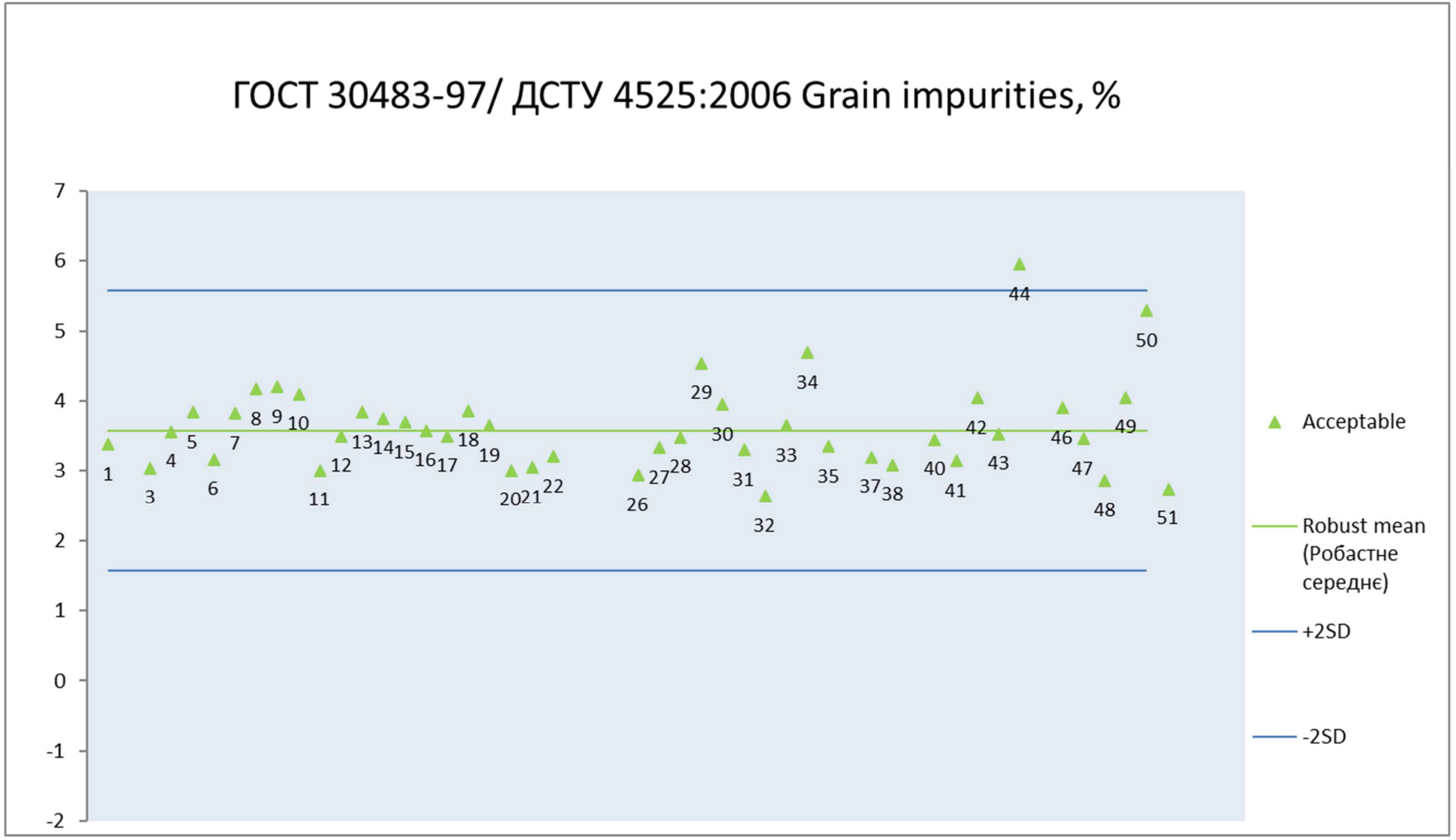

z-score distribution for ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT)
Test weight, g/l
3
2
1
0
-1
-2
-3
38 -1,64
11 -1,31
7 -1,14
21 -0,98
35 -0,98
6 -0,81
32 -0,60
20 -0,48
23 -0,48
42 -0,48
1 -0,32
24 -0,32
5 0,02
28 0,02
27 0,04
34 0,14
17 0,18
22 0,18
44 0,18
41 0,35
48 0,51
49 0,66
12 0,68
51 0,68
37 0,84
3 0,96
36 1,38
26 1,67
33 1,67

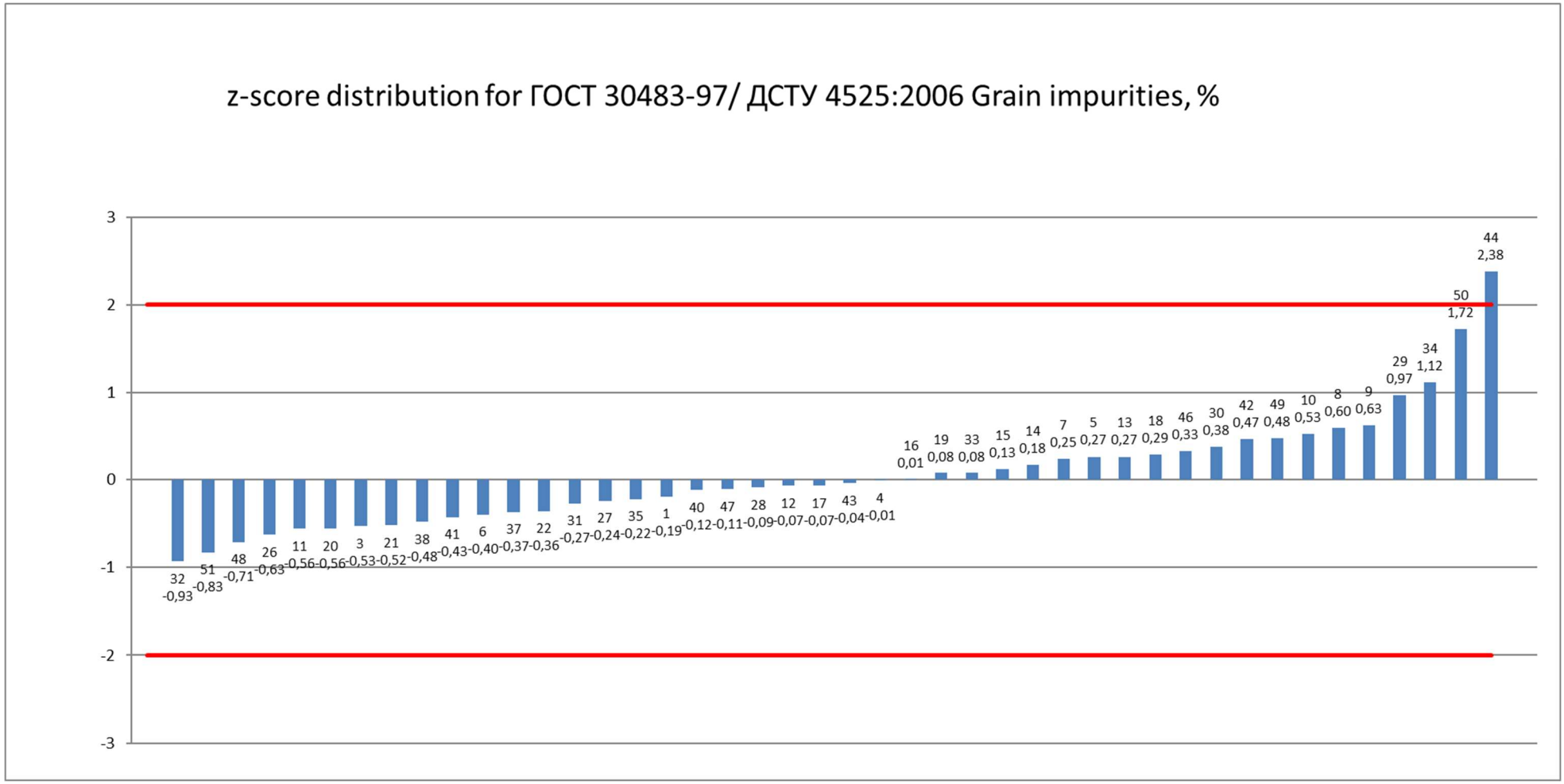
8.25. ГОСТ 30483-97/ ДСТУ 4525:2006 Foreign impurities, %



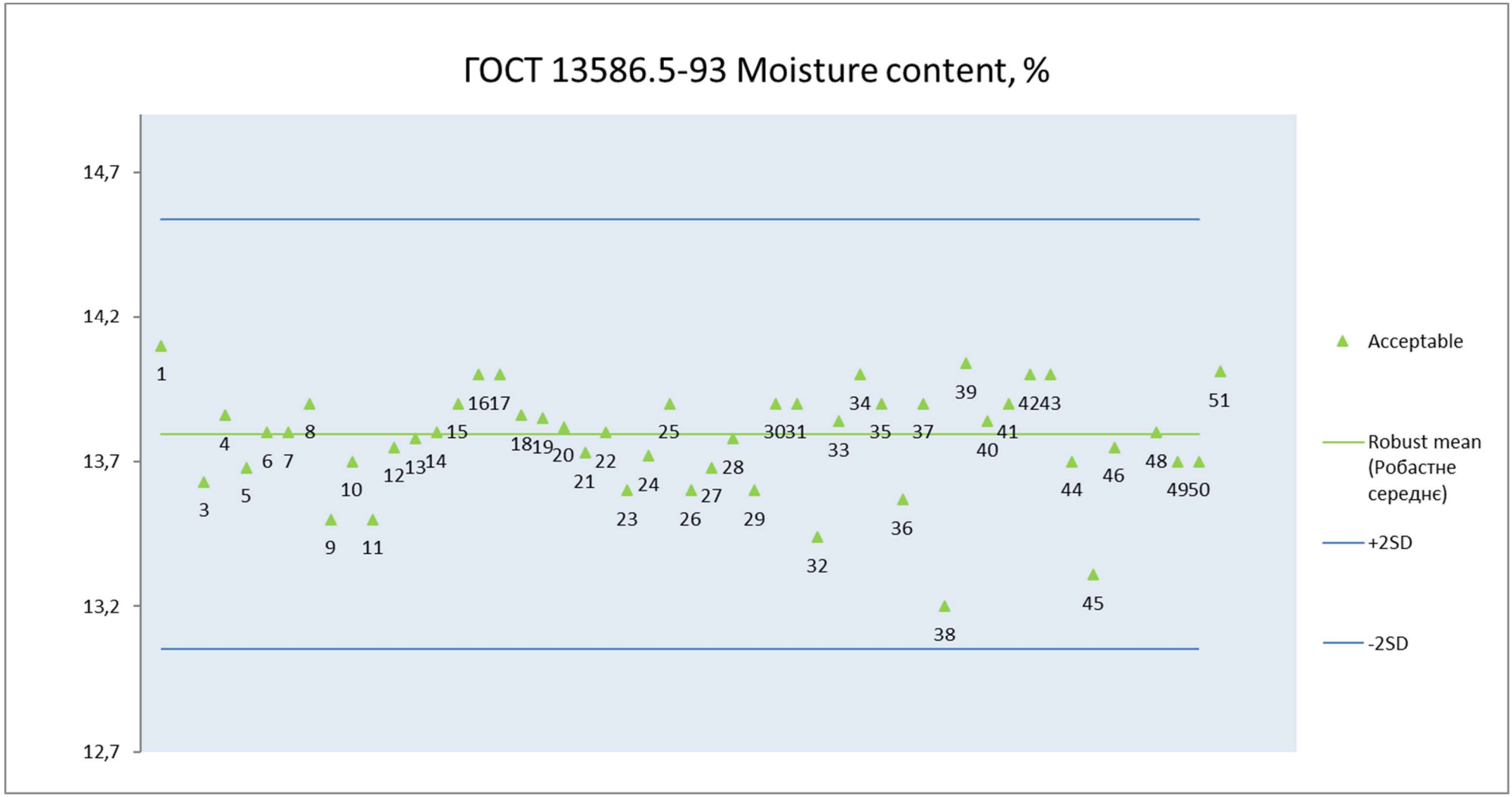

z-score distribution for ГОСТ 30483-97/ ДСТУ 4525:2006 Foreign impurities, %
3
2
1
0
-1
-2
-3
26 -1,46
48 -1,16
38 -1,09
3 -0,72
16 -0,72
49 -0,66
34 -0,62
46 -0,39
33 -0,32
12 -0,26
30 -0,26
37 -0,26
9 -0,22
5 -0,19
10 -0,16
22 -0,12
47 -0,12
15 -0,09
31 -0,06
40 -0,06
50 -0,06
32 -0,02
41 -0,02
21 0,04
6 0,08
14 0,08
18 0,08
20 0,08
25 0,08
44 0,08
51 0,08
13 0,21
43 0,21
4 0,28
8 0,31
19 0,31
27 0,31
17 0,41
35 0,71
29 0,78
28 0,94
7 1,01
11 1,21
42 1,31
1 1,71

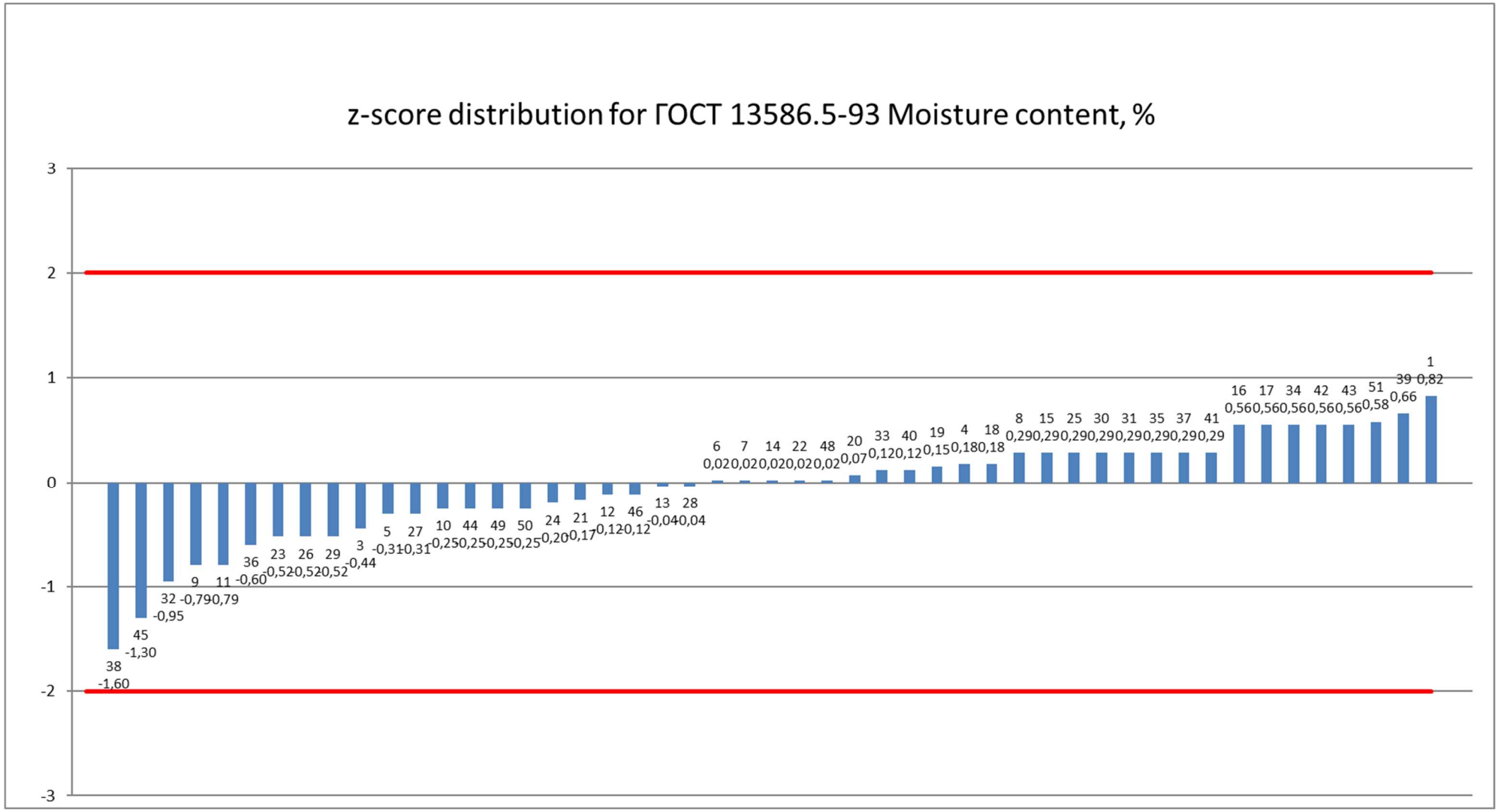
8.26. ГОСТ 30483-97/ ДСТУ 4525:2006 Grain impurities, %



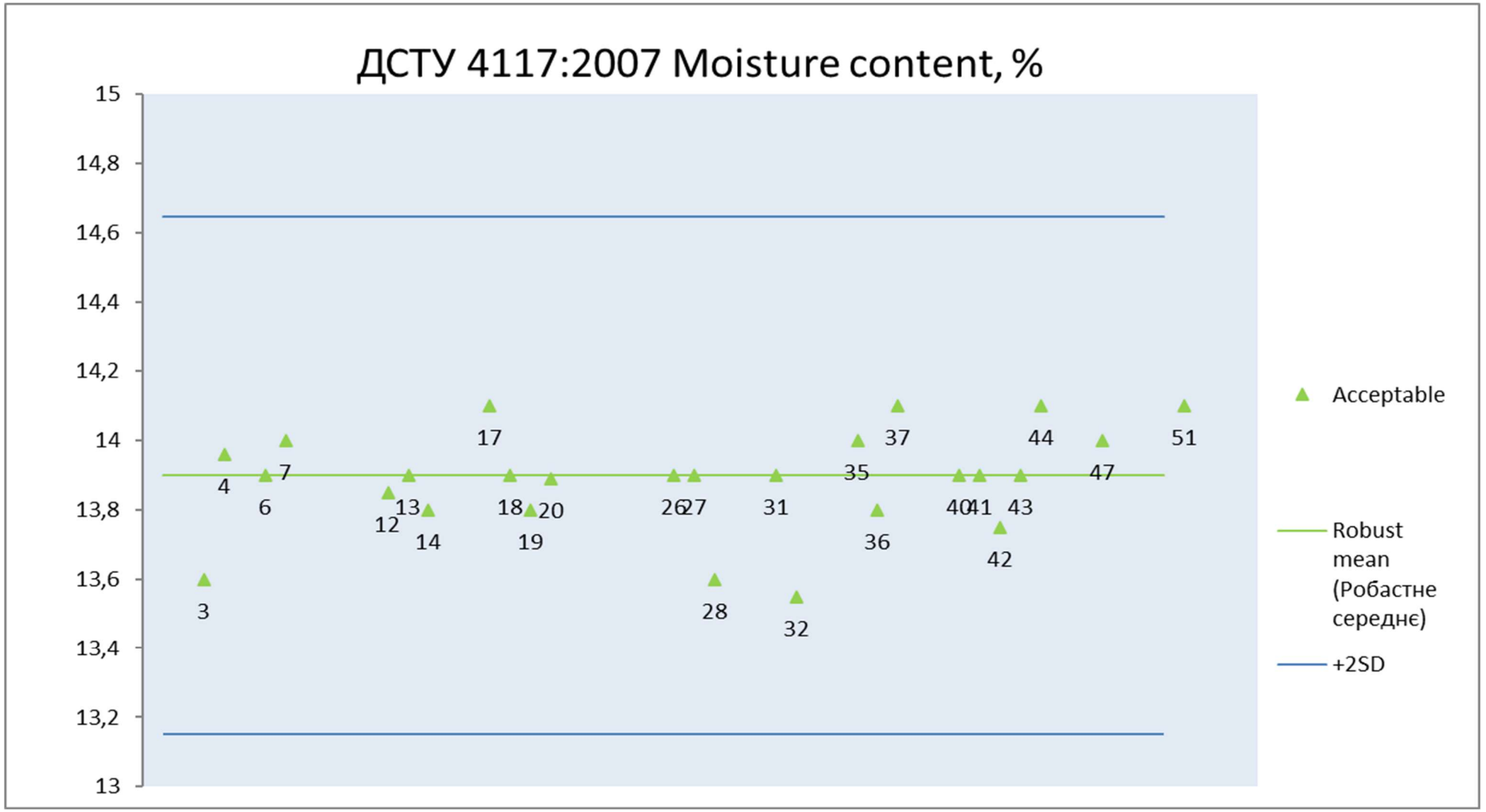

z-score distribution for ГОСТ 30483-97/ ДСТУ 4525:2006 Grain impurities, %
3
2
1
0
-1
-2
-3
32 -0,93
51 -0,83
48 -0,71
26 -0,63
11 -0,56
20 -0,56
3 -0,53
21 -0,52
38 -0,48
41 -0,43
6 -0,40
37 -0,37
22 -0,36
31 -0,27
27 -0,24
35 -0,22
1 -0,19
40 -0,12
47 -0,11
28 -0,09
12 -0,07
17 -0,07
43 -0,04
4 -0,01
16 0,01
19 0,08
33 0,08
15 0,13
14 0,18
7 0,25
5 0,27
13 0,27
18 0,29
46 0,33
30 0,38
42 0,47
49 0,48
10 0,53
8 0,60
9 0,63
29 0,97
34 1,12
50 1,72
44 2,38

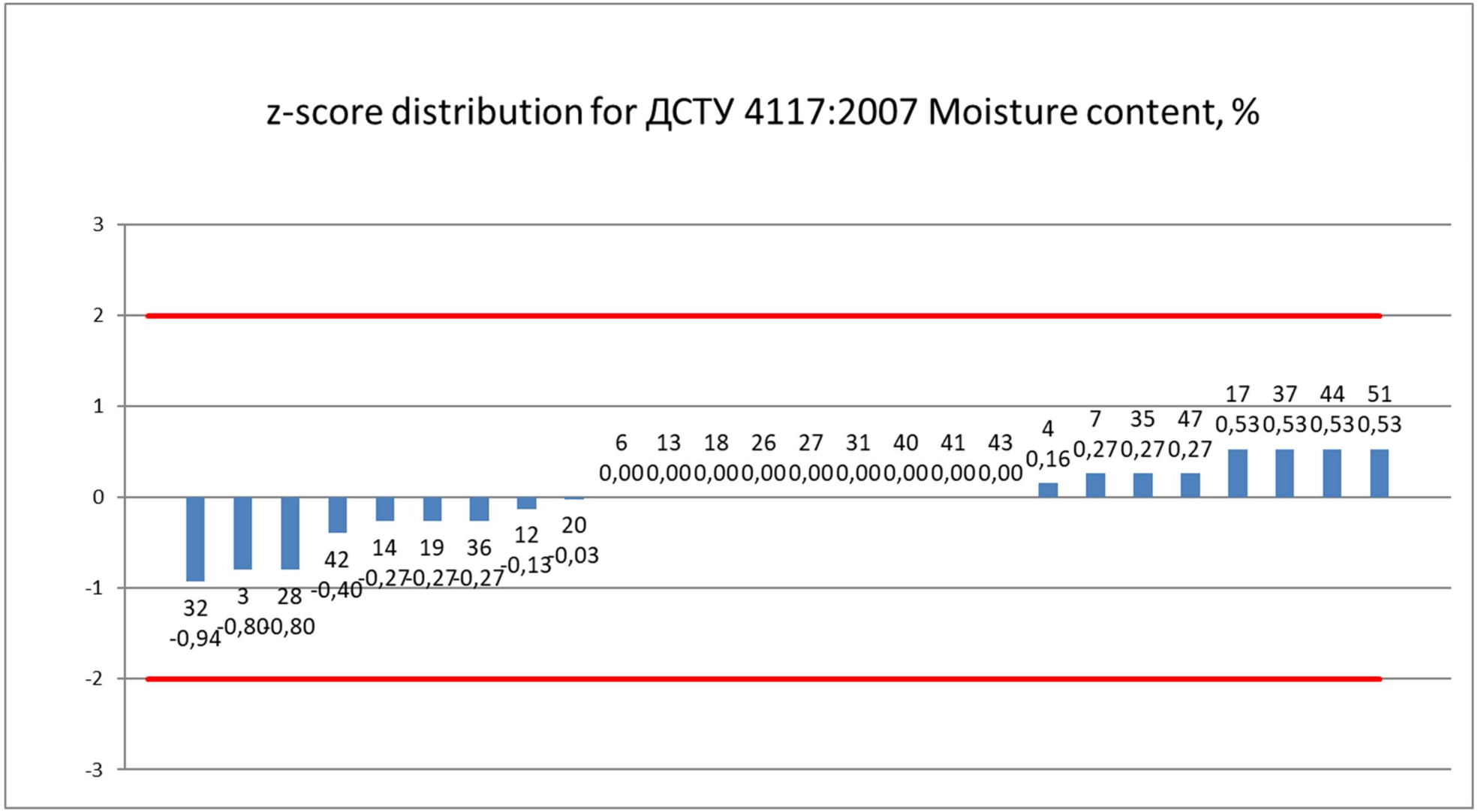
8.27. ДСТУ 4117:2007 Moisture content, %



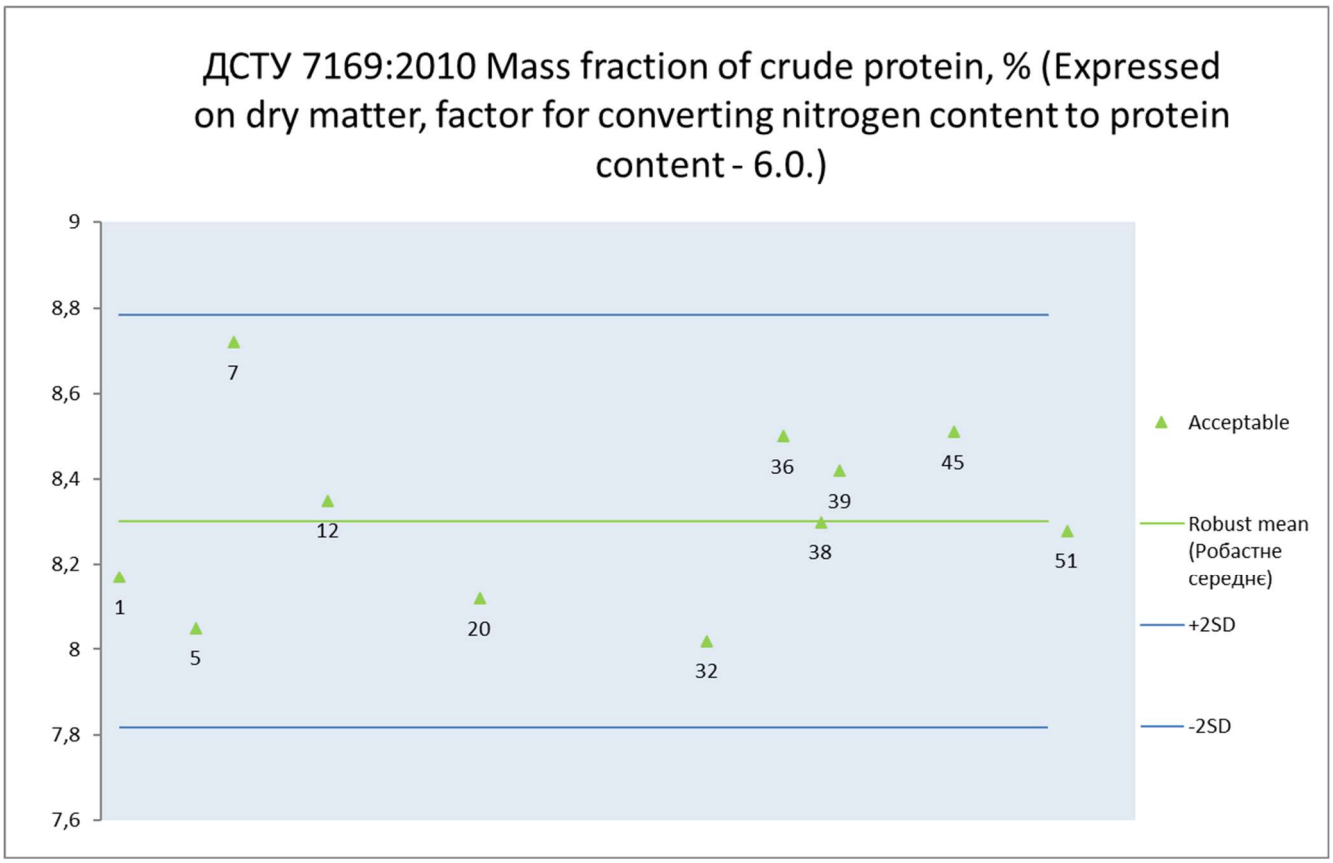

z-score distribution for ГОСТ 13586.5-93 Moisture content, %
3
2
1
0
-1
-2
-3
38 -1,60
45 -1,30
32 -0,95
9 -0,79
11 0,79
36 -0,60
23 -0,52
26 0,52
29 0,52
3 -0,44
5 -0,31
27 0,31
10 -0,25
44 0,25
49 0,25
50 0,25
24 -0,20
21 0,17
12 -0,12
46 0,12
13 -0,04
28 0,04
6 0,02
7 0,02
14 0,02
22 0,02
48 0,02
20 0,07
33 0,12
40 0,12
19 0,15
4 0,18
18 0,18
8 0,29
15 0,29
25 0,29
30 0,29
31 0,29
35 0,29
37 0,29
41 0,29
16 0,56
17 0,56
34 0,56
42 0,56
43 0,56
51 0,58
39 0,66
1 0,82

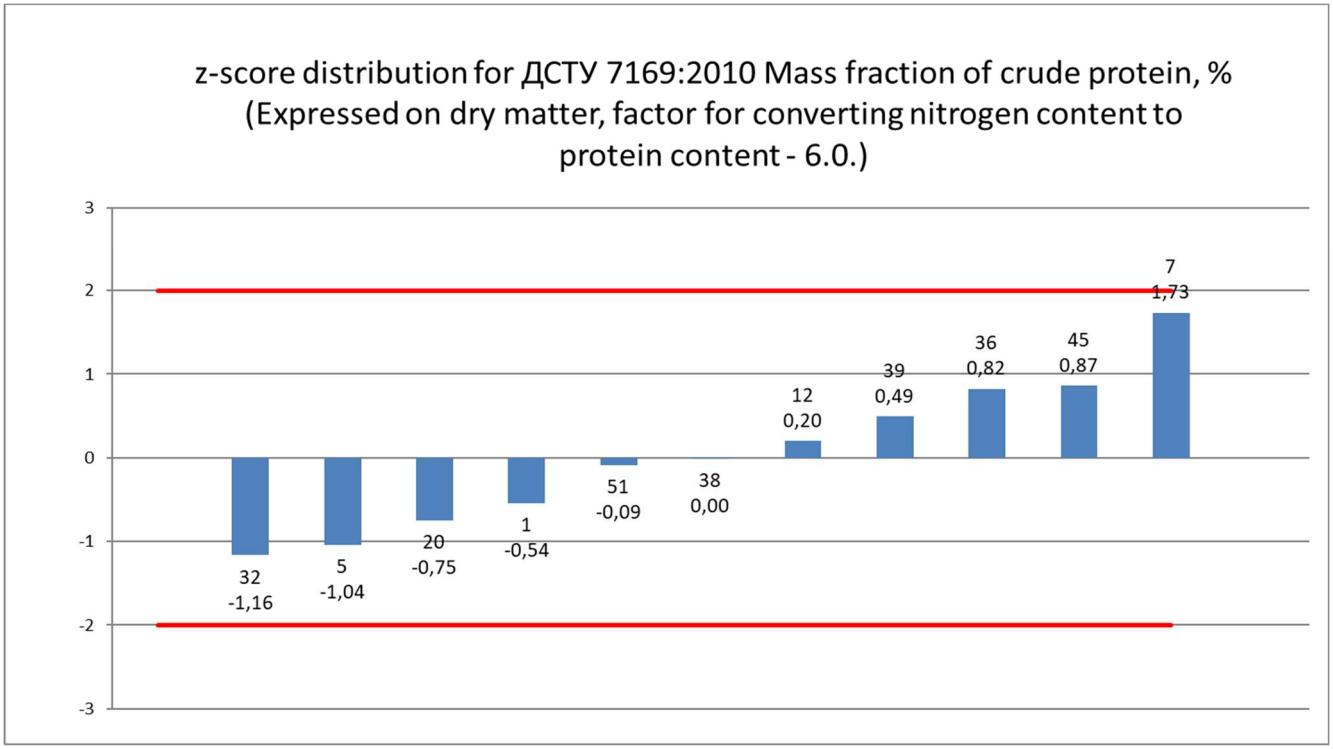
8.28. ДСТУ 4117:2007 Moisture content, %



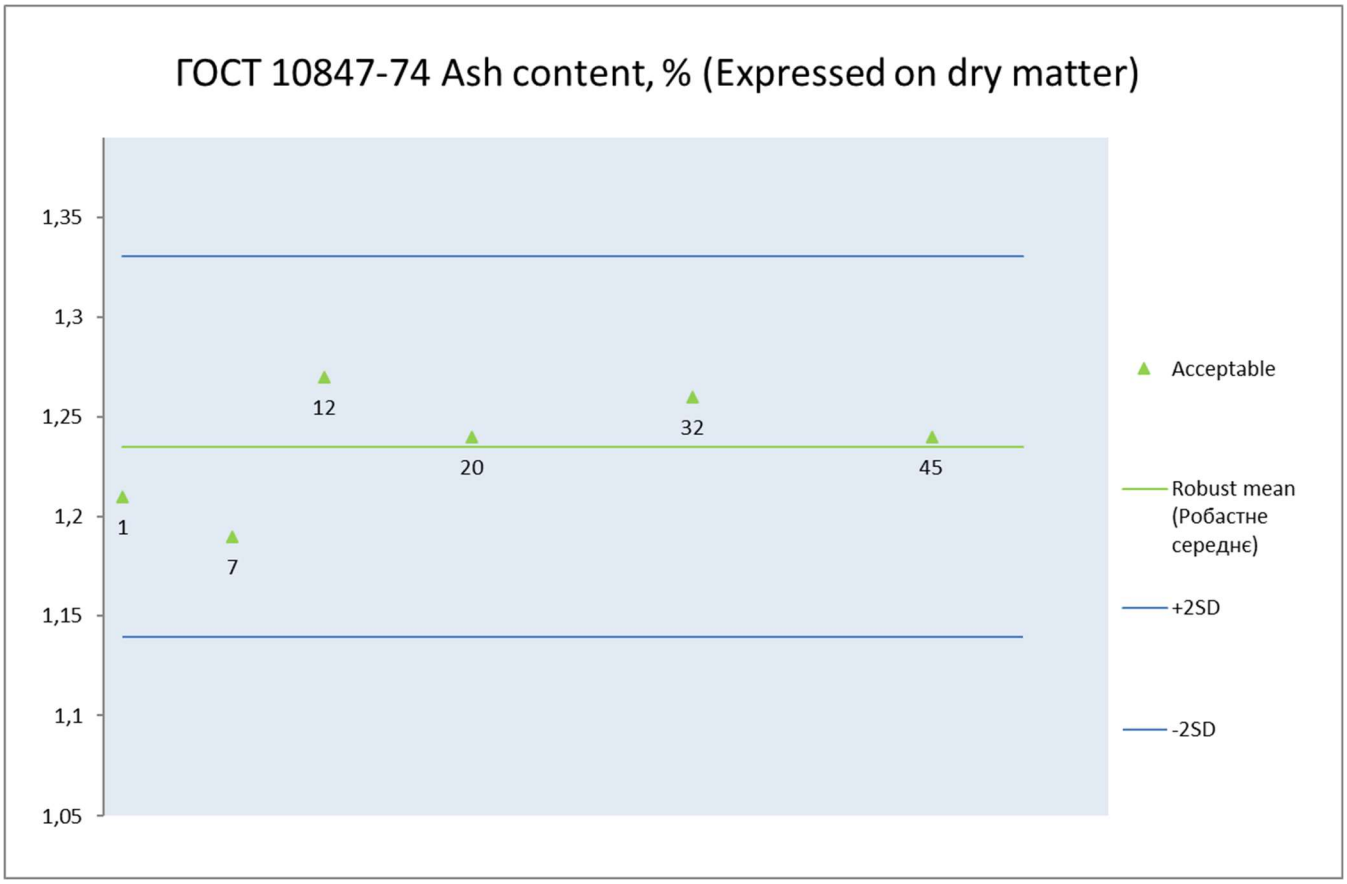

z-score distribution for ДСТУ 4117:2007 Moisture content, %
3
2
1
0
-1
-2
-3
32 -0,94
3 -0,80
28 -0,80
42 -0,40
14 -0,27
19 -0,27
36 -0,27
12 -0,13
20 -0,03
6 0,00
13 0,00
18 0,00
26 0,00
27 0,00
31 0,00
40 0,00
41 0,00
43 0,00
4 0,16
7 0,27
35 0,27
47 0,27
17 0,53
37 0,53
44 0,53
51 0,53

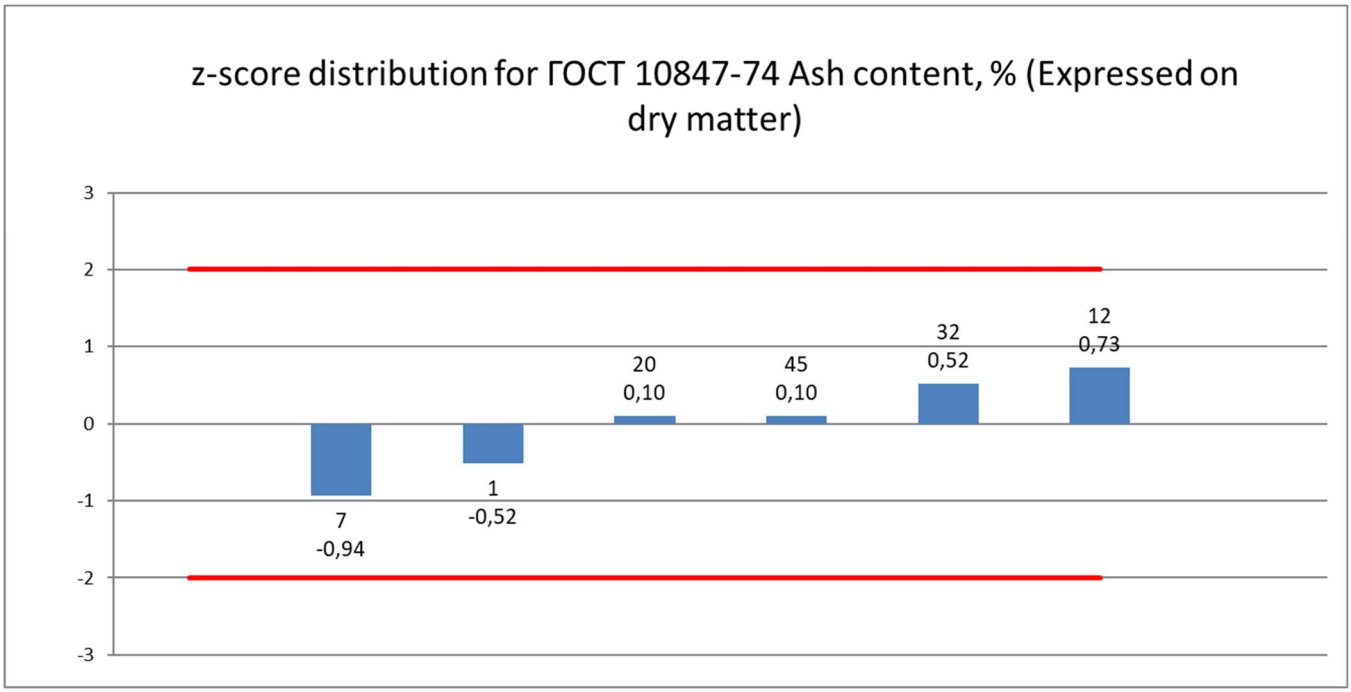
8.29. ДСТУ 7169:2010 Mass fraction of crude protein, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.0.)



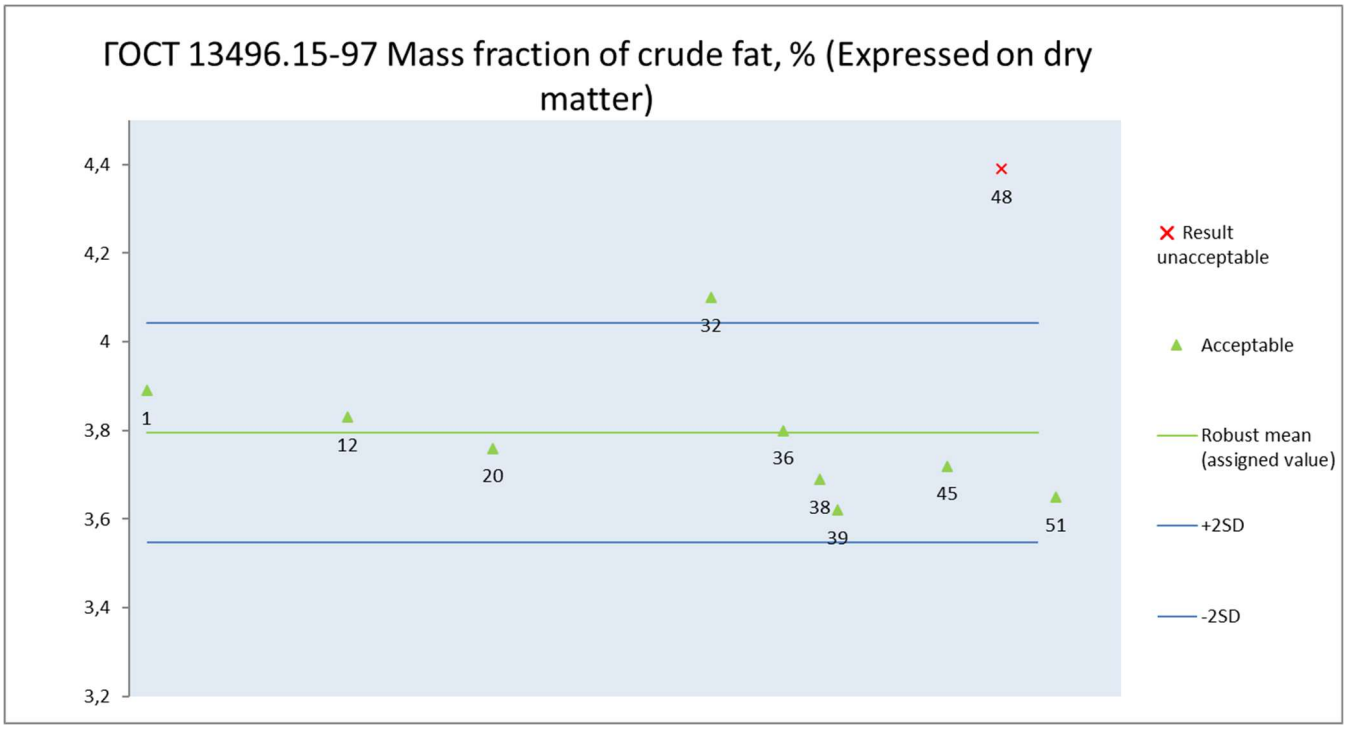


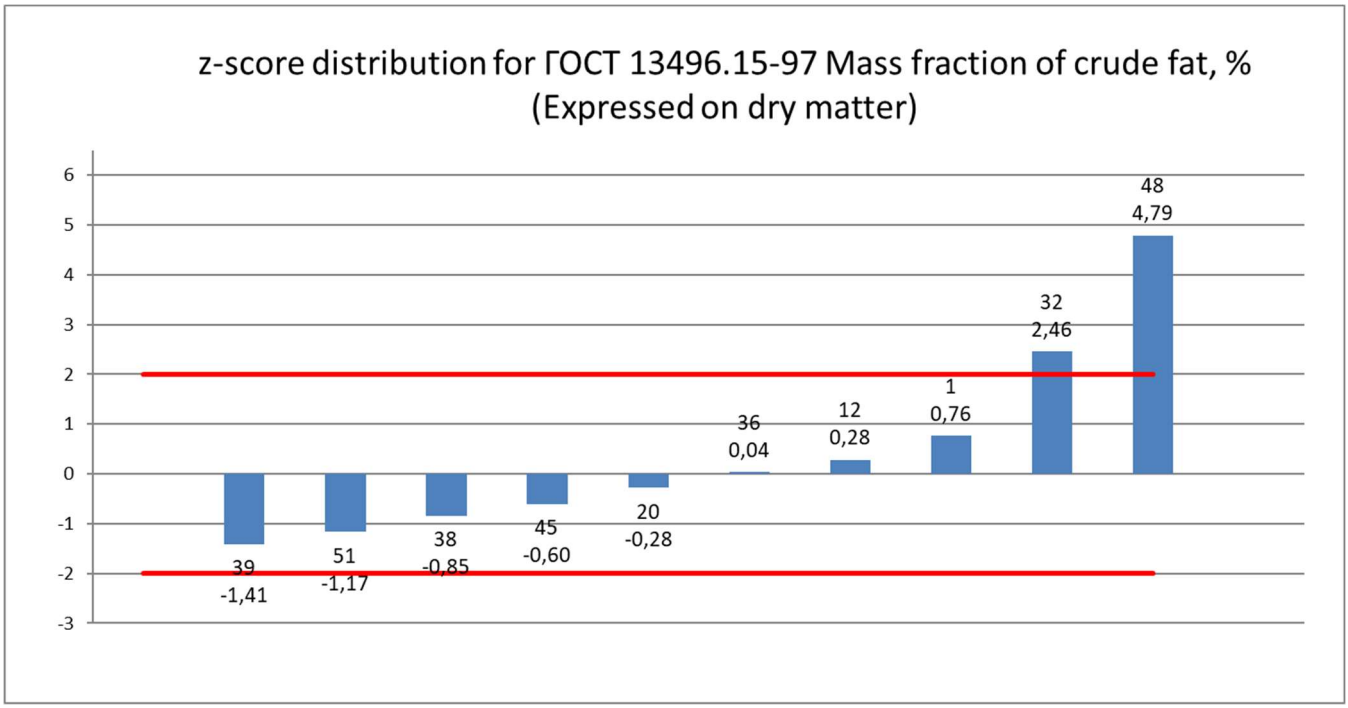
8.30. ГОСТ 10847-74 Ash content, % (Expressed on dry matter)



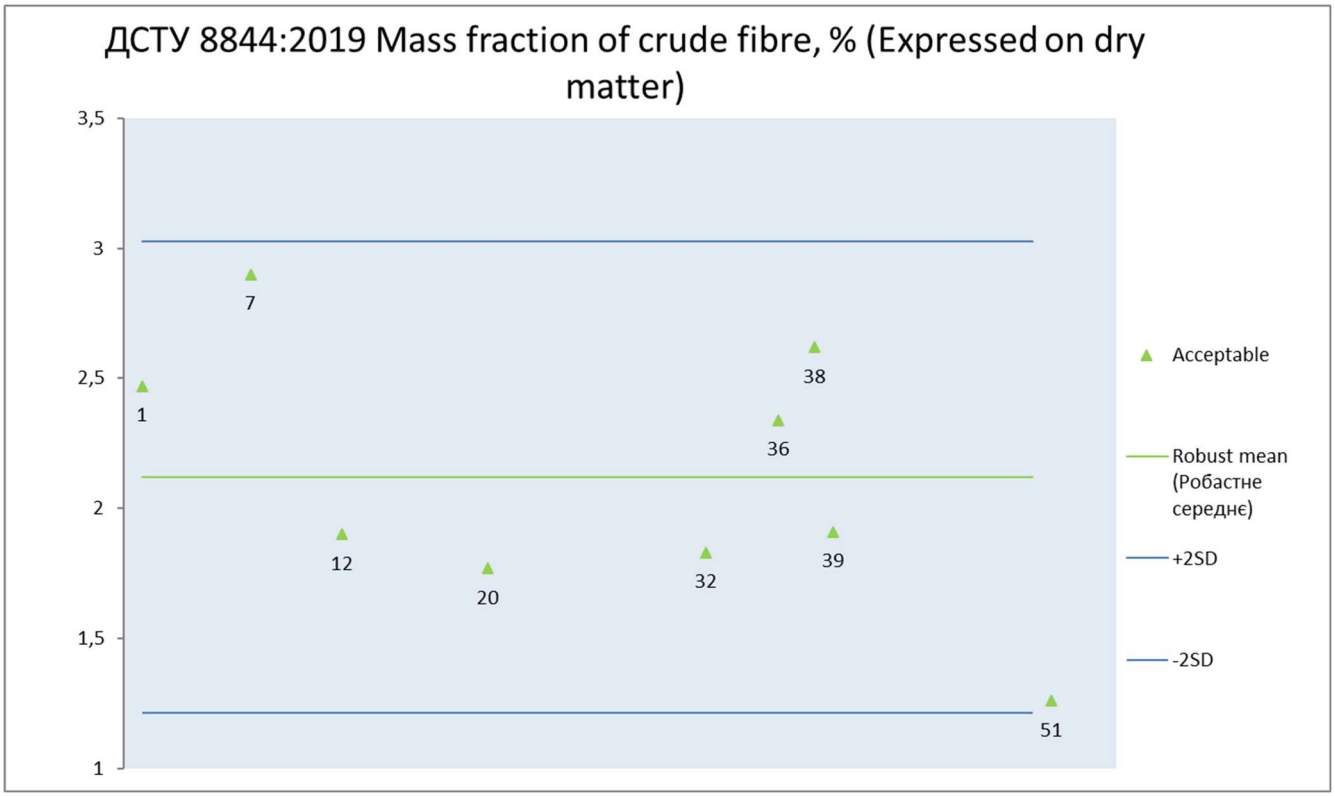


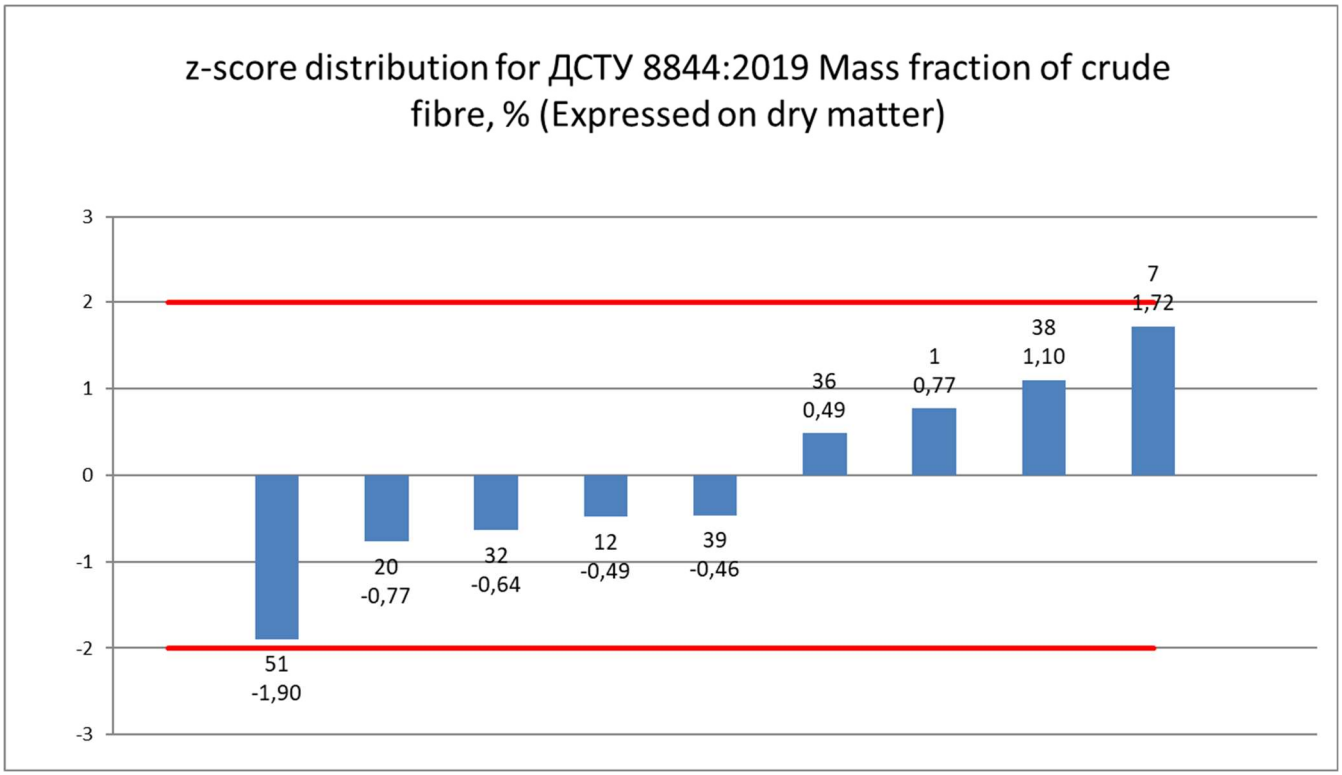
8.31. ДСТУ 8844:2019 Mass fraction of crude fibre, % (Expressed on dry matter)



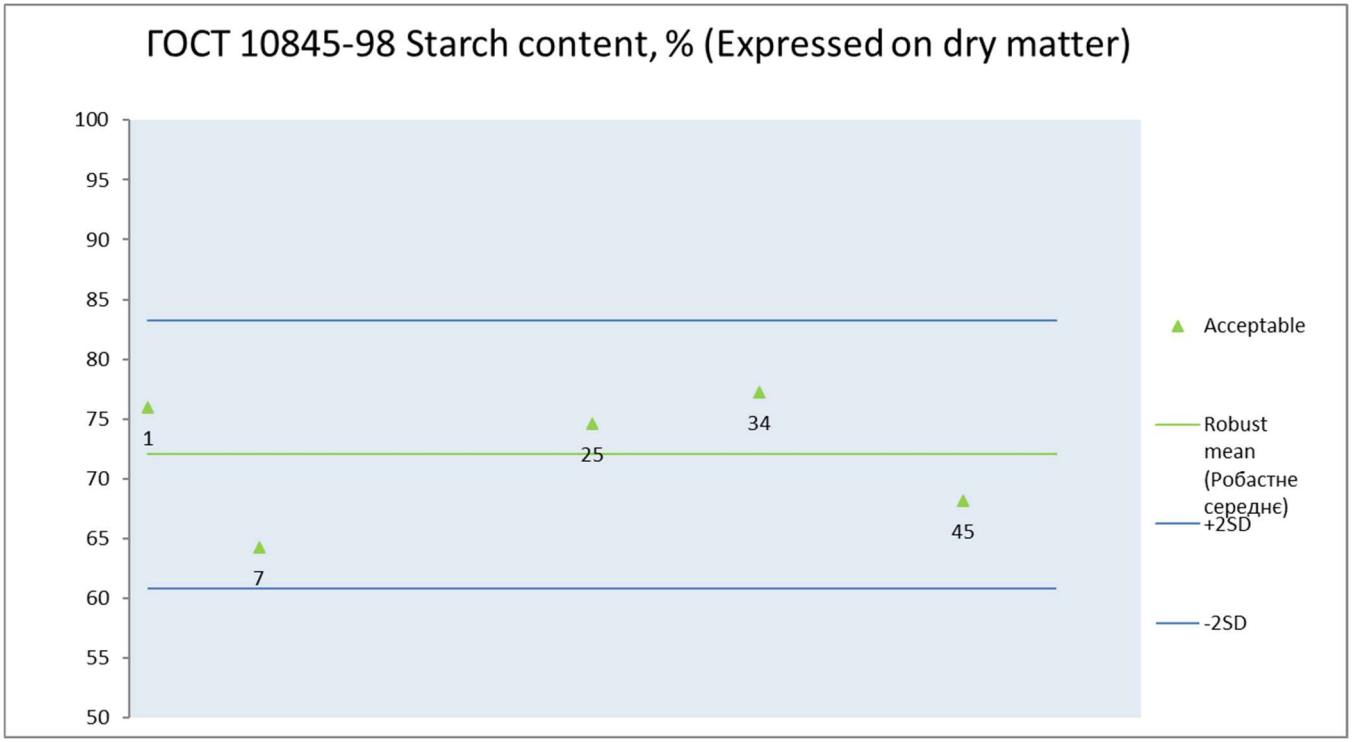


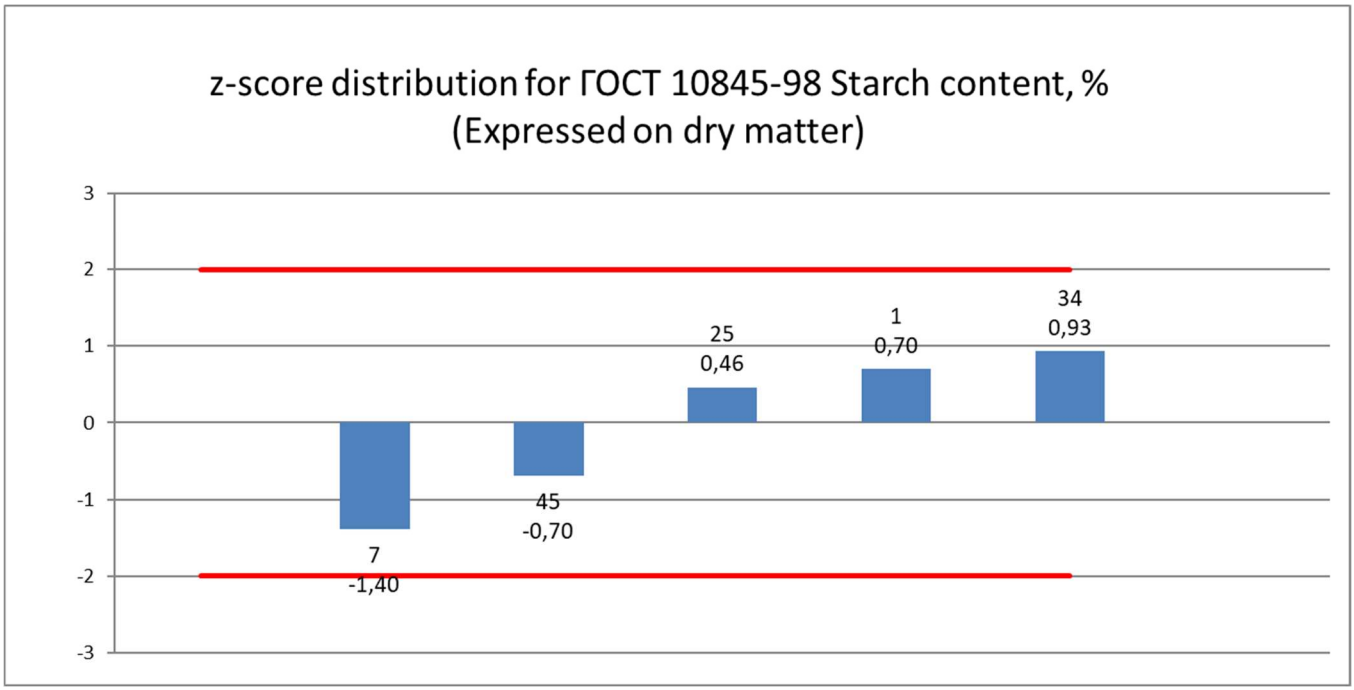
8.32. ДСТУ 8844:2019 Mass fraction of crude fibre, % (Expressed on dry matter)





8.33. ГОСТ 10845-98 Starch content, % (Expressed on dry matter)





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