METROLOGY SERVICE

Director
Metrology service Ltd.

Bozhko Nataliia
February 24th 2021

PROFICIENCY TESTING PT.UA.1.2.2016

MAIZE ANALYSIS (QUALITY)

PROFICIENCY TESTING REPORT

ROUND 5 FEBRUARY 2021

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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 5 held in February 2021. 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 52 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 5. 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 25.01.2021 according to schedule of proficiency testing programme PT.UA.1.2.2016 Round 5.

3.3.2. Each produced and identified sample was hermetically sealed.

3.3.3. A total of 52 participants in 4 countries received one sample. Results were returned from 52 participants.

The countries involved in this round were as follows:

Ukraine	48
Russian Federation	2
Moldova	1
Turkey	1

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 [2,3]

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 $|z| \leq 2$ (marked green in tables). z-Scores were deemed questionable if $2 < |z| \leq 3$ (marked yellow in tables). If $|z| \geq 3$, the results were considered to be unsatisfactory (marked red in tables). The calculations were made according to [1,3,5].

3.5.5. Only 1.49% (8 results) of all results in this round are considered to be unsatisfactory. In Round 4, there were 2.16% (10 results) unsatisfactory results.

3.5.6. Participants №23 and №24 stated «Moisture content, %» by «ГОСТ 13586.5-2015» instead of «ГОСТ 13586.5-93». These results were assessed by the Provider.

3.5.7. None of the participants provided results for «Ash content, % (Expressed on dry matter)» according by the method «ДСТУ 4117:2007». Corresponding column are not presented in tables.

3.5.8. The participant №51 stated an additional result for "Test weight" by the «ISO 7971-3:2019» method. 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 6540:1980/ 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	14,21	14,18	14,20	0,0005	0,00	1	14,21	14,18	28,39	0,0009
2	14,20	14,24	14,22	0,0008	0,00	2	14,20	14,24	28,44	0,0016
3	14,19	14,16	14,18	0,0004	0,00	3	14,19	14,16	28,35	0,0009
4	14,21	14,17	14,19	0,0008	0,00	4	14,21	14,17	28,38	0,0016
5	14,21	14,20	14,21	0,0001	0,00	5	14,21	14,20	28,41	0,0001
6	14,09	14,20	14,15	0,0060	0,00	6	14,09	14,20	28,29	0,0121
7	14,16	14,20	14,18	0,0008	0,00	7	14,16	14,20	28,36	0,0016
										0,0188
Mean	14,187		Worst pair	0,0060		Mean	14,187			
Max	14,24		SUM of SD²	0,0094		Max	14,24			
Min	14,09		C	0,6436		Min	14,09			
			Ccr, 5%	0,7271						
			Ccr, 1%	0,8376		Analytical variance S²a	0,0013	SD	0,0354	
			Conclusion			Sanal	0,0366	RSDR	0,2495	
			5%	PASS		Ssums	0,0023			
			1%	PASS		MSb	0,0011			
					Between sample variance S²sam		-0,0001			
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
1	C>13.8%, HORWITZ	0,3767
	120ppb<C<13.8%, HORWITZ	0,3807
	C<120 ppb	3,121171
MASS NEGATIVE POWER FOR HORWITZ EQUATION(%=2, ppb=9,ppm=6)		2
	SD	0,0341
	Trial SD	3,9800
	Target SD chosen	0,3767
	σ²all	0,012768
	Replicates	7
	F1	2,1
	F2	1,43
	Critical value	0,0287
	Between sample variance S²sam	-0,0001
	Sufficient homogenity test	PASS

4.5. Data for all analytes

Method	EN 16378:2013	EN 16378:2013	EN 16378:2013	ISO 6540:1980/ ДСТУ ISO 6540:2007	ISO 20483:2013/ ДСТУ ISO 20483:2016	ISO 16634-2:2016	ISO 2171:2007/ ДСТУ ISO 2171:2009	ISO 11085:2015	ISO 6865:2000/ ДСТУ ISO 6865	GAFTA 7.0:2018	ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT)	ГОСТ 13586.5-93
	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	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)	Crude fibre content, % (Expressed as a mass fraction of the product as received)	Volatile nitrogenous basis, %	Test weight, g/l	Moisture content, %
Гомогенність та стабільність												
С-тест "Кохрана"												
Crtitical value(5%,10pairs)=0,602	0,7243	0,5460	0,4851	0,6436	0,2630	0,3525	0,5266	0,4236	0,4353	0,2909	0,1600	0,6648
Mean Result	2,4393	1,0650	0,9707	14,1871	8,8129	8,9686	1,1546	3,0807	2,4753	0,0147	711,6429	13,9086
Conclusion(Висновок)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Analytical variance test(тест аналітичної дисперсії)												
S^2anal	0,0029	0,0026	0,0007	0,0013	0,0022	0,0117	0,0001	0,0029	0,0012	0,0000	1,7857	0,0013
Sanal	0,0534	0,0506	0,0269	0,0366	0,0469	0,1080	0,0088	0,0534	0,0342	0,0004	1,3363	0,0361
S^2sample	0,0052	0,0478	0,0054	0	0,0018	0	0,0002	0,0034	0,0014	0,0000	0,1667	0,0001
σ_p	0,4510	0,5120	0,3360	0,3767	0,1400	0,2579	0,0452	0,1040	0,2450	0,0040	6,0330	0,3729
σ_p source	Trial SD	Trial SD	Trial SD	Horwitz	Method Tr SD	Horwitz	Horwitz	Horwitz	Trial SD	Trial SD	Trial SD	Horwitz
σ^2all	0,0183	0,0236	0,0102	0,0128	0,0018	0,0060	0,0002	0,0010	0,0054	0,0000	3,2757	0,0125
Critical value	0,0425	0,0532	0,0224	0,0287	0,0069	0,0293	0,0005	0,0061	0,0130	0,0000	9,4326	0,0281
Conclusion(Висновок)	PASS	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 6540:1980/ 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
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	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)
No of Results	24	24	24	15	15	15	15	27	15	2	7	19	13	6	6
No of Results |z|>3	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0
No of Results |z|>3, %	4,167	4,167	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	10,526	0,000	0,000	0,000
Mean	2,572	1,334	1,039	2,571	1,179	0,034	0,965	13,929	8,851	9,105	8,956	1,203	3,182	3,198	3,230
Min	1,750	0,590	0,425	2,100	0,550	0,000	0,600	13,450	8,580	8,970	8,700	1,030	3,040	3,070	3,150
Max	4,095	4,865	1,460	2,800	1,890	0,100	1,590	14,180	9,040	9,240	9,500	1,310	3,400	3,410	3,300
SD	0,451	0,840	0,243	0,205	0,401	0,024	0,246	0,158	0,141	0,191	0,270	0,072	0,098	0,121	0,057
Median	2,570	1,165	1,050	2,600	1,100	0,030	0,930	13,960	8,840	9,105	8,900	1,220	3,180	3,185	3,230
Robust mean (assigned value)	2,579	1,171	1,041	2,599	1,158	0,030	0,944	13,941	8,858	9,105	8,906	1,213	3,175	3,183	3,230
Robust SD	0,216	0,231	0,188	0,150	0,344	0,014	0,180	0,116	0,128	0,191	0,164	0,044	0,077	0,091	0,057
SD from method (Tr.SD)	0,740	0,930	0,850	0,670	0,943	0,247	0,490	N/A	0,140	0,330	N/A	0,033	0,199	N/A	N/A
SD from Horwitz eq.	0,089	0,046	0,041	0,090	0,045	0,002	0,038	0,375	0,255	0,261	0,256	0,047	0,107	0,107	0,108
Target SD	0,451	0,512	0,336	0,205	0,381	0,098	0,262	0,375	0,140	0,261	0,256	0,047	0,138	0,107	0,108
Source of target SD of PT	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Trial SD	Horwitz	Method Tr SD	Horwitz	Horwitz	Horwitz	Trial SD	Horwitz	Horwitz

Method	ISO 6865:2000/ ДСТУ ISO 6865	ISO 12099:2017	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
Laboratory number	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)	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)
No of Results	17	2	2	10	10	10	10	34	45	45	49	25	15	11	14	11
No of Results |z|>3	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	1
No of Results |z|>3, %	0,000	0,000	0,000	0,000	0,000	10,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	18,182	0,000	9,091
Mean	1,927	2,030	0,013	2,813	0,752	1,927	56,775	716,611	1,033	3,776	13,547	13,742	8,588	1,185	3,690	2,064
Min	1,550	1,880	0,010	2,320	0,580	1,310	54,900	706,000	0,330	1,970	12,900	13,300	8,190	1,040	3,560	1,480
Max	2,470	2,180	0,015	3,420	0,910	4,570	58,300	728,340	1,520	5,850	13,900	14,160	9,027	1,330	3,810	3,850
SD	0,269	0,212	0,004	0,348	0,113	0,958	1,239	4,998	0,231	0,892	0,198	0,192	0,214	0,085	0,080	0,664
Median	1,920	2,030	0,013	2,780	0,745	1,680	57,200	717,000	1,080	3,830	13,600	13,780	8,560	1,210	3,685	1,850
Robust mean (assigned value)	1,913	2,030	0,013	2,798	0,752	1,679	56,778	716,435	1,057	3,802	13,559	13,745	8,582	1,188	3,691	1,912
Robust SD	0,245	0,212	0,004	0,322	0,112	0,275	1,234	3,628	0,145	0,633	0,163	0,129	0,167	0,064	0,078	0,303
SD from method (Tr.SD)	N/A	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
SD from Horwitz eq.	0,069	0,073	0,001	0,096	0,031	0,062	N/A	N/A	0,042	0,124	0,366	0,371	0,248	0,046	0,121	0,069
Target SD	0,245	0,148	0,004	0,322	0,112	0,275	1,387	6,033	0,300	1,000	0,366	0,371	0,248	0,046	0,121	0,557
Source of target SD of PT	Trial SD	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

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 6540:1980/ 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
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	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)
1	2,47	1,03	1,01	2,40	1,01	0,01	0,93	14,10	8,82	8,97		1,15		3,07	
2															
3	4,10	4,87	0,43					13,96							
4	2,78	1,10	1,12	2,80	0,96	0,04	1,08	14,00	8,92			1,25	3,26		
5	2,75	1,15	1,10	2,70	1,10	0,06	1,05	13,95				1,22		3,23	
6															
7								13,80							
8	2,42	1,28	1,17					13,85							
9															
10	2,65	2,30	1,25					13,80	8,58		8,71	1,15	3,05		3,21
11	1,75	1,90	1,44					13,94	9,04	9,24		1,31	3,04		
12	2,56	1,09	1,16					14,00	8,99			1,24	3,21		
13															
14															
15	2,90	1,18	1,09					14,00							
16															
17															
18															
19															
20	2,70	1,18	1,22	2,74	1,36	0,03	1,17	14,03	9,03		8,88	1,25	3,40	3,41	3,28
21	2,07	1,35	1,39	2,60	1,17	0,02	1,59	13,96			8,97				3,25
22	2,78	1,48	0,80	2,78	1,48	0,00	0,80	14,00							
23	2,85	1,40	0,90	2,61	1,89	0,02	0,70	13,93	8,80			1,25	3,15	3,15	
24	2,74	1,44	0,98	2,59	1,76	0,02	0,80	13,92	8,84			1,17	3,11	3,11	
25	2,48	1,30	0,82	2,48	1,79	0,10	0,60	13,80	8,70			1,18	3,22		
26															
27								13,45							
28															
29															
30	2,54	1,08	0,76					14,00							
31															
32															
33	2,50	0,90	0,72					13,83							
34															
35															
36															
37	2,22	0,97	0,92	2,23	1,04	0,03	0,80	14,15	8,91			1,23	3,14		
38	2,79	0,59	1,23	2,79	0,55	0,04	1,23	14,10	8,91			1,22	3,18		
39								13,66				1,26			
40	2,58	0,98	0,99	2,52	0,95	0,06	0,89	14,11	8,82		8,70	1,21		3,22	3,19
41															
42	2,67	1,18	1,00	2,70	1,10	0,02	0,94	13,97			9,03				
43	2,56	0,98	1,10	2,53	0,85	0,03	1,07	14,18	9,01		9,50	1,22	3,26		3,15
44	2,11	0,70	0,87	2,10	0,68	0,03	0,83	13,80	8,75		8,90	1,20	3,23		3,30
45															
46												1,04			
47															
48															
49															
50															
51	1,77	0,59	1,46					13,79	8,64			1,27	3,11		
52												1,03			

Method	ISO 6865:2000/ ДСТУ ISO 6865	ISO 12099:2017	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
Laboratory number	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)	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)
1	2,47		0,015	2,55	0,77	1,86	55,25	712,00	1,00	3,54	13,81	13,92	8,44	1,13	3,67	2,55
2	1,57							718,00	1,02	3,91	13,30	14,16	8,35		3,73	
3								718,67						1,15		
4	1,92							715,00	1,04	3,90	13,65		8,56			
5	2,00			2,91	0,72	1,70	55,80	718,00	1,20	3,83	13,65	13,75		1,25	3,75	
6								709,00	1,12	4,24	13,70	13,80				
7									1,28	4,50	13,70					
8								716,00	1,11	4,70	13,40	13,80				
9								712,00	1,20	3,80	13,40					
10	2,00	2,18		3,42	0,91	4,57	57,30	721,19			13,38	13,80	8,44		3,62	2,15
11	1,69							728,34	0,99	2,51	13,69		8,70			
12	1,86							714,00	1,12	3,91	13,64					
13									1,39	4,13	13,90					
14									1,15	3,72	13,70					
15				3,29	0,89	1,74	55,80	718,00	1,24	3,72	13,64	13,60				
16									0,98	5,14	13,30					
17								724,00	1,52	4,12	13,20	13,60				
18											13,37		8,63		3,56	1,96
19									1,07	4,39	13,40	13,40				
20	1,63		0,010	2,75	0,70	1,66	58,30	711	1,18	4,12	13,59		8,63	1,24	3,71	1,85
21				2,32	0,81	1,31	57,80	709,00	1,18	3,99	13,60					
22								714	0,83	4,77	13,40					
23	1,84			2,81	0,58	1,40	57,3	718			13,50					
24	2,03			2,74	0,62	1,44	57,1	716			13,44					
25	2,00							718,00								
26									1,04	4,23	13,55	13,57				
27								717,00	0,76	2,55	13,19		9,03		3,70	2,08
28									1,05	5,16	13,54	13,50				
29									1,11	4,92	13,65					
30								714,00	0,62	3,68	13,70	13,90				
31									1,16	3,60	13,60	13,70				
32									1,13	5,85	13,70					
33									1,20	2,4	13,40					
34									1,11	3,58	13,70	13,80				
35									1,20	3,68	13,80	13,75				
36								710,00	0,80	3,35	12,90		8,88	1,19	3,80	3,85
37	2,14							714,00	1,03	3,28	13,78		8,46		3,65	1,85
38	1,59			2,92	0,85	2,09	58,20	727,00	0,88	2,87	13,80	14,10	8,55	1,22	3,62	1,48
39								718,50	0,77	2,28	13,51	13,67		1,33		
40	1,91	1,88						717,00	0,90	3,40	13,65	13,70	8,47			
41								713,00	1,10	3,40	13,80	13,90				
42								718,00	0,94	4,07	13,77	13,85				
43	2,24							716,00	1,30	3,40	13,60	13,60		1,21	3,81	
44	1,55			2,42	0,67	1,50	54,90	706,00	0,81	2,96	13,28	13,30	8,19	1,21	3,64	1,63
45									1,18	5,45	13,70					
46									0,33	2,0	13,3		8,8	1,04	3,6	1,7
47								719,07	0,97	4,56	13,53	13,78				
48								723,00	0,86	3,92	13,37					
49								719 г/л	1,20	2,30	13,60	13,80				
50								723,00	1,08	4,12	13,50	13,80				
51	2,32															
52									0,34	1,97	13,5		8,7	1,06	3,8	1,6

7. Z SCORES

Method	EN 16378:2013	EN 16378:2013	EN 16378:2013	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 19942:2018	ISO 6540:1980/ 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
Laboratory number	Broken grains, %	Grain impurities, %	Miscellaneous impurities, %	Broken grains, %	Damaged grains, %	Other grains, %	Miscellaneous impurities, %	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)
1	-0,24	-0,27	-0,09	-0,97	-0,39	-0,21	-0,05	0,42	-0,27	-0,52		-1,33		-1,06	
2															
3	3,36	7,22	-1,83					0,05							
4	0,45	-0,14	0,24	0,98	-0,52	0,10	0,52	0,16	0,44			0,79	0,61		
5	0,38	-0,04	0,18	0,49	-0,15	0,30	0,40	0,02				0,15		0,44	
6															
7								-0,38							
8	-0,35	0,21	0,38					-0,24							
9															
10	0,16	2,21	0,62					-0,38	-1,99		-0,76	-1,33	-0,91		-0,18
11	-1,84	1,42	1,19					0,00	1,30	0,52		2,06	-0,98		
12	-0,04	-0,16	0,36					0,16	0,94			0,58	0,25		
13															
14															
15	0,71	0,02	0,15					0,16							
16															
17															
18															
19															
20	0,27	0,02	0,53	0,69	0,53	0,00	0,86	0,24	1,23		-0,10	0,79	1,63	2,12	0,46
21	-1,13	0,35	1,04	0,00	0,03	-0,10	2,47	0,05			0,25				0,18
22	0,45	0,60	-0,72	0,88	0,85	-0,31	-0,55	0,16							
23	0,60	0,45	-0,42	0,05	1,92	-0,10	-0,93	-0,03	-0,42			0,79	-0,18	-0,31	
24	0,36	0,53	-0,18	-0,04	1,58	-0,10	-0,55	-0,06	-0,13			-0,91	-0,47	-0,69	
25	-0,22	0,25	-0,66	-0,58	1,66	0,71	-1,31	-0,38	-1,13			-0,69	0,32		
26															
27								-1,31							
28															
29															
30	-0,09	-0,18	-0,84					0,16							
31															
32															
33	-0,18	-0,53	-0,95					-0,30							
34															
35															
36															
37	-0,80	-0,39	-0,36	-1,80	-0,31	0,00	-0,55	0,56	0,37			0,37	-0,26		
38	0,47	-1,13	0,56	0,93	-1,59	0,10	1,09	0,42	0,37			0,15	0,03		
39								-0,75				1,00			
40	0,00	-0,37	-0,15	-0,39	-0,55	0,30	-0,21	0,45	-0,27		-0,80	-0,06		0,34	-0,37
41															
42	0,20	0,02	-0,12	0,49	-0,15	-0,10	-0,02	0,08			0,48				
43	-0,04	-0,37	0,18	-0,34	-0,81	0,00	0,48	0,64	1,08		2,32	0,15	0,61		-0,74
44	-1,04	-0,92	-0,51	-2,43	-1,25	0,00	-0,44	-0,38	-0,77		-0,02	-0,27	0,40		0,65
45															
46												-3,67			
47															
48															
49															
50															
51	-1,79	-1,13	1,25					-0,40	-1,56			1,22	-0,47		
52												-3,88			

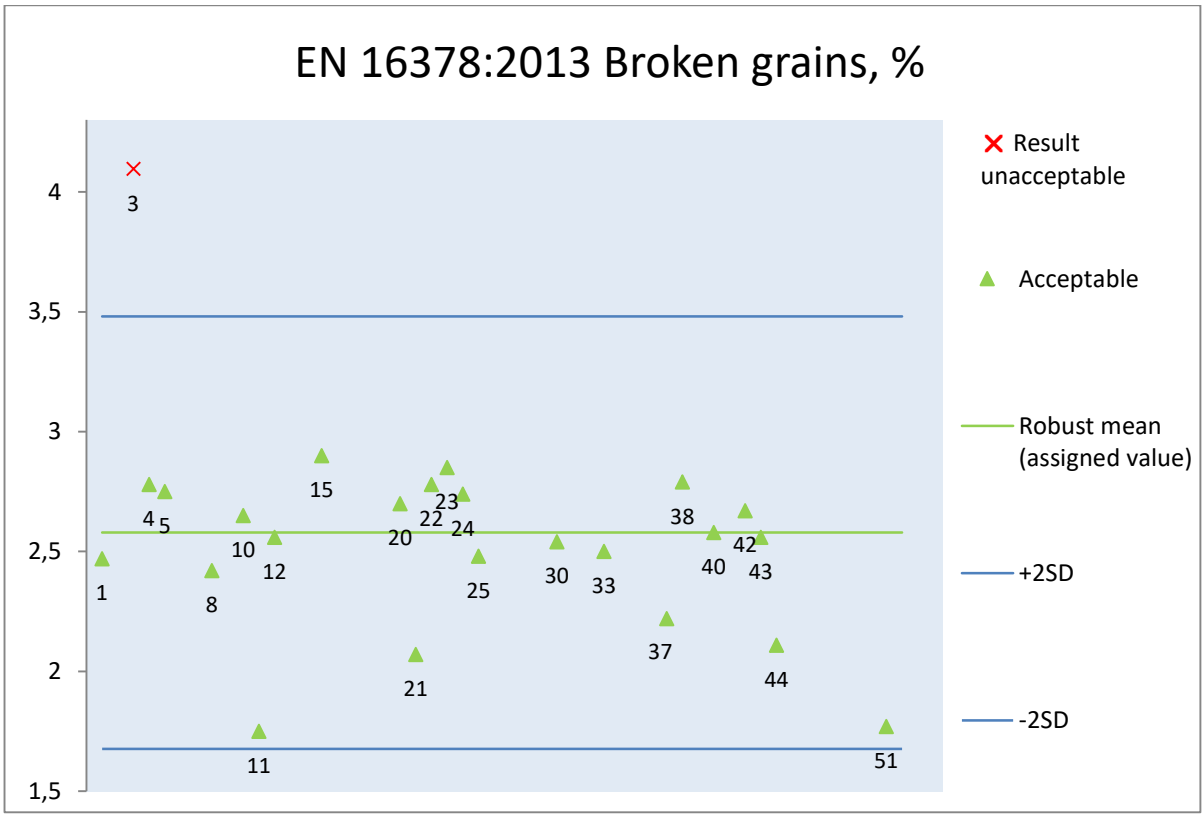
Method	ISO 6865:2000/ ДСТУ ISO 6865	ISO 12099:2017	GAFTA 7.0:2018	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020)	USDA (Grain Grading Procedures, Chapter 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
Laboratory number	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)	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)
1	2,27		0,71	-0,77	0,16	0,66	-1,10	-0,74	-0,19	-0,26	0,68	0,47	-0,57	-1,25	-0,17	1,15
2	-1,42							0,26	-0,12	0,11	-0,71	1,12	-0,93		0,32	
3								0,37						-0,82		
4	0,03							-0,24	-0,06	0,10	0,25		-0,09			
5	0,35			0,35	-0,29	0,08	-0,70	0,26	0,48	0,03	0,25	0,01		1,34	0,49	
6								-1,23	0,21	0,44	0,38	0,15				
7									0,74	0,70	0,38					
8								-0,07	0,18	0,90	-0,44	0,15				
9								-0,74	0,48	0,00	-0,44					
10	0,35	1,01		1,93	1,40	10,52	0,38	0,79			-0,49	0,15	-0,57		-0,58	0,43
11	-0,91							1,97	-0,22	-1,29	0,36		0,48			
12	-0,22							-0,40	0,21	0,11	0,22					
13									1,11	0,33	0,93					
14									0,31	-0,08	0,38					
15				1,53	1,23	0,22	-0,70	0,26	0,61	-0,08	0,22	-0,39				
16									-0,26	1,34	-0,71					
17								1,25	1,54	0,32	-0,98	-0,39				
18											-0,52		0,19		-1,08	0,09
19									0,04	0,59	-0,44	-0,93				
20	-1,16		-0,71	-0,15	-0,47	-0,07	1,10	-0,90	0,41	0,32	0,08		0,19	1,12	0,16	-0,11
21				-1,49	0,51	-1,34	0,74	-1,23	0,41	0,19	0,11					
22								-0,40	-0,76	0,97	-0,44					
23	-0,30			0,04	-1,54	-1,02	0,38	0,26			-0,16					
24	0,48			-0,18	-1,18	-0,87	0,23	-0,07			-0,33					
25	0,35							0,26								
26									-0,06	0,43	-0,03	-0,47				
27								0,09	-0,99	-1,25	-1,01		1,79		0,07	0,30
28									-0,02	1,36	-0,05	-0,66				
29									0,18	1,12	0,25					
30								-0,40	-1,46	-0,12	0,38	0,42				
31									0,34	-0,20	0,11	-0,12				
32									0,24	2,05	0,38					
33									0,48	-1,40	-0,44					
34									0,18	-0,22	0,38	0,15				
35									0,48	-0,12	0,66	0,01				
36								-1,07	-0,86	-0,45	-1,80		1,20	0,04	0,90	3,48
37	0,93							-0,40	-0,09	-0,52	0,60		-0,49		-0,34	-0,11
38	-1,32			0,38	0,87	1,50	1,03	1,75	-0,59	-0,93	0,66	0,96	-0,13	0,69	-0,58	-0,78
39								0,34	-0,96	-1,52	-0,14	-0,20		3,07		
40	-0,01	-1,01						0,09	-0,52	-0,40	0,25	-0,12	-0,45			
41								-0,57	0,14	-0,40	0,66	0,42				
42								0,26	-0,39	0,27	0,57	0,28				
43	1,33							-0,07	0,81	-0,40	0,11	-0,39		0,48	0,98	
44	-1,48			-1,17	-0,73	-0,65	-1,35	-1,73	-0,82	-0,84	-0,76	-1,20	-1,58	0,48	-0,42	-0,51
45									0,41	1,65	0,38					
46									-2,42	-1,80	-0,71		0,88	-3,20	-0,75	-0,38
47								0,44	-0,29	0,76	-0,08	0,09				
48								1,09	-0,66	0,12	-0,52					
49								0,43	0,48	-1,50	0,11	0,15				
50								1,09	0,08	0,32	-0,16	0,15				
51	1,66															
52									-2,39	-1,83	-0,16		0,48	-2,76	0,90	-0,56

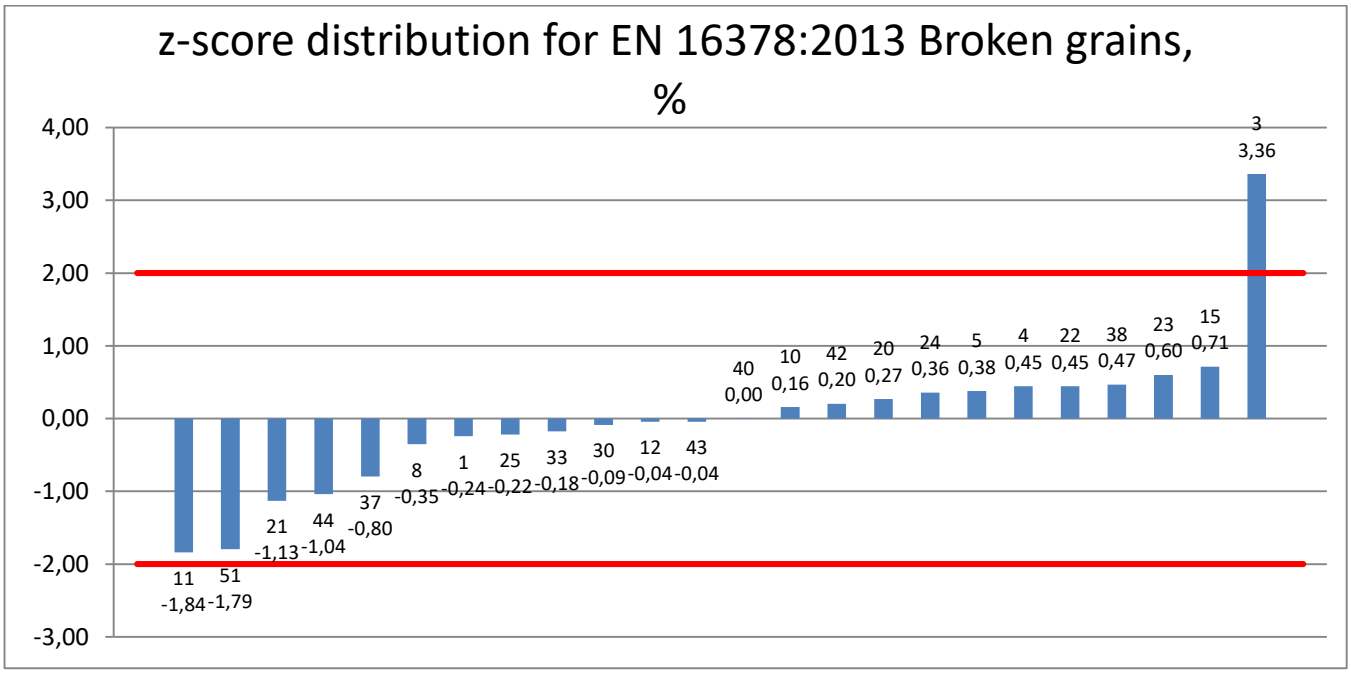
Remarks

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

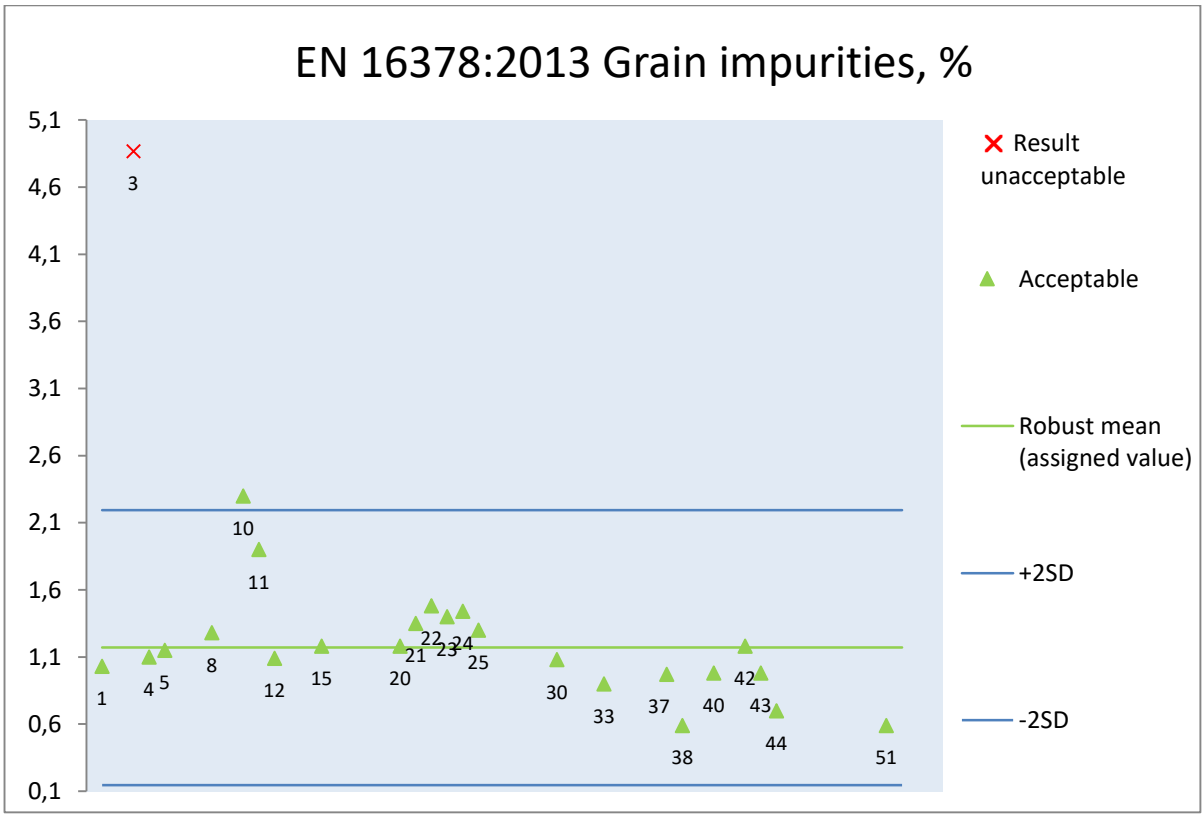
8. Z SCORE PLOTS AND RESULTS CHARTS.

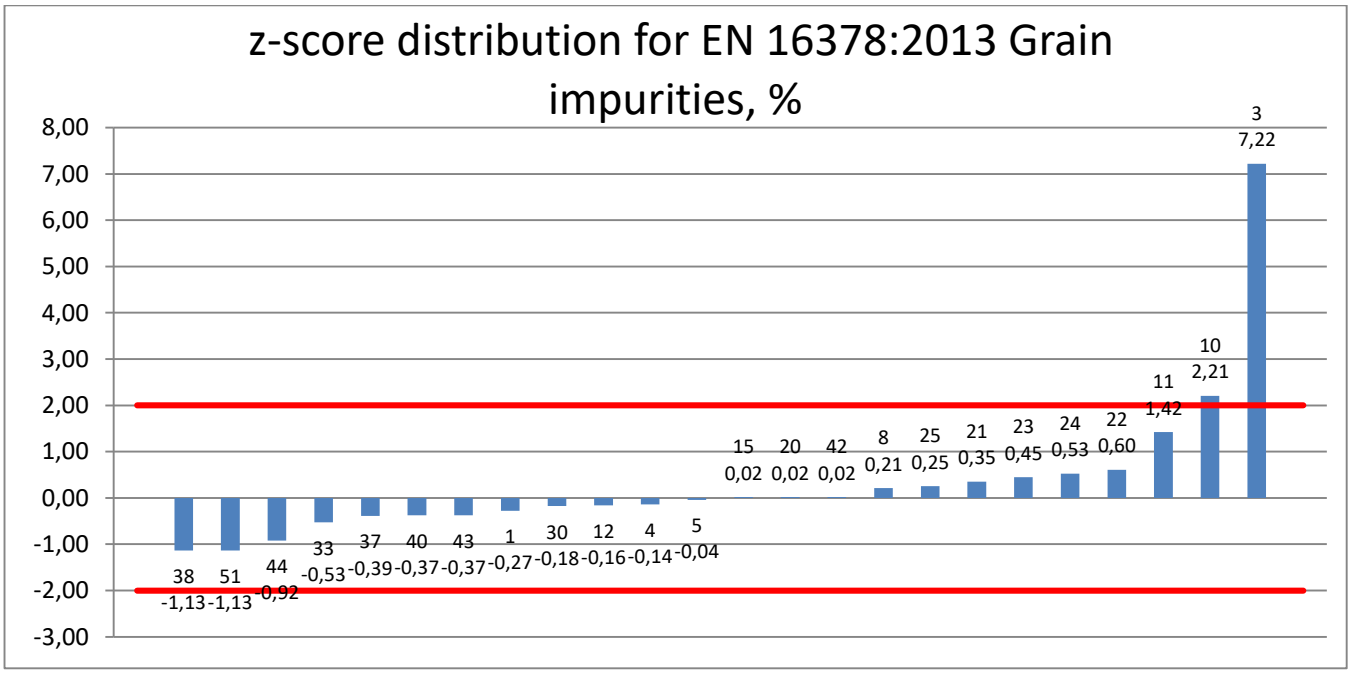
8.1. EN 16378:2013 Broken grains, %



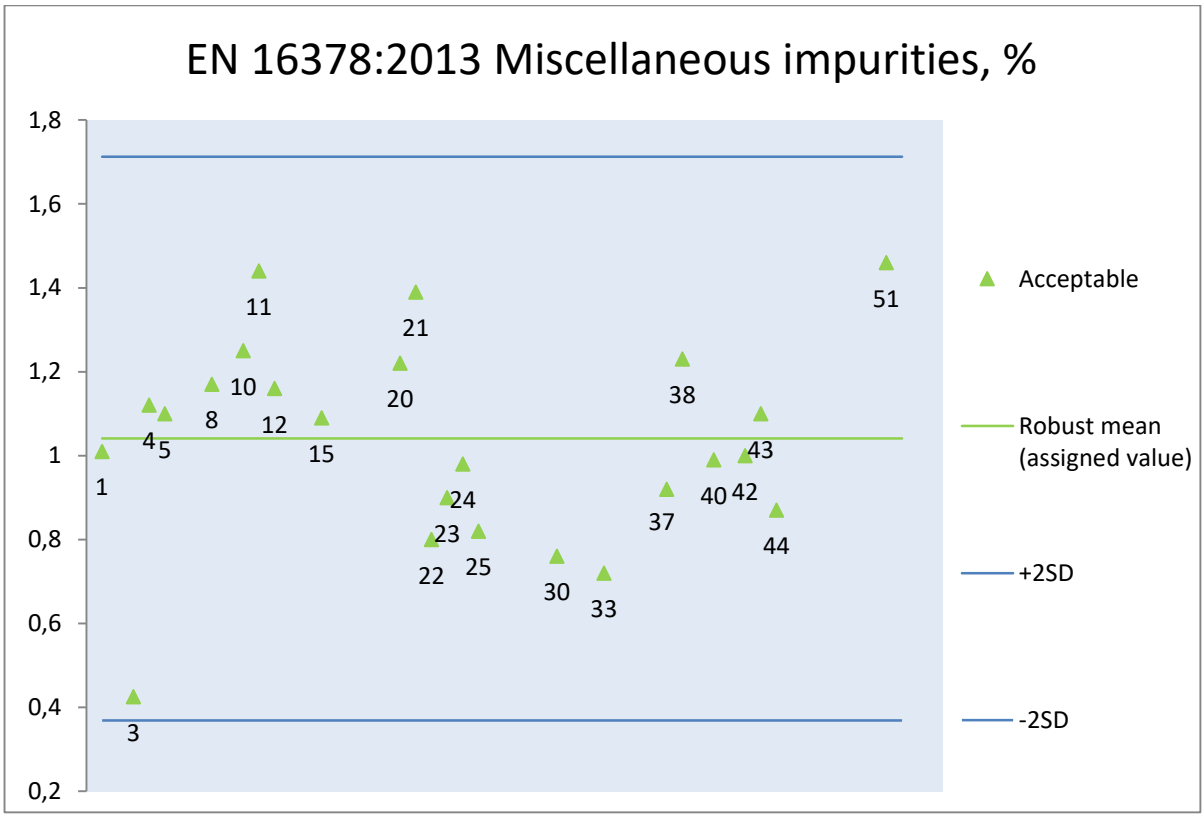


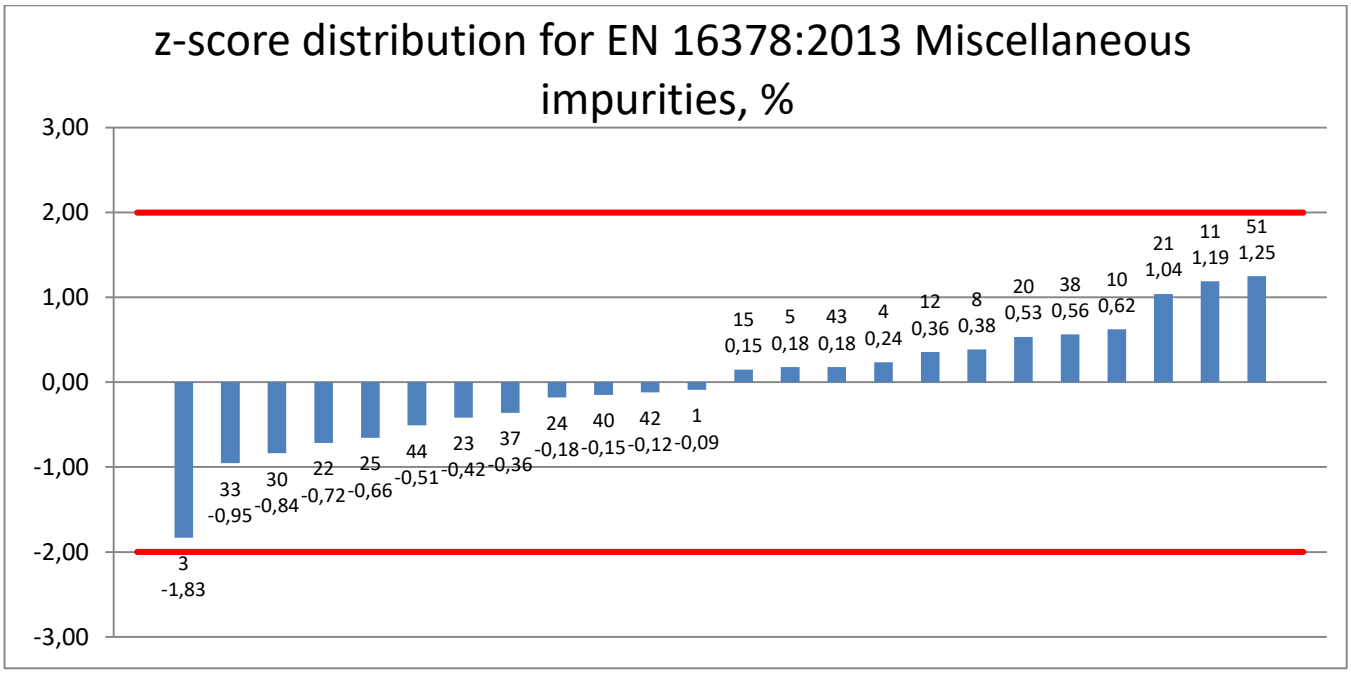
8.2. EN 16378:2013 Grain impurities, %



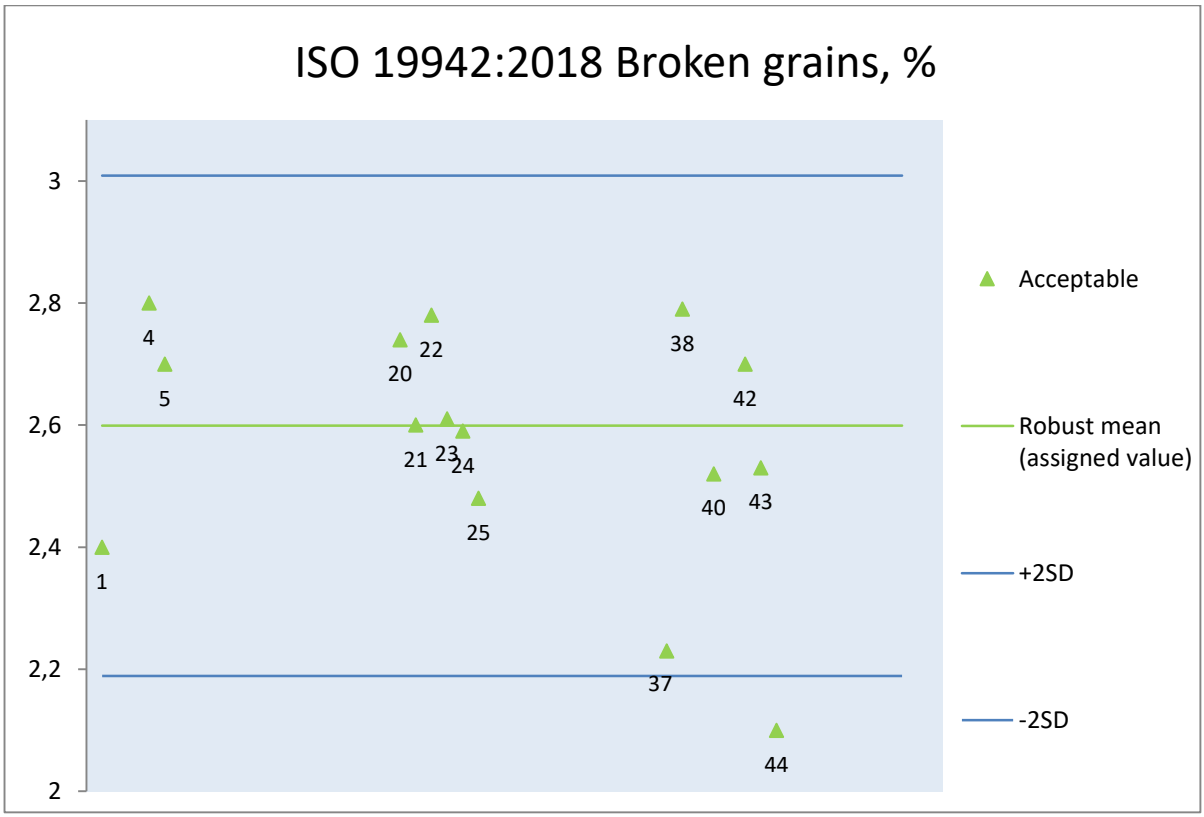


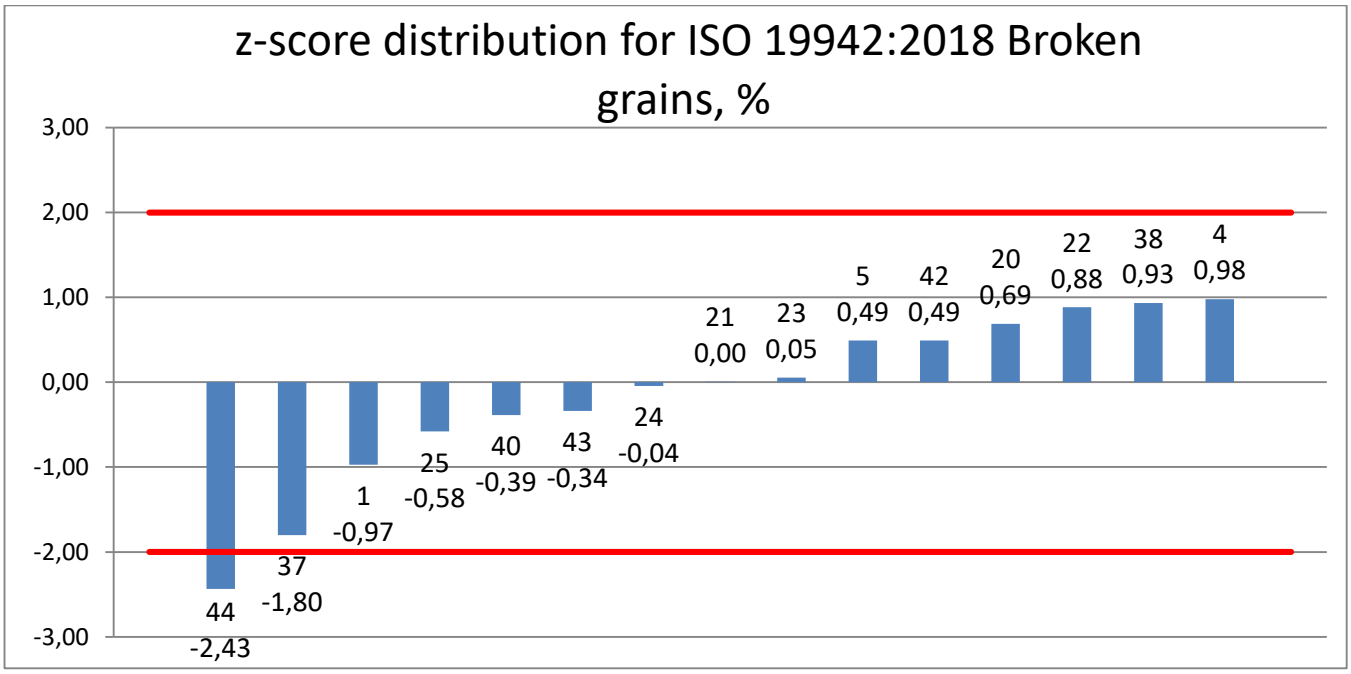
8.3. EN 16378:2013 Miscellaneous impurities, %



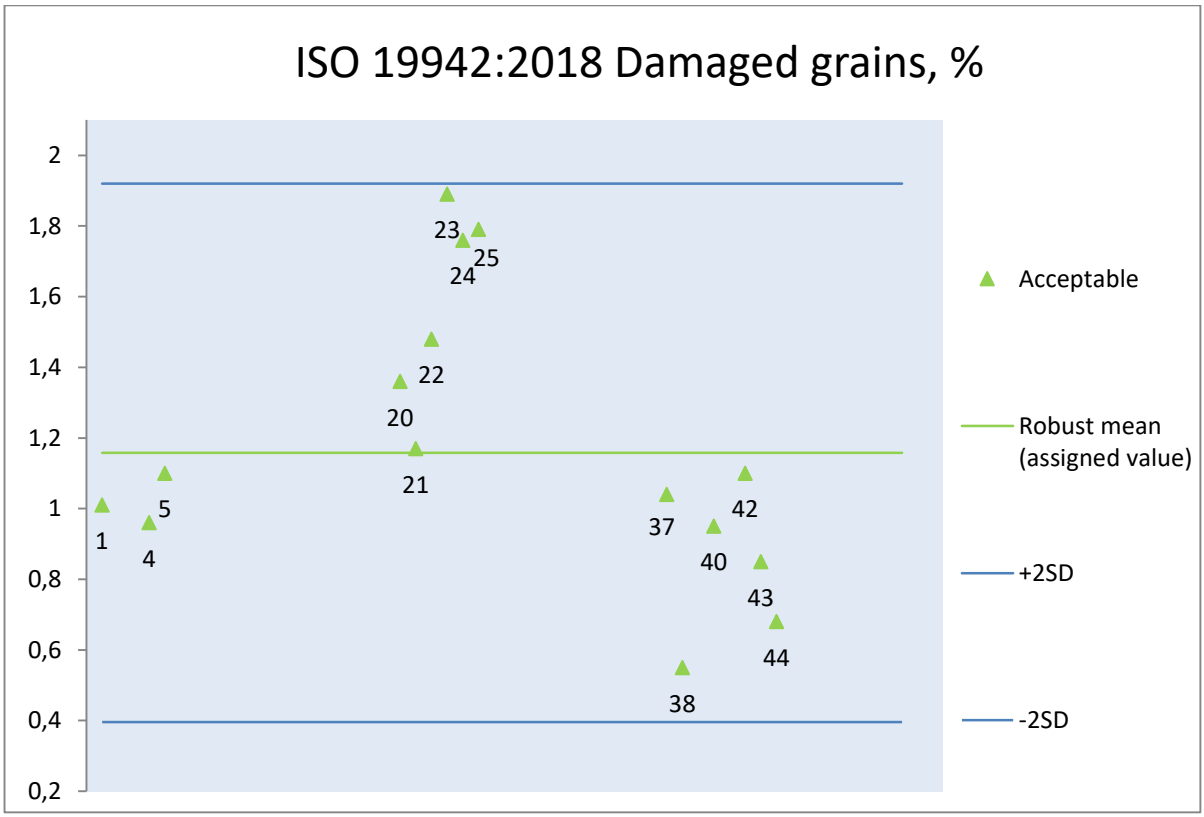


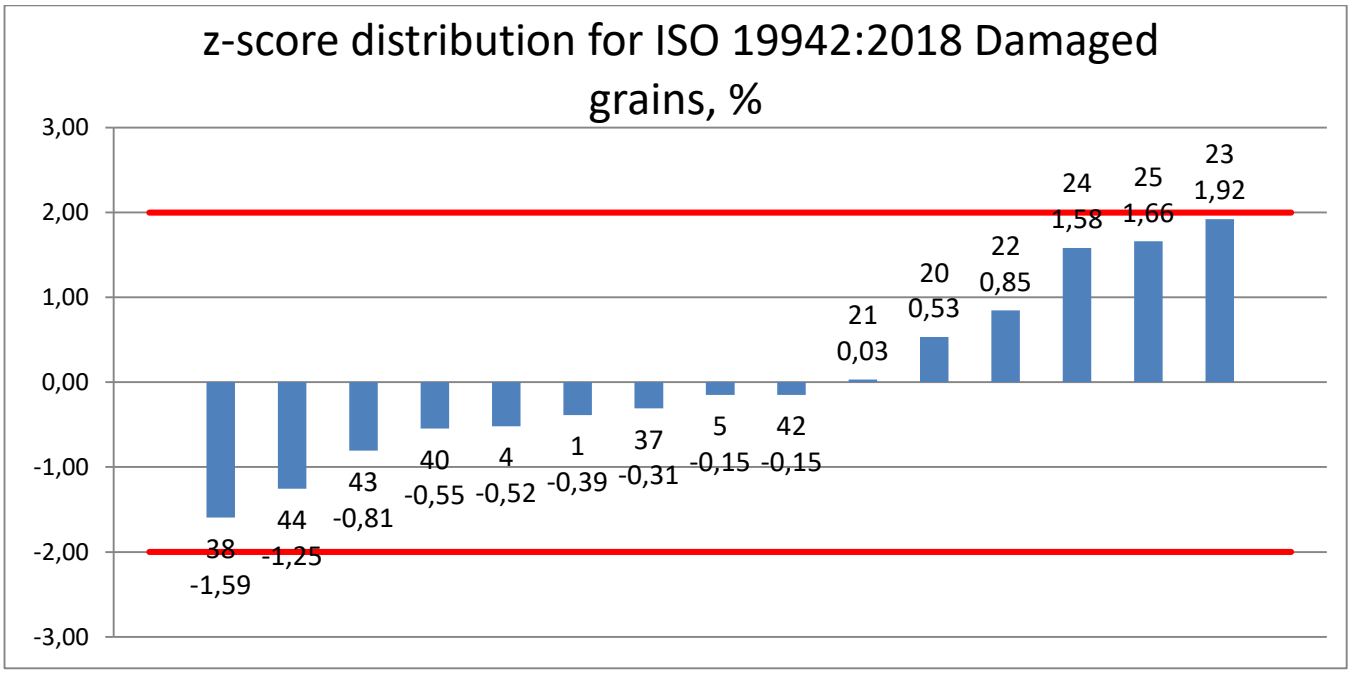
8.4. ISO 19942:2018 Broken grains, %



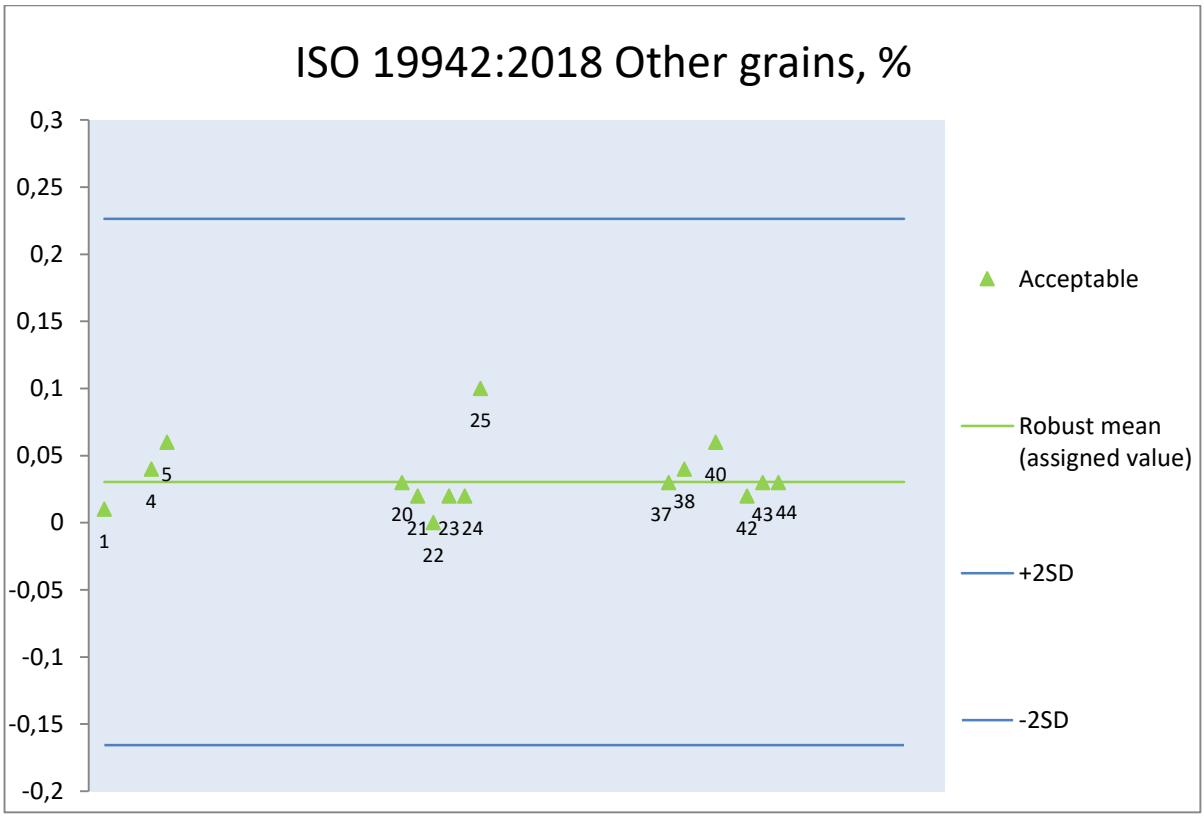


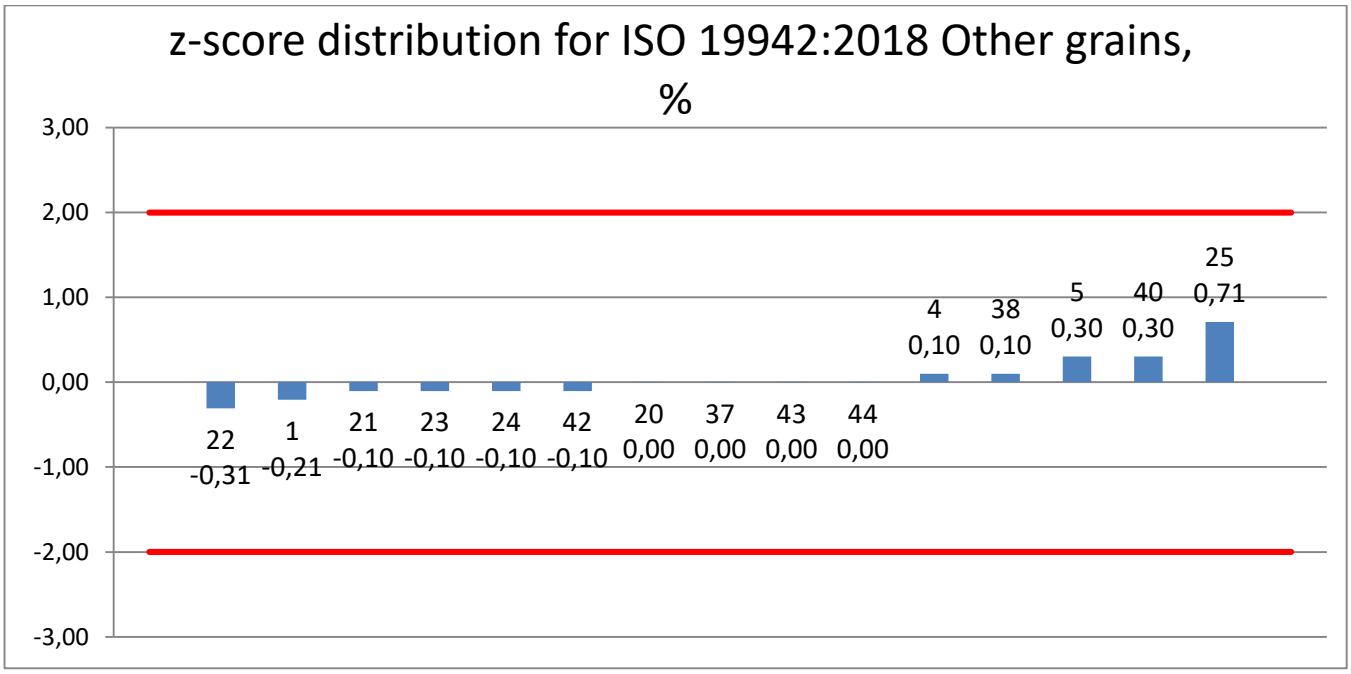
8.5. ISO 19942:2018 Damaged grains, %



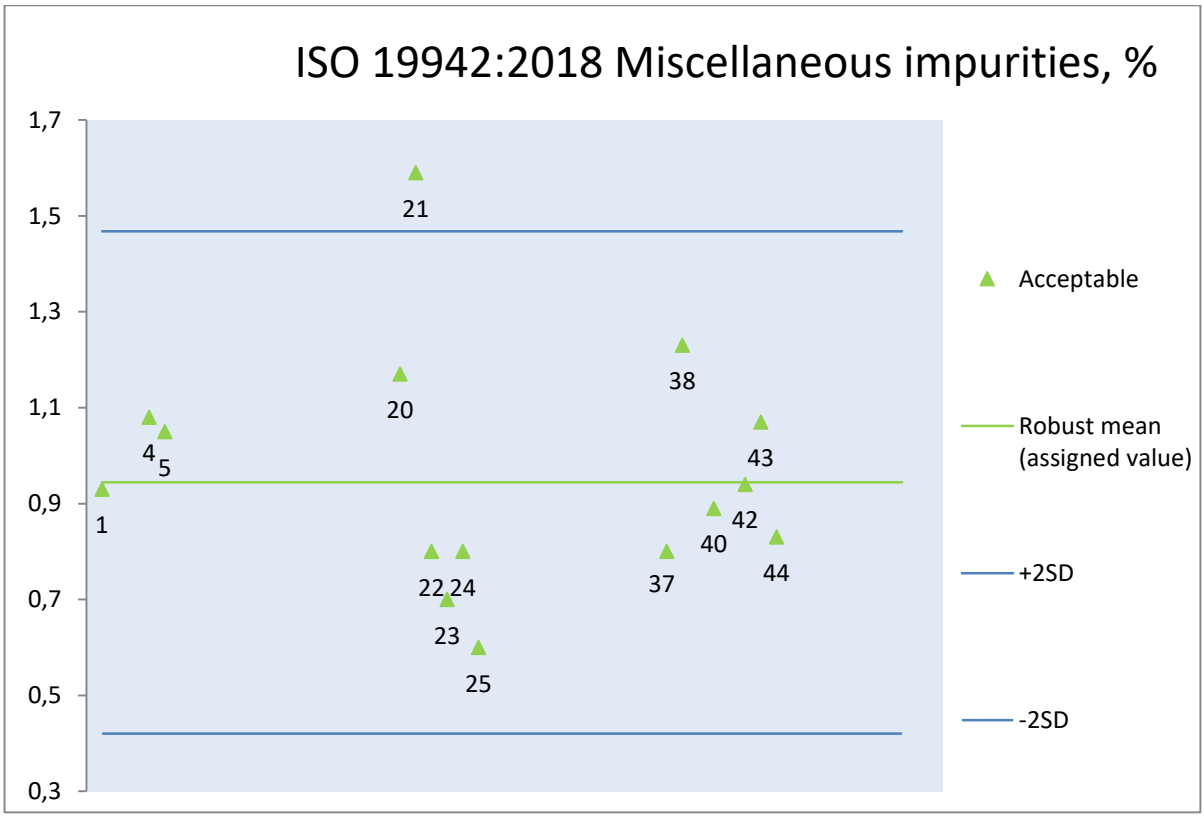


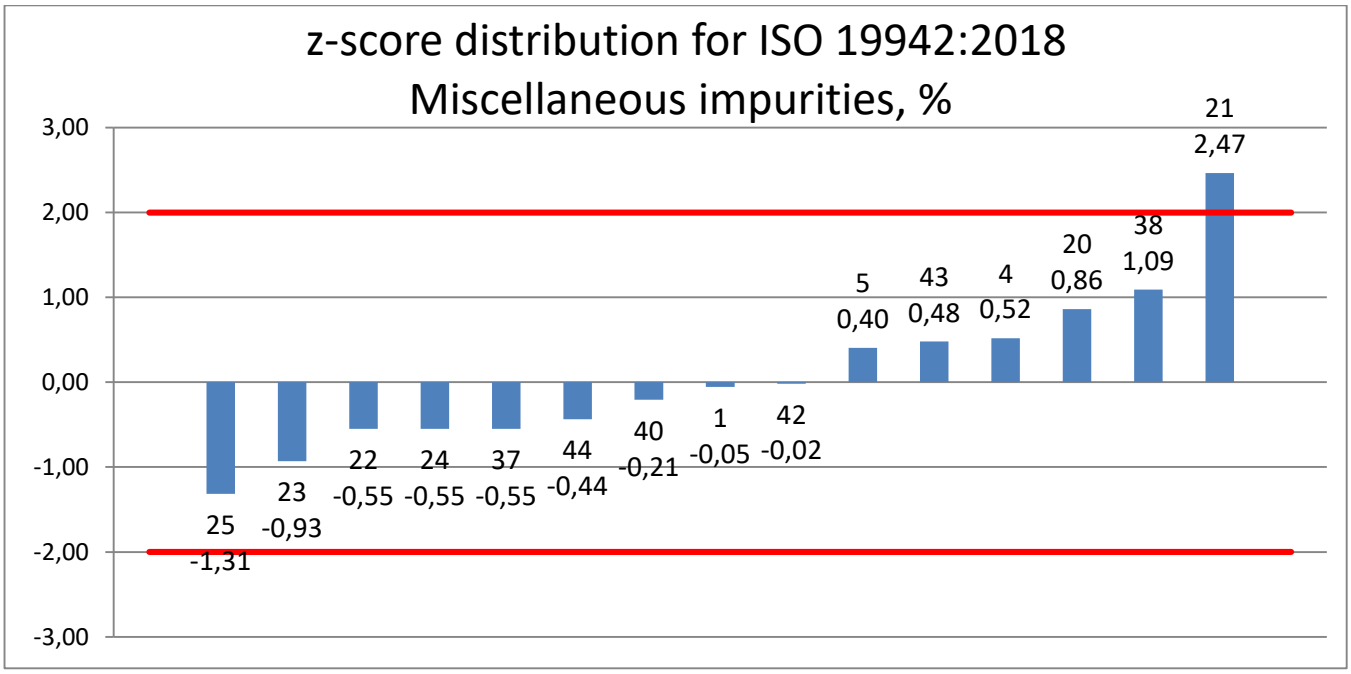
8.6. ISO 19942:2018 Other grains, %



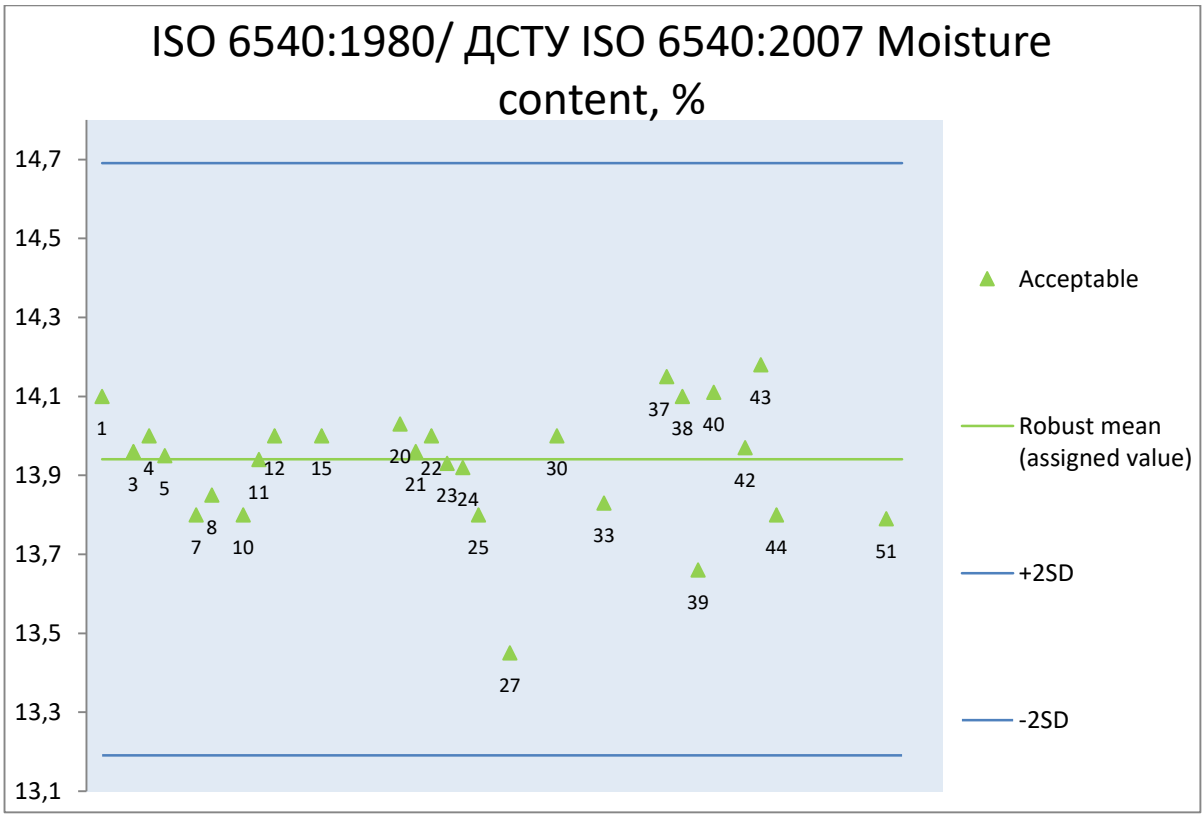


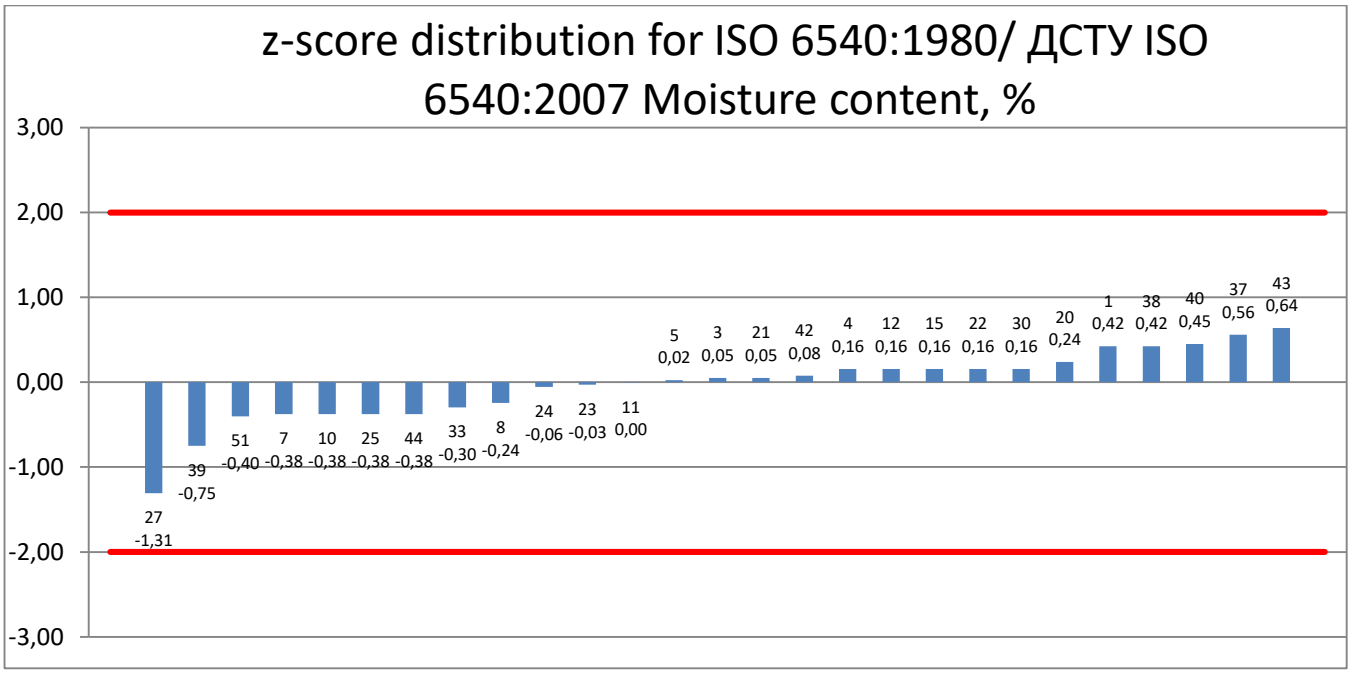
8.7. ISO 19942:2018 Miscellaneous impurities, %



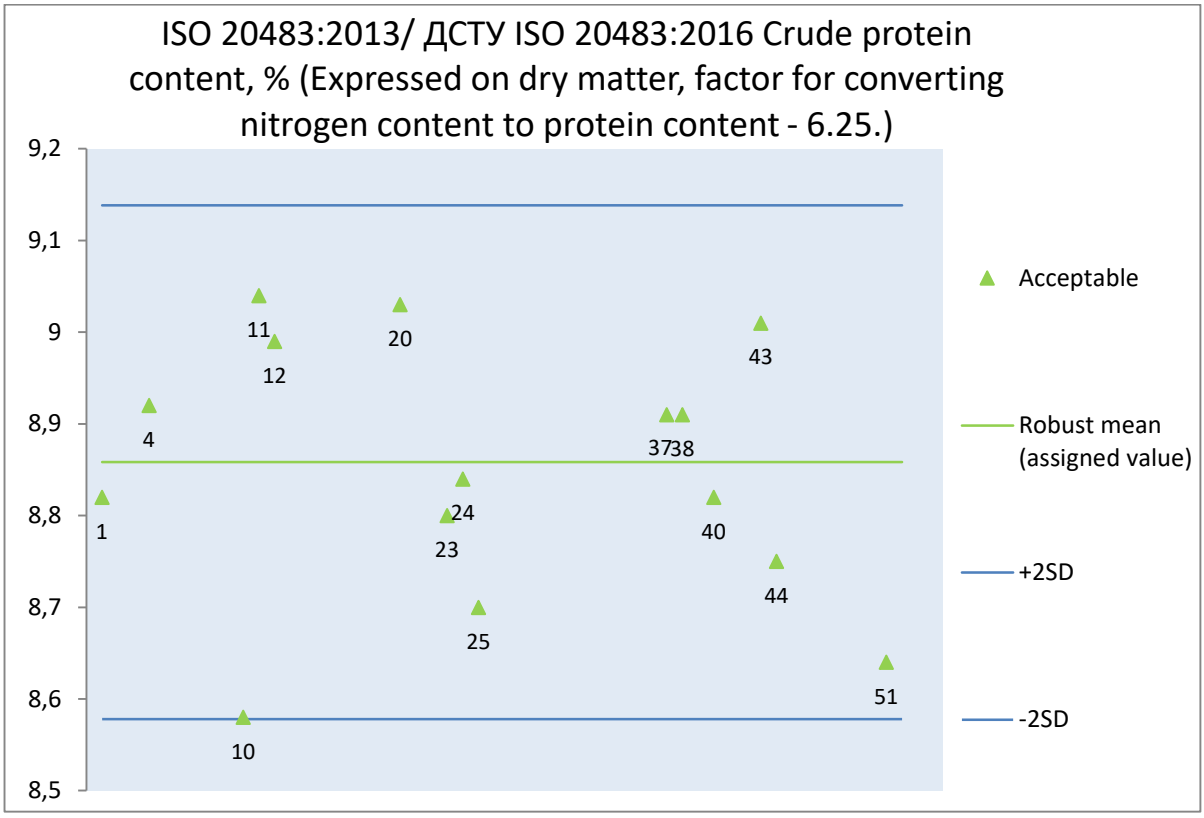


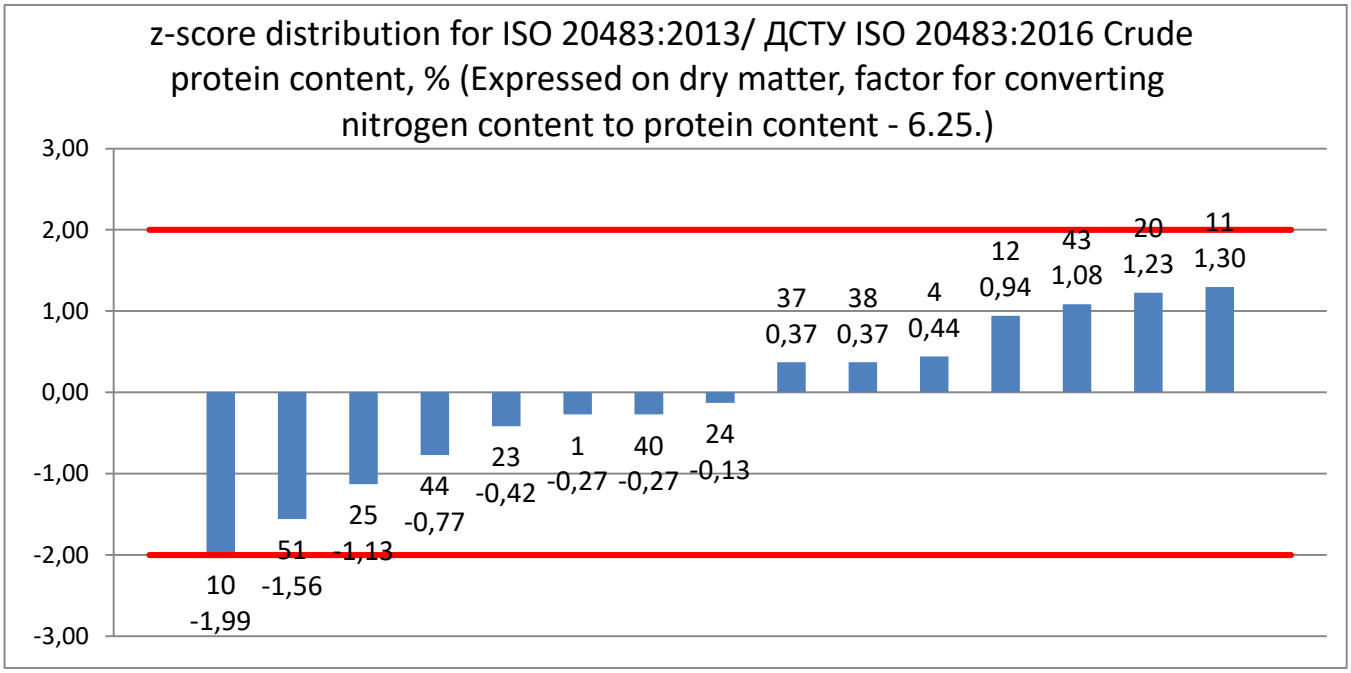
8.8. ISO 6540:1980/ ДСТУ ISO 6540:2007 Moisture content, %



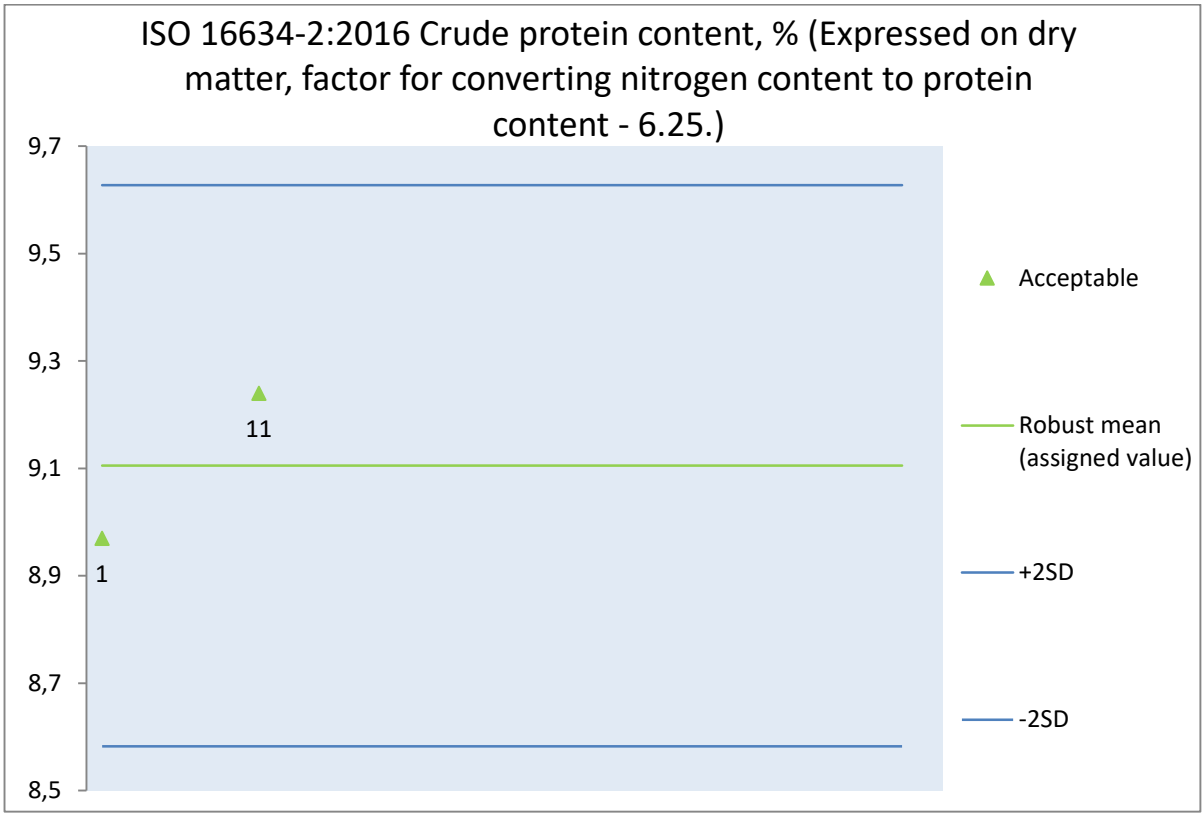


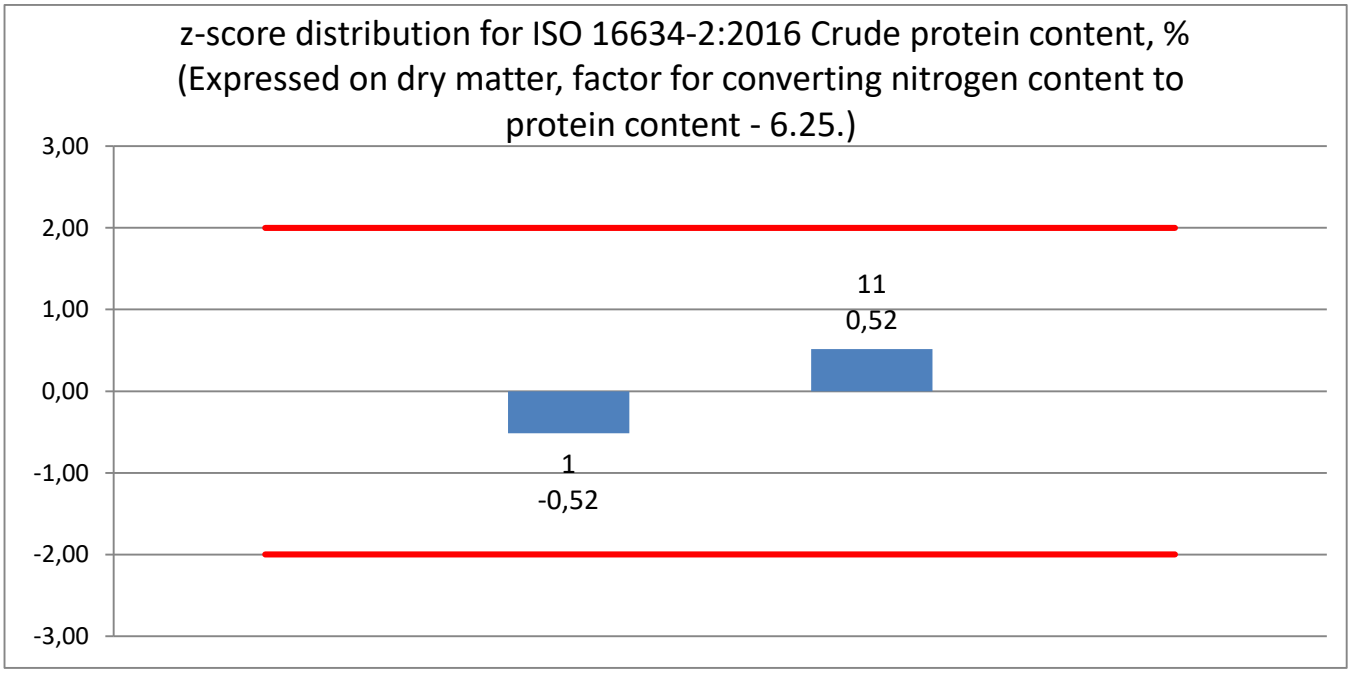
8.9. ISO 20483:2013/ ДСТУ ISO 20483:2016 Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)



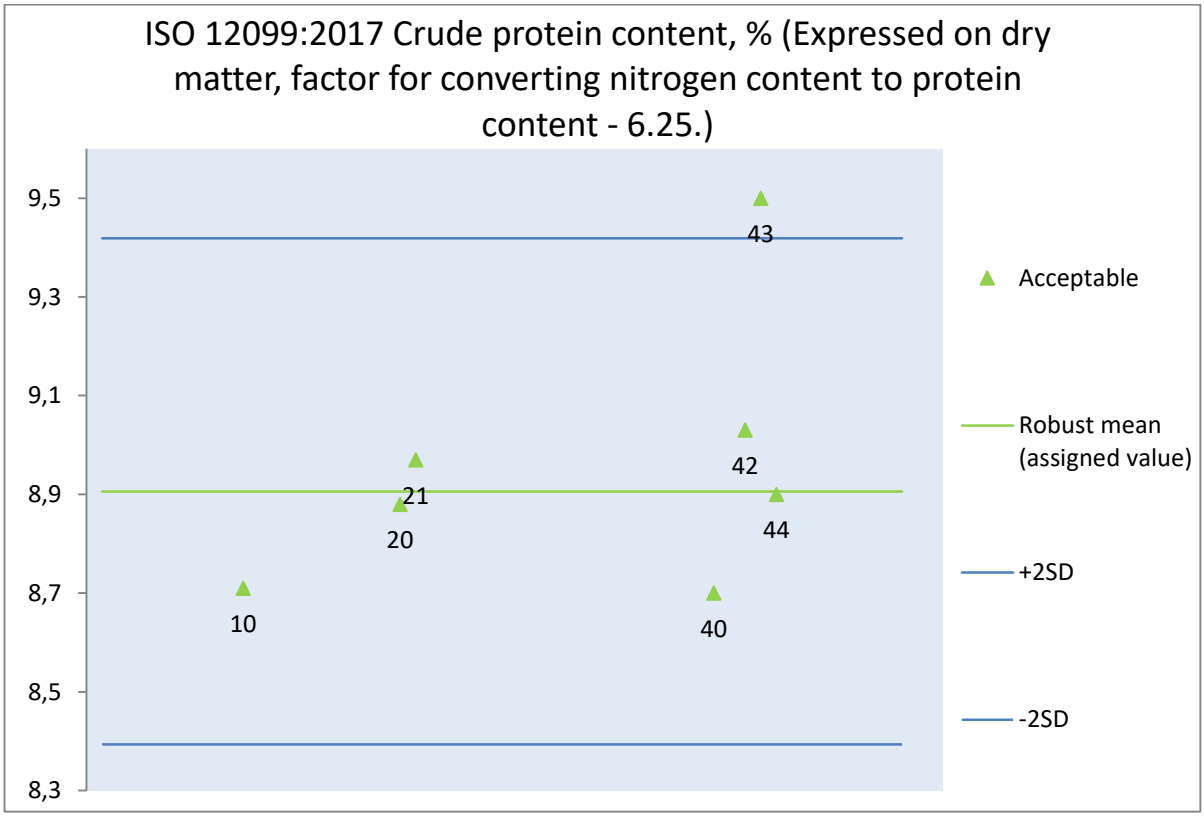


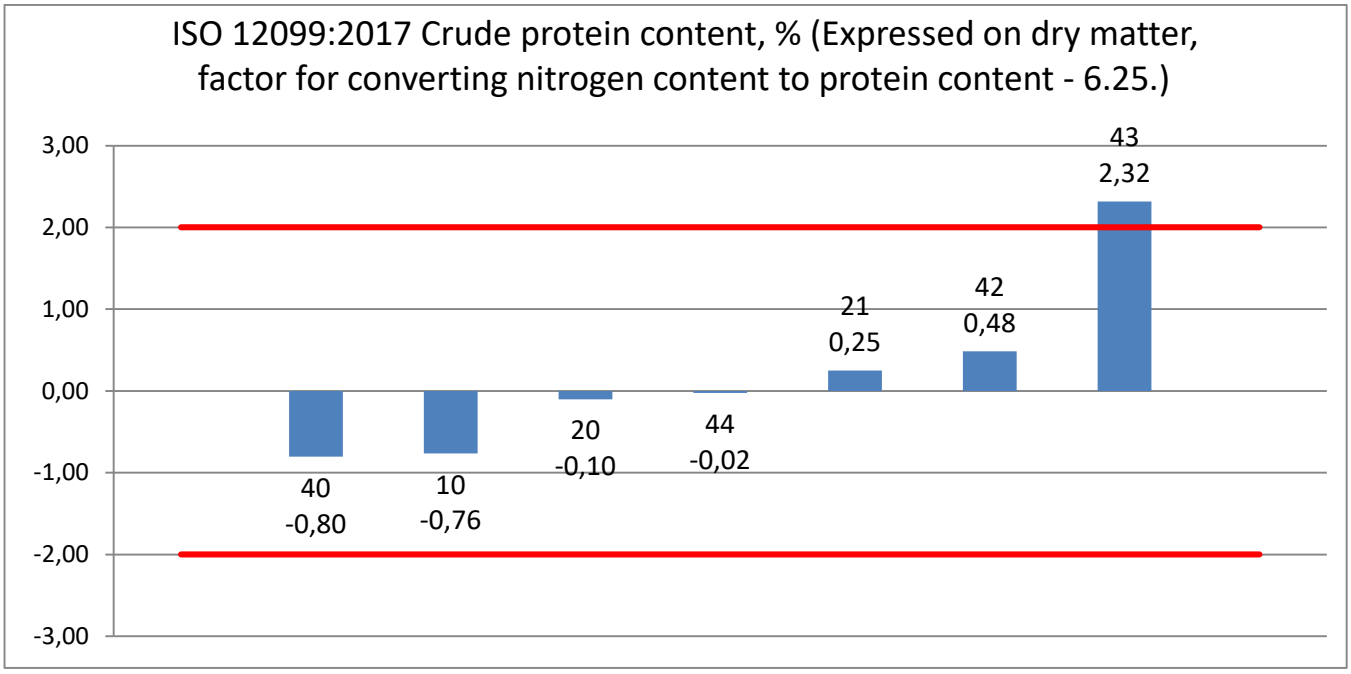
8.10. ISO 16634-2:2016 Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)



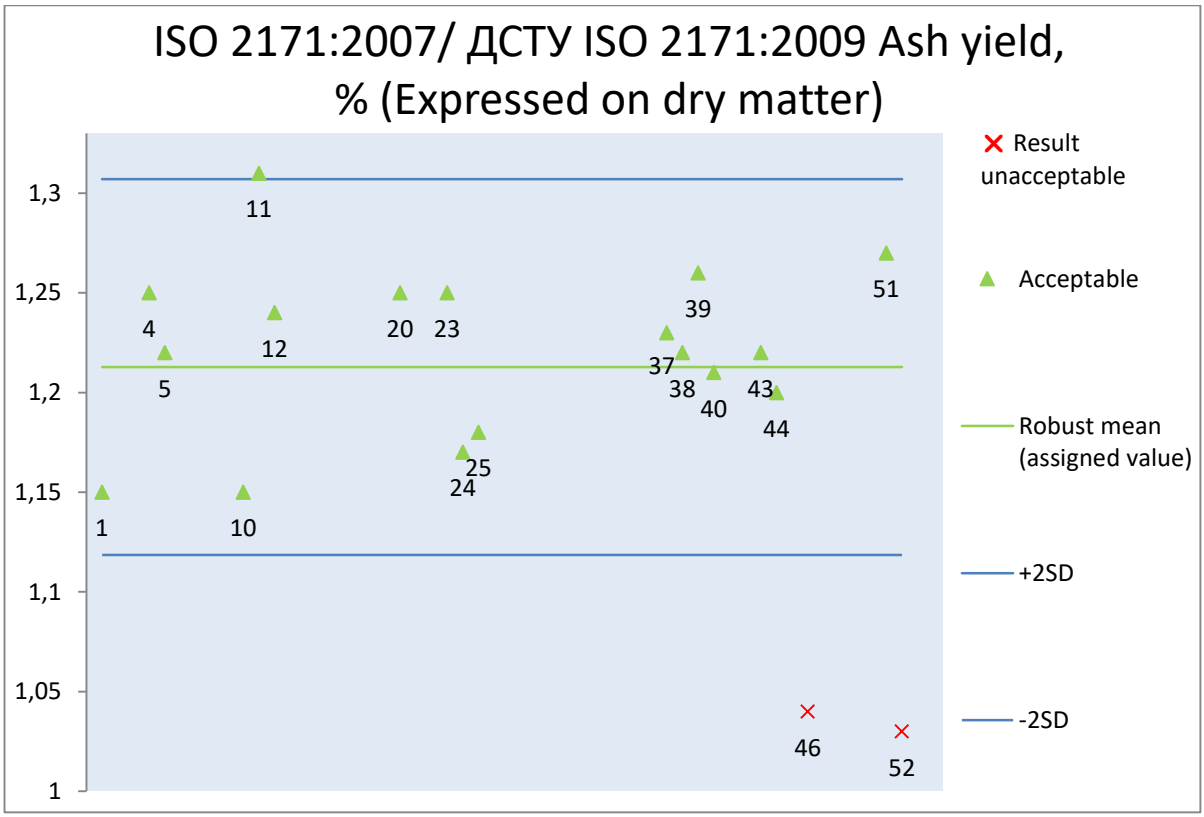


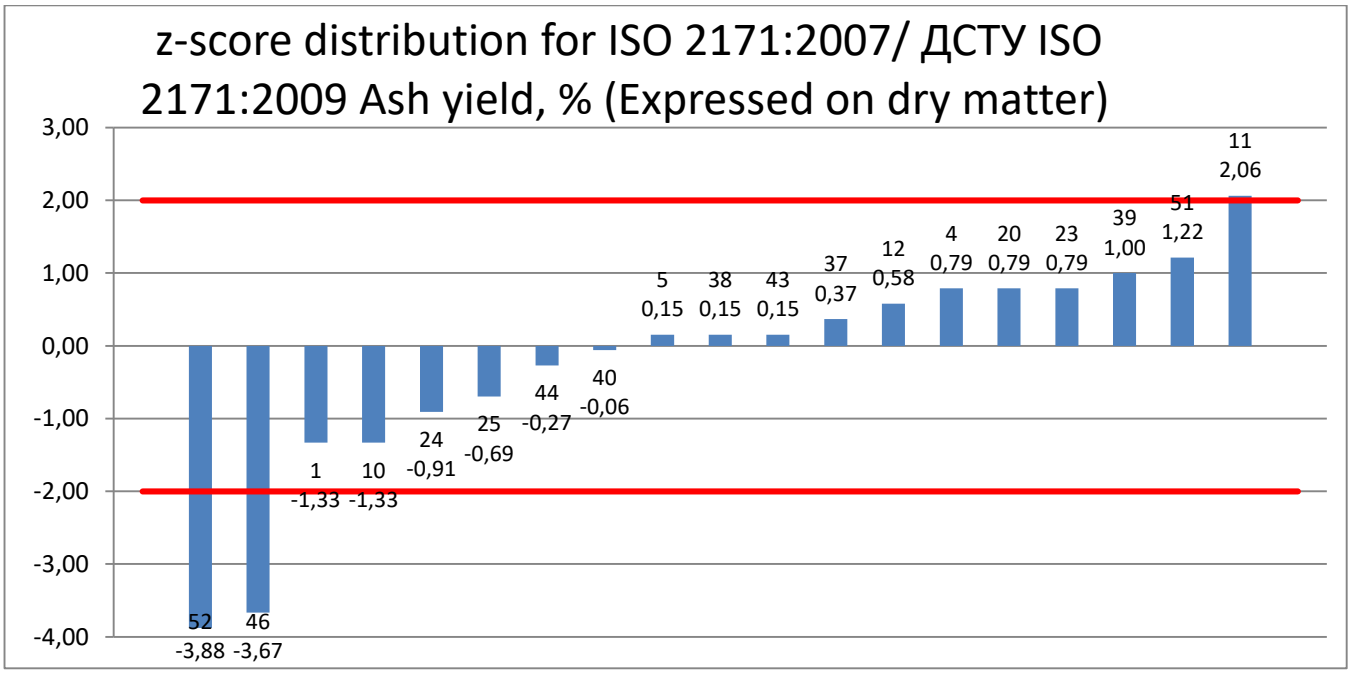
8.11. ISO 12099:2017 Crude protein content, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.25.)



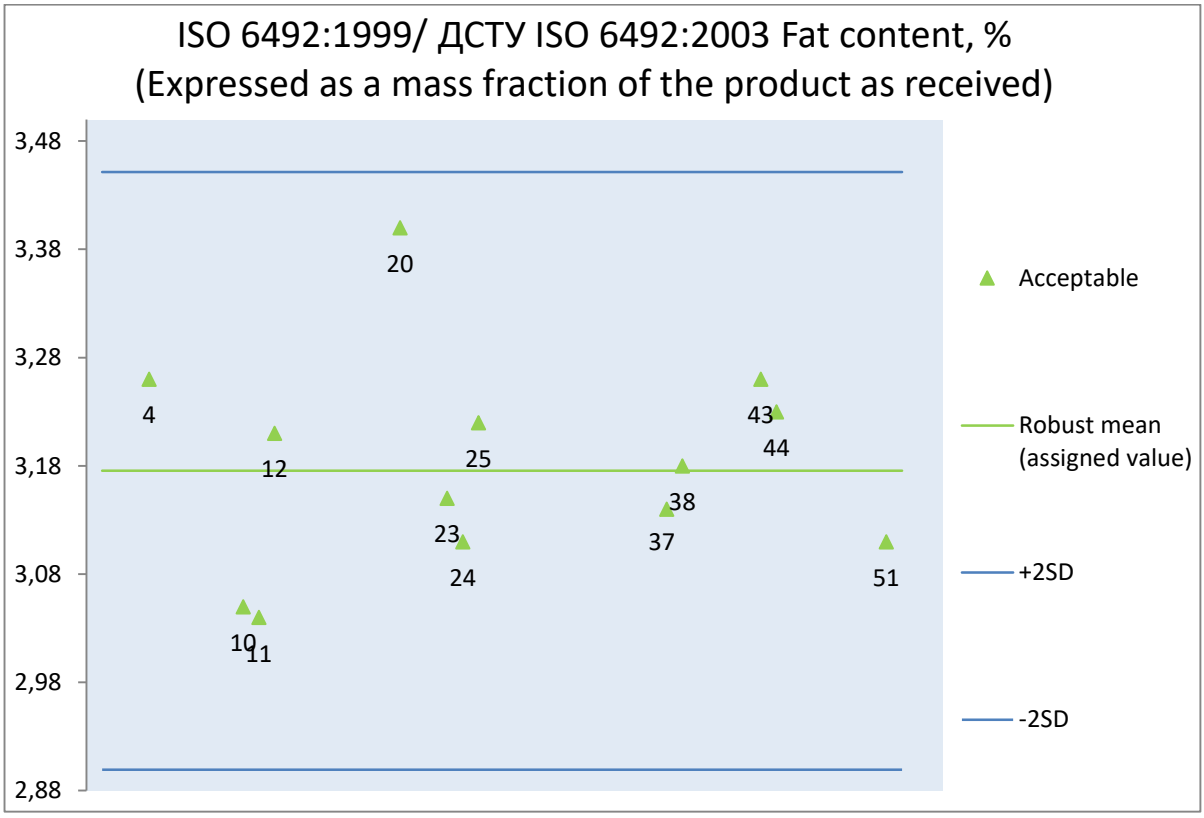


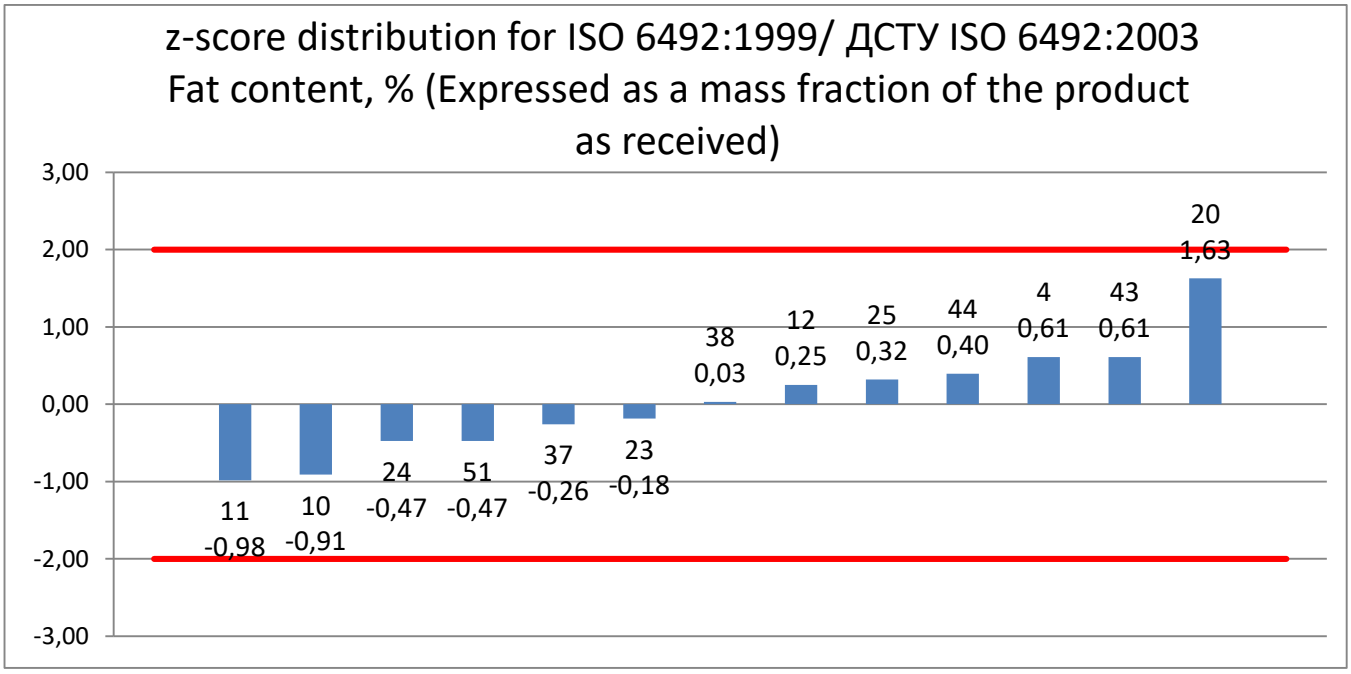
8.12. ISO 2171:2007/ ДСТУ ISO 2171:2009 Ash yield, % (Expressed on dry matter)



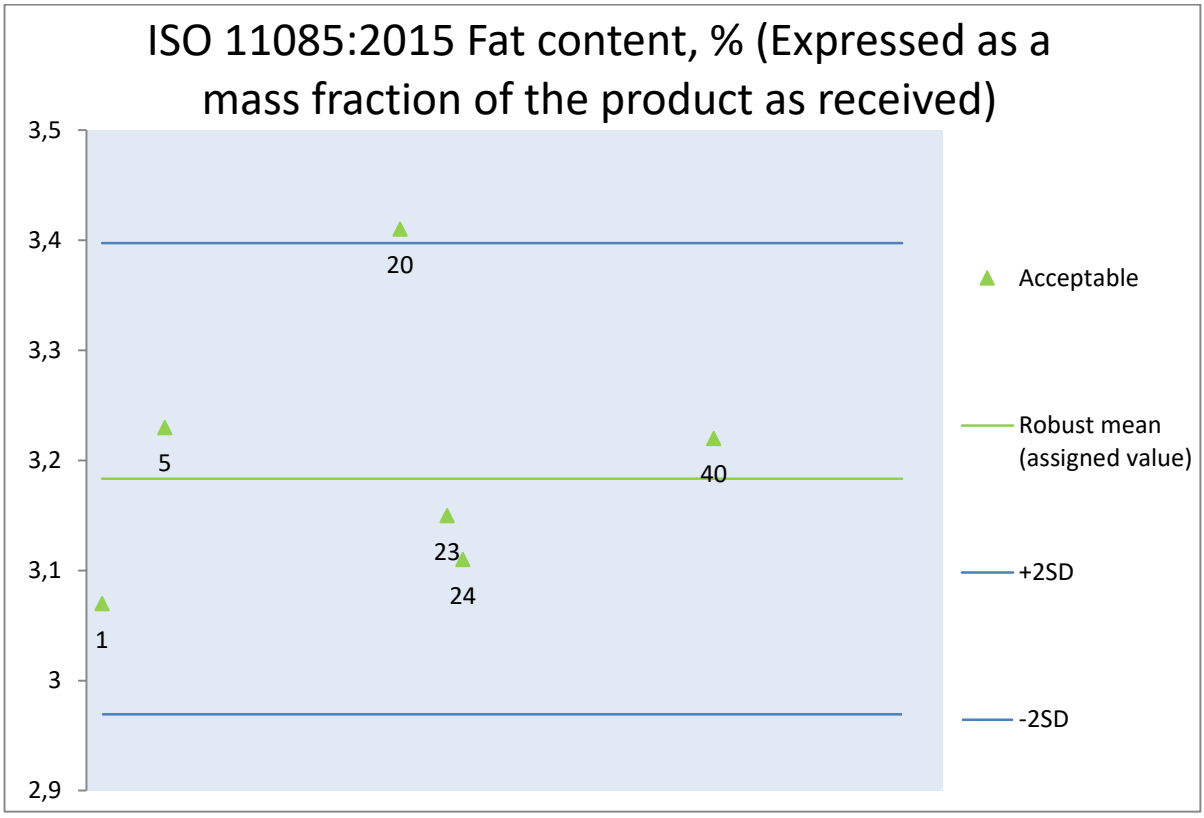


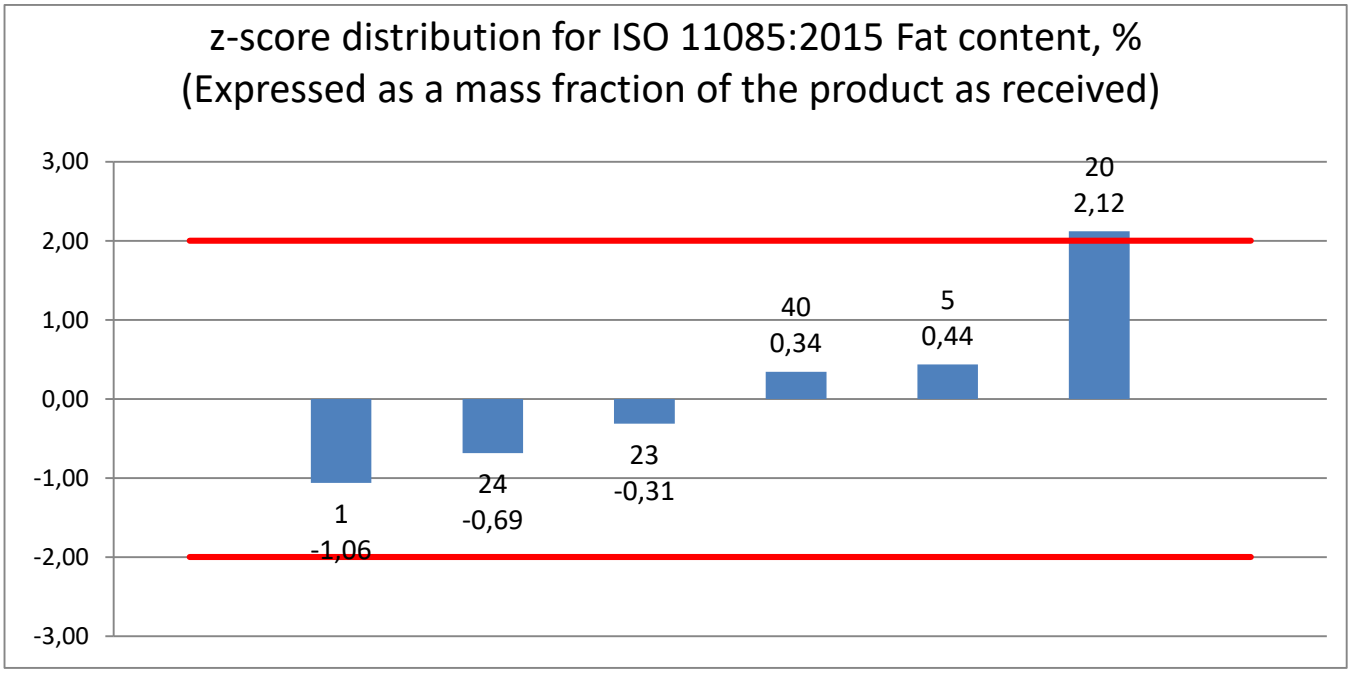
8.13. ISO 6492:1999/ ДСТУ ISO 6492:2003 Fat content, % (Expressed as a mass fraction of the product as received)



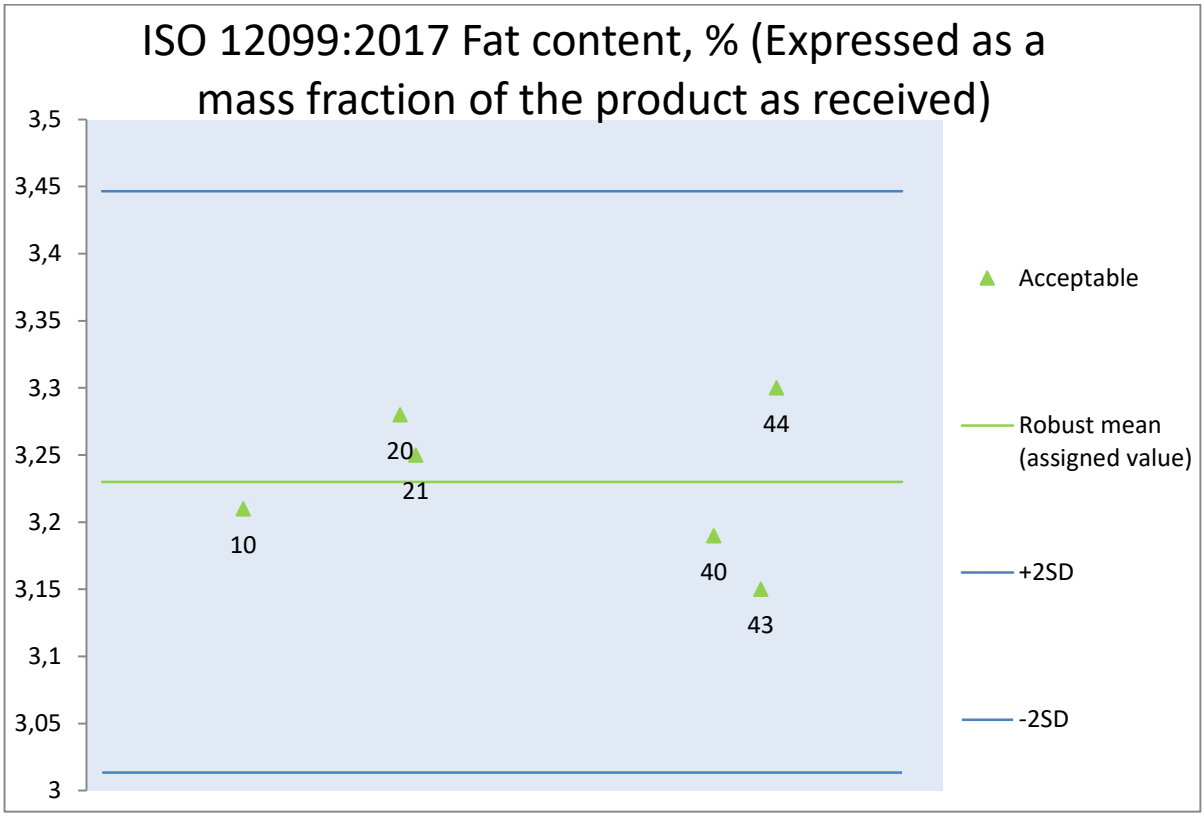


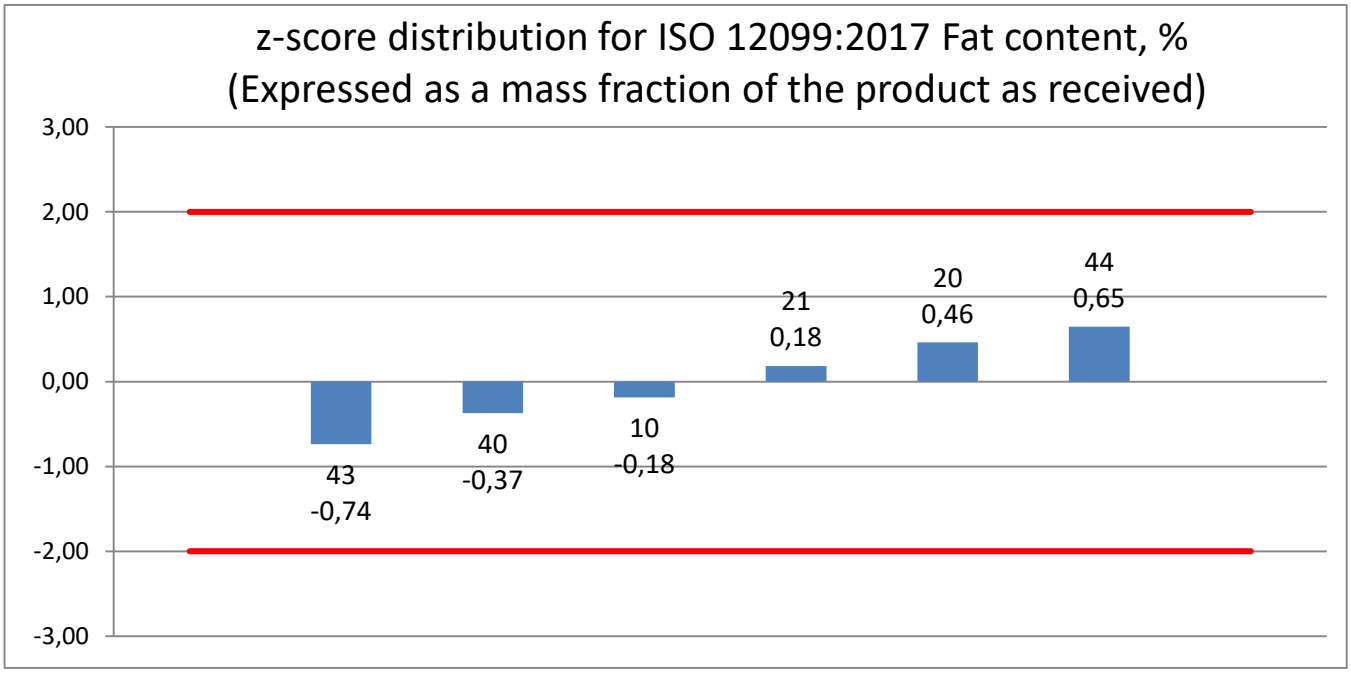
8.14. ISO 11085:2015 Fat content, % (Expressed as a mass fraction of the product as received)



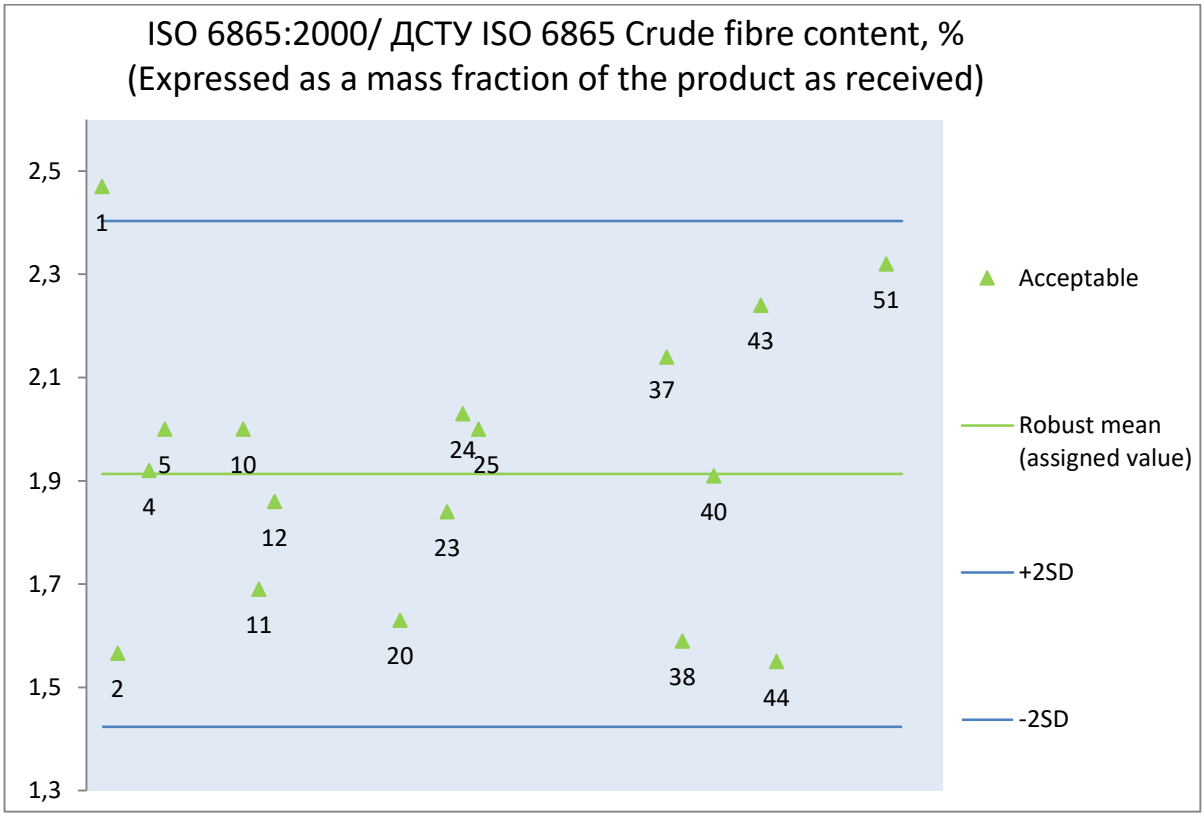


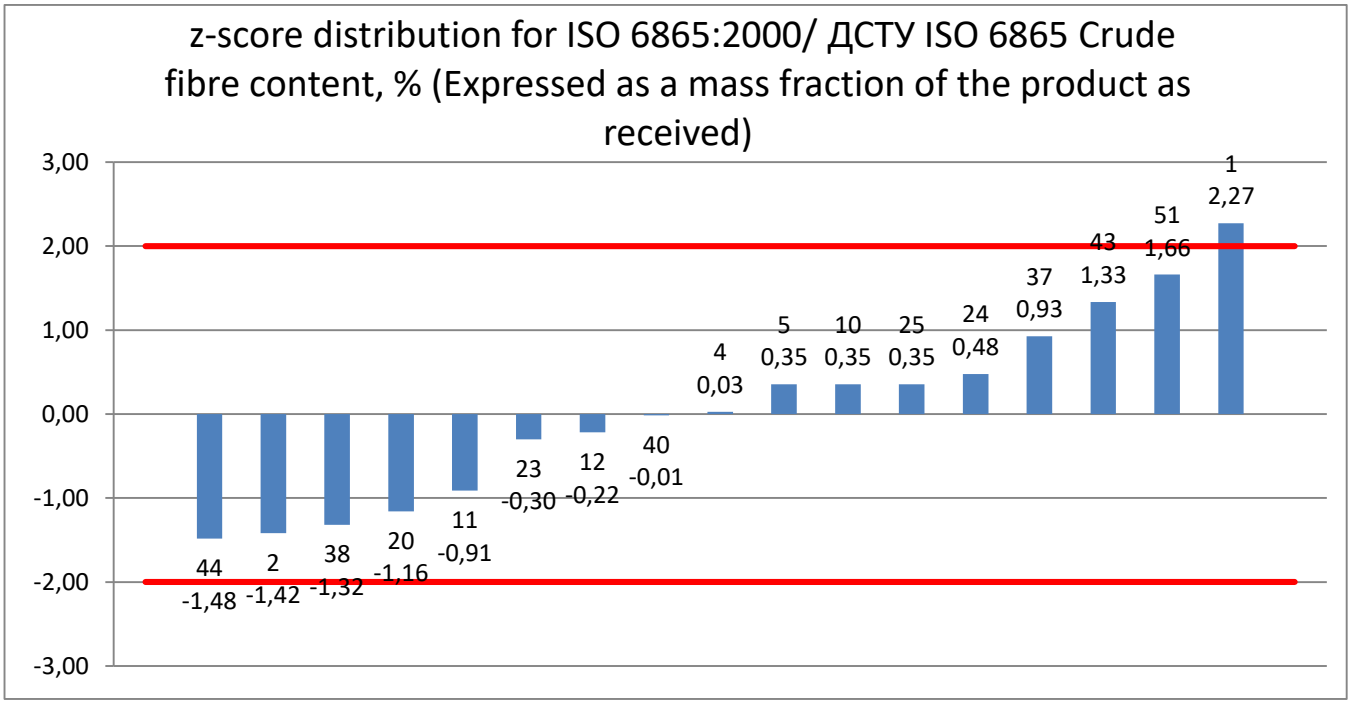
8.15. ISO 12099:2017 Fat content, % (Expressed as a mass fraction of the product as received)



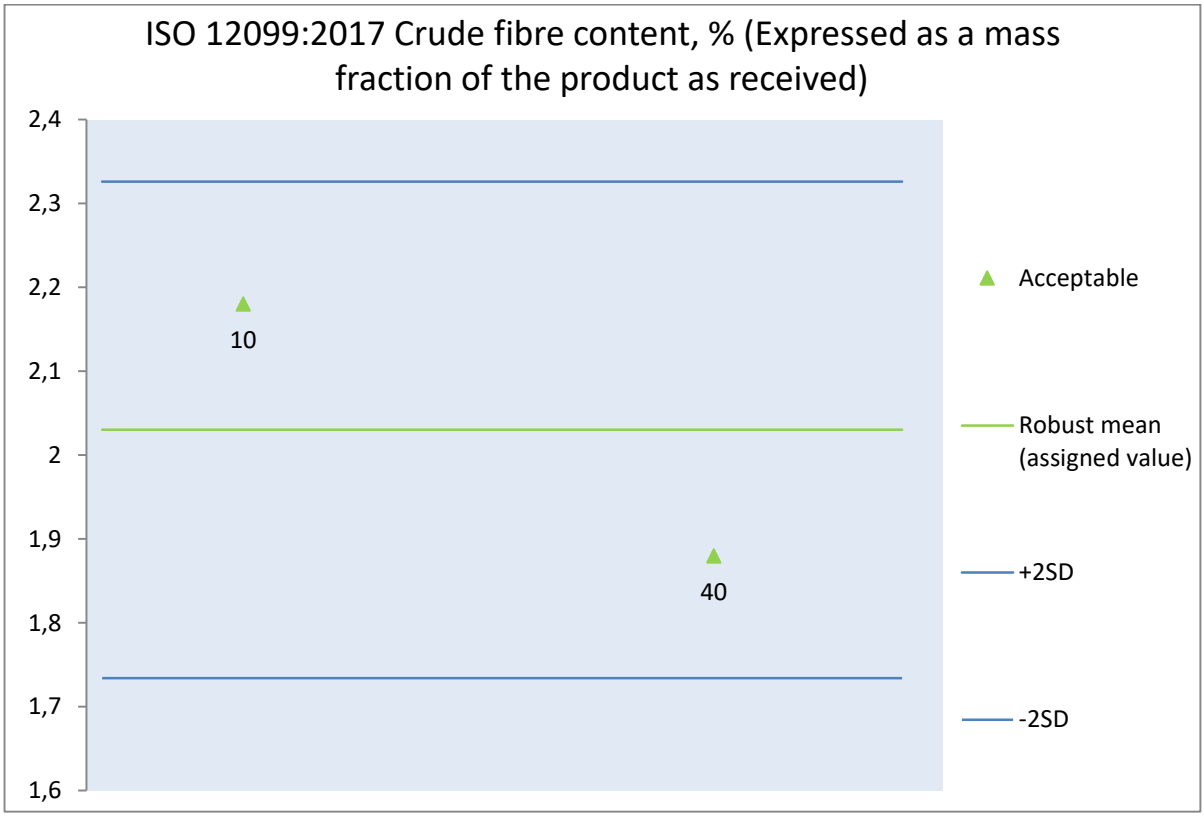


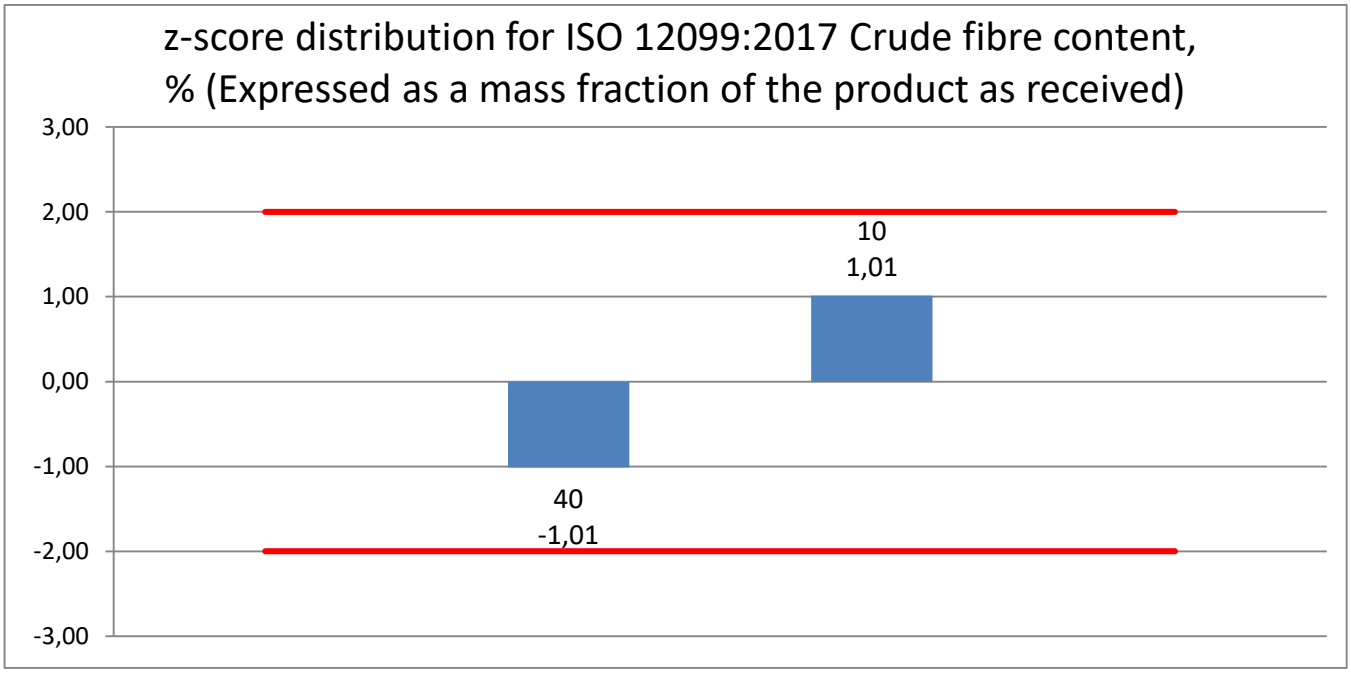
8.16. ISO 6865:2000/ ДСТУ ISO 6865 Crude fibre content, % (Expressed as a mass fraction of the product as received)



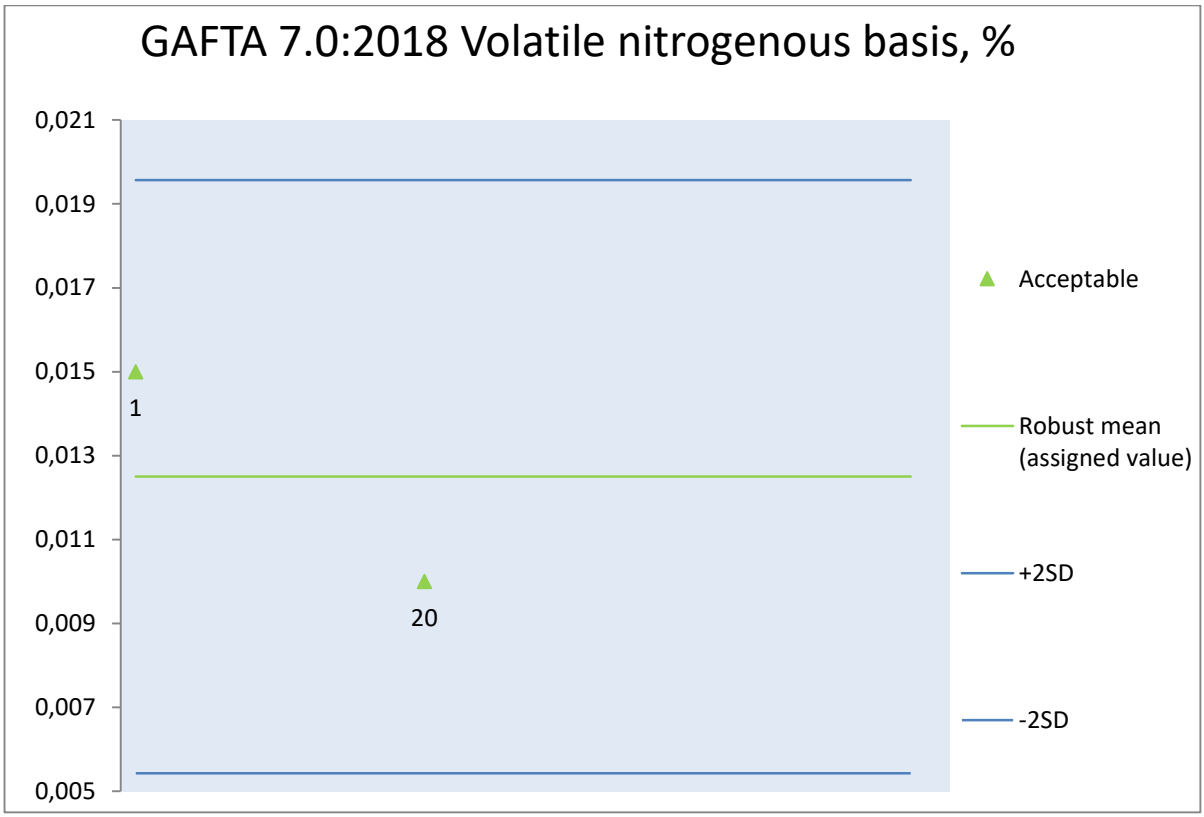


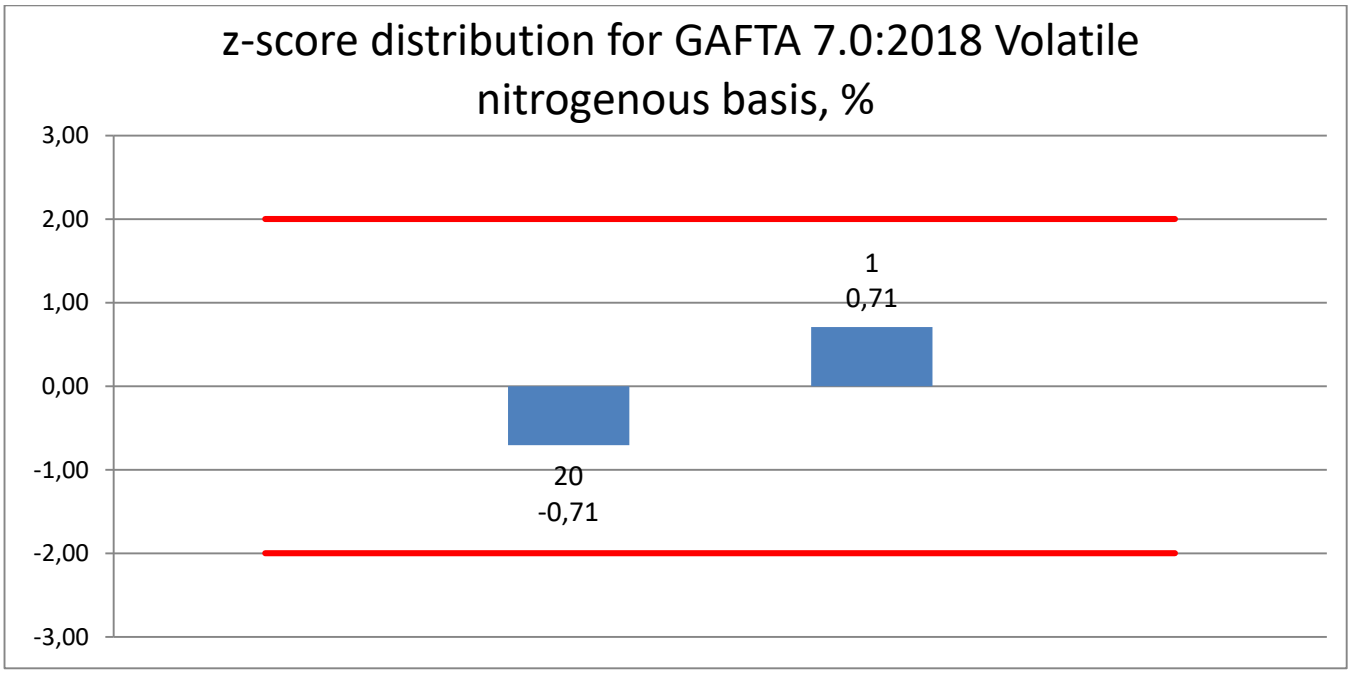
8.17. ISO 12099:2017 Crude fibre content, % (Expressed as a mass fraction of the product as received)



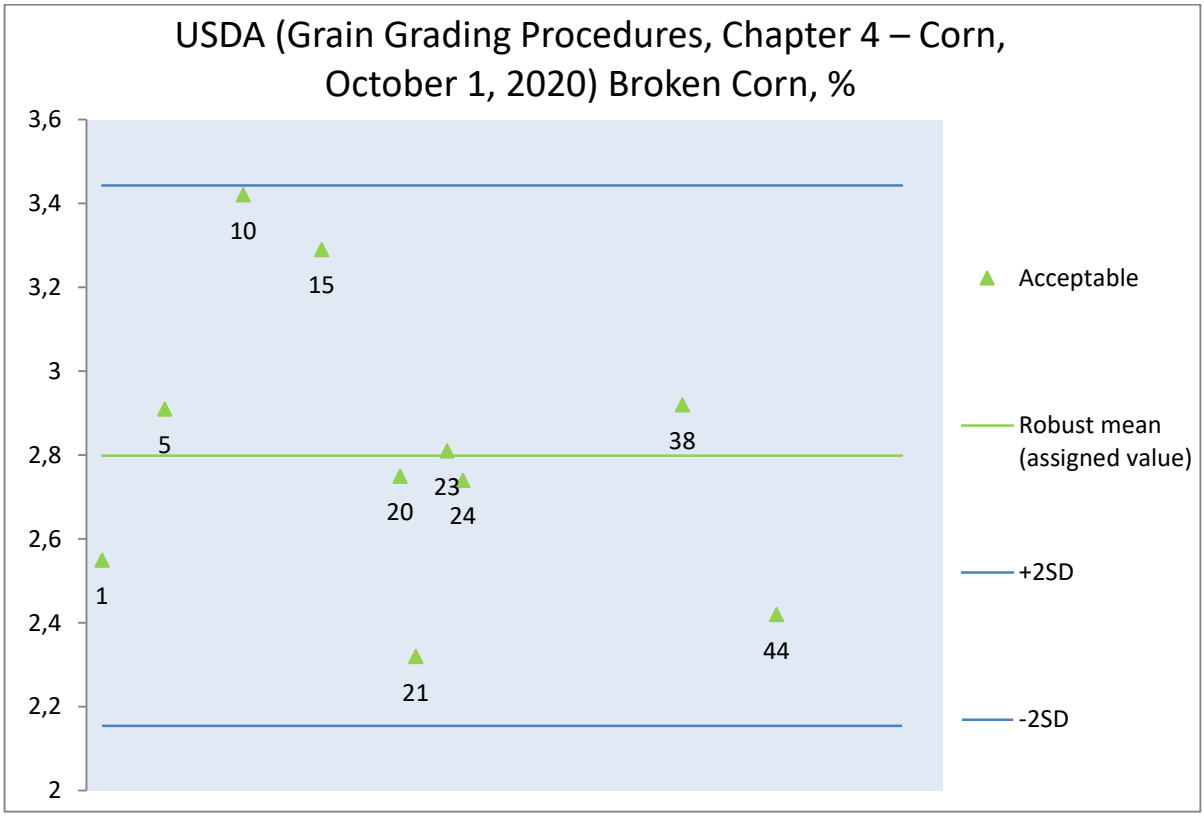


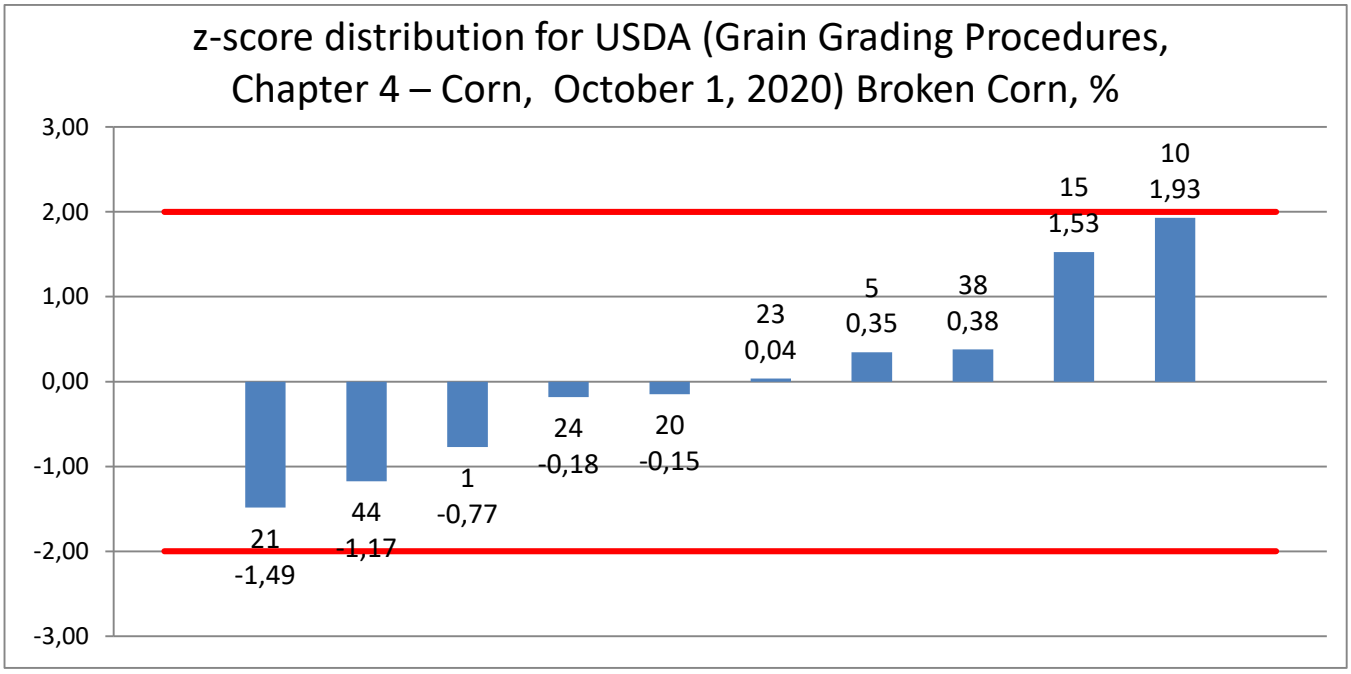
8.18. GAFTA 7.0:2018 Volatile nitrogenous basis, %



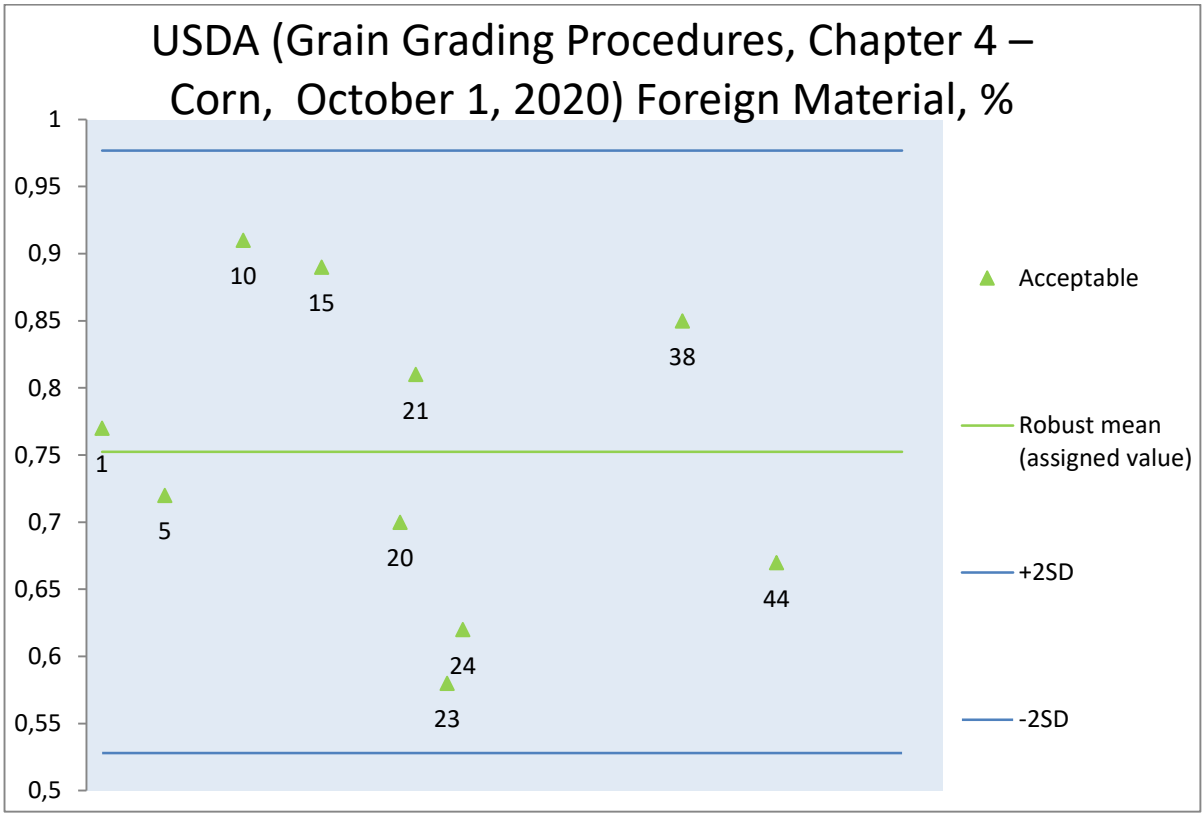


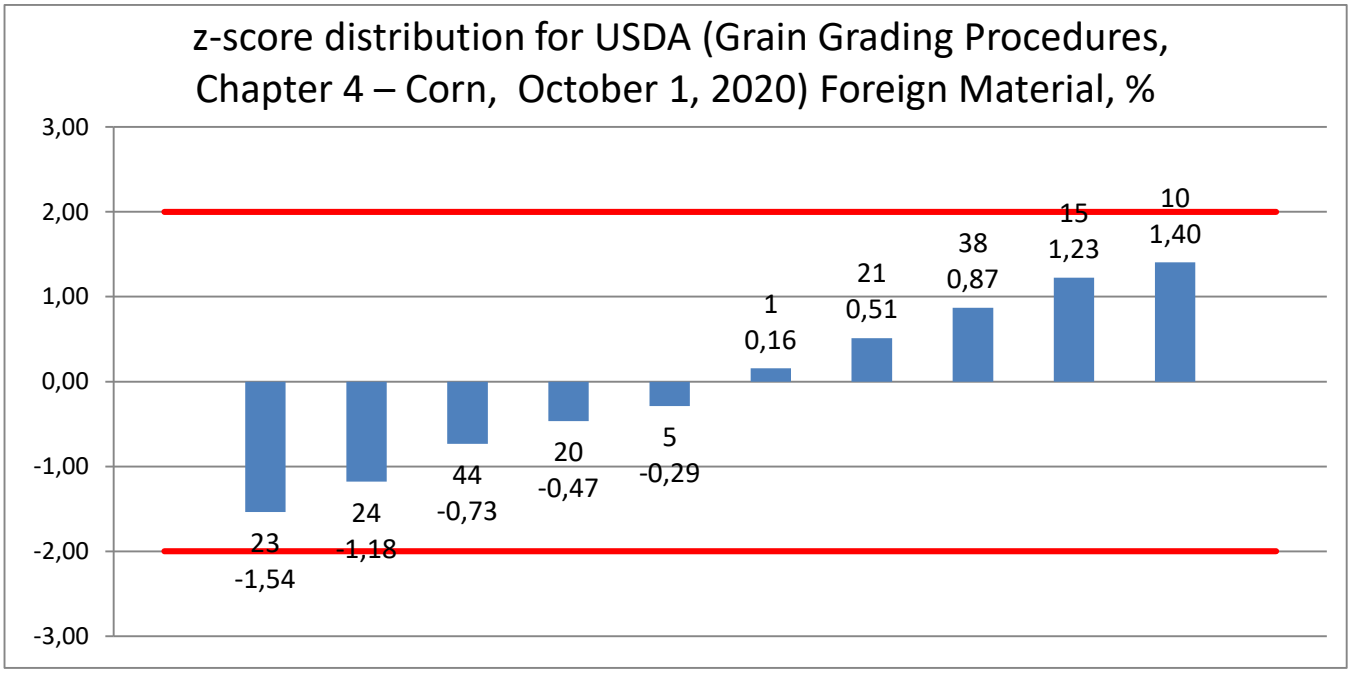
8.19. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Broken Corn, %



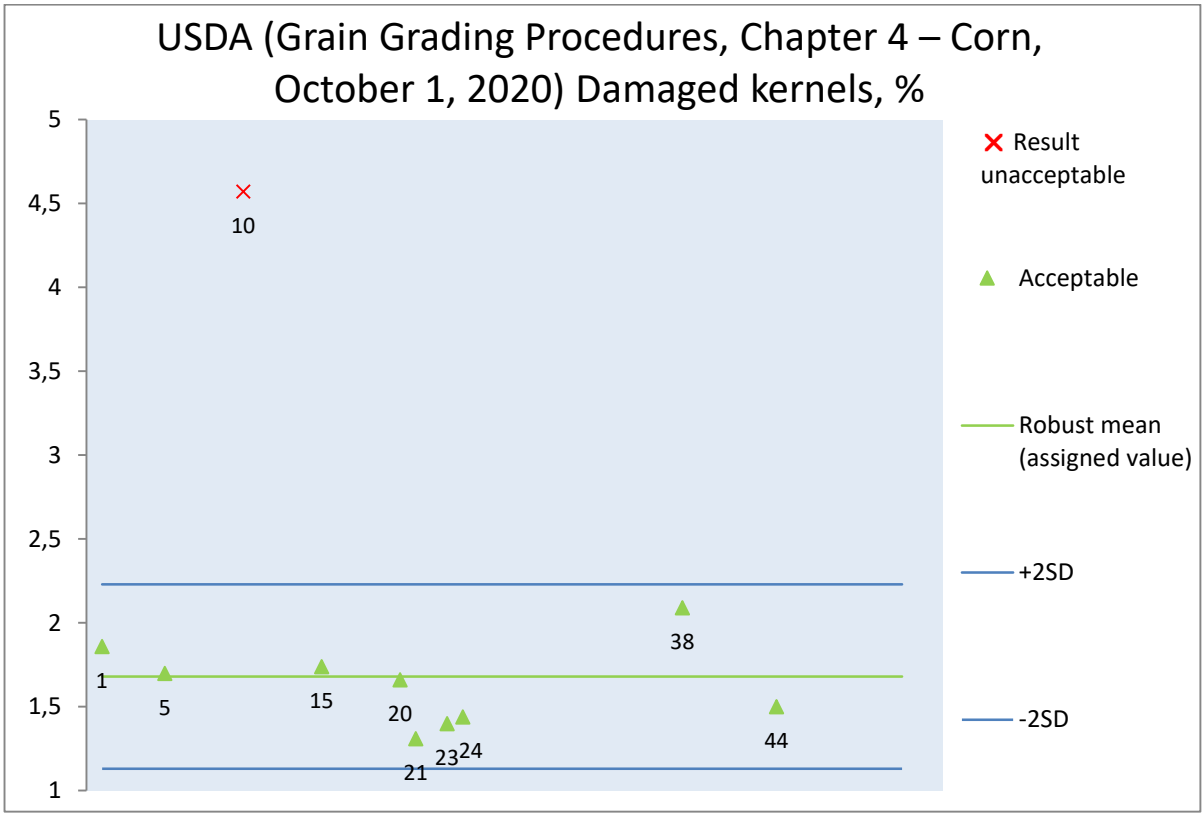


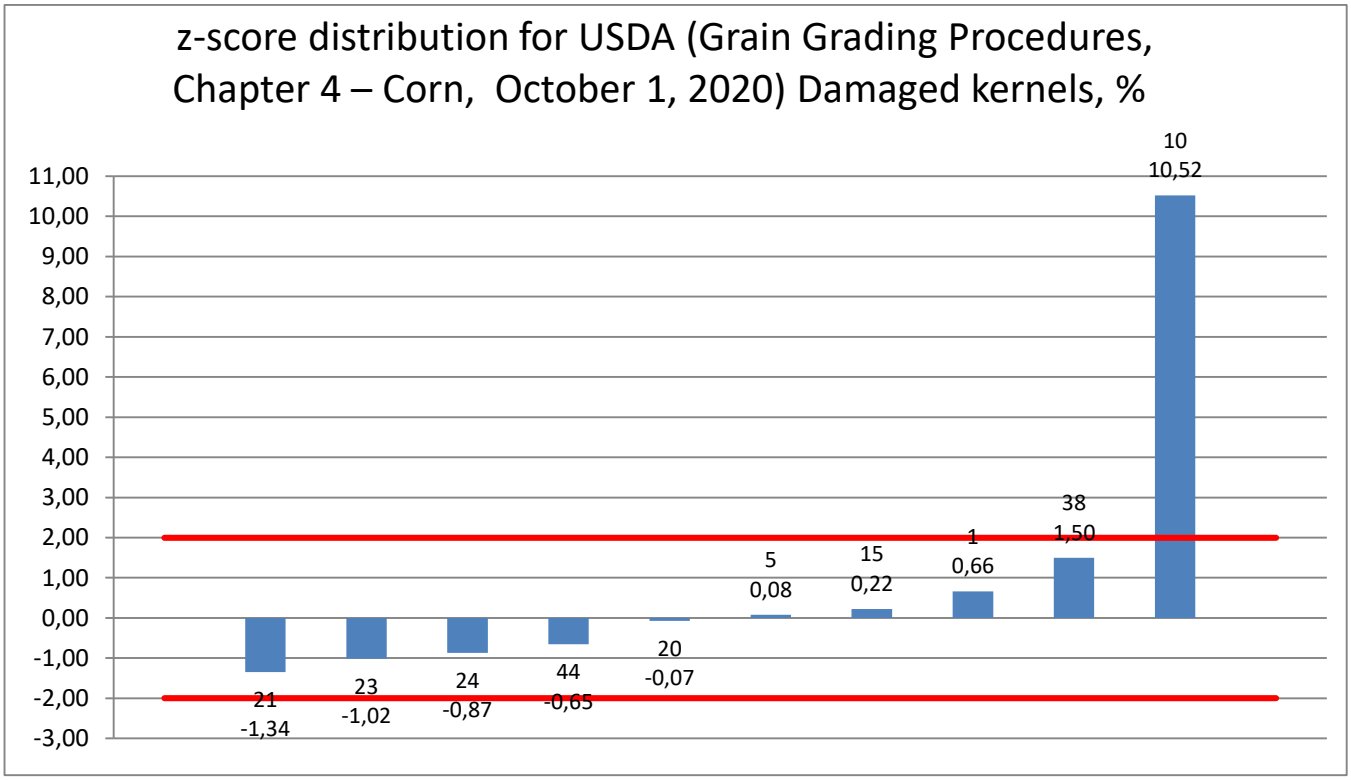
8.20. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Foreign Material, %



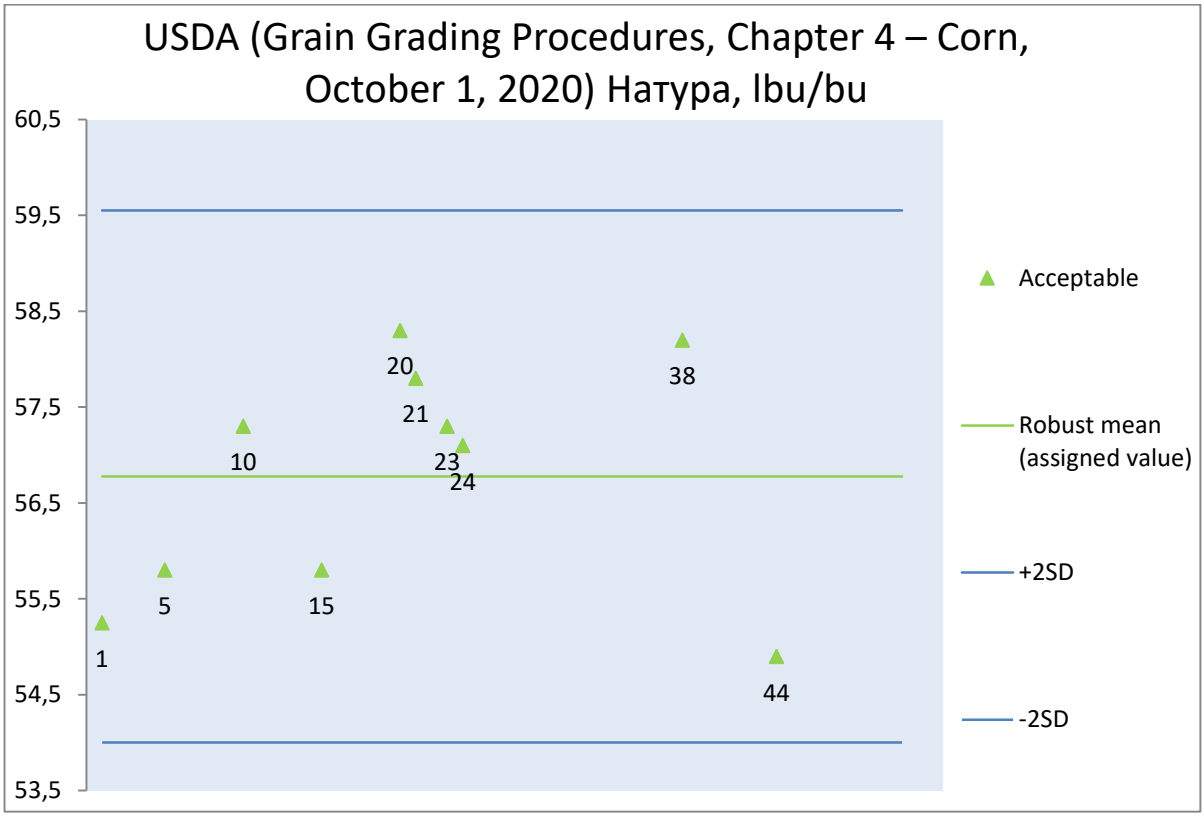


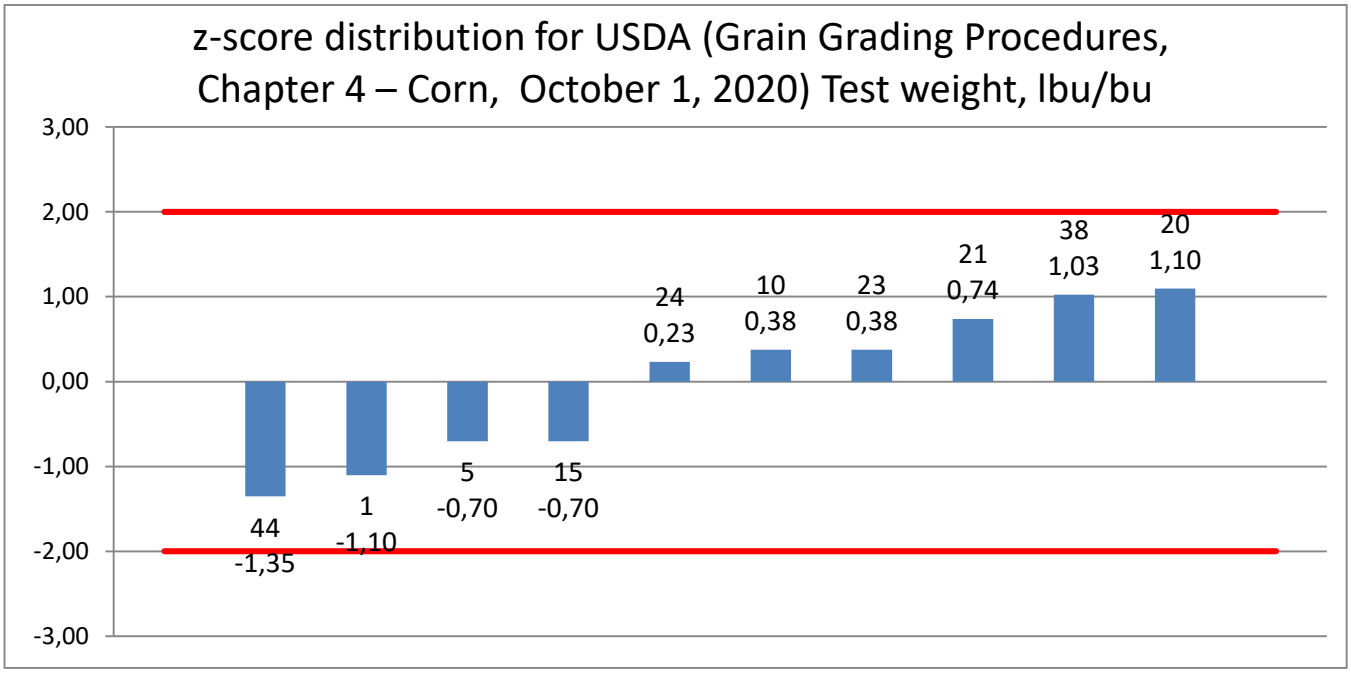
8.21. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Damaged kernels, %



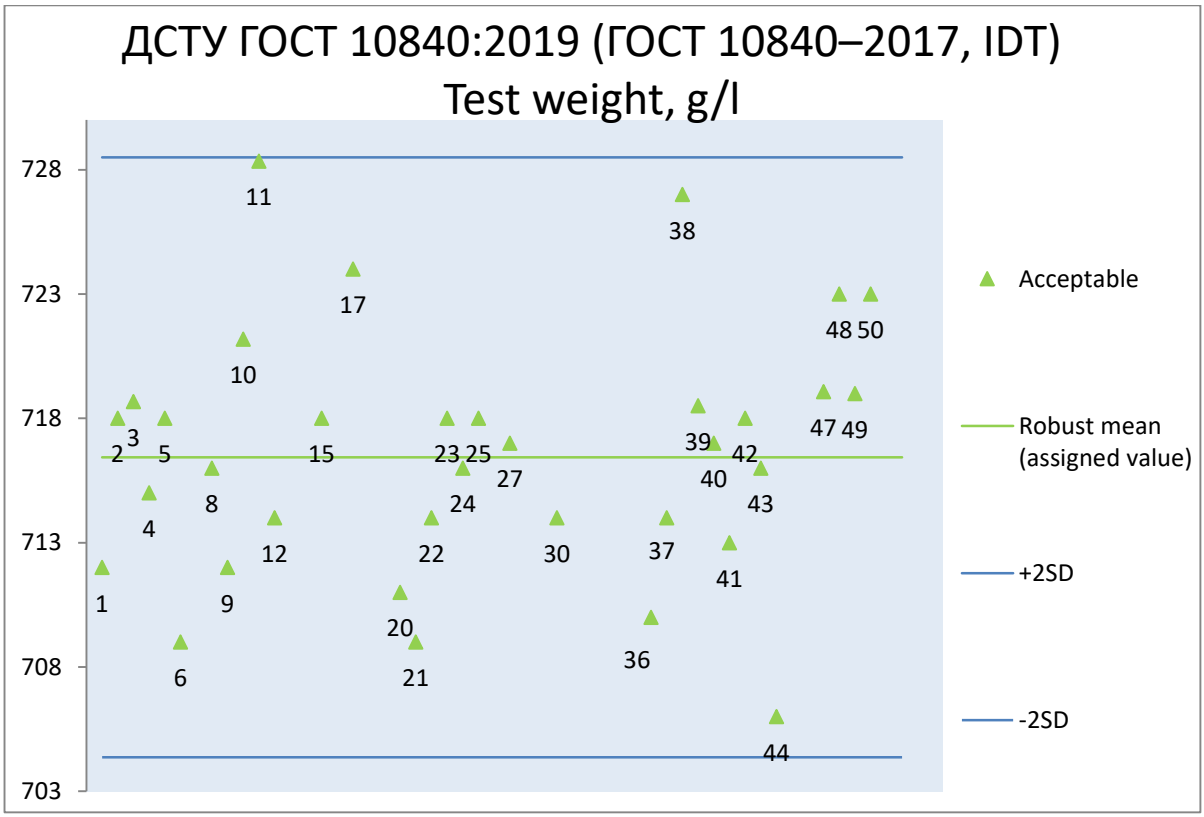


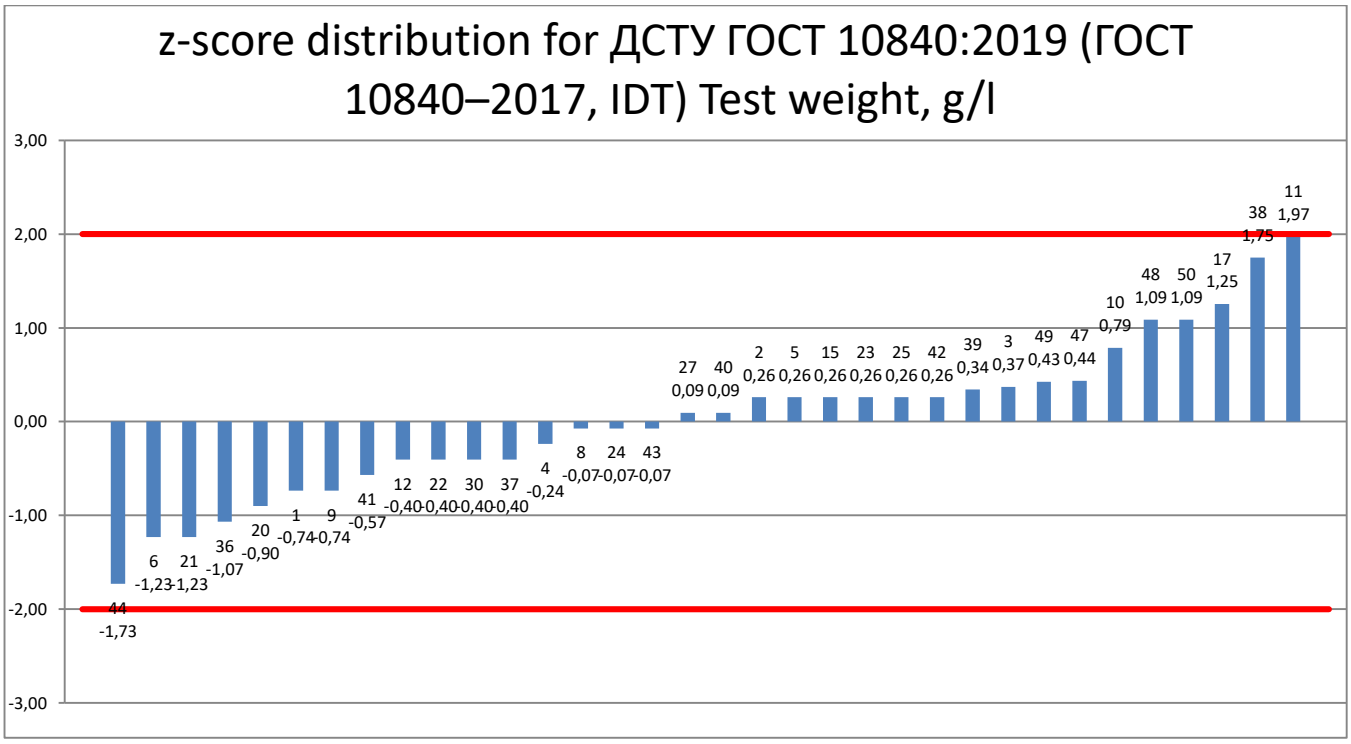
8.22. USDA (Grain Grading Procedures, Chapter 4 – Corn, October 1, 2020) Test weight, lbu/bu



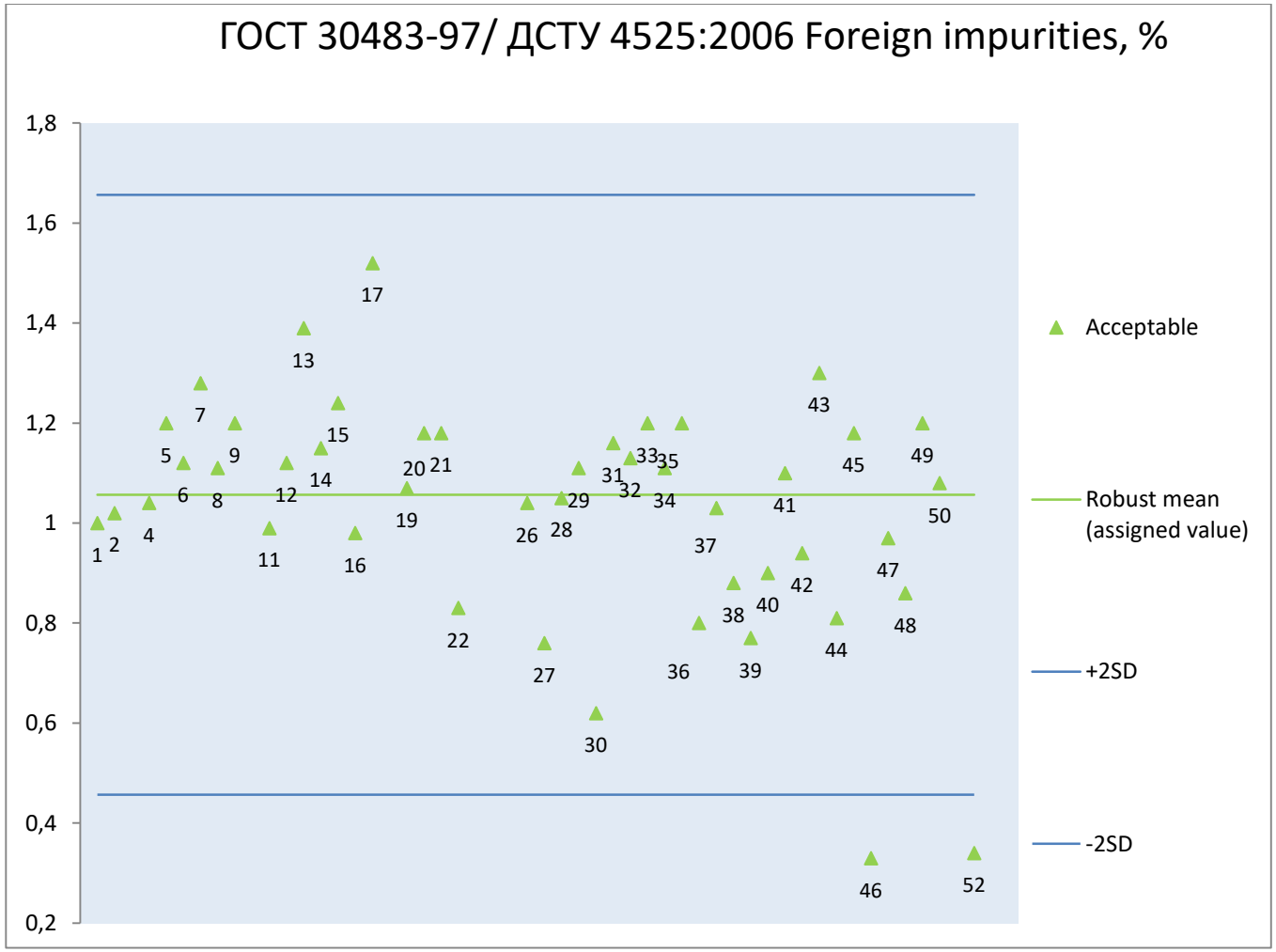


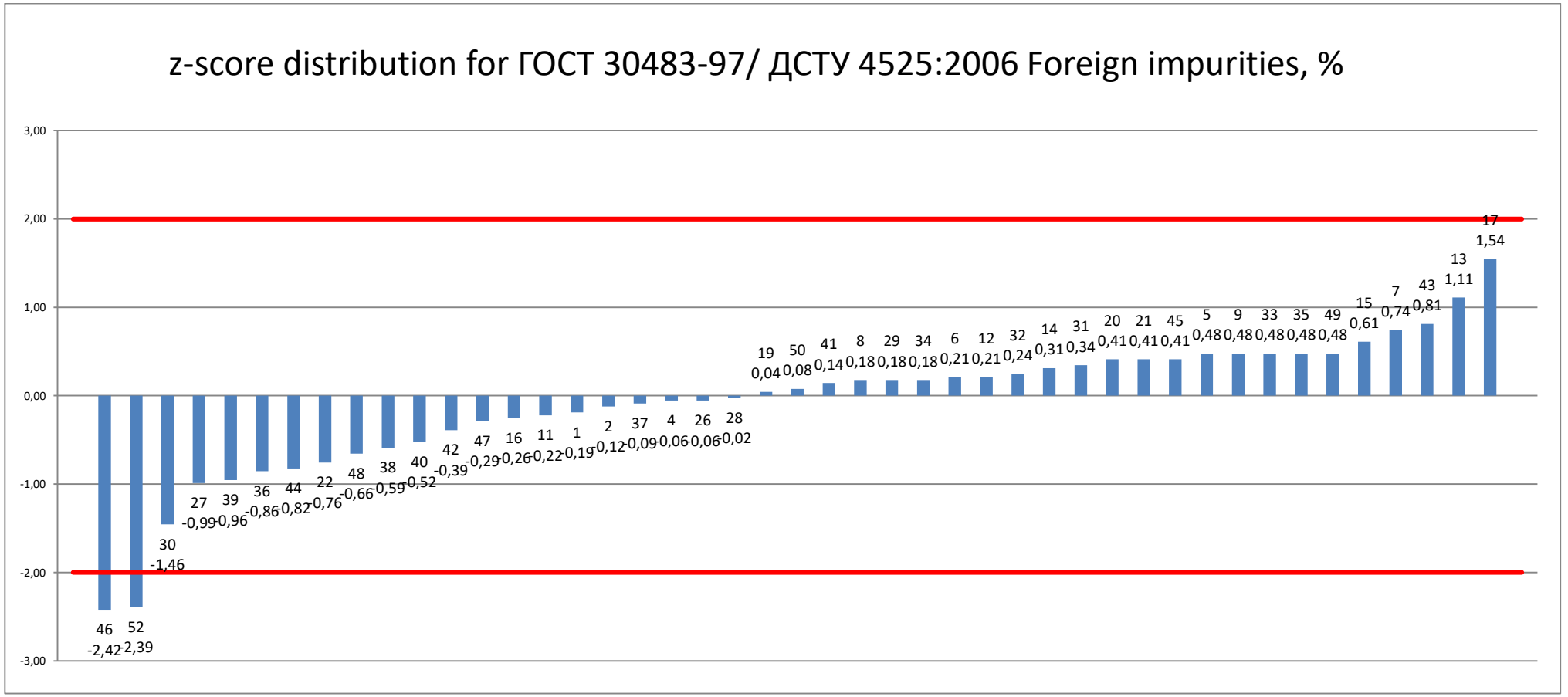
8.23. ДСТУ ГОСТ 10840:2019 (ГОСТ 10840–2017, IDT) Test weight, g/l



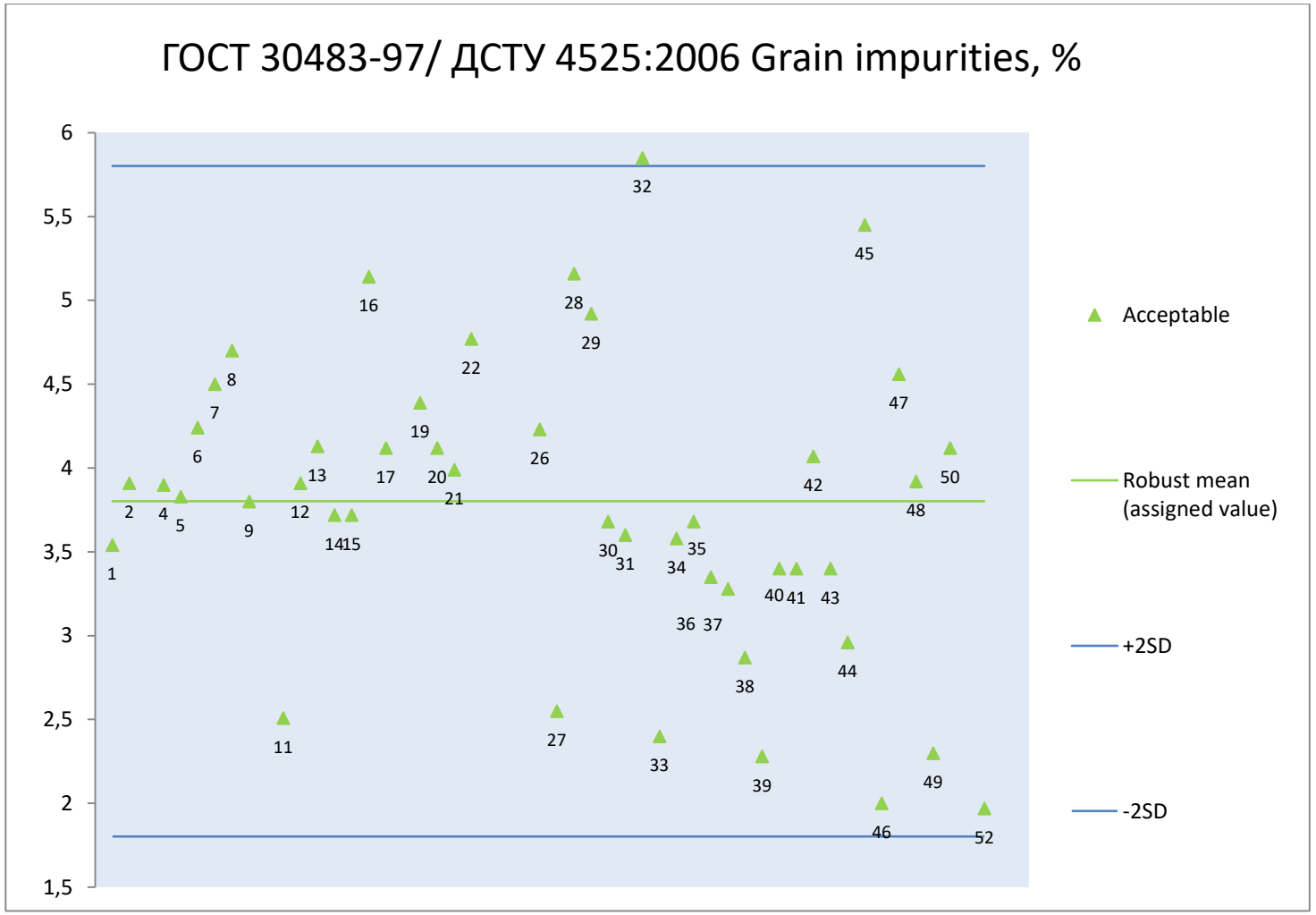


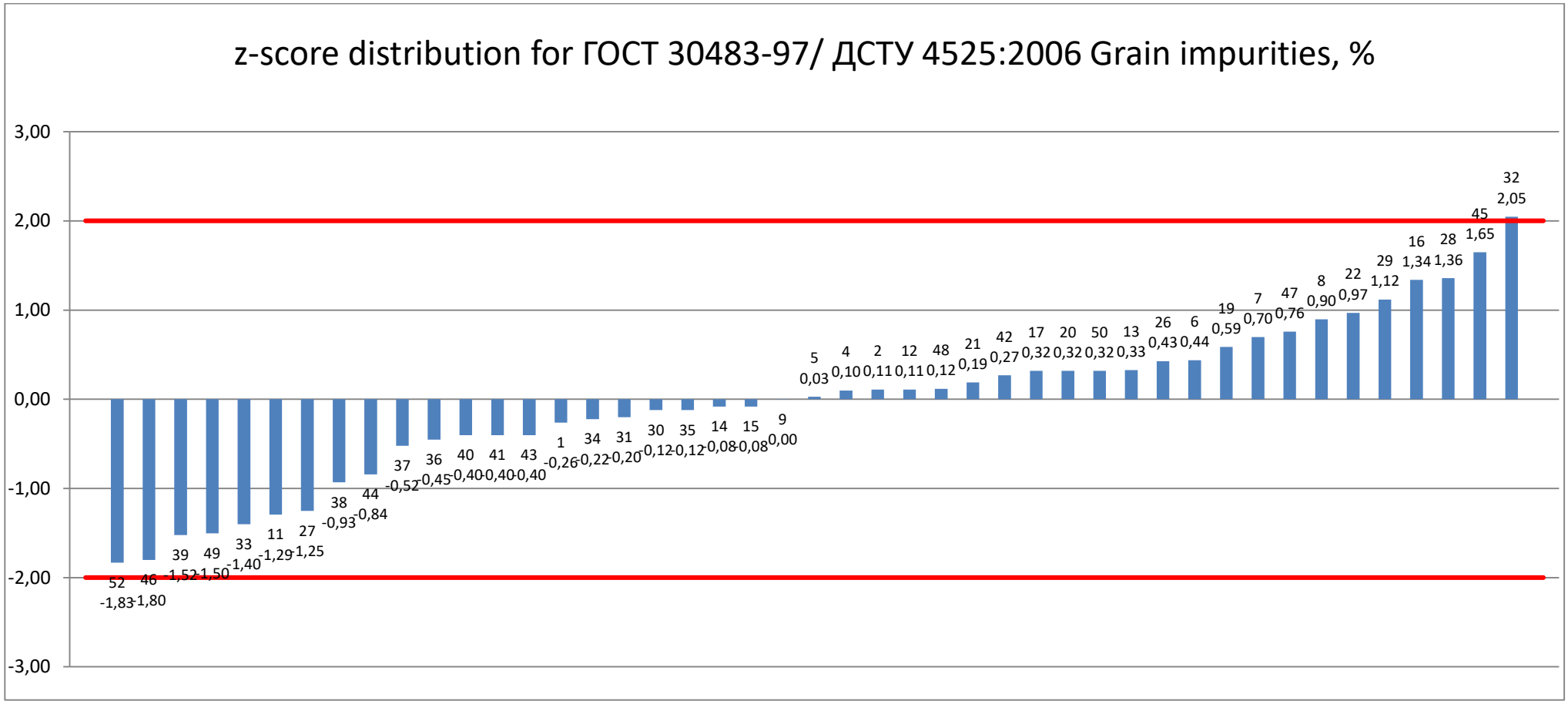
8.24. ГОСТ 30483-97/ ДСТУ 4525:2006 Foreign impurities, %



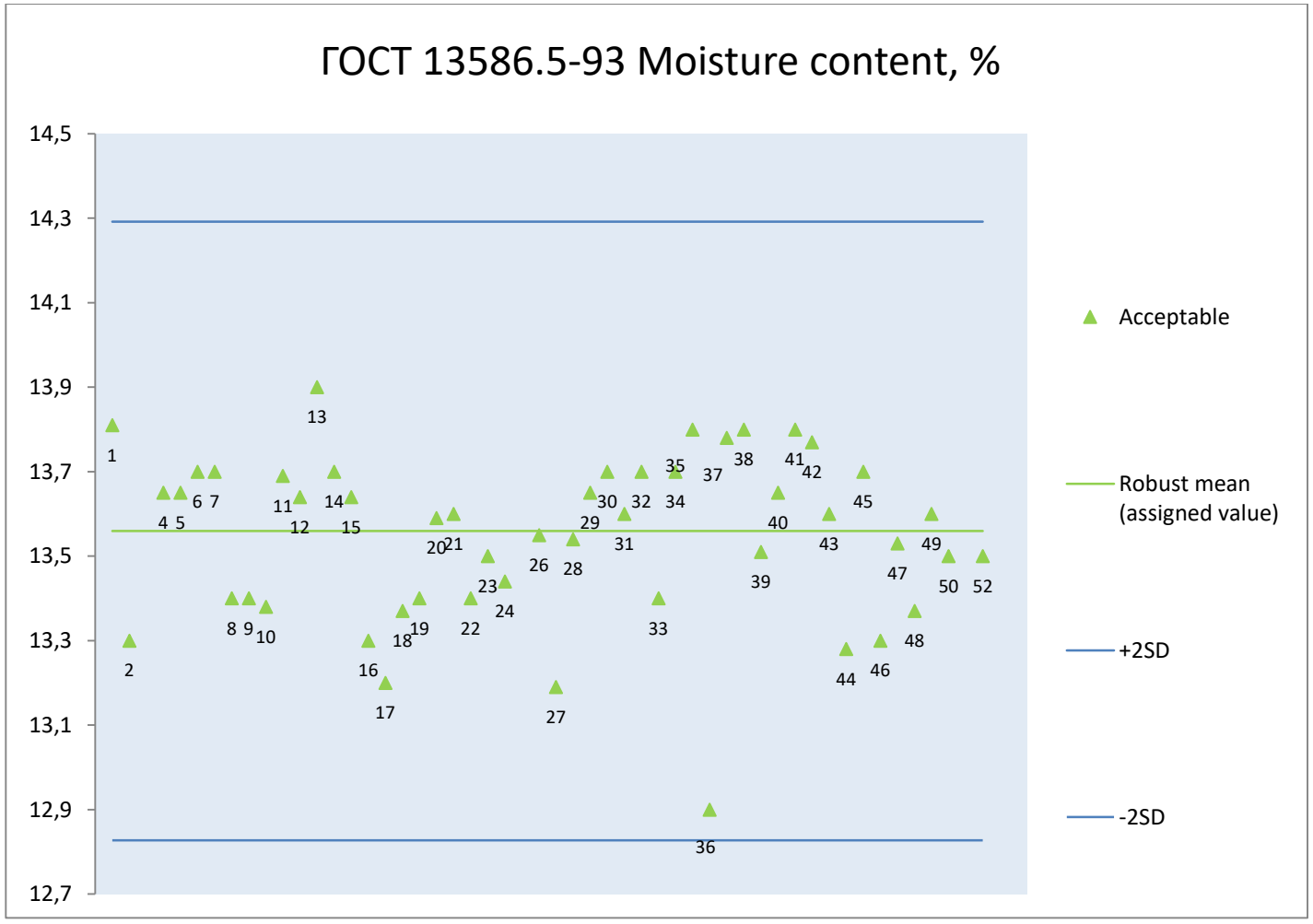

z-score distribution for ГОСТ 30483-97/ ДСТУ 4525:2006 Foreign impurities, %
3,00
2,00
1,00
0,00
-1,00
-2,00
-3,00
46 -2,42
52 -2,39
30 -1,46
27 -0,99
39 -0,96
36 -0,86
44 -0,82
22 -0,76
48 -0,66
38 -0,59
40 -0,52
42 -0,39
47 -0,29
16 -0,26
11 -0,22
1 -0,19
2 -0,12
37 -0,09
4 -0,06
26 -0,06
28 -0,02
19 0,04
50 0,08
41 0,14
8 0,18
29 0,18
34 0,18
6 0,21
12 0,21
32 0,24
14 0,31
31 0,34
20 0,41
21 0,41
45 0,41
5 0,48
9 0,48
33 0,48
35 0,48
49 0,48
15 0,61
7 0,74
43 0,81
13 1,11
17 1,54

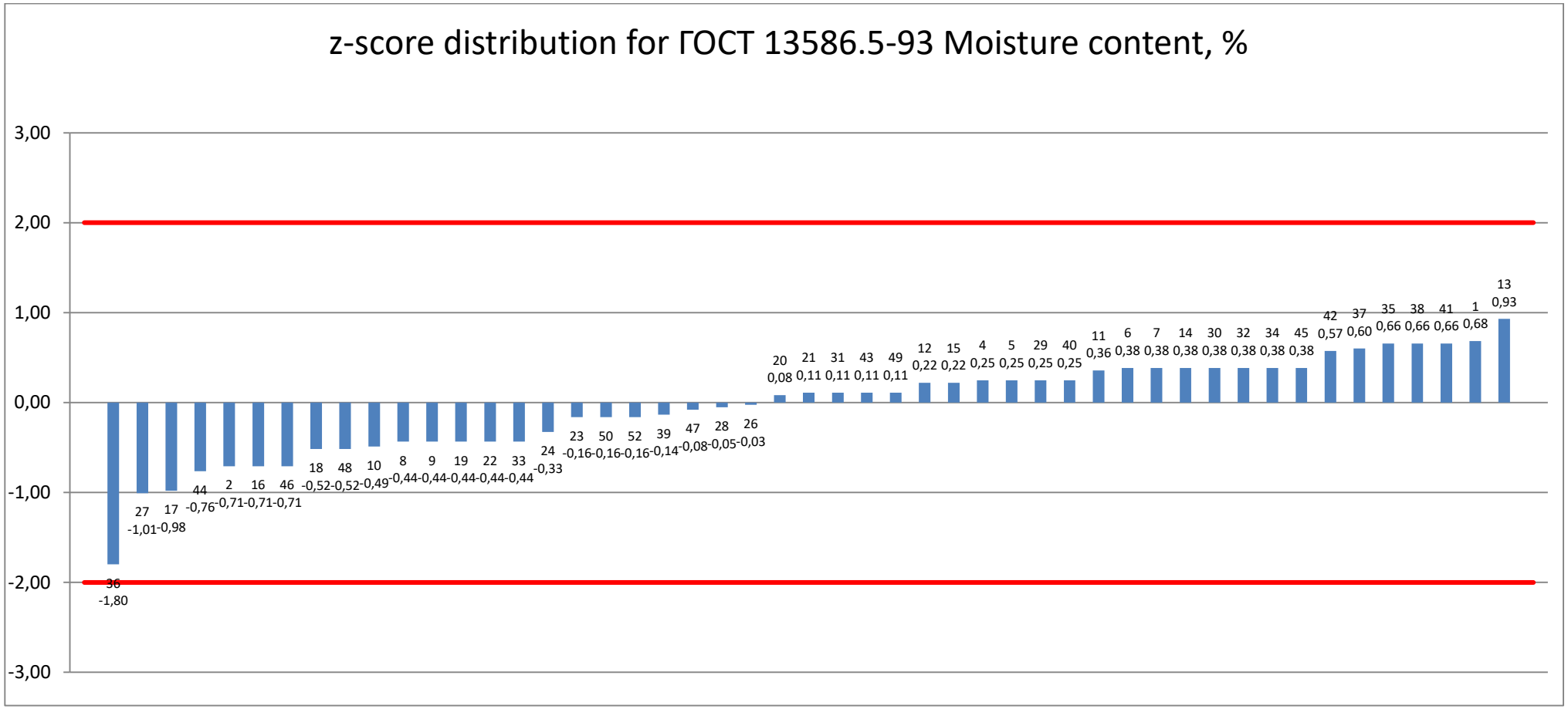
8.25. ГОСТ 30483-97/ ДСТУ 4525:2006 Grain impurities, %



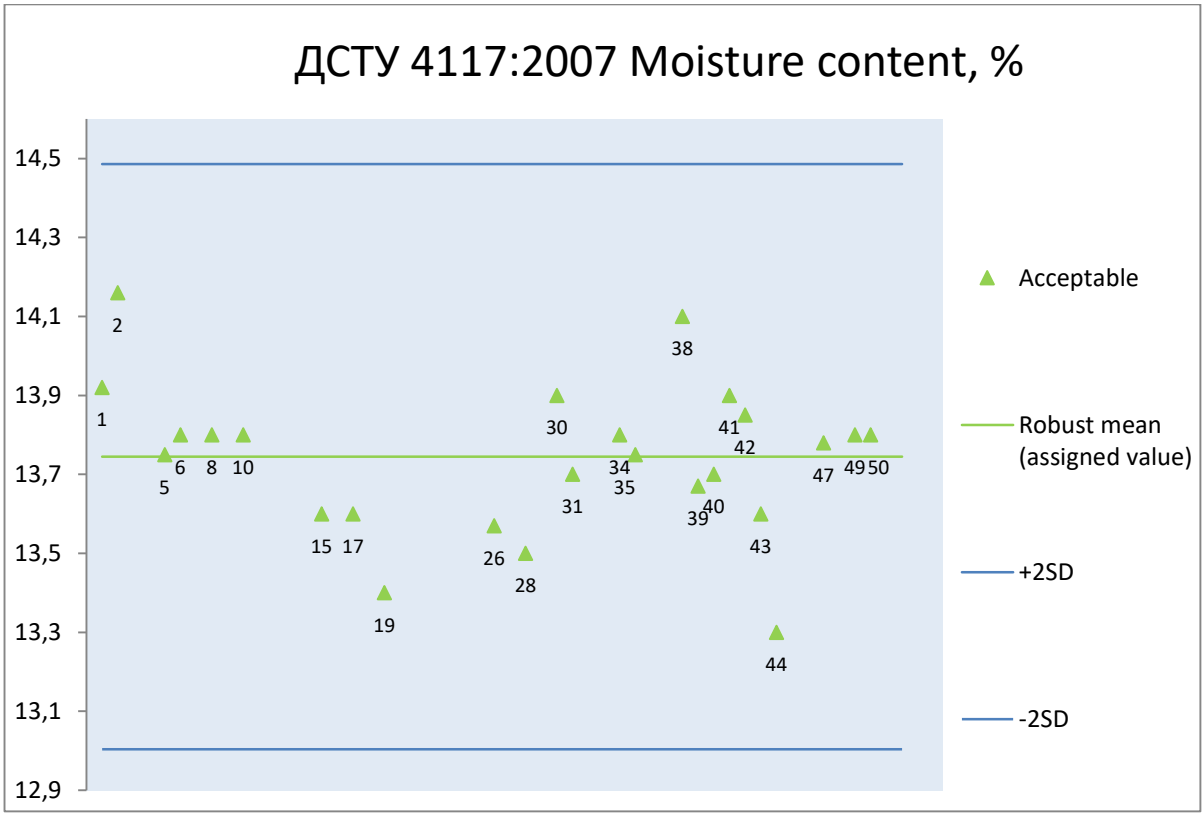

z-score distribution for ГОСТ 30483-97/ ДСТУ 4525:2006 Grain impurities, %
3,00
2,00
1,00
0,00
-1,00
-2,00
-3,00
52 -1,83
46 -1,80
39 -1,52
49 -1,50
33 -1,40
11 -1,29
27 -1,25
38 -0,93
44 -0,84
37 -0,52
36 -0,45
40 -0,40
41 -0,40
43 -0,40
1 -0,26
34 -0,22
31 -0,20
30 -0,12
35 -0,12
14 -0,08
15 -0,08
9 0,00
5 0,03
4 0,10
2 0,11
12 0,11
48 0,12
21 0,19
42 0,27
17 0,32
20 0,32
50 0,32
13 0,33
26 0,43
6 0,44
19 0,59
7 0,70
47 0,76
8 0,90
22 0,97
29 1,12
16 1,34
28 1,36
45 1,65
32 2,05

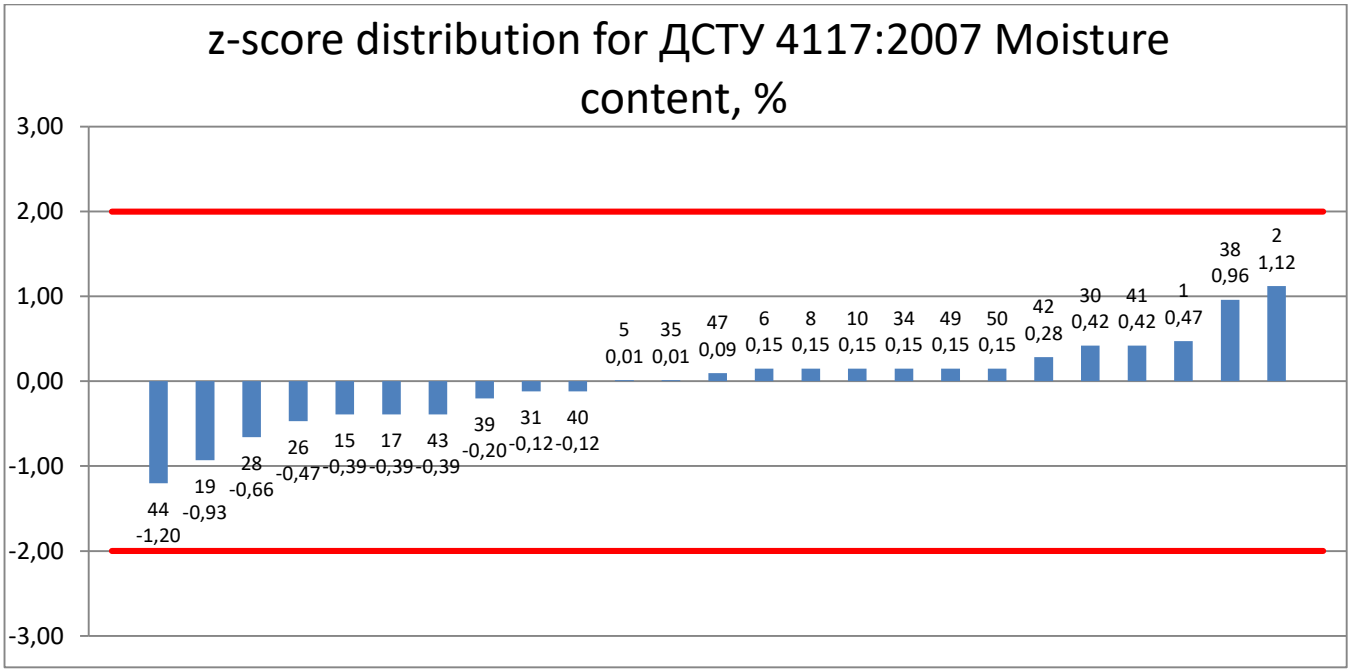
8.26. ГОСТ 13586.5-93 Moisture content, %



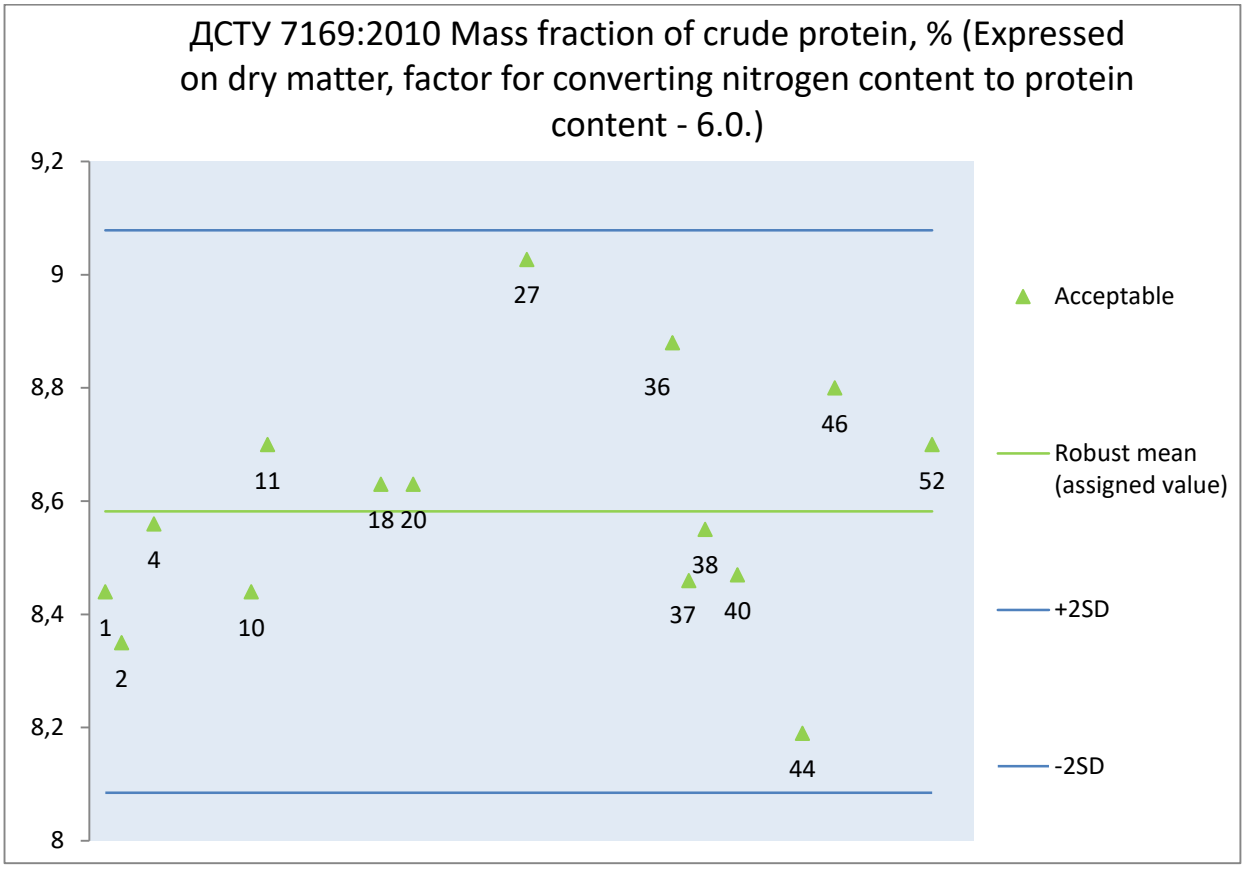

z-score distribution for ГОСТ 13586.5-93 Moisture content, %
3,00
2,00
1,00
0,00
-1,00
-2,00
-3,00
36 -1,80
27 -1,01
17 -0,98
44 -0,76
2 -0,71
16 -0,71
46 -0,71
18 -0,52
48 -0,52
10 -0,49
8 -0,44
9 -0,44
19 -0,44
22 -0,44
33 -0,44
24 -0,33
23 -0,16
50 -0,16
52 -0,16
39 -0,14
47 -0,08
28 -0,05
26 -0,03
20 0,08
21 0,11
31 0,11
43 0,11
49 0,11
12 0,22
15 0,22
4 0,25
5 0,25
29 0,25
40 0,25
11 0,36
6 0,38
7 0,38
14 0,38
30 0,38
32 0,38
34 0,38
45 0,38
42 0,57
37 0,60
35 0,66
38 0,66
41 0,66
1 0,68
13 0,93

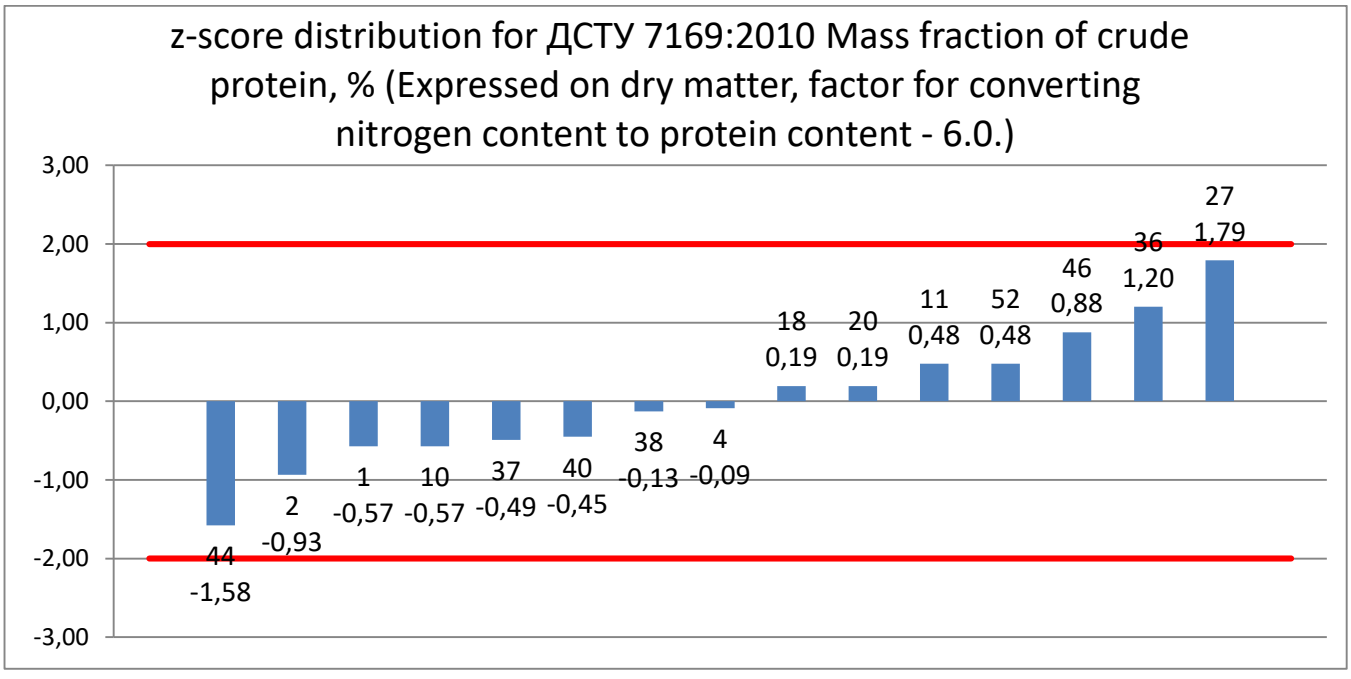
8.27. ДСТУ 4117:2007 Moisture content, %



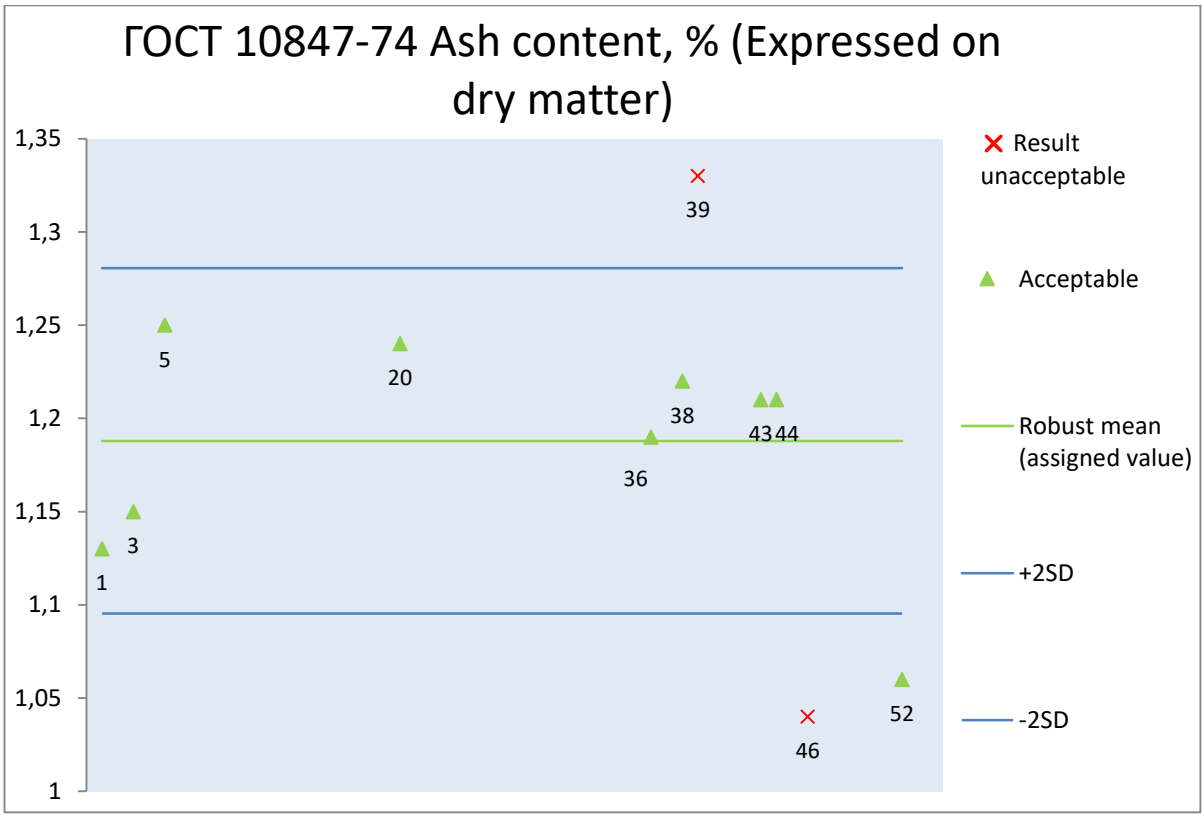


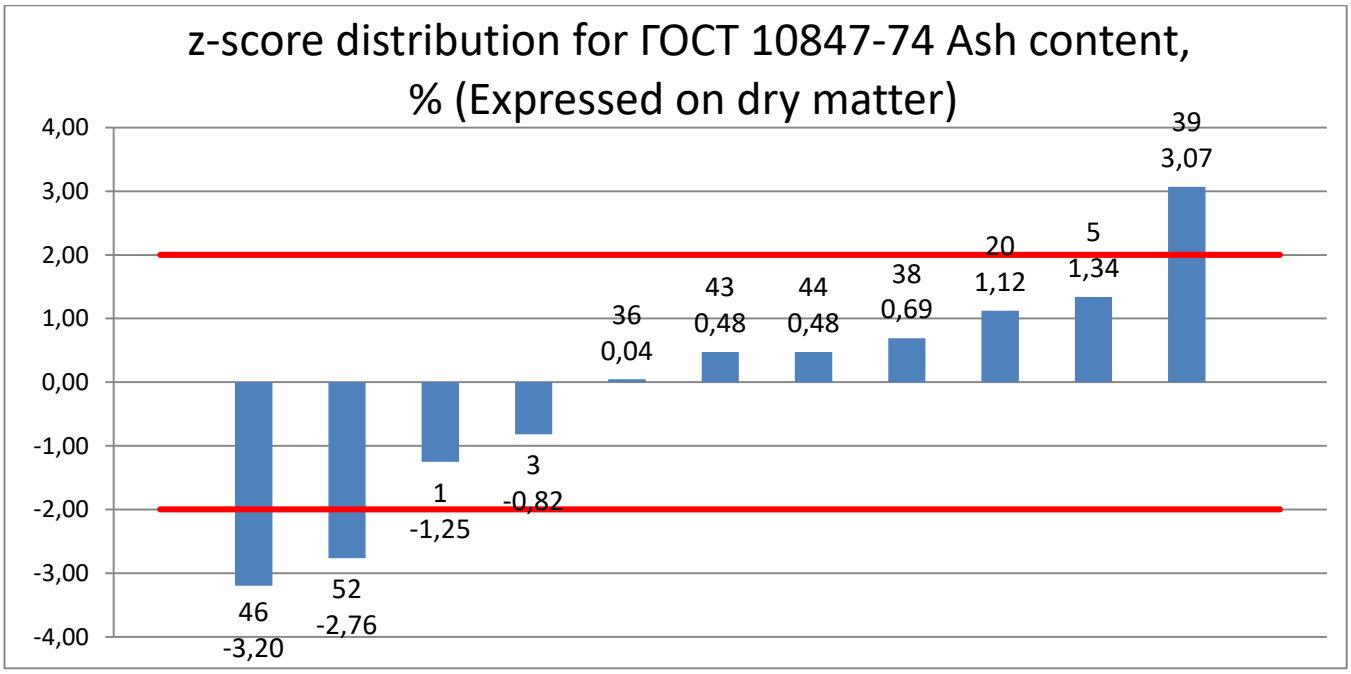
8.28. ДСТУ 7169:2010 Mass fraction of crude protein, % (Expressed on dry matter, factor for converting nitrogen content to protein content - 6.0.)



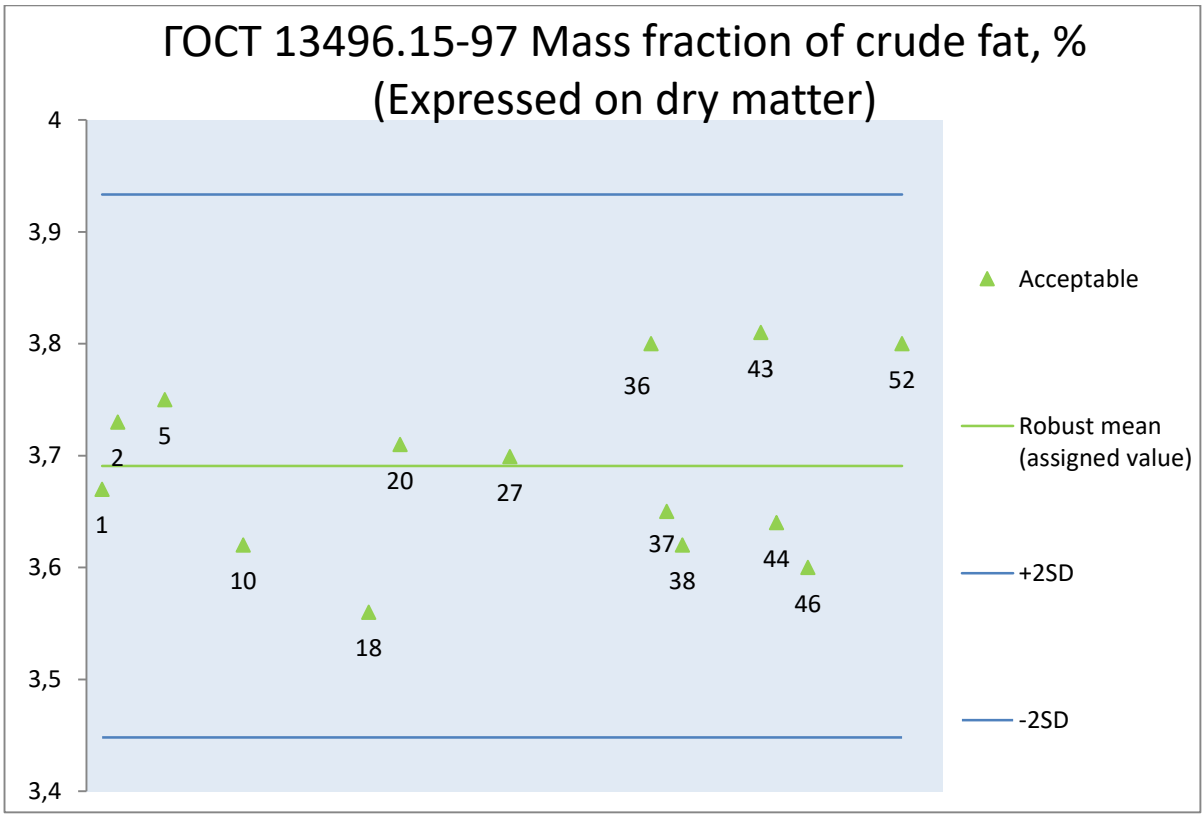


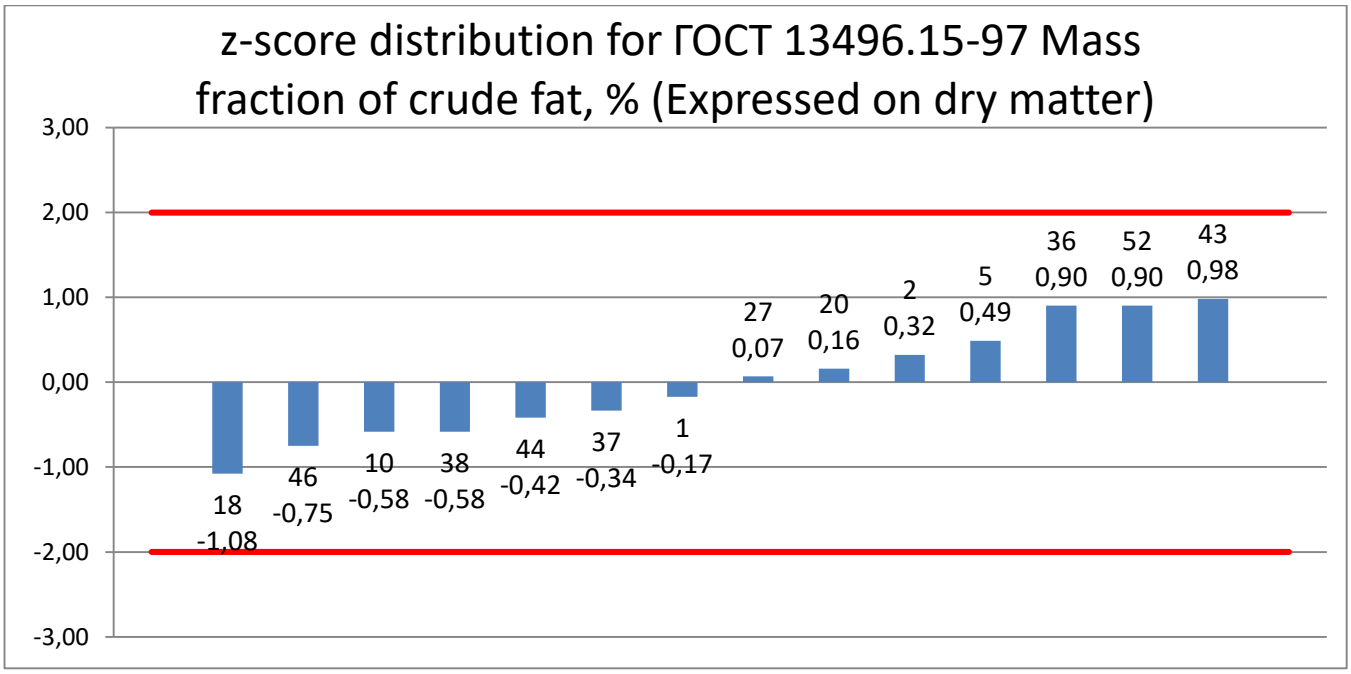
8.29. ГОСТ 10847-74 Ash content, % (Expressed on dry matter)



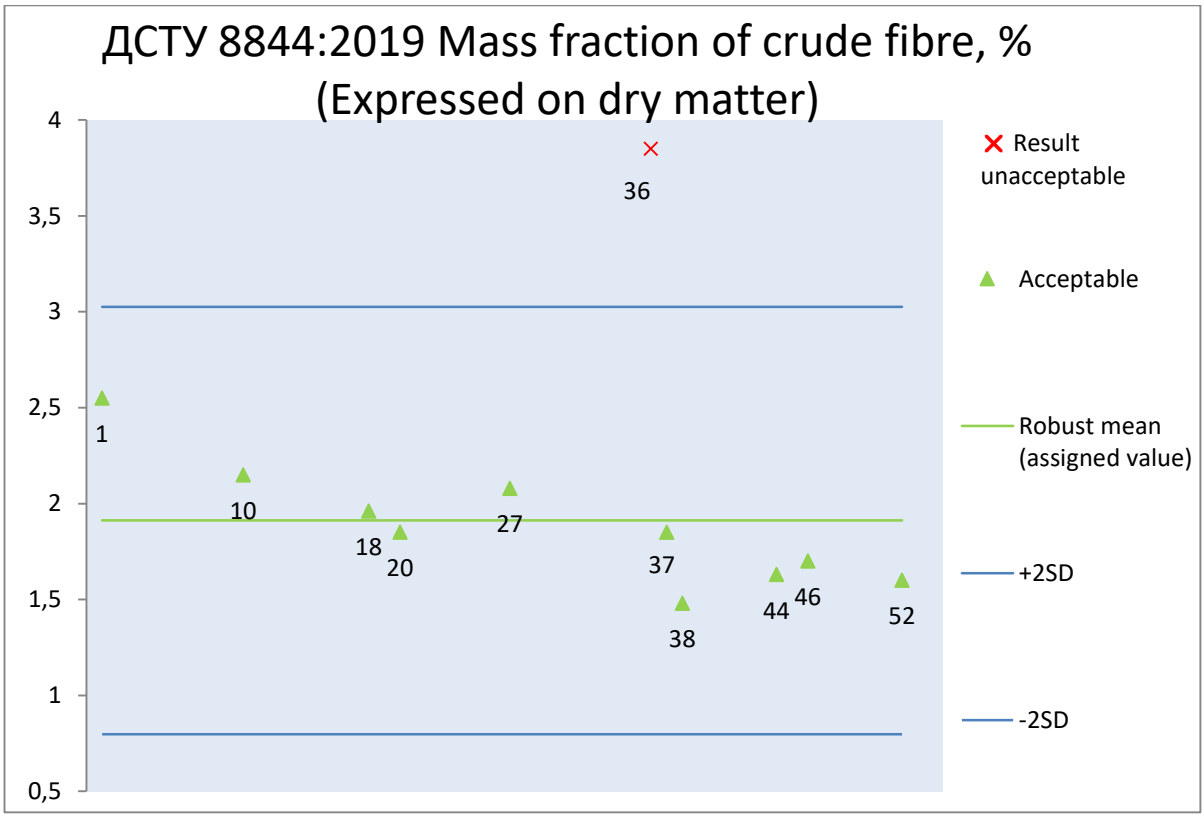


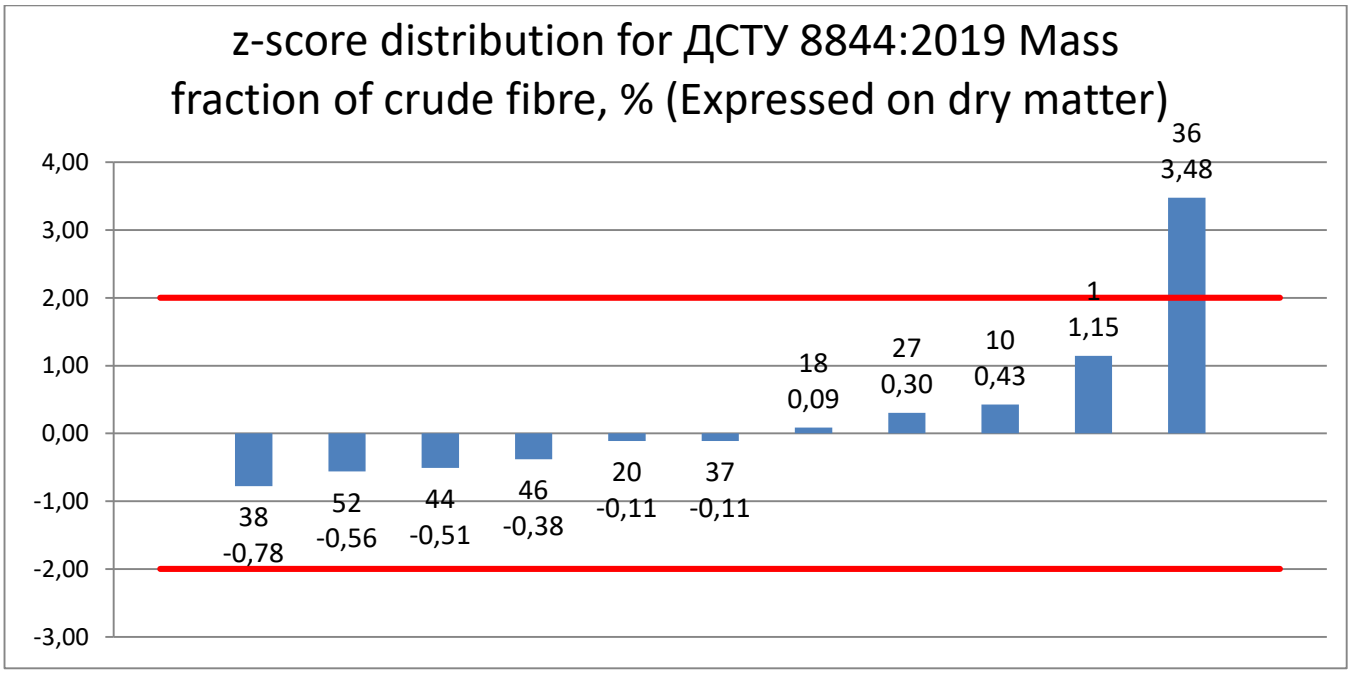
8.30. ГОСТ 13496.15-97 Mass fraction of crude fat, % (Expressed on dry matter)





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





9. NORMATIVE REFERENCE

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3. FOOD ANALYSIS PERFORMANCE ASSESSMENT SCHEME (FAPAS). Protocol for the organization and analysis of data, sixth edition, 2002.
4. Fearn, T. and Thompson, M, A new test for 'sufficient homogeneity', Analyst, 2001, 126, 1414-1417.
5. ISO 13528:2015 Statistical methods for use in proficiency testing by interlaboratory comparisons.
6. ISO Guide 35:2017 Reference materials – Guidance for characterization and assessment of homogeneity and stability.
7. ILAC Discussion Paper on Homogeneity and Stability Testing, April 2008.