

**AOF Test Check program**

**Test Report**

**Round 2 2023.**

## Summary

1. The test materials for the AOF test check program Round 2 2023 were dispatched in May 2023. Each participant received two canola seed test samples to be analysed for a selection of parameters.
2. An assigned value was determined for each analyte and in conjunction with the standard deviation was used to calculate the z-score for each result.
3. Results for this proficiency test are summarised as follows:

**Table 1** Sample 3 - Assigned values and standard deviation

Analyte	Assigned value	Standard deviation	units	No. of participating laboratories
Test weight	65.30	0.44	(kg/hL)	14
Impurities	1.39	0.46	%	14
Oil NIR	45.01	0.35	% by weight	15
Oil solvent	44.95	1.77	% by weight	7
Moisture NIR	5.98	0.13	% by weight	15
Moisture oven	5.92	0.20	% by weight	11
Oleic acid	59.12	1.22	% total fatty acids	6
Linoleic acid	19.85	0.30	% total fatty acids	6
Linolenic acid	11.29	0.39	% total fatty acids	6
Free fatty acid	0.29	0.14	% (as oleic acid)	7

**Table 2** Sample 4 - Assigned values and standard deviation

Analyte	Assigned value	Standard deviation	units	No. of participating laboratories
Test weight	65.34	0.63	(kg/hL)	14
Impurities	1.68	0.21	%	14
Oil NIR	44.17	0.46	% by weight	15
Oil solvent	44.07	0.91	% by weight	7
Moisture NIR	5.78	0.27	% by weight	15
Moisture oven	5.78	0.28	% by weight	11
Oleic acid	58.77	1.34	% total fatty acids	6
Linoleic acid	19.83	1.57	% total fatty acids	6
Linolenic acid	11.21	0.23	% total fatty acids	6
Free fatty acid	0.29	0.15	% (as oleic acid)	7

## 1. Test Material

Preparations for this test check program were sub-contracted to organisations for sample packing and distribution as well as data analysis and reporting.

## 2. Statistical evaluation of results

The results submitted by participants were statistically analysed in order to provide an assigned value for each analyte. The assigned values were then used in combination with the standard deviation to calculate a Z-score for each result.

Raw data was analysed using Grubbs' test to determine any outliers. Outliers (Z-score >2) were removed and the remaining samples were used to calculate the assigned value (mean) and standard deviation results.

Participants Z-scores were calculated as:

$$Z = \frac{(\textit{participants result} - \textit{assigned value})}{\textit{standard deviation}}$$

### 3. Results and Z-scores

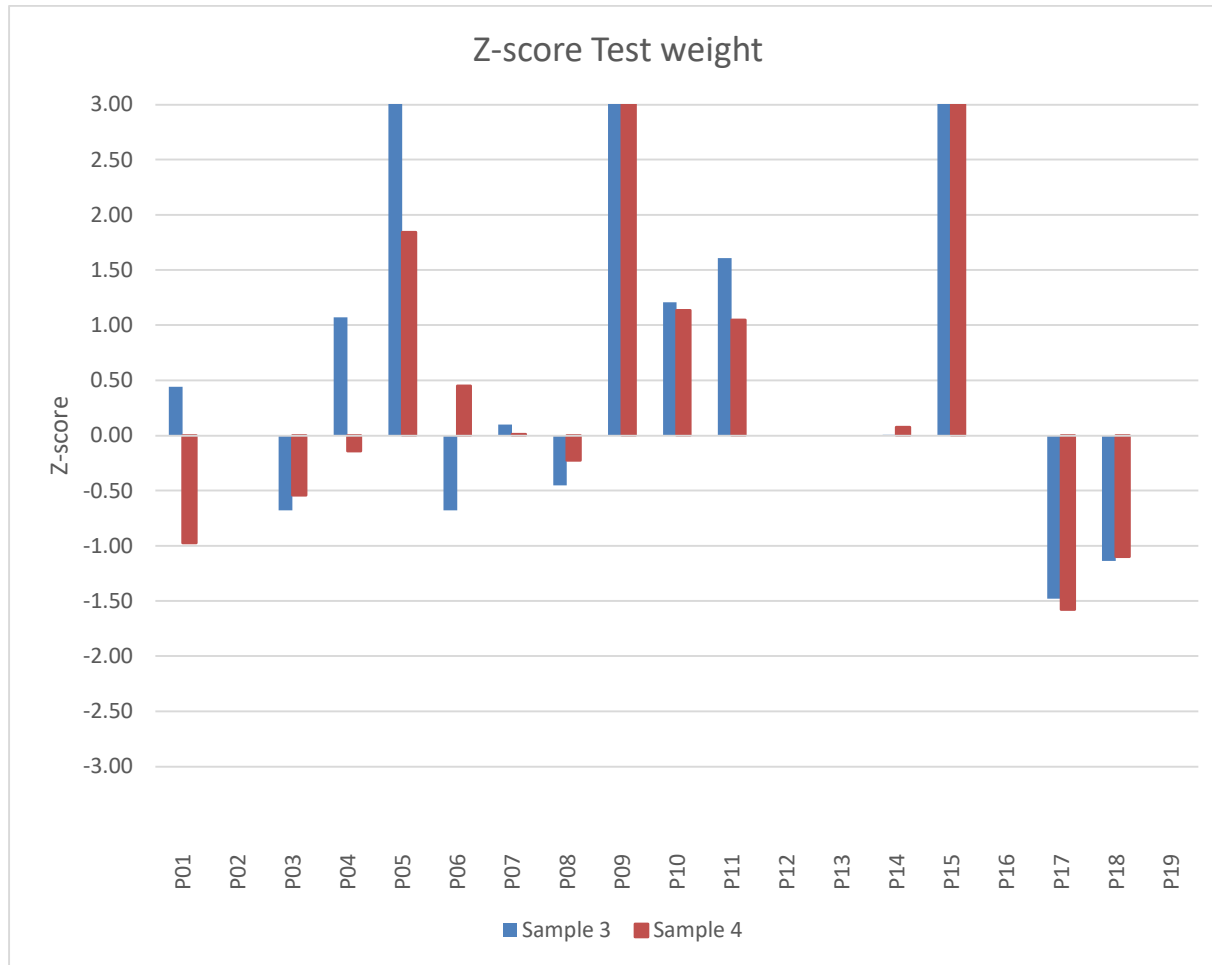
**Table 3** Results and Z-scores for test weight.

Test weight (kg/hL)				
Lab number	Sample 3		Sample 4	
	Result	Z-score	Result	Z-score
P01	65.49	0.44	64.73	-0.97
P02				
P03	65.00	-0.68	65.00	-0.54
P04	65.77	1.07	65.25	-0.14
P05	67.25	4.47	66.50	1.84
P06	65.00	-0.68	65.63	0.45
P07	65.34	0.10	65.35	0.01
P08	65.10	-0.45	65.20	-0.23
P09	69.67	10.00	68.27	4.66
P10	65.83	1.21	66.06	1.13
P11	66.00	1.61	66.00	1.05
P12				
P13				
P14	65.30	0.01	65.39	0.08
P15	66.80	3.44	67.92	4.10
P16				
P17	64.65	-1.48	64.35	-1.58
P18	64.80	-1.14	64.65	-1.10
P19				
<b>Assigned value</b>	65.30		65.34	
<b>Standard Deviation</b>	0.44		0.63	
<b>Count</b>	14		14	

**Note** - Laboratory number P05, P09 and P15 Sample 3 were removed from assigned value calculations as the results were outliers.

**Note** - Laboratory number P09 and P15 Sample 4 were removed from assigned value calculations as the results were outliers.

Figure 1 Z-scores for test weight.

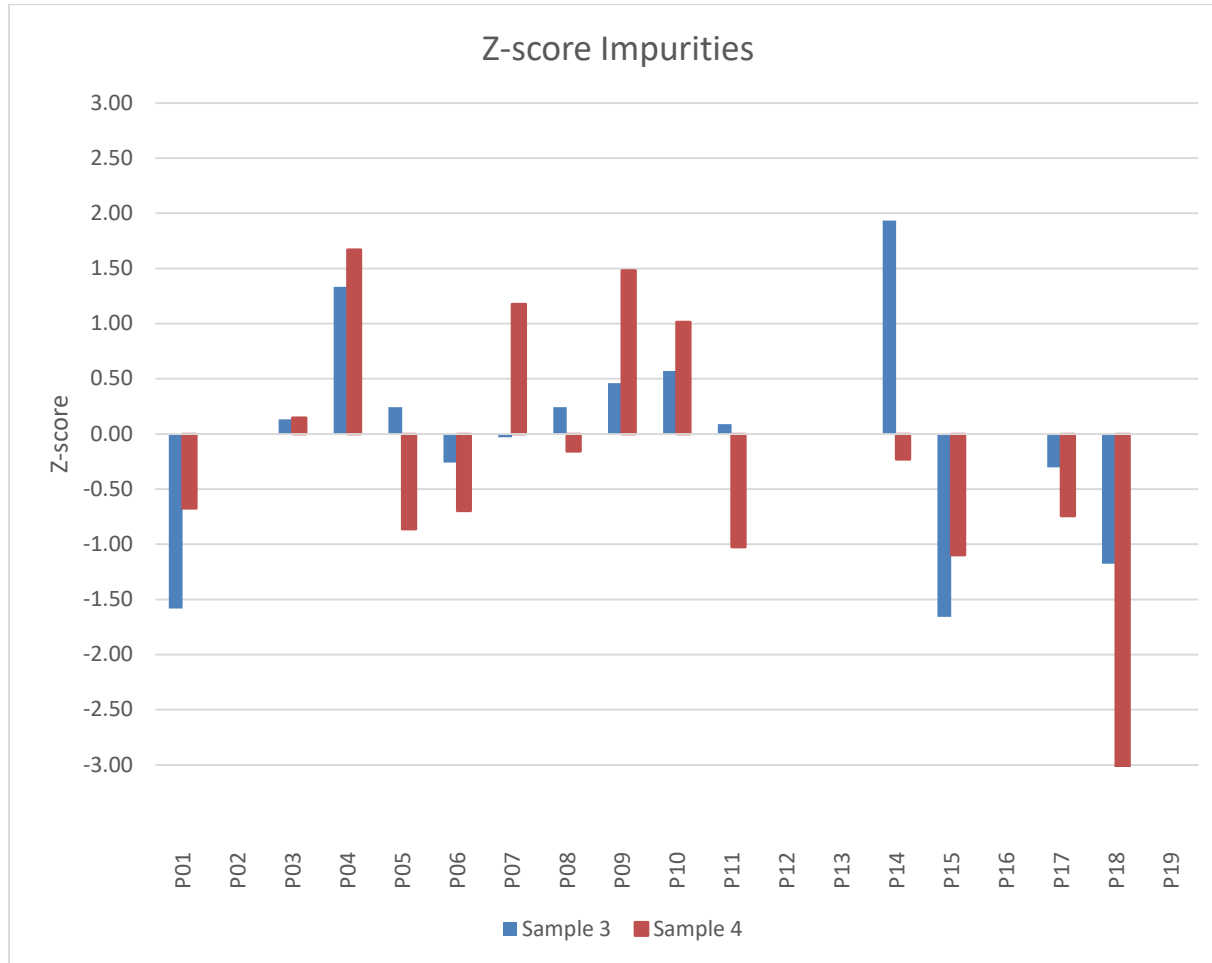


**Table 4** Results and Z-scores for impurities.

<b>Impurities (%)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	0.67	-1.58	1.54	-0.67
P02				
P03	1.45	0.13	1.72	0.15
P04	2.00	1.33	2.04	1.67
P05	1.50	0.24	1.50	-0.86
P06	1.27	-0.26	1.54	-0.70
P07	1.38	-0.03	1.94	1.18
P08	1.50	0.24	1.65	-0.16
P09	1.60	0.46	2.00	1.48
P10	1.65	0.57	1.90	1.01
P11	1.43	0.09	1.47	-1.03
P12				
P13				
P14	2.28	1.94	1.64	-0.23
P15	0.63	-1.66	1.45	-1.10
P16				
P17	1.25	-0.30	1.53	-0.74
P18	0.85	-1.18	0.65	-4.85
P19				
<b>Assigned value</b>	1.39		1.68	
<b>Standard Deviation</b>	0.46		0.21	
<b>Count</b>	14		14	

**Note** - Laboratory number P18 Sample 4 was removed from assigned value calculation as the result was an outlier.

Figure 2 Z-scores for impurities.



**Table 5** Results and Z-scores for oil content (NIR).

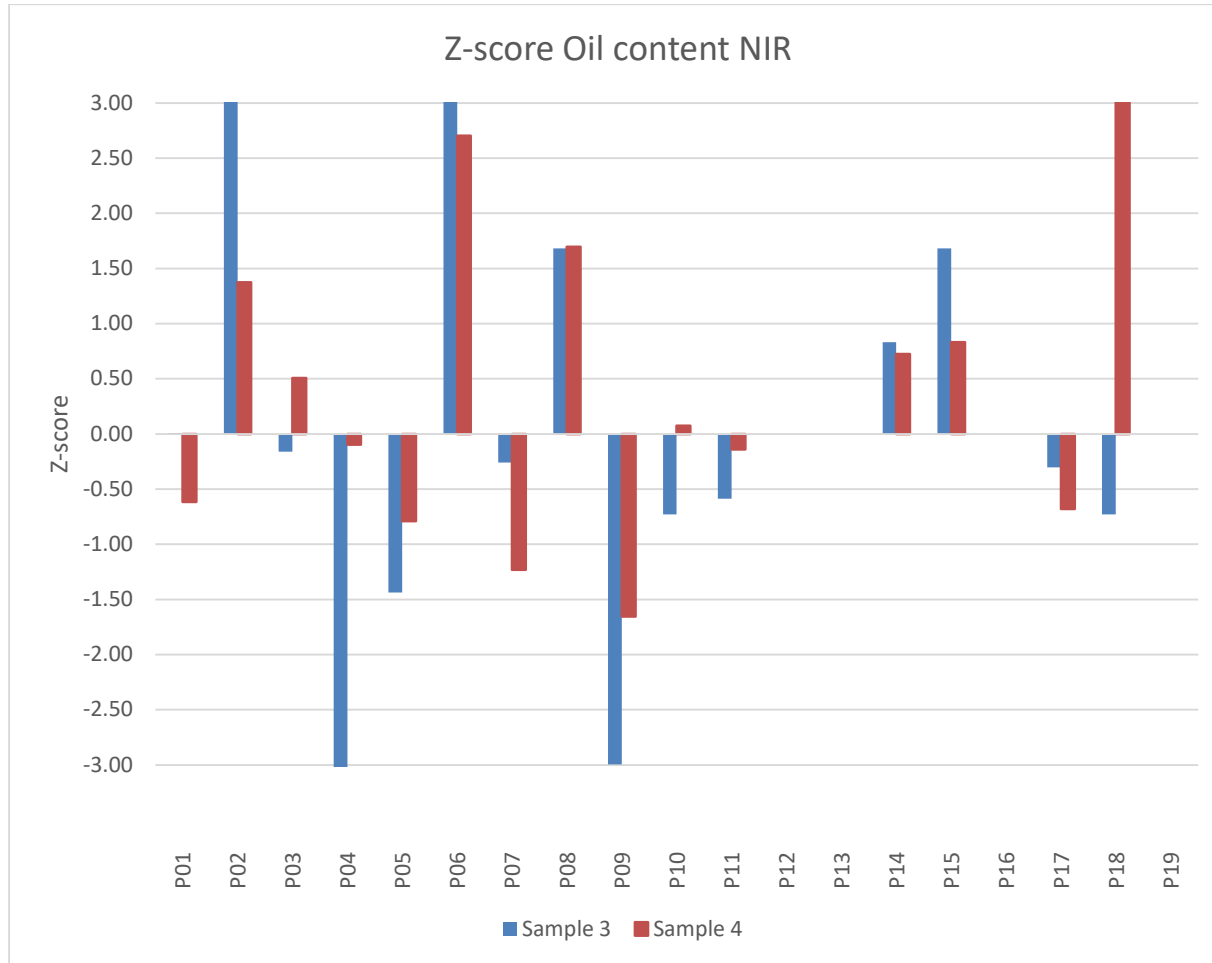
Oil content NIR (%)				
Lab number	Sample 3		Sample 4	
	Result	Z-score	Result	Z-score
P01	45.01	0.01	43.88	-0.62
P02	46.35	3.81	44.80	1.37
P03	44.95	-0.16	44.40	0.51
P04	43.24	-5.01	44.12	-0.10
P05	44.50	-1.44	43.80	-0.79
P06	46.82	5.14	45.42	2.70
P07	44.92	-0.26	43.60	-1.23
P08	45.60	1.68	44.95	1.70
P09	43.95	-3.00	43.40	-1.65
P10	44.75	-0.73	44.20	0.08
P11	44.80	-0.59	44.10	-0.14
P12				
P13				
P14	45.30	0.83	44.50	0.72
P15	45.60	1.68	44.55	0.83
P16				
P17	44.90	-0.30	43.85	-0.68
P18	44.75	-0.73	45.80	3.54
P19				
<b>Assigned value</b>	45.01		44.17	
<b>Standard Deviation</b>	0.35		0.46	
<b>Count</b>	15		15	

**Note** - Laboratory number P02, P04, P06 and P09 Sample 3 were removed from assigned value calculation as the results were outliers.

**Note** - Laboratory number P06 and P18 Sample 4 were removed from assigned value calculation as the results were outliers.



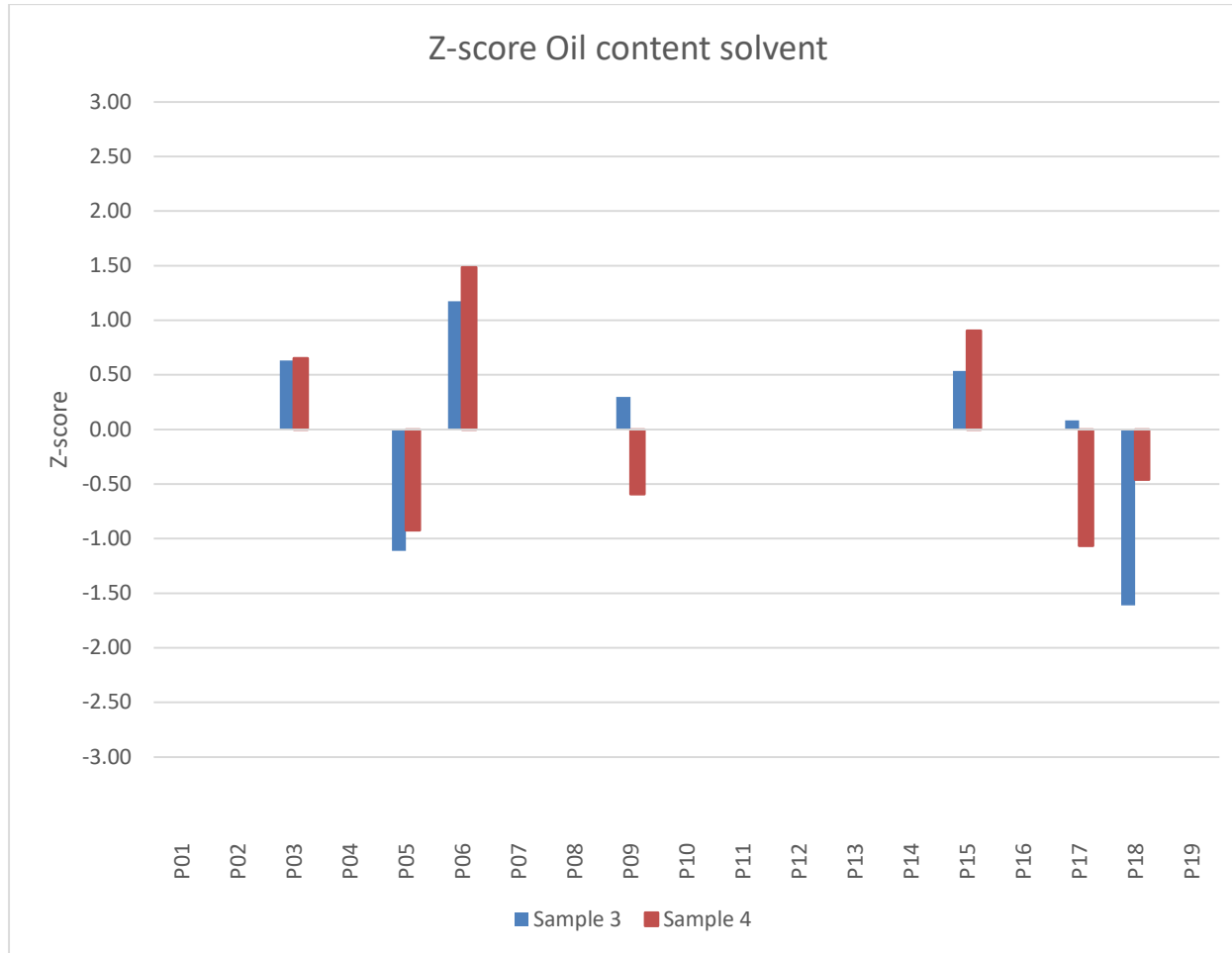
**Figure 3** Z-scores for oil content by NIR.



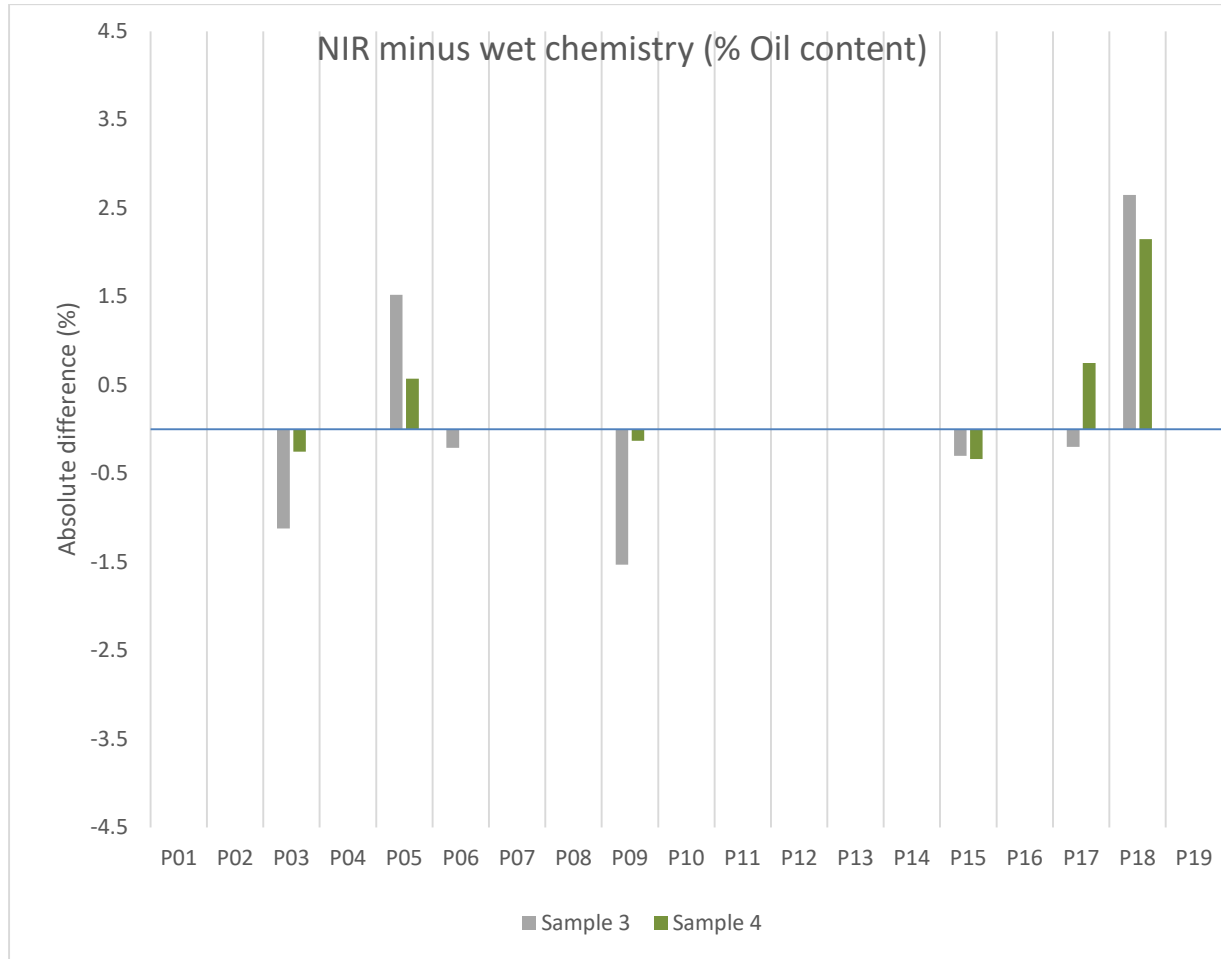
**Table 6** Results and Z-scores for oil content solvent.

<b>Oil content solvent (%)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	46.07	0.63	44.66	0.65
P04				
P05	42.98	-1.11	43.23	-0.92
P06	47.03	1.17	45.41	1.49
P07				
P08				
P09	45.48	0.30	43.53	-0.59
P10				
P11				
P12				
P13				
P14				
P15	45.90	0.54	44.89	0.91
P16				
P17	45.10	0.08	43.10	-1.07
P18	42.10	-1.61	43.65	-0.46
P19				
<b>Assigned value</b>	44.95		44.07	
<b>Standard Deviation</b>	1.77		0.91	
<b>Count</b>	7		7	

**Figure 4** Z-scores for oil content by solvent extraction.



**Figure 5** Absolute difference between oil content (NIR result minus wet chemistry).



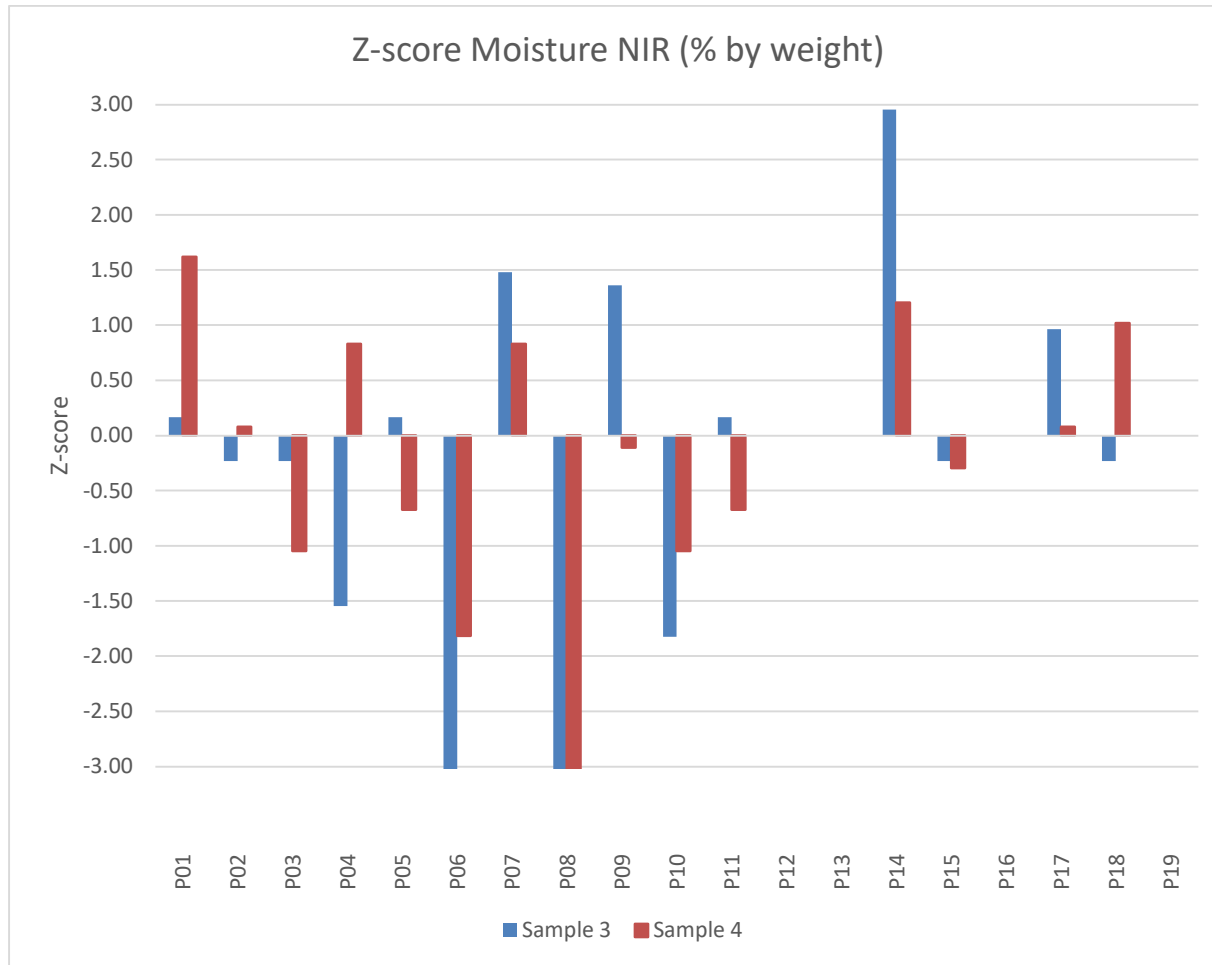
**Table 7** Results and Z-scores for moisture content (NIR).

<b>Moisture NIR (% by weight)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	6.00	0.17	6.21	1.62
P02	5.95	-0.23	5.80	0.08
P03	5.95	-0.23	5.50	-1.05
P04	5.79	-1.55	6.00	0.83
P05	6.00	0.17	5.60	-0.67
P06	5.43	-4.38	5.30	-1.82
P07	6.17	1.48	6.00	0.83
P08	3.90	-16.57	3.75	-7.62
P09	6.15	1.36	5.75	-0.11
P10	5.75	-1.83	5.50	-1.05
P11	6.00	0.17	5.60	-0.67
P12				
P13				
P14	6.35	2.95	6.10	1.21
P15	5.95	-0.23	5.70	-0.30
P16				
P17	6.10	0.96	5.80	0.08
P18	5.95	-0.23	6.05	1.02
P19				
<b>Assigned value</b>	5.98		5.78	
<b>Standard Deviation</b>	0.13		0.27	
<b>Count</b>	15		15	

**Note** - Laboratory number P06, P08 and P14 Sample 3 were removed from assigned value calculations as the results were outliers.

**Note** - Laboratory number P08 Sample 4 was removed from assigned value calculation as the result was an outlier.

**Figure 6** Z-scores for moisture content by NIR.

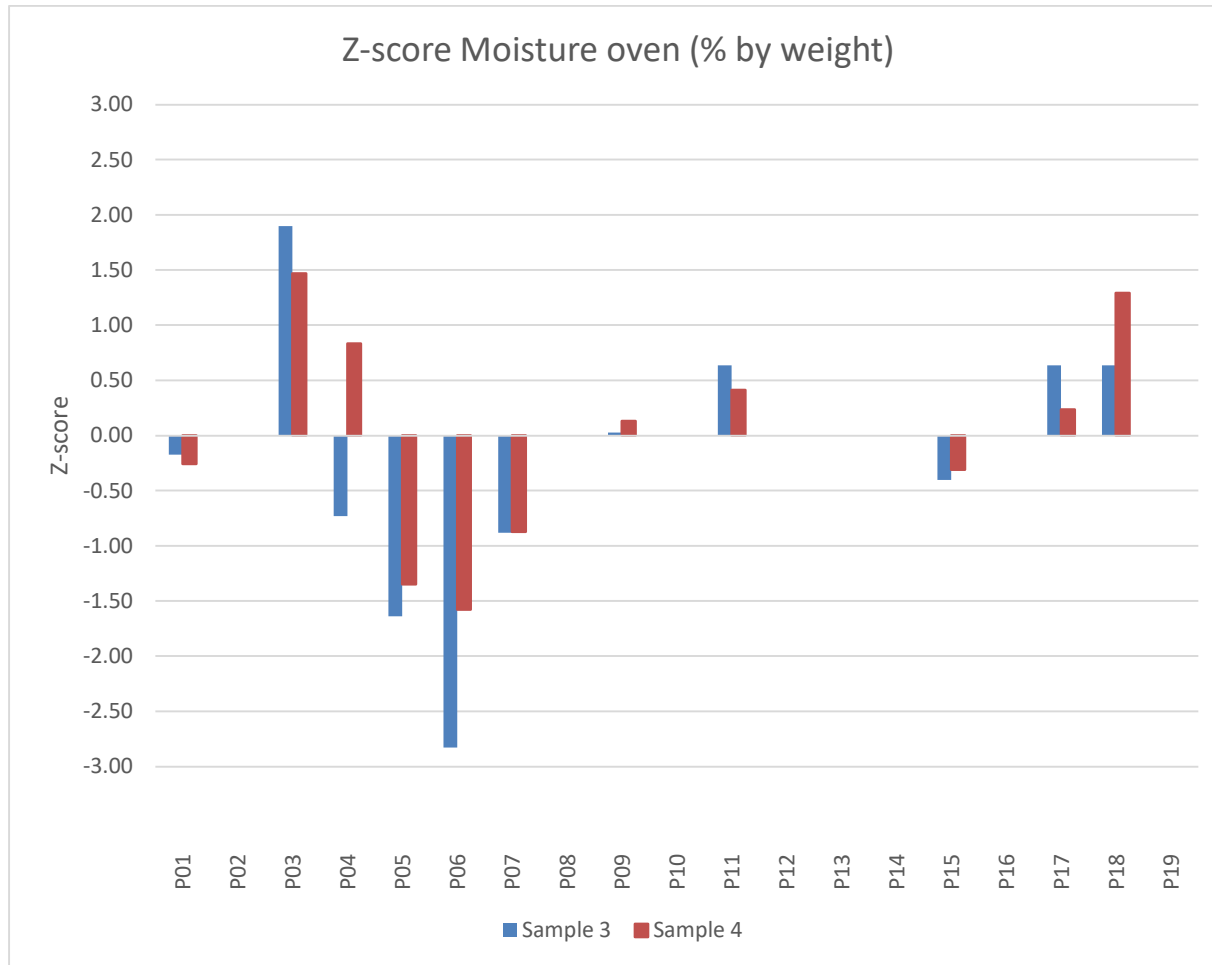


**Table 8** Results and Z-scores for moisture content by oven.

<b>Moisture Oven (% by weight)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	5.89	-0.17	5.71	-0.26
P02				
P03	6.30	1.90	6.20	1.47
P04	5.78	-0.73	6.02	0.83
P05	5.60	-1.64	5.40	-1.35
P06	5.37	-2.83	5.34	-1.58
P07	5.75	-0.88	5.54	-0.87
P08				
P09	5.93	0.03	5.82	0.13
P10				
P11	6.05	0.63	5.90	0.41
P12				
P13				
P14				
P15	5.85	-0.40	5.70	-0.31
P16				
P17	6.05	0.63	5.85	0.24
P18	6.05	0.63	6.15	1.29
P19				
<b>Assigned value</b>	5.92		5.78	
<b>Standard Deviation</b>	0.20		0.28	
<b>Count</b>	11		11	

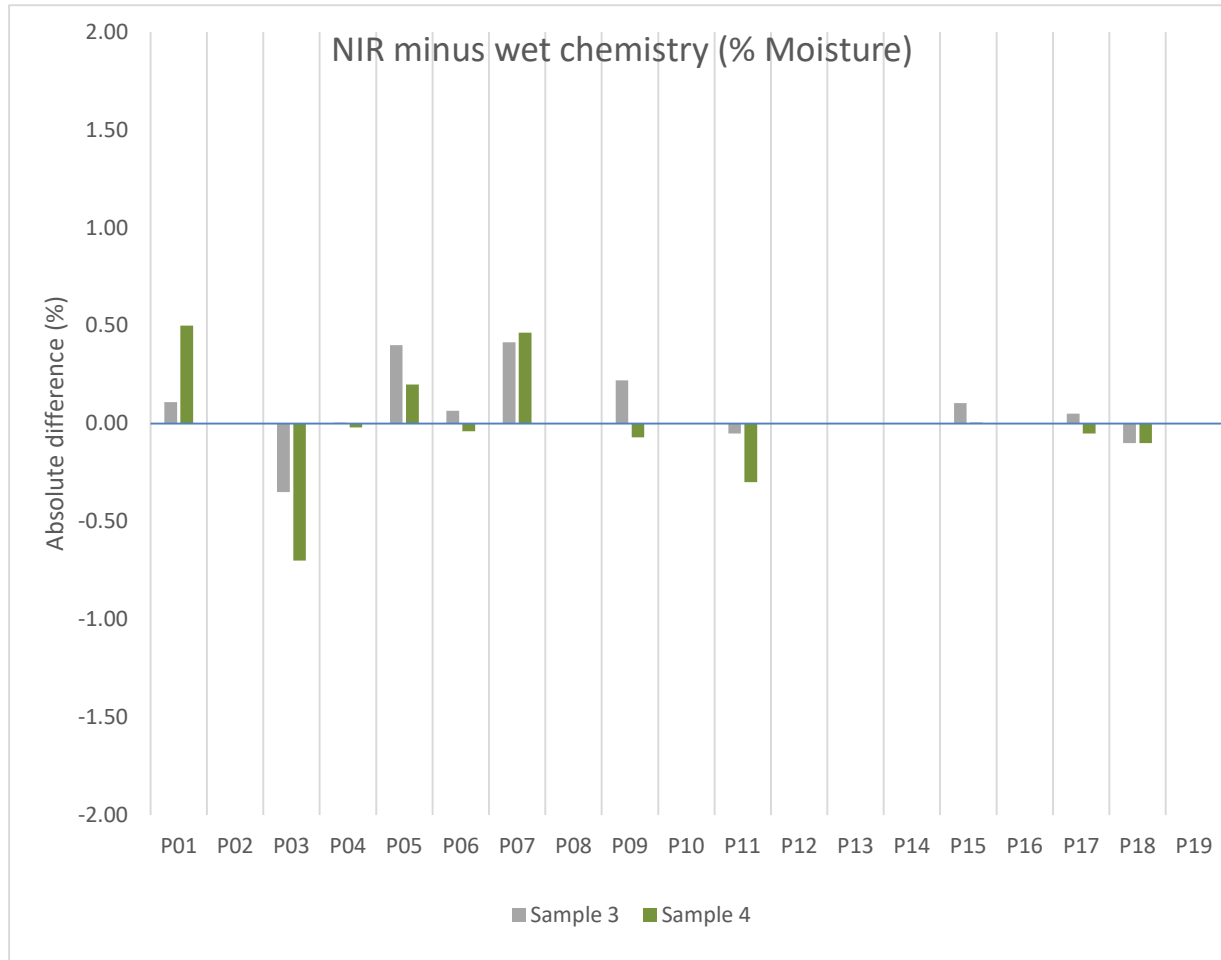
**Note** - Laboratory numbers P06 Sample 3 was removed from assigned value calculation as the result was an outlier.

**Figure 7** Z-scores for moisture content by oven.





**Figure 8** Absolute difference between moisture content (NIR result minus wet chemistry)



**Table 9** Results and Z-scores for oleic acid.

Lab number	Oleic acid (% of total fatty acids)			
	Sample 3		Sample 4	
	Result	Z-score	Result	Z-score
P01				
P02				
P03	58.61	-0.42	58.23	-0.41
P04				
P05	59.74	0.50	59.31	0.40
P06	59.18	0.04	58.94	0.13
P07				
P08				
P09	61.04	1.57	60.87	1.57
P10				
P11				
P12				
P13				
P14				
P15				
P16				
P17	58.80	-0.26	58.45	-0.24
P18	57.38	-1.43	56.82	-1.46
P19				
<b>Assigned value</b>	59.12		58.77	
<b>Standard Deviation</b>	1.22		1.34	
<b>Count</b>	6		6	

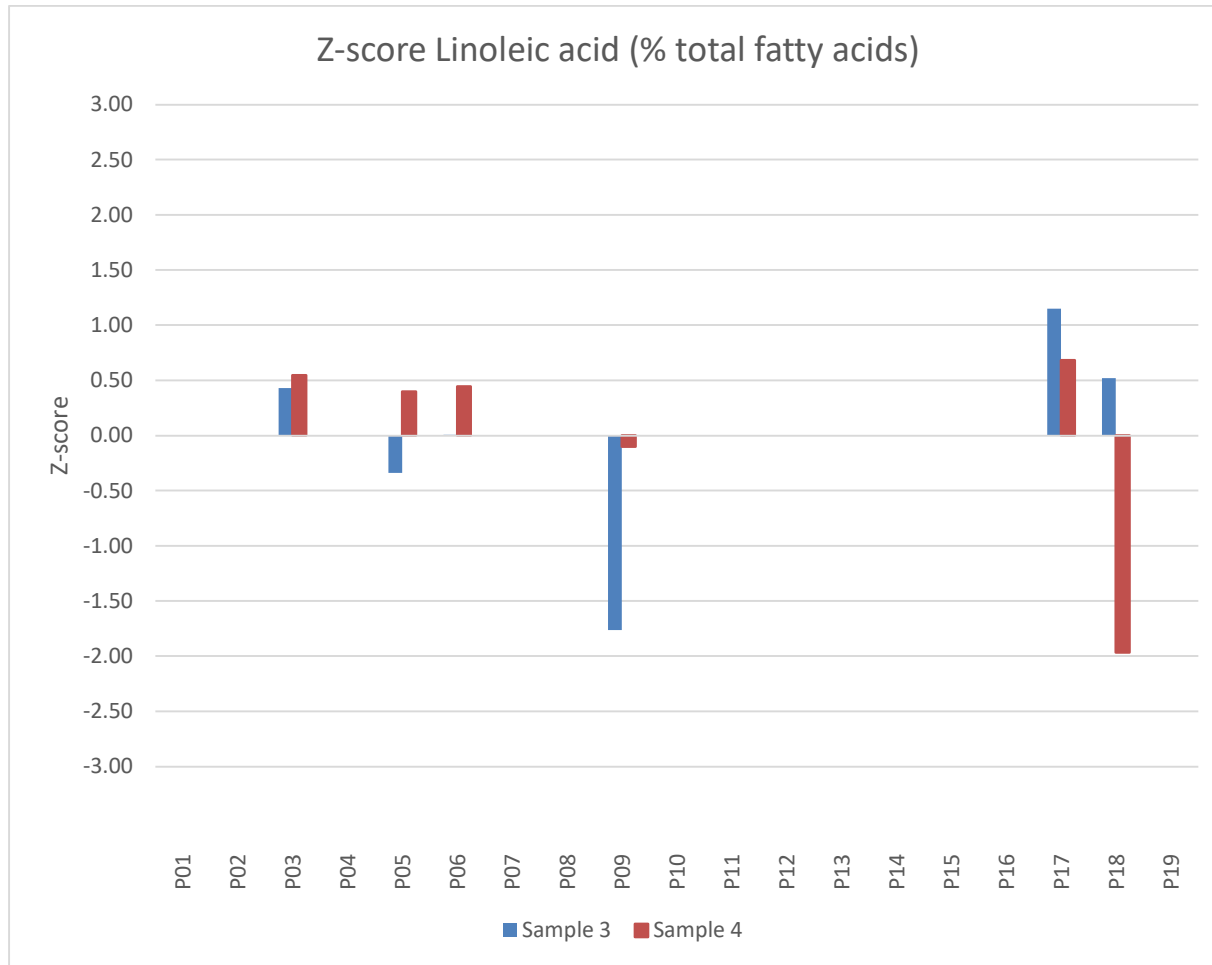
**Figure 9** Z-scores for oleic acid content.



**Table 10** Results and Z-scores for linoleic acid.

<b>Linoleic acid (% of total fatty acids)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	19.98	0.43	20.69	0.55
P04				
P05	19.75	-0.34	20.46	0.40
P06	19.86	0.01	20.53	0.44
P07				
P08				
P09	19.32	-1.76	19.67	-0.10
P10				
P11				
P12				
P13				
P14				
P15				
P16				
P17	20.20	1.15	20.90	0.68
P18	20.01	0.52	16.74	-1.97
P19				
<b>Assigned value</b>	19.85		19.83	
<b>Standard Deviation</b>	0.30		1.57	
<b>Count</b>	6		6	

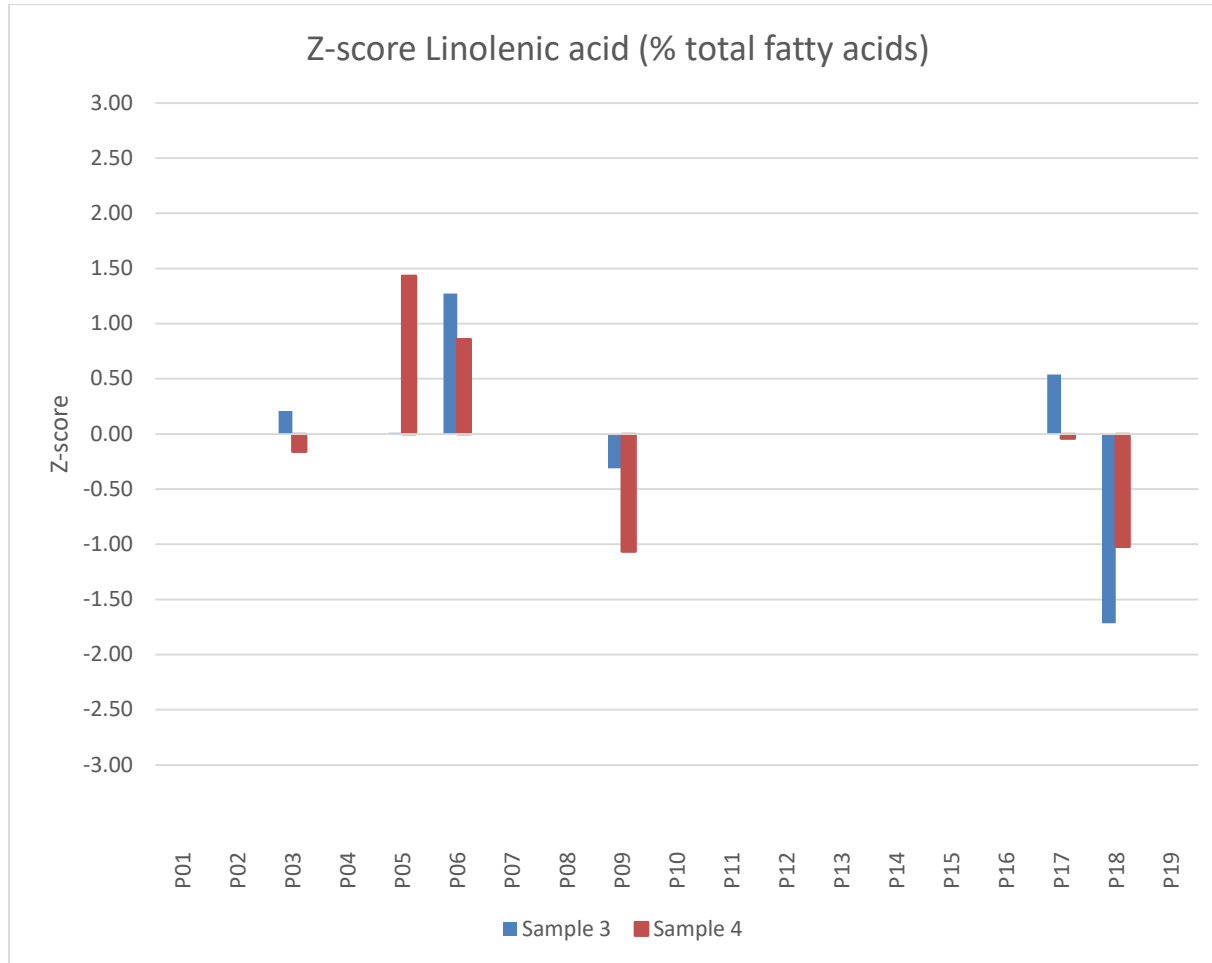
**Figure 10** Z-scores for linoleic acid content.



**Table 11** Results and Z-scores for linolenic acid.

<b>Linolenic acid (% of total fatty acids)</b>				
<b>Lab number</b>	<b>Sample 3</b>		<b>Sample 4</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	11.37	0.21	11.17	-0.16
P04				
P05	11.30	0.01	11.55	1.43
P06	11.79	1.27	11.41	0.86
P07				
P08				
P09	11.17	-0.31	10.96	-1.07
P10				
P11				
P12				
P13				
P14				
P15				
P16				
P17	11.50	0.54	11.20	-0.04
P18	10.63	-1.72	10.97	-1.02
P19				
<b>Assigned value</b>	11.29		11.21	
<b>Standard Deviation</b>	0.39		0.23	
<b>Count</b>	6		6	

**Figure 11** Z-scores for linolenic acid content.

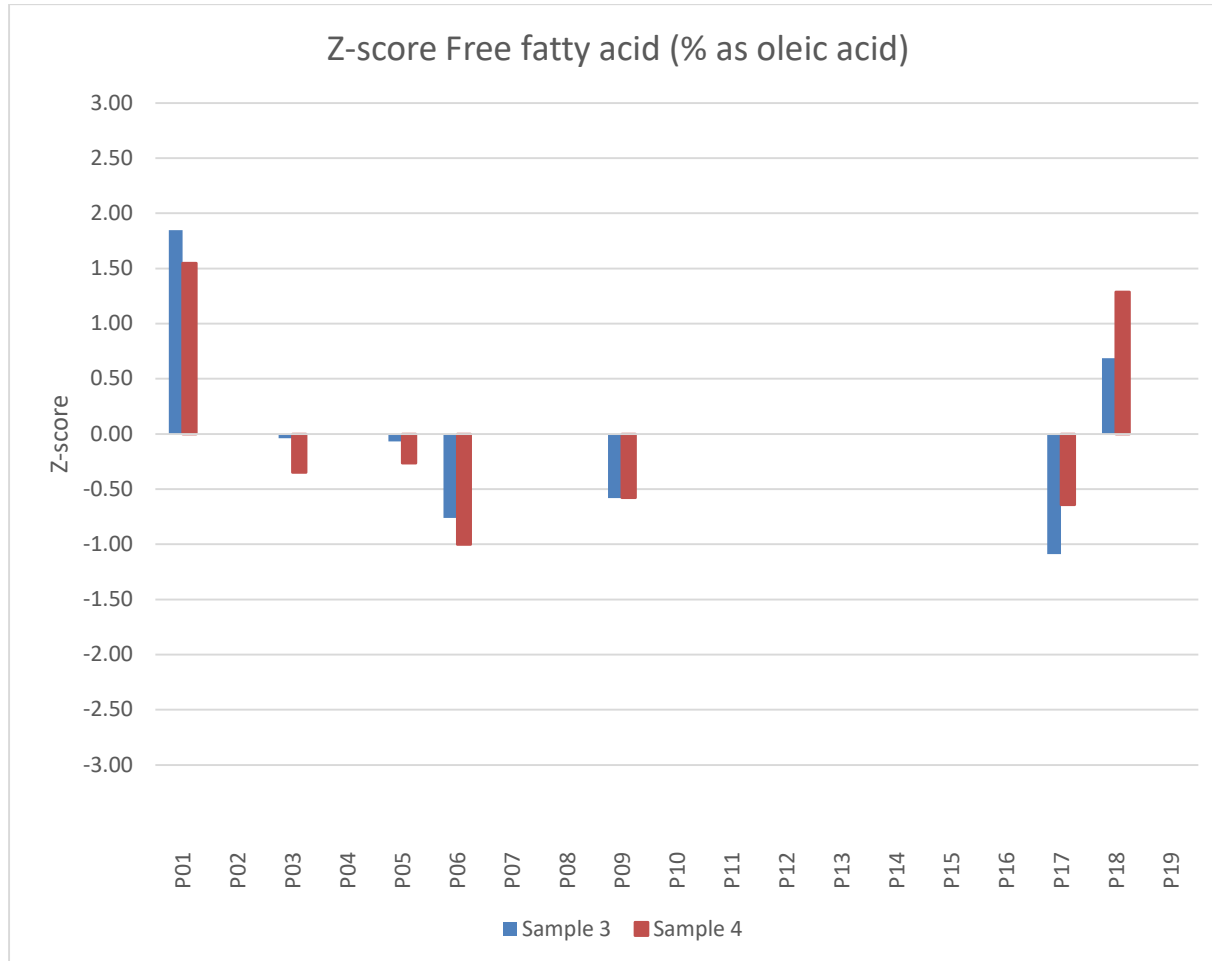


**Table 12** Results and Z-scores for free fatty acids.

Lab number	Free fatty acid (% as oleic acid)			
	Sample 3		Sample 4	
	Result	Z-score	Result	Z-score
P01	0.55	1.85	0.53	1.55
P02				
P03	0.29	-0.04	0.24	-0.35
P04				
P05	0.28	-0.07	0.25	-0.26
P06	0.19	-0.76	0.14	-1.00
P07				
P08				
P09	0.21	-0.58	0.20	-0.58
P10				
P11				
P12				
P13				
P14				
P15				
P16				
P17	0.14	-1.09	0.19	-0.64
P18	0.39	0.69	0.49	1.29
P19				
<b>Assigned value</b>	0.29		0.29	
<b>Standard Deviation</b>	0.14		0.15	
<b>Count</b>	7		7	



**Figure 12** Z-scores for free fatty acid content.



## **Appendix**

### **Analytical methods used**

Participating laboratories were asked to indicate which analytical methods were used for each determination. Information is summarised below (number of laboratories using method in brackets):

#### **Test weight**

Chondrometer (2), half litre measure (1), Test weight cup (1), not indicated (6), M55 - Measurement of grain density by CBH chondrometer (1), uncleaned seed (1), GTA (1), ISO7971-2 (1).

#### **Impurities**

AOF 4-1.2(b)(1), AOF 4-1.3 (3), not indicated (8), screen and aspirator (1), GTA (1).

#### **Oil content (NIR)**

Calibration based on ISO659 (2), NIR (2), FOSS NIR (2), Infratec 1241 (2), not indicated (6), GTA (1).

#### **Oil content (solvent)**

ISO659:2009 (3), AOF 4-1.24a (1), Not indicated (1), Infratec 1241 (1), AOCS Af 3-54 (1).

#### **Moisture (NIR)**

Calibration based on ISO665 (1), FOSS NIR (2), NIR (2), Infratec 1241 (1), not indicated (8), GTA (1).

#### **Moisture (oven)**

AOF 4-1.5 (130°C for 1 hour) (4), ISO665 (103°C for 3 hours, then 1 hour, 5g) (1), 105°C for 2 hours (1), AOCS Ca 2b-38 (130°C, 2 hours) (1), not indicated (2), AACC 44-15A (130°C for 75 minutes) (1), ISO662 (1).

#### **Fatty acids (oleic, linoleic and linolenic acid)**

IOC doc no. 24 (1), AOCS Ce 1a-13 mod (1), Gas chromatography (2), ISO 12966-4 (1), AOAC 969-33 (1).

#### **Free fatty acids**

AOCS Ac 5-41 (3), AOCS Ca 5a-40 (2), ISO660 (1), not indicated (1).