

**AOF Test Check program**

**Test Report**

**Round 3 2023.**

## Summary

1. The test materials for the AOF test check program Round 3 2023 were dispatched in June 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 5 - Assigned values and standard deviation

Analyte	Assigned value	Standard deviation	units	No. of participating laboratories
Test weight	64.96	0.42	(kg/hL)	16
Impurities	1.14	0.39	%	16
Oil NIR	45.63	0.75	% by weight	16
Oil solvent	45.96	1.14	% by weight	10
Moisture NIR	5.87	0.15	% by weight	16
Moisture oven	5.77	0.13	% by weight	14
Oleic acid	59.25	0.41	% total fatty acids	8
Linoleic acid	19.82	0.37	% total fatty acids	8
Linolenic acid	11.29	0.21	% total fatty acids	8
Free fatty acid	0.21	0.07	% (as oleic acid)	10

**Table 2** Sample 6 - Assigned values and standard deviation

Analyte	Assigned value	Standard deviation	units	No. of participating laboratories
Test weight	65.72	0.66	(kg/hL)	16
Impurities	1.27	0.12	%	16
Oil NIR	47.51	0.87	% by weight	16
Oil solvent	47.74	1.05	% by weight	10
Moisture NIR	6.02	0.36	% by weight	16
Moisture oven	5.85	0.14	% by weight	14
Oleic acid	61.65	1.30	% total fatty acids	8
Linoleic acid	18.53	0.37	% total fatty acids	8
Linolenic acid	11.69	0.5	% total fatty acids	8
Free fatty acid	0.29	0.11	% (as oleic acid)	10

## 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

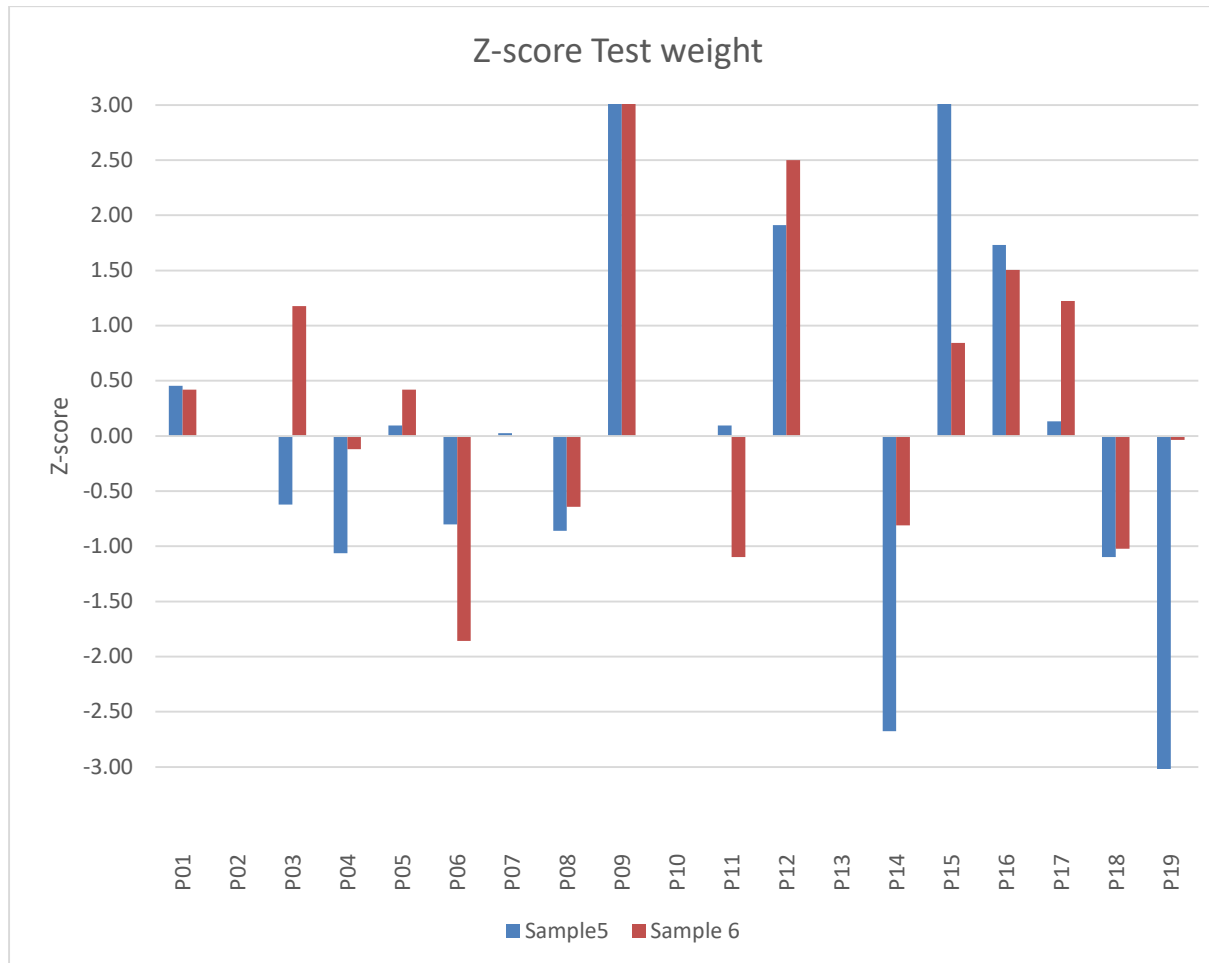
**Table 3** Results and Z-scores for test weight.

Test weight (kg/hL)				
Lab number	Sample 5		Sample 6	
	Result	Z-score	Result	Z-score
P01	65.15	0.45	66.00	0.42
P02				
P03	64.70	-0.62	66.50	1.18
P04	64.52	-1.06	65.65	-0.12
P05	65.00	0.10	66.00	0.42
P06	64.63	-0.80	64.50	-1.86
P07	64.97	0.02	65.72	-0.01
P08	64.60	-0.86	65.30	-0.64
P09	67.94	7.12	68.87	4.78
P10				
P11	65.00	0.10	65.00	-1.10
P12	65.76	1.91	67.37	2.50
P13				
P14	63.84	-2.68	65.19	-0.81
P15	66.44	3.52	66.28	0.84
P16	65.69	1.73	66.72	1.50
P17	65.02	0.13	66.53	1.22
P18	64.50	-1.10	65.05	-1.02
P19	62.09	-6.87	65.70	-0.04
<b>Assigned value</b>	64.96		65.72	
<b>Standard Deviation</b>	0.42		0.66	
<b>Count</b>	16		16	

**Note** - Sample 5 Laboratory number P09, P14, P15 and P19 were removed from assigned value calculations as the results were outliers.

**Note** - Sample 6 Laboratory number P09 and P12 were removed from assigned value calculations as the results were outliers.

**Figure 1** Z-scores for test weight.



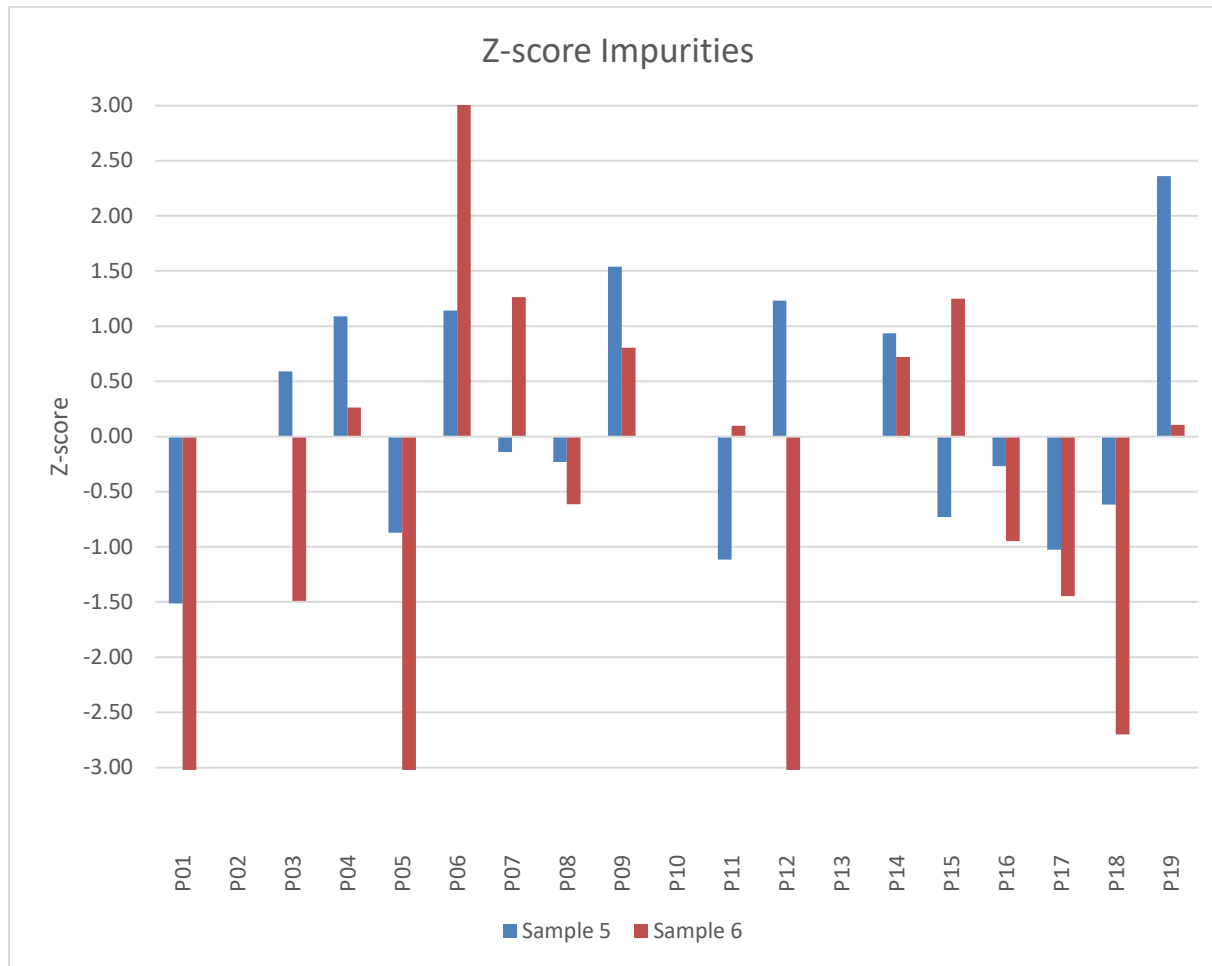
**Table 4** Results and Z-scores for impurities.

<b>Impurities (%)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	0.55	-1.51	0.85	-3.53
P02				
P03	1.37	0.59	1.10	-1.49
P04	1.57	1.09	1.31	0.26
P05	0.80	-0.87	0.70	-4.79
P06	1.59	1.14	1.74	3.85
P07	1.09	-0.14	1.43	1.26
P08	1.05	-0.23	1.20	-0.61
P09	1.74	1.54	1.37	0.80
P10				
P11	0.71	-1.12	1.29	0.10
P12	1.62	1.23	0.50	-6.45
P13				
P14	1.51	0.94	1.36	0.72
P15	0.86	-0.73	1.42	1.25
P16	1.04	-0.27	1.16	-0.95
P17	0.74	-1.03	1.10	-1.45
P18	0.90	-0.62	0.95	-2.70
P19	2.06	2.36	1.29	0.10
<b>Assigned value</b>	1.14		1.27	
<b>Standard Deviation</b>	0.39		0.12	
<b>Count</b>	16		16	

**Note** - Sample 5 Laboratory number P19 was removed from assigned value calculation as the result was an outlier.

**Note** - Sample 6 Laboratory number P1, P5, P6, P12, P18 were removed from assigned value calculation as the results were outliers.

Figure 2 Z-scores for impurities.



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

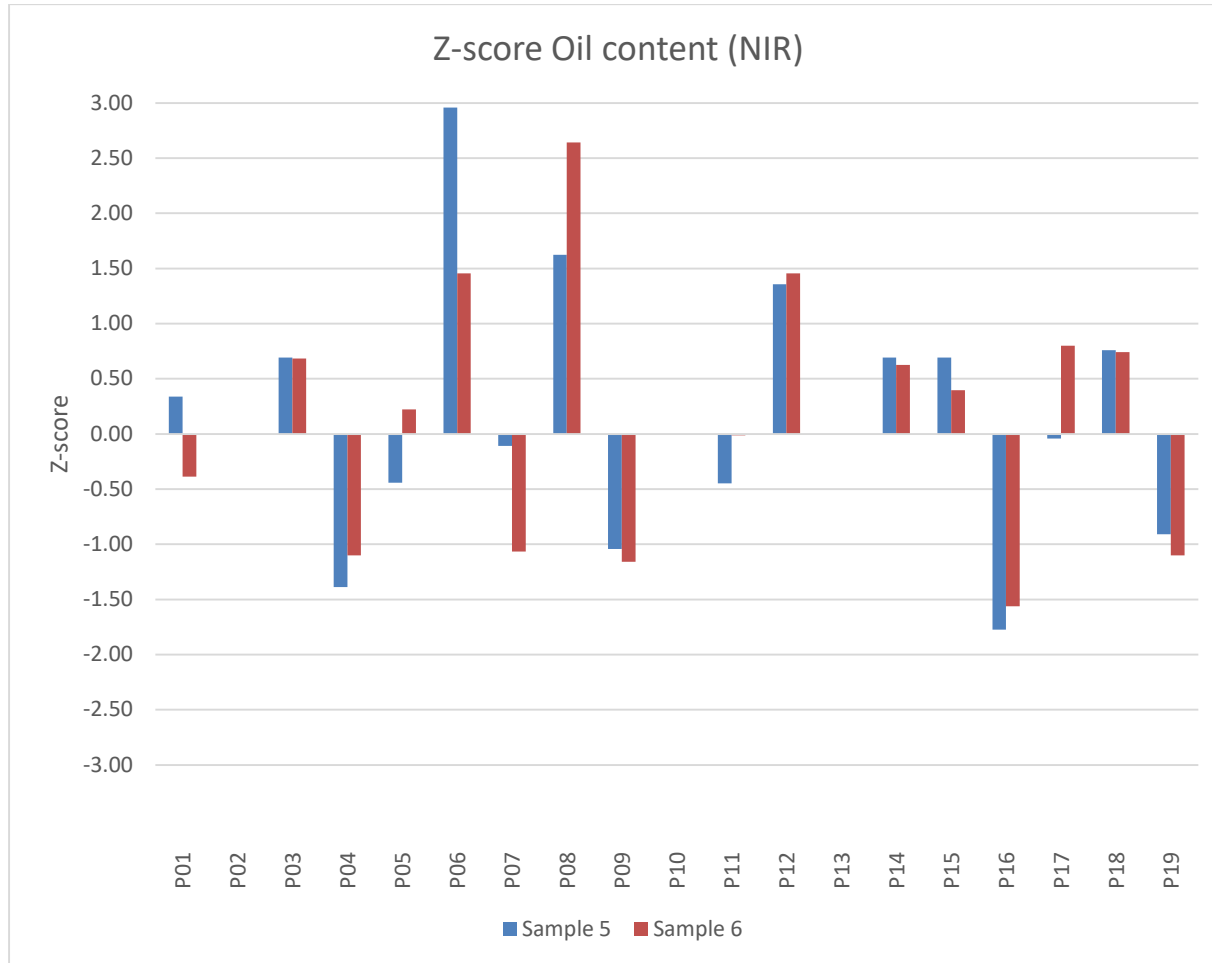
Oil content NIR (%)				
Lab number	Sample 5		Sample 6	
	Result	Z-score	Result	Z-score
P01	45.89	0.34	47.17	-0.39
P02				
P03	46.15	0.69	48.10	0.68
P04	44.59	-1.39	46.55	-1.10
P05	45.30	-0.44	47.70	0.22
P06	47.85	2.96	48.77	1.46
P07	45.55	-0.11	46.58	-1.07
P08	46.85	1.62	49.80	2.64
P09	44.85	-1.04	46.50	-1.16
P10				
P11	45.30	-0.45	47.50	-0.01
P12	46.65	1.36	48.77	1.46
P13				
P14	46.15	0.69	48.05	0.63
P15	46.15	0.69	47.85	0.40
P16	44.30	-1.77	46.15	-1.56
P17	45.60	-0.04	48.20	0.80
P18	46.20	0.76	48.15	0.74
P19	44.95	-0.91	46.55	-1.10
<b>Assigned value</b>	45.63		47.51	
<b>Standard Deviation</b>	0.75		0.87	
<b>Count</b>	16		16	

**Note** - Sample 5 Laboratory number P06 was removed from assigned value calculation as the result was an outlier.

**Note** - Sample 6 Laboratory number P08 was removed from assigned value calculation as the result was an outlier.



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

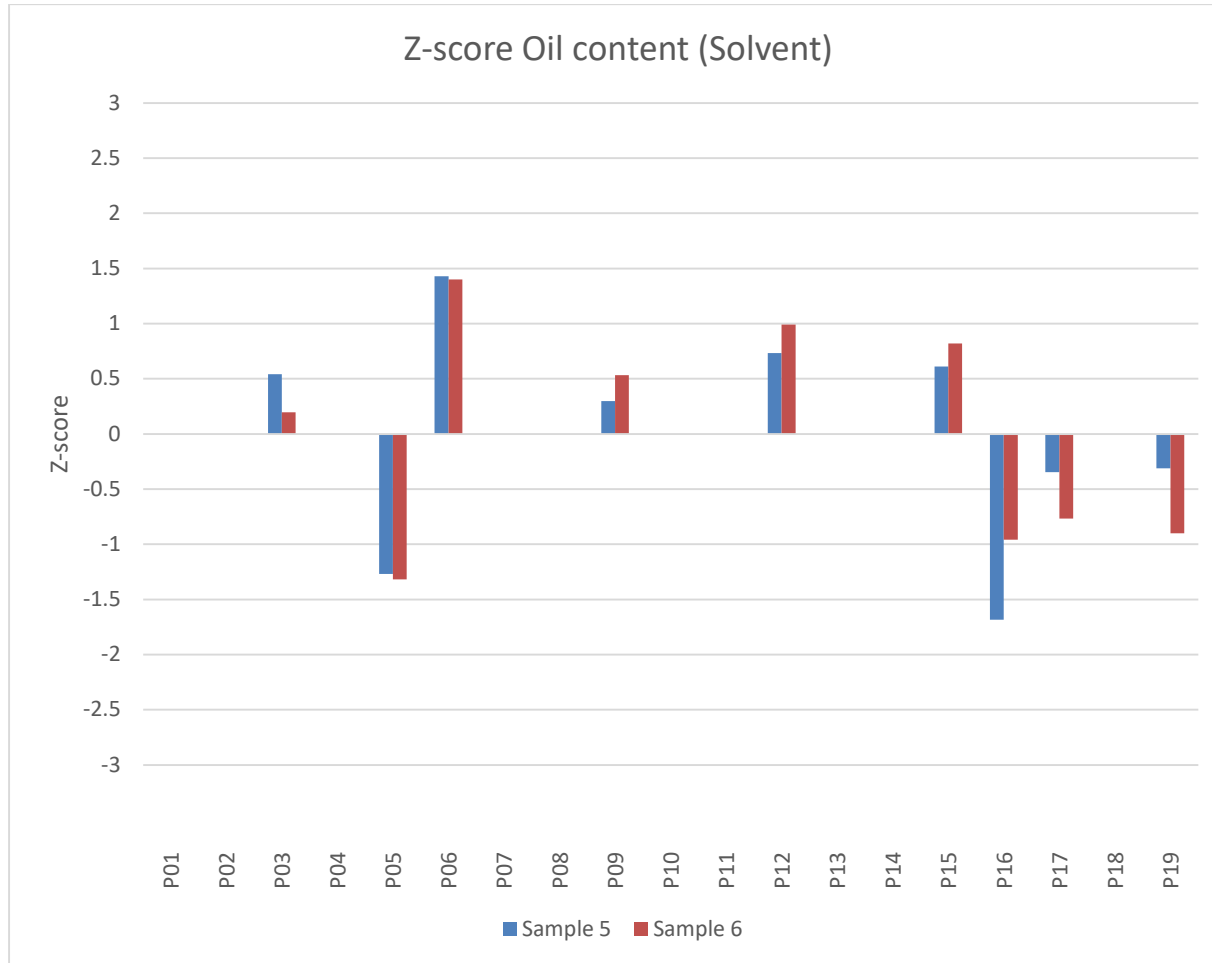


**Table 6** Results and Z-scores for oil content solvent.

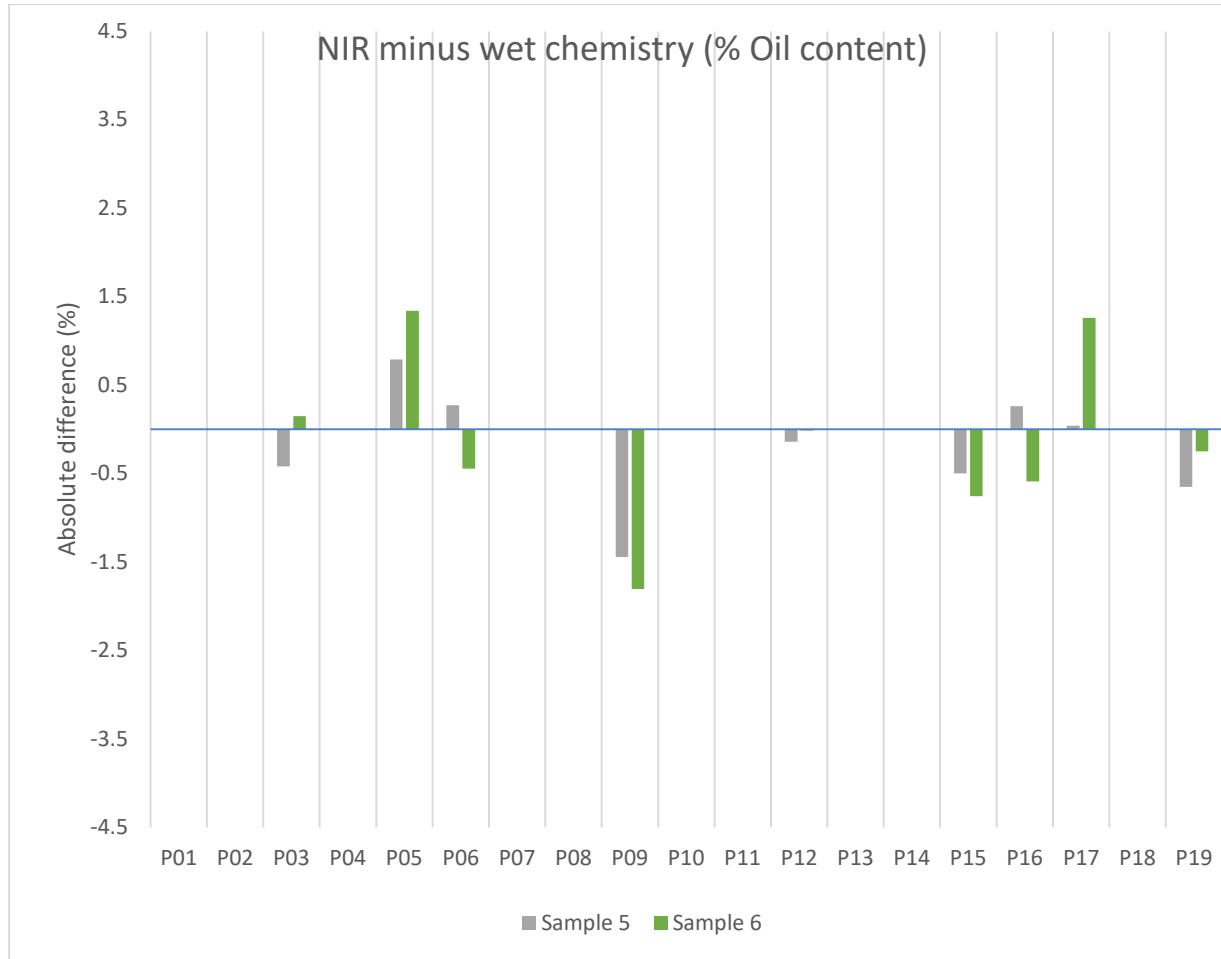
<b>Oil content solvent (%)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	46.57	0.54	47.95	0.20
P04				
P05	44.51	-1.27	46.36	-1.32
P06	47.58	1.43	49.22	1.40
P07				
P08				
P09	46.30	0.30	48.31	0.53
P10				
P11				
P12	46.79	0.73	48.79	0.99
P13				
P14				
P15	46.65	0.61	48.61	0.82
P16	44.04	-1.68	46.74	-0.96
P17	45.56	-0.35	46.94	-0.77
P18	46.10	*	46.40	*
P19	45.60	-0.31	46.80	-0.90
<b>Assigned value</b>	45.96		47.74	
<b>Standard Deviation</b>	1.14		1.05	
<b>Count</b>	10		10	

**Note** - \* indicates laboratory reported one result only. Result removed from assigned value calculation.

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



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

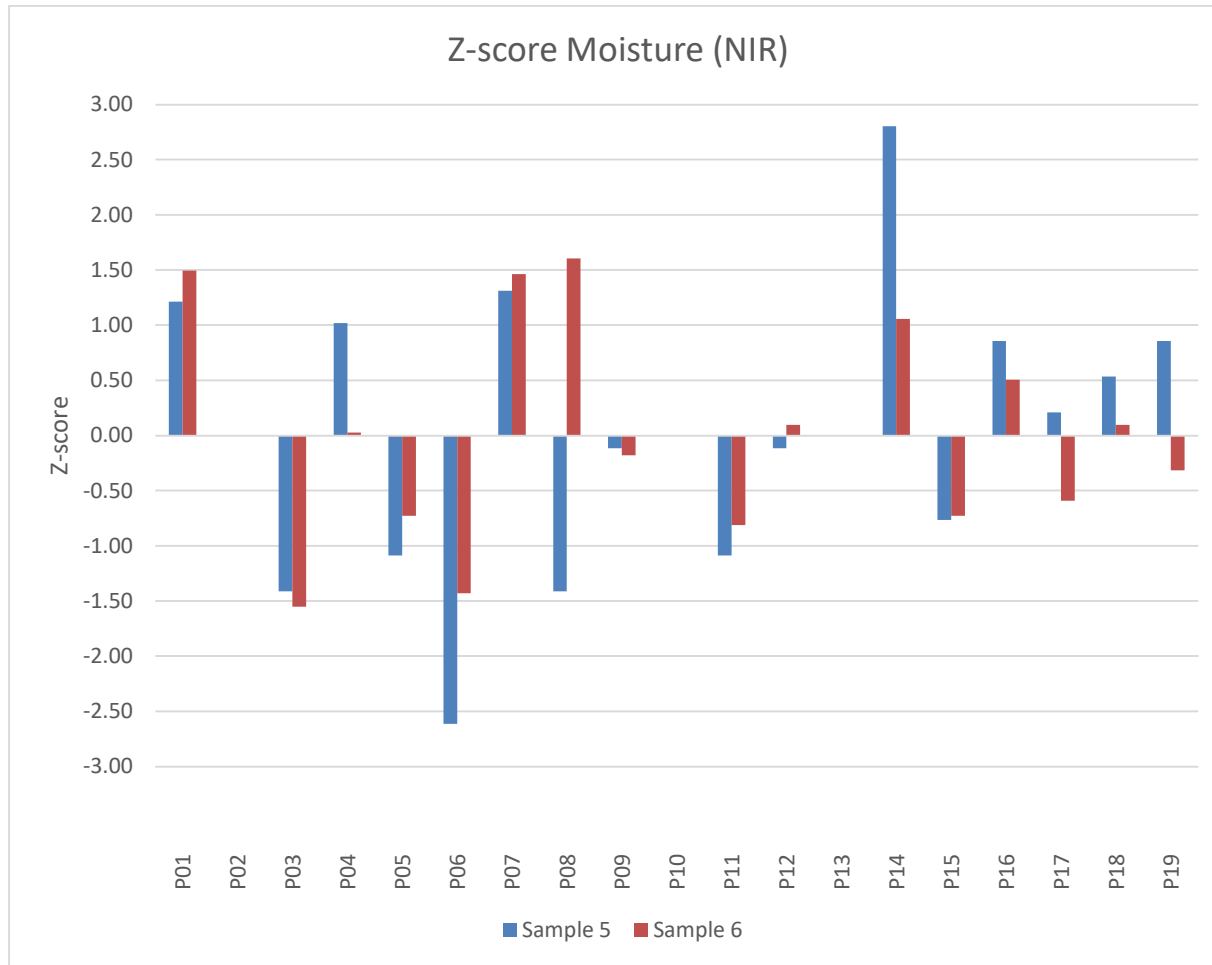


**Table 7** Results and Z-scores for moisture content (NIR).

<b>Moisture NIR (% by weight)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	6.06	1.21	6.56	1.49
P02				
P03	5.65	-1.41	5.45	-1.55
P04	6.03	1.02	6.03	0.03
P05	5.70	-1.09	5.75	-0.73
P06	5.47	-2.61	5.50	-1.43
P07	6.07	1.31	6.55	1.46
P08	5.65	-1.41	6.60	1.60
P09	5.85	-0.12	5.95	-0.18
P10				
P11	5.70	-1.09	5.72	-0.81
P12	5.85	-0.12	6.05	0.09
P13				
P14	6.30	2.80	6.40	1.06
P15	5.75	-0.76	5.75	-0.73
P16	6.00	0.86	6.20	0.51
P17	5.90	0.21	5.80	-0.59
P18	5.95	0.53	6.05	0.09
P19	6.00	0.86	5.90	-0.32
<b>Assigned value</b>	5.87		6.02	
<b>Standard Deviation</b>	0.15		0.36	
<b>Count</b>	16		16	

**Note** - Sample 5 Laboratory number P06 and P14 were removed from assigned value calculations as the results were outliers.

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



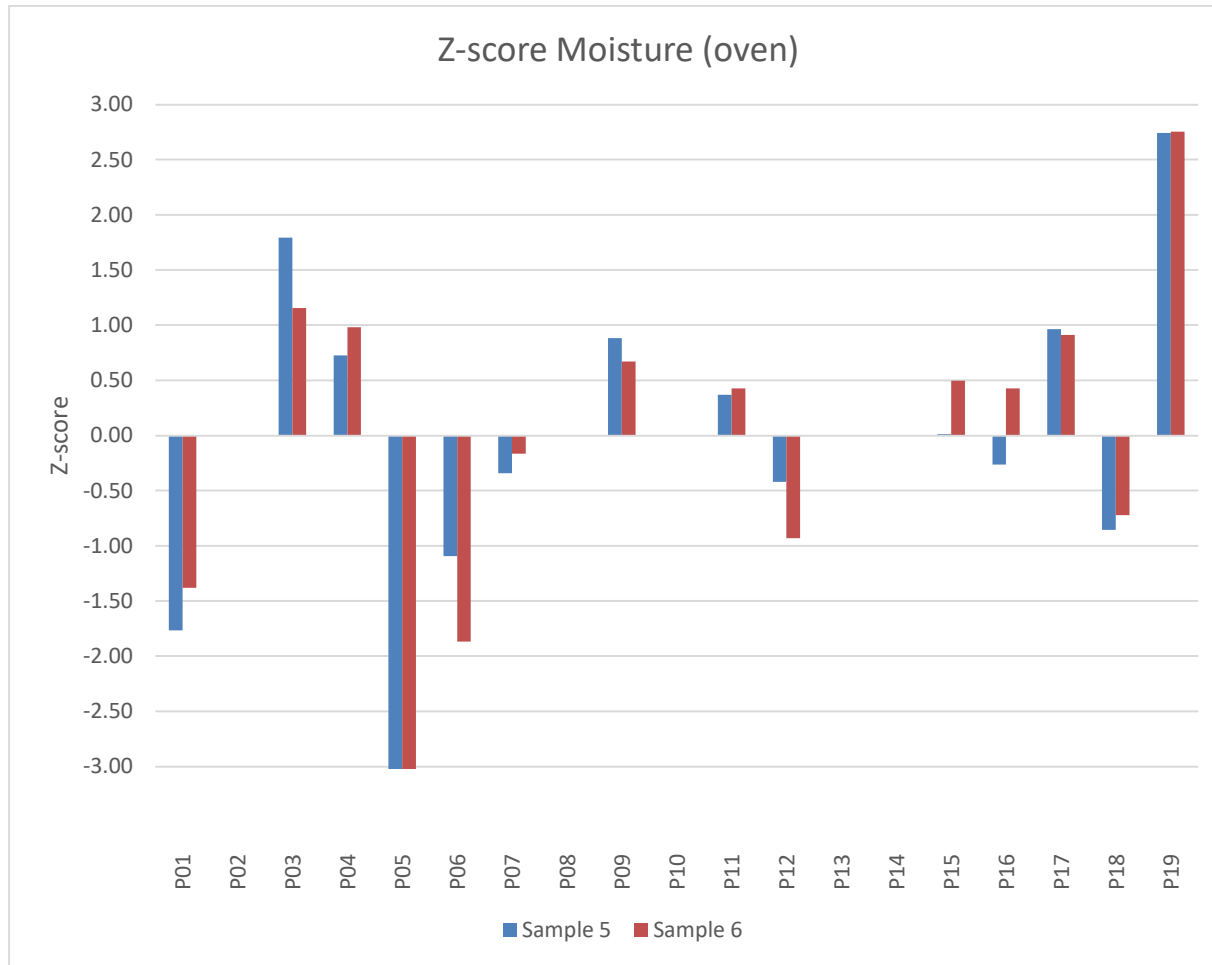
**Table 8** Results and Z-scores for moisture content by oven.

<b>Moisture Oven (% by weight)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01	5.55	-1.77	5.66	-1.38
P02				
P03	6.00	1.79	6.02	1.16
P04	5.86	0.73	6.00	0.98
P05	4.88	-7.03	5.01	-5.90
P06	5.63	-1.09	5.59	-1.87
P07	5.73	-0.34	5.83	-0.17
P08				
P09	5.88	0.88	5.95	0.67
P10				
P11	5.82	0.37	5.92	0.43
P12	5.72	-0.42	5.72	-0.93
P13				
P14				
P15	5.77	0.01	5.93	0.50
P16	5.74	-0.26	5.92	0.43
P17	5.89	0.96	5.99	0.91
P18	5.66	-0.86	5.75	-0.72
P19	6.12	2.74	6.25	2.75
<b>Assigned value</b>	5.77		5.85	
<b>Standard Deviation</b>	0.13		0.14	
<b>Count</b>	14		14	

**Note** - Sample 5 Laboratory numbers P05 and P19 were removed from assigned value calculation as the results were outliers.

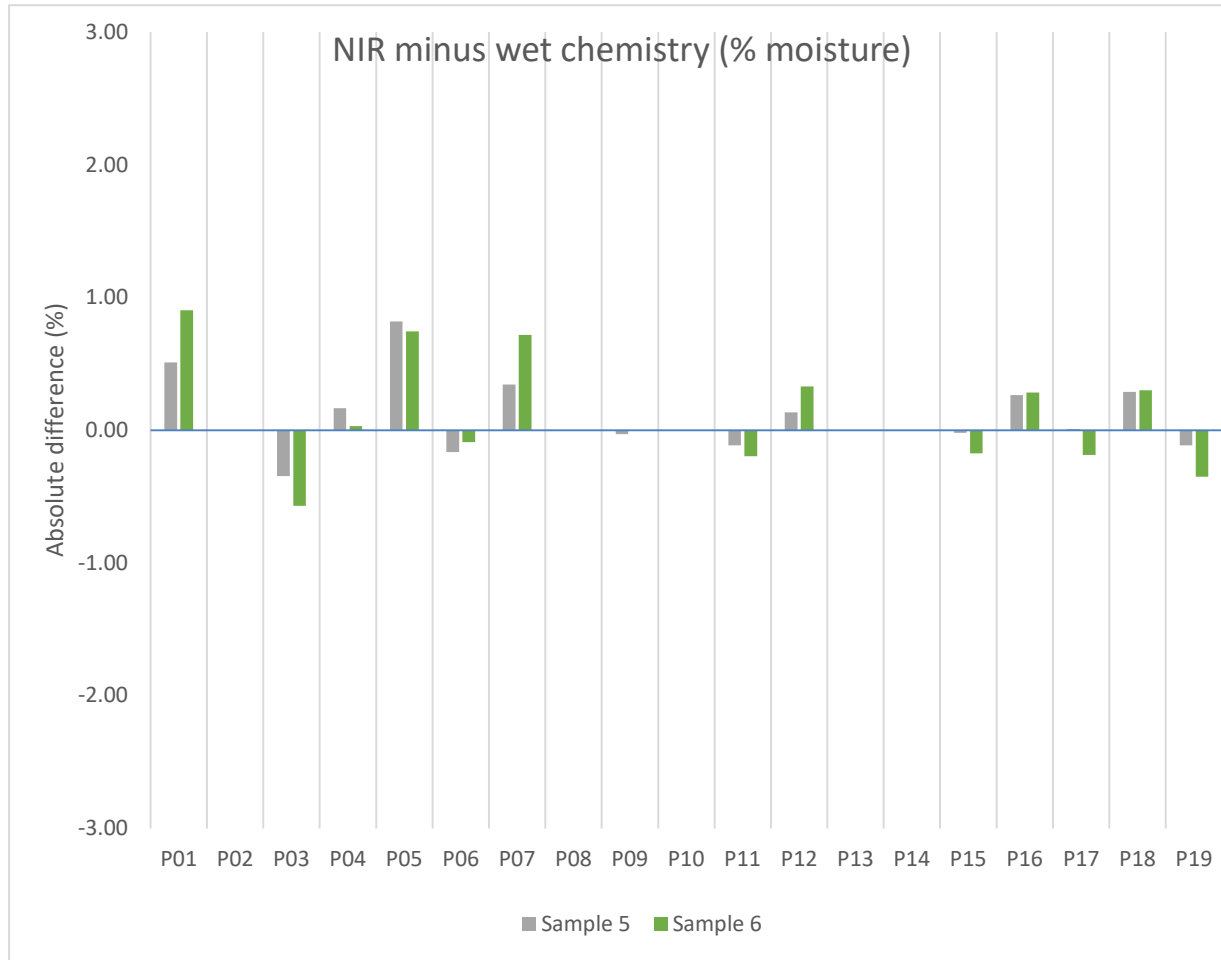
**Note** - Sample 6 Laboratory numbers P05 and P19 were removed from assigned value calculation as the results were outliers.

**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 5		Sample 6	
	Result	Z-score	Result	Z-score
P01				
P02				
P03	59.04	-0.51	60.38	-0.98
P04				
P05	59.99	1.80	61.87	0.16
P06	59.27	0.04	61.15	-0.39
P07				
P08				
P09	62.12	7.02	64.72	2.35
P10				
P11				
P12	59.28	0.08	61.41	-0.19
P13				
P14				
P15				
P16	59.18	-0.17	61.28	-0.28
P17	58.62	-1.54	61.15	-0.39
P18	59.37	0.30	61.28	-0.29
P19				
<b>Assigned value</b>	59.25		61.65	
<b>Standard Deviation</b>	0.41		1.30	
<b>Count</b>	8		8	

**Note** - Sample 5 Laboratory numbers P09 was removed from assigned value calculation as the result was an outlier.

**Note** - Sample 6 Laboratory numbers P09 was removed from assigned value calculation as the result was an outlier

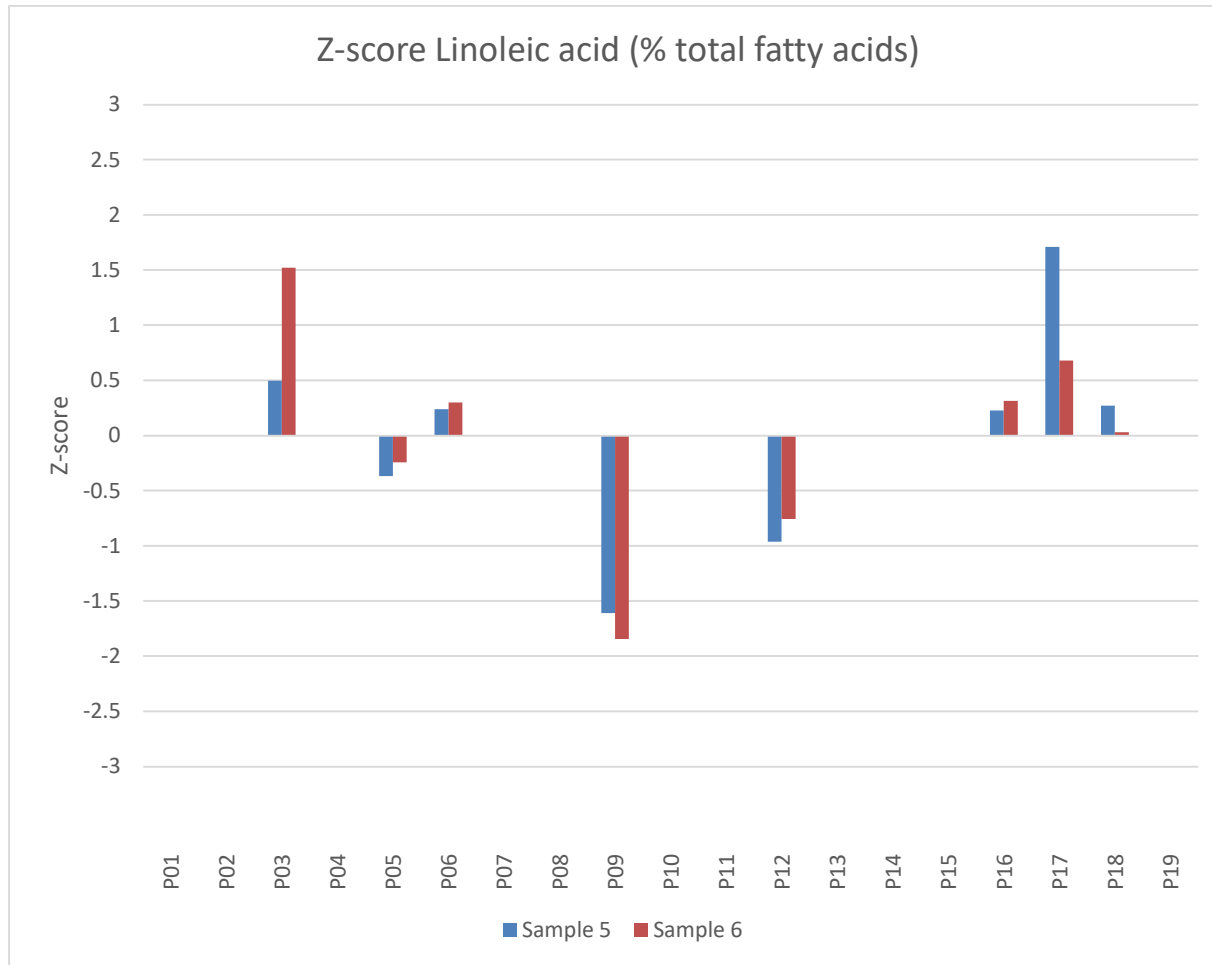
**Figure 9** Z-scores for oleic acid content.



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

<b>Linoleic acid (% of total fatty acids)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	20.01	0.50	19.09	1.52
P04				
P05	19.69	-0.37	18.44	-0.24
P06	19.91	0.24	18.64	0.30
P07				
P08				
P09	19.23	-1.61	17.85	-1.84
P10				
P11				
P12	19.47	-0.96	18.25	-0.76
P13				
P14				
P15				
P16	19.91	0.23	18.65	0.31
P17	20.46	1.71	18.78	0.68
P18	19.92	0.27	18.54	0.03
P19				
<b>Assigned value</b>	19.82		18.53	
<b>Standard Deviation</b>	0.37		0.37	
<b>Count</b>	8		8	

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

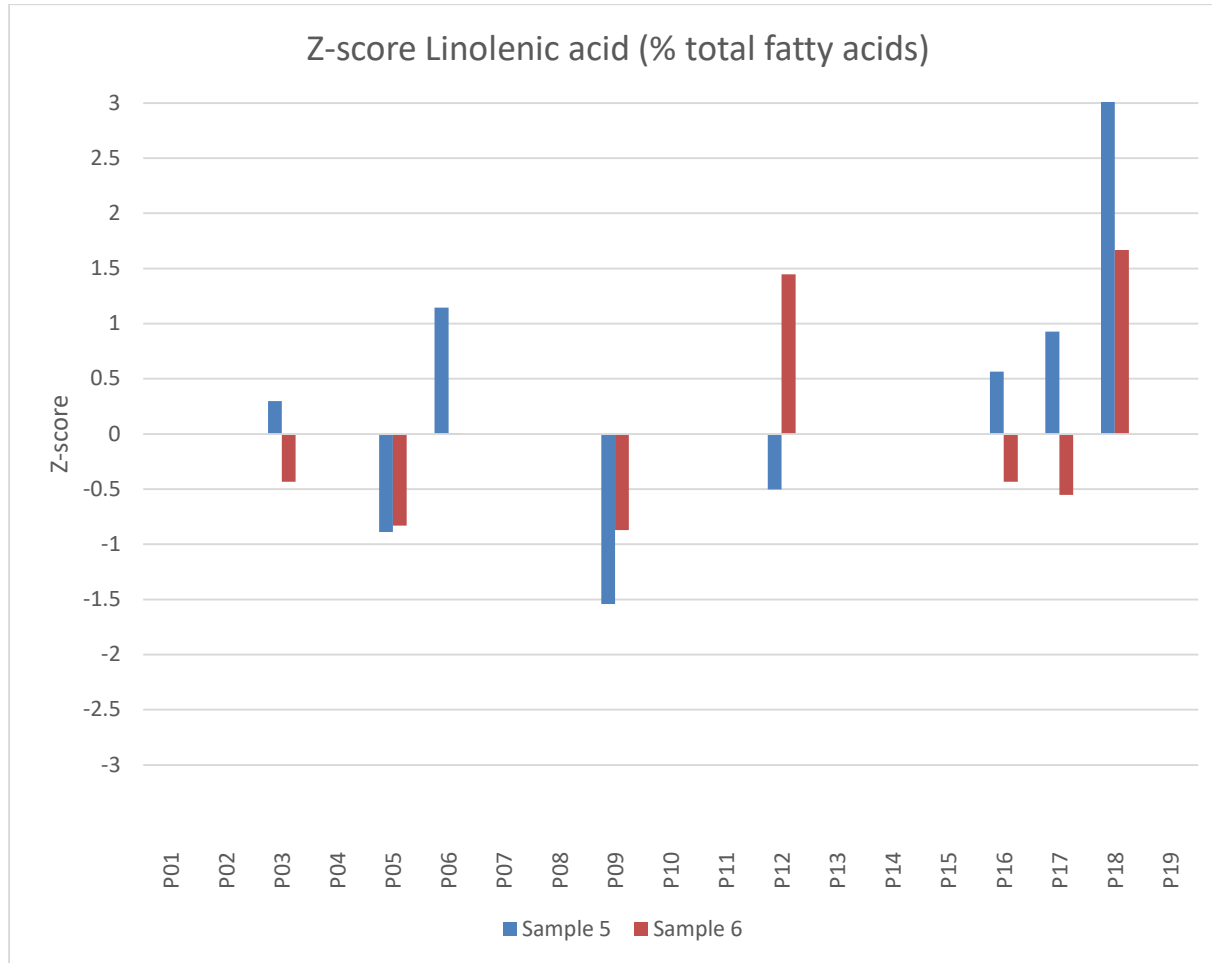


**Table 11** Results and Z-scores for linolenic acid.

<b>Linolenic acid (% of total fatty acids)</b>				
<b>Lab number</b>	<b>Sample 5</b>		<b>Sample 6</b>	
	<b>Result</b>	<b>Z-score</b>	<b>Result</b>	<b>Z-score</b>
P01				
P02				
P03	11.35	0.30	11.48	-0.43
P04				
P05	11.11	-0.89	11.28	-0.83
P06	11.53	1.15	11.70	0.00
P07				
P08				
P09	10.97	-1.54	11.26	-0.87
P10				
P11				
P12	11.19	-0.50	12.42	1.45
P13				
P14				
P15				
P16	11.41	0.56	11.48	-0.43
P17	11.48	0.93	11.42	-0.55
P18	12.25	4.67	12.53	1.67
P19				
<b>Assigned value</b>	11.29		11.69	
<b>Standard Deviation</b>	0.21		0.50	
<b>Count</b>	8		8	

**Note** - Sample 5 Laboratory numbers P18 was removed from assigned value calculation as the result was an outlier.

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



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

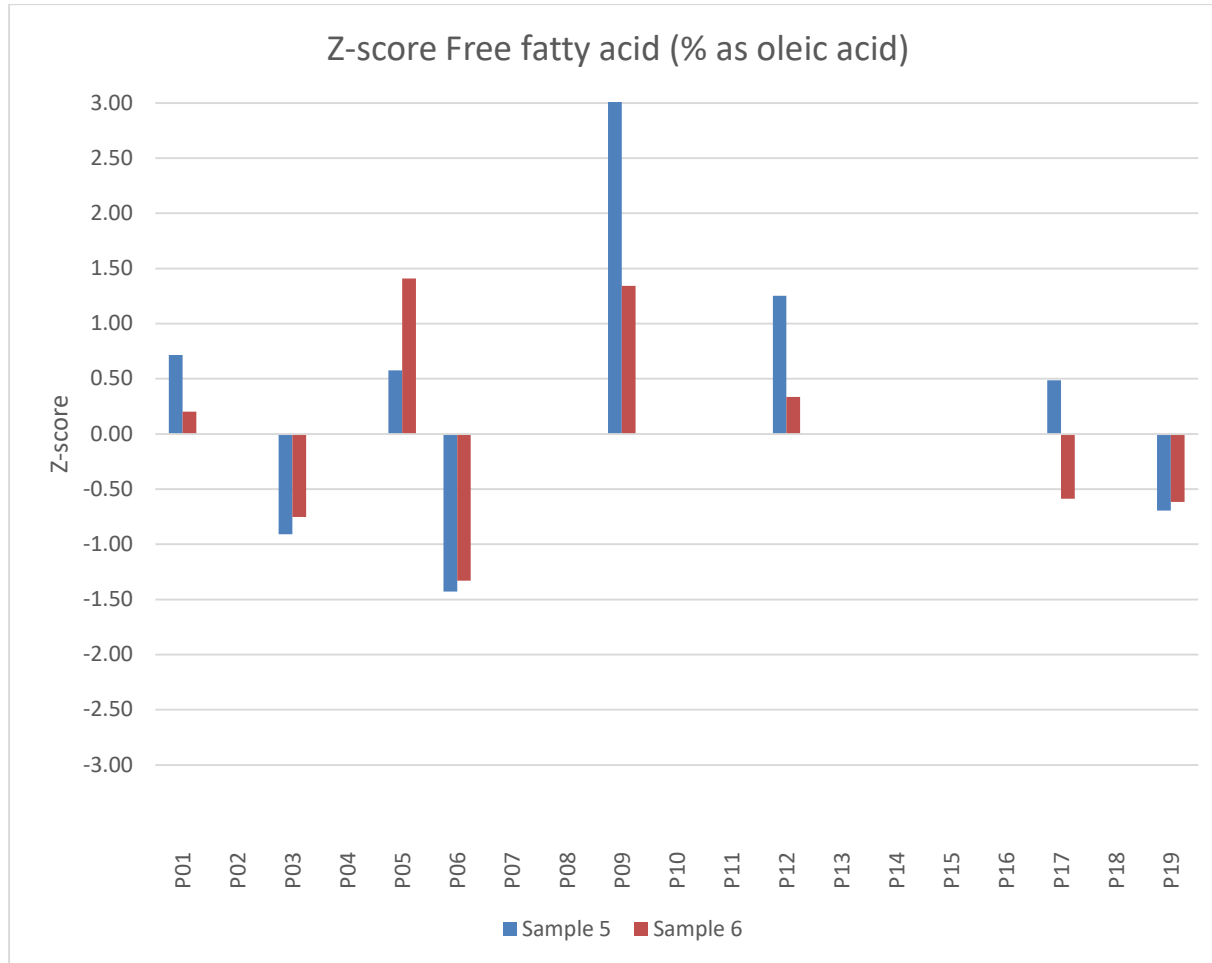
Lab number	Free fatty acid (% as oleic acid)			
	Sample 5		Sample 6	
	Result	Z-score	Result	Z-score
P01	0.26	0.72	0.32	0.20
P02				
P03	0.15	-0.91	0.21	-0.75
P04				
P05	0.25	0.58	0.45	1.41
P06	0.12	-1.43	0.14	-1.33
P07				
P08				
P09	0.51	4.55	0.45	1.34
P10				
P11				
P12	0.30	1.25	0.33	0.33
P13				
P14				
P15				
P16	0.32	*	0.32	*
P17	0.25	0.49	0.23	-0.59
P18	0.31	*	0.26	*
P19	0.17	-0.69	0.22	-0.62
<b>Assigned value</b>	0.21		0.29	
<b>Standard Deviation</b>	0.07		0.11	
<b>Count</b>	10		10	

**Note** - Sample 5 Laboratory numbers P09 was removed from assigned value calculation as the result was an outlier.

**Note** - \* indicates laboratory reported one result only. Result removed from assigned value calculation.



**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, uncleaned seed (2), half litre measure (1), Test weight cup (1), not indicated (10), M55 - Measurement of grain density by CBH chondrometer (1), GTA (1).

#### **Impurities**

AOF 4-1.3 (4), not indicated (9), screen and aspirator (1), GTA (1), ISO658 (1).

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

Calibration based on ISO659 (1), FOSS NIR (1), Infratec 1241 (2), not indicated (9), GTA (1), FOSS + Perten (1), NMR (1).

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

AOF 4-1.24a (1), Not indicated (2), Am 2-93 (1), ISO659 (5), Gerhardt Soxtherm hot extraction (150°C) (1).

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

Calibration based on ISO665 (1), FOSS NIR (1), FOSS + Perten (1), NIR (1), Infratec 1241 (2), not indicated (9), GTA (1).

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

AOF 4-1.5 (130°C for 1 hour) (5), ISO665 (103°C for 3 hours, then 1 hour, 5g) (2), 105°C for 2 hours (1), AOCS Ba 2a-38 (1), not indicated (4), 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), not indicated (3).

#### **Free fatty acids**

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