PRODUCTION REGION	(15) North-West South-Eastern Region				(16) North-West Central-Eastern Region				(17) North-West Central-Northern Region (Ottosdal)			
Grading:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
1. Damaged sunflower seed, %	0.03	0.00	0.18	0.07	0.08	0.00	0.18	0.09	0.07	0.00	0.24	0.11
2. Screenings, %	1.32	1.18	1.46	0.10	1.62	0.30	4.11	1.31	2.03	0.92	3.90	1.03
3. Sclerotia, %	0.04	0.00	0.22	0.09	0.28	0.00	0.64	0.24	1.05	0.09	2.18	0.73
4. Foreign Matter, %	1.61	0.71	4.17	1.30	1.59	0.26	5.10	1.85	1.53	0.30	6.00	1.99
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	2.97	2.17	5.35	1.20	3.49	2.04	9.53	2.96	4.61	1.86	10.02	2.80
Poisonous seeds (Crotalaria sp., Datura sp., Ricinis communis)	0	0	0	0.00	0	0	0	0.00	1	0	5	1.89
Poisonous seeds (Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	6				6				7			
Nutritional analysis:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
Moisture, % (5 hr, 105 ºC)	4.9	4.4	5.5	0.47	4.8	4.0	6.3	0.87	5.1	3.5	6.3	0.97
Crude Protein, % (as is)	17.18	15.73	19.13	1.54	15.73	14.18	18.33	1.55	15.16	14.40	15.57	0.38
Crude Fat, % (as is)	38.6	37.7	39.2	0.71	39.4	30.2	42.6	4.68	38.2	32.4	42.5	3.00
Crude Fibre, % (as is)	21.4	20.5	23.1	0.93	21.2	18.1	25.0	2.41	22.5	19.3	23.9	1.55
Ash, % (as is)	2.91	2.68	3.12	0.19	2.74	2.56	2.91	0.14	2.72	2.56	3.03	0.16
Number of samples	6				6				7			

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PRODUCTION REGION	(18) North-West Central Region (Ventersdorp)				(19) North-West Central Region (Lichtenburg)				(20) North-West Eastern Region			
Grading:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
1. Damaged sunflower seed, %	0.14	0.00	0.38	0.14	0.13	0.00	0.54	0.22	0.32	0.00	1.60	0.72
2. Screenings, %	1.66	0.84	3.62	1.00	4.84	2.18	12.02	3.73	2.76	1.18	6.70	2.29
3. Sclerotia, %	0.91	0.08	1.98	0.71	0.68	0.08	2.32	0.83	0.40	0.00	0.96	0.43
4. Foreign Matter, %	1.16	0.12	3.20	1.11	2.06	0.40	5.20	1.78	1.44	0.80	1.90	0.55
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	3.73	1.90	6.24	1.67	7.58	3.82	17.44	5.60	4.60	2.84	8.60	2.32
Poisonous seeds (Crotalaria sp., Datura sp., Ricinis communis)	4	0	17	6.83	0	0	0	0.00	6	0	16	7.80
Poisonous seeds (Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	6				6				5			
Nutritional analysis:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
Moisture, % (5 hr, 105 ºC)	4.4	3.1	5.0	0.67	5.0	2.9	6.2	1.16	4.9	3.6	6.1	1.02
Crude Protein, % (as is)	14.96	14.09	16.55	0.92	15.09	12.92	16.13	1.13	16.12	15.37	17.71	0.99
Crude Fat, % (as is)	40.4	39.4	41.8	0.90	39.2	36.3	47.0	4.05	38.4	37.3	40.0	1.38
Crude Fibre, % (as is)	21.7	20.4	22.5	0.88	23.4	22.3	24.4	0.98	21.2	20.8	21.7	0.35
Ash, % (as is)	2.71	2.53	2.97	0.15	2.74	2.62	2.82	0.08	2.63	2.47	2.83	0.15
Number of samples	6				6				5			

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PRODUCTION REGION	(21) Free State North-Western Region (Viljoenskroon)				(22) Free State North-Western Region (Bothaville)				(23) Free State North-Western Region (Bultfontein)			
Grading:	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_
1. Damaged sunflower seed, %	0.61	0.00	12.60	2.56	0.18	0.00	0.60	0.24	0.17	0.00	1.85	0.47
2. Screenings, %	2.58	0.36	6.16	1.51	3.10	1.04	6.70	2.10	2.69	0.70	6.23	1.58
3. Sclerotia, %	0.39	0.00	1.62	0.47	0.27	0.00	0.60	0.25	0.30	0.00	1.06	0.33
4. Foreign Matter, %	1.83	0.42	7.70	1.87	3.37	0.72	9.84	3.36	2.17	0.33	6.87	1.84
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	4.80	1.04	10.80	2.54	6.74	3.68	13.94	4.38	5.17	1.79	10.74	2.85
Poisonous seeds (*Crotalaria sp., Datura sp., Ricinis communis*)	1	0	10	2.62	5	0	10	4.47	1	0	12	3.22
Poisonous seeds (*Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.*)	0	0	10	2.04	0	0	0	0.00	0	0	0	0.00
Number of samples	**24**				**6**				**17**			
Nutritional analysis:	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_
Moisture, % (5 hr, 105 ºC)	4.7	3.5	7.5	0.88	5.2	4.8	5.5	0.27	5.1	4.5	5.9	0.46
Crude Protein, % (as is)	15.85	13.05	18.10	1.24	16.02	15.61	16.43	0.34	16.83	14.61	19.55	1.31
Crude Fat, % (as is)	39.0	34.4	44.5	2.51	36.3	32.6	38.6	2.38	37.7	32.5	42.5	2.77
Crude Fibre, % (as is)	21.5	16.8	24.8	1.86	22.7	20.1	25.5	1.88	21.9	15.7	24.5	2.12
Ash, % (as is)	2.75	2.31	3.14	0.21	2.73	2.46	3.04	0.20	2.86	2.32	3.29	0.26
Number of samples	**24**				**6**				**17**			

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PRODUCTION REGION	(24) Free State Central Region				(25) Free State South-Western Region				(26) Free State South-Eastern Region			
Grading:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
1. Damaged sunflower seed, %	0.05	0.00	0.32	0.11	0.12	0.00	0.24	0.17	0.34	0.00	0.72	0.29
2. Screenings, %	3.16	0.32	15.36	4.00	1.22	1.00	1.44	0.31	2.84	0.54	6.83	2.21
3. Sclerotia, %	0.34	0.00	1.78	0.47	1.05	0.24	1.86	1.15	2.95	0.56	7.84	2.36
4. Foreign Matter, %	1.15	0.55	2.76	0.66	1.65	1.50	1.80	0.21	1.71	0.50	4.44	1.30
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	4.66	1.61	18.28	4.50	3.92	3.04	4.80	1.24	7.50	2.66	13.29	4.01
Poisonous seeds (Crotalaria sp., Datura sp., Ricinis communis)	3	0	40	11.55	4	0	8	5.66	0	0	0	0.00
Poisonous seeds (Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	12				2				9			
Nutritional analysis:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
Moisture, % (5 hr, 105 ºC)	5.0	4.0	5.8	0.72	4.8	4.6	5.0	0.28	4.6	4.1	5.0	0.33
Crude Protein, % (as is)	14.67	12.74	16.02	0.98	14.77	14.13	15.41	0.91	13.70	12.64	15.42	1.01
Crude Fat, % (as is)	37.6	36.2	41.1	1.47	37.3	36.9	37.6	0.49	38.4	36.1	40.7	1.67
Crude Fibre, % (as is)	23.4	21.7	25.2	1.11	23.8	23.7	23.9	0.14	23.2	21.7	24.7	0.84
Ash, % (as is)	2.52	2.40	2.69	0.10	2.87	2.79	2.94	0.11	2.61	2.45	2.85	0.14
Number of samples	12				2				9			

South Africa
REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(27) Free State Northern Region				(28) Free State Eastern Region				(29) Mpumalanga Southern Region			
Grading:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
1. Damaged sunflower seed, %	0.52	0.00	3.10	1.27	0.03	0.00	0.18	0.06	12.77	3.66	16.60	4.69
2. Screenings, %	2.24	0.86	4.00	1.46	1.23	0.52	2.32	0.60	1.29	0.90	2.28	0.50
3. Sclerotia, %	0.08	0.00	0.34	0.14	0.76	0.00	3.50	1.19	0.04	0.00	0.24	0.10
4. Foreign Matter, %	1.92	0.50	4.12	1.43	1.09	0.30	3.14	0.88	0.70	0.18	1.36	0.39
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	4.23	1.36	8.12	2.43	3.08	1.42	6.52	2.00	2.03	1.08	3.88	0.97
Poisonous seeds (*Crotalaria sp., Datura sp., Ricinis communis*)	1	0	3	1.22	0	0	0	0.00	0	0	0	0.00
Poisonous seeds (*Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.*)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Number of samples	6				8				6			
Nutritional analysis:	ave	min	max	stdev	ave	min	max	stdev	ave	min	max	stdev
Moisture, % (5 hr, 105 °C)	5.0	4.6	5.5	0.38	4.2	3.2	5.4	0.76	4.7	4.5	5.1	0.28
Crude Protein, % (as is)	15.86	13.95	18.57	1.58	15.61	14.50	17.70	0.95	14.79	14.48	15.30	0.32
Crude Fat, % (as is)	39.0	36.0	41.8	2.07	40.1	35.4	43.1	2.36	39.7	37.1	41.3	1.53
Crude Fibre, % (as is)	22.0	20.8	22.7	0.80	20.9	18.1	25.4	2.63	24.1	21.3	25.2	1.44
Ash, % (as is)	2.50	2.35	2.69	0.13	2.55	2.10	2.83	0.21	2.21	2.14	2.36	0.08
Number of samples	6				8				6			

South Africa
REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(34) Gauteng Region				(35) Limpopo Region			
Grading:	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_
1. Damaged sunflower seed, %	0.28	-	-	-	0.04	0.00	0.40	0.11
2. Screenings, %	4.79	-	-	-	2.55	0.36	6.74	1.86
3. Sclerotia, %	0.22	-	-	-	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.65	-	-	-	0.72	0.10	1.82	0.52
5. Deviations in 2, 3 and 4 collectively, %: Provided that such deviations are individually within the limits of said items	6.66	-	-	-	3.27	0.50	6.98	1.88
Poisonous seeds _(Crotalaria sp., Datura sp., Ricinis communis)_	0	-	-	-	0	0	0	0.00
Poisonous seeds _(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)_	0	-	-	-	0	0	0	0.00
Number of samples	**_1_**				**_13_**			
Nutritional analysis:	_ave_	_min_	_max_	_stdev_	_ave_	_min_	_max_	_stdev_
Moisture, % (5 hr, 105 ºC)	4.2	-	-	-	4.6	3.4	5.2	0.49
Crude Protein, % (as is)	11.54	-	-	-	17.08	15.01	19.84	1.34
Crude Fat, % (as is)	35.6	-	-	-	38.4	35.1	41.5	1.98
Crude Fibre, % (as is)	25.4	-	-	-	20.1	17.2	22.5	1.46
Ash, % (as is)	2.71	-	-	-	2.52	2.08	2.72	0.17
Number of samples	**_1_**				**_13_**			

Fatty acid Profile

Fatty acid profiles are the most important tool for identification of authenticity of vegetable fats and oils. All types of oil have their own specific fatty acid profile which is unique to that product. Fatty acids are typically esterified to a glycerol backbone to form triglycerides (also called fats or oils). Fatty acids are either described as saturated or unsaturated, with saturated fatty acids being solid at room temperature and unsaturated fatty acids being liquid at room temperature. Unsaturated fatty acids are further subdivided into mono-unsaturated (one double bond in the carbon chain) or poly-unsaturated (more than one double bond in the carbon chain). The unique fatty acid profile of each product/crop is a combination of saturated, mono-unsaturated and poly-unsaturated oils and is specific to that type of oil.

Fatty acid profiles of every crop, however, are subject to variation. The variation or typical pattern of fatty acids in a specific oil not only influences the stability and physical properties of the oil but also aids in distinguishing one type of oil from another. Variation of fatty acids within the same product depend on climate, latitude, soil type, cultivar, rainfall as well as seasonal variation. These variations should be included when ranges for identification of authenticity are determined.

It is imperative to include ranges wherein fatty acids vary, in order to successfully validate the authenticity of a specific vegetable oil. Building of a database requires gathering of information over different seasons, areas and cultivars in order to give a true reflection of the ranges wherein fatty acids can differ. Currently, no national updated database for fatty acid composition of sunflower oil is available.

It is important that South Africa, as a sunflower seed producing country, develop and maintain a national fatty acid profile database to the benefit of the Oil Seed Industry. Annual analysis of crop and cultivar samples will ensure that the natural variation caused by different cultivars as well as the influence of climate and locality are included in the database values. Seasonal variations will also be addressed. Recording all variation applicable to the crops in the database will enable the annual review of the specified ranges.

Precision Oil Laboratories was subcontracted for the second consecutive year to perform fatty acid profile analyses on 20 composite crop samples representing different production regions as well as 20 cultivar samples from different localities. Please refer to Tables 6, 7 and 8 on pages 32 to 34 for the results.

The following fatty acid were included in the profile analysis:

C14:0	Myristic acid	C18:3n5	n5 Linolenic acid
C16:0	Palmitic acid	C18:3n3	n3 Linolenic acid
C16:1	Palmitoleic acid	C20:0	Arachidic acid
C17:0	Margaric acid	C20:1	Eicosenoic acid
C17:1	Glinkgolic acid	C20:2	Eicosadienoic acid
C18:0	Stearic acid	C21:0	Heneicosanoic acid
C18:1 c	cis Oleic acid	C22:0	Behenic acid
C18:2 c	cis Linoleic acid	C24:0	Lignoceric acid
C18:3n6	n6 Linolenic acid	C24:1	Nervonic acid

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The Fatty acid Profile information was supplied by Dr. Mathilda Mostert from Precision Oil Laboratories.

Table 6: Fatty acid profile results of a selection of crop quality samples from the 2019/20 season

g Fatty acids/100 g Fatty Acids

Province	Region	C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	12	ND	6.46	ND	ND	ND	6.01	17.57	67.7	ND	0.32	<LOQ	0.56	<LOQ	ND	ND	0.95	<LOQ	ND
	13	ND	5.19	ND	ND	ND	5.35	21.29	66.1	ND	0.30	<LOQ	0.49	<LOQ	ND	ND	0.83	<LOQ	ND
	14	ND	6.09	ND	ND	ND	5.81	17.69	68.3	ND	<LOQ	<LOQ	0.51	<LOQ	ND	ND	0.89	<LOQ	ND
	15	ND	5.44	ND	ND	ND	7.73	16.54	68.2	ND	0.30	<LOQ	0.56	<LOQ	ND	ND	0.79	<LOQ	ND
	16	ND	5.57	ND	ND	ND	5.85	19.61	66.9	ND	0.41	<LOQ	0.47	<LOQ	ND	ND	0.77	<LOQ	ND
	17	ND	5.47	ND	ND	ND	6.01	19.62	67.1	ND	ND	<LOQ	0.53	<LOQ	ND	ND	0.78	<LOQ	ND
	18	ND	6.29	ND	ND	ND	4.96	17.98	68.9	ND	<LOQ	<LOQ	0.48	<LOQ	ND	ND	0.83	<LOQ	ND
	19	ND	6.18	ND	ND	ND	7.58	15.60	68.8	ND	ND	<LOQ	0.59	<LOQ	ND	ND	0.88	<LOQ	ND
	Min	-	*5.19*	-	-	-	*4.96*	*15.60*	*66.1*	-	*0.30*	-	*0.47*	-	-	-	*0.77*	-	ND
	Max	-	*6.46*	-	-	-	*7.73*	*21.29*	*68.9*	-	*0.41*	-	*0.59*	-	-	-	*0.95*	-	-
	N	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Free State	20	ND	6.20	ND	ND	ND	6.16	16.43	69.2	ND	ND	<LOQ	0.54	<LOQ	ND	ND	0.96	<LOQ	ND
	21	ND	6.20	ND	ND	ND	5.05	16.58	70.0	ND	0.34	<LOQ	0.48	<LOQ	ND	ND	0.89	<LOQ	ND
	21	ND	5.93	ND	ND	ND	5.78	22.52	63.6	ND	0.35	<LOQ	0.51	<LOQ	ND	ND	0.89	<LOQ	ND
	22	ND	6.04	ND	ND	ND	4.97	19.53	67.5	ND	<LOQ	<LOQ	0.48	<LOQ	ND	ND	0.92	<LOQ	ND
	23	ND	5.38	ND	ND	ND	6.84	17.47	68.2	ND	0.33	<LOQ	0.53	<LOQ	ND	ND	0.85	<LOQ	ND
	24	ND	5.57	ND	ND	ND	5.76	16.83	69.8	ND	ND	<LOQ	0.54	<LOQ	ND	ND	1.00	<LOQ	ND
	26	ND	5.87	ND	ND	ND	6.68	16.39	69.0	ND	ND	<LOQ	0.54	<LOQ	ND	ND	0.99	<LOQ	ND
	27	ND	6.06	ND	ND	ND	5.61	19.53	66.6	ND	<LOQ	<LOQ	0.56	<LOQ	ND	ND	0.88	<LOQ	ND
	28	ND	5.26	ND	ND	ND	6.30	16.41	69.8	ND	0.37	<LOQ	0.52	<LOQ	ND	ND	0.81	<LOQ	ND
	Min	-	*5.26*	-	-	-	*4.97*	*16.39*	*63.6*	-	*0.33*	-	*0.48*	-	-	-	*0.81*	-	-
	Max	-	*6.20*	-	-	-	*6.84*	*22.52*	*70.0*	-	*0.37*	-	*0.56*	-	-	-	*1.00*	-	-
	N	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
Mpumalanga	29	ND	6.33	ND	ND	ND	5.22	18.44	67.8	ND	0.30	<LOQ	0.50	<LOQ	ND	ND	0.89	<LOQ	ND
Gauteng	34	ND	7.16	ND	ND	ND	4.25	16.99	69.7	ND	ND	<LOQ	0.48	<LOQ	ND	ND	0.86	<LOQ	ND
Limpopo	35	ND	6.27	ND	ND	ND	7.24	15.87	68.5	ND	<LOQ	<LOQ	0.57	<LOQ	ND	ND	0.89	<LOQ	ND
RSA	*Min*	-	*5.19*	-	-	-	*4.25*	*15.60*	*63.60*	-	*0.30*	-	*0.47*	-	-	-	*0.77*	-	-
	Max	-	*7.16*	-	-	-	*7.73*	*22.52*	*69.97*	-	*0.41*	-	*0.59*	-	-	-	*1.00*	-	-
	N	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*	*20*

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

Table 7: Fatty acid profile results of a selection of cultivar samples from the 2019/20 season

g Fatty acids/100 g Fatty Acids

Province	Locality	Region	Cultivar	C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
North West	Potchefstroom 1	18	AGSUN 5106 CLP	ND	5.38	ND	ND	ND	4.44	28.36	59.8	ND	<LOQ	ND	0.41	<LOQ	ND	ND	0.81	<LOQ	ND
			AGSUN 8251	ND	4.80	ND	ND	ND	5.25	33.5	54.6	ND	ND	ND	0.45	<LOQ	ND	ND	0.90	<LOQ	ND
			P 65 LL14	ND	5.96	ND	ND	ND	3.94	22.15	66.0	ND	0.26	ND	0.42	<LOQ	ND	ND	0.78	<LOQ	ND
			PAN 7170	ND	5.71	ND	ND	ND	3.57	23.50	65.5	ND	<LOQ	ND	0.38	<LOQ	ND	ND	0.78	<LOQ	ND
			SY 3975 CLOH	0.00	3.13	ND	ND	ND	3.61	86.4	4.43	ND	ND	<LOQ	0.36	<LOQ	ND	ND	1.32	0.38	ND
			Min	-	3.13	-	-	-	3.57	22.15	4.43	-	-	-	0.36	-	-	-	0.78	-	-
			Max	-	5.96	-	-	-	5.25	86.4	66.0	-	0.26	-	0.45	-	-	-	1.32	0.38	-
			N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Potchefstroom 3	18	AGSUN 5106 CLP	ND	5.16	ND	ND	ND	6.05	21.16	65.7	ND	<LOQ	ND	0.49	<LOQ	ND	ND	0.93	<LOQ	ND
			AGSUN 8251	ND	5.25	ND	ND	ND	6.37	22.36	64.0	ND	<LOQ	ND	0.53	<LOQ	ND	ND	0.88	<LOQ	ND
			P 65 LL14	ND	5.66	ND	ND	ND	5.08	18.08	69.1	ND	<LOQ	<LOQ	0.49	<LOQ	ND	ND	0.85	<LOQ	ND
			PAN 7170	ND	5.11	ND	ND	ND	4.71	20.67	67.5	ND	0.20	<LOQ	0.45	<LOQ	ND	ND	0.88	<LOQ	ND
			SY 3975 CLOH	ND	3.03	ND	ND	ND	5.02	82.4	6.75	ND	ND	<LOQ	0.47	<LOQ	ND	ND	1.60	0.39	ND
			Min	-	3.03	-	-	-	4.71	18.08	6.75	-	-	-	0.45	-	-	-	0.85	-	-
			Max	-	5.66	-	-	-	6.37	82.4	69.1	-	0.20	-	0.53	-	-	-	1.60	0.39	-
			N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Potchefstroom 5	18	AGSUN 5106 CLP	ND	6.39	ND	ND	ND	8.12	14.39	68.6	ND	ND	<LOQ	0.77	<LOQ	ND	ND	1.02	<LOQ	ND
			AGSUN 8251	ND	6.38	ND	ND	ND	8.42	11.81	71.1	ND	0.03	<LOQ	0.78	<LOQ	ND	ND	0.92	<LOQ	ND
			P 65 LL14	ND	6.26	ND	ND	ND	8.42	14.13	68.9	ND	ND	<LOQ	0.77	ND	ND	ND	1.13	0.29	ND
			PAN 7170	ND	6.33	ND	ND	ND	7.74	14.72	68.9	ND	ND	<LOQ	0.70	<LOQ	ND	ND	1.08	<LOQ	ND
			SY 3975 CLOH	ND	4.02	ND	ND	ND	7.57	71.2	13.98	ND	0.00	<LOQ	0.70	<LOQ	ND	ND	1.81	0.38	ND
			Min	-	4.02	-	-	-	7.57	11.81	13.98	-	-	-	0.70	-	-	-	0.92	-	-
			Max	-	6.39	-	-	-	8.42	71.2	71.1	-	0.03	-	0.78	-	-	-	1.81	0.38	-
			N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
			Min	-	3.03	-	-	-	3.57	11.81	4.43	-	0.03	-	0.36	-	-	-	0.78	0.29	-
			Max	-	6.39	-	-	-	8.42	86.4	71.1	-	0.26	-	0.78	-	-	-	1.81	0.39	-
			N	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Free State	Kroonstad	24	AGSUN 5106 CLP	ND	5.81	ND	ND	ND	9.15	11.68	71.0	ND	ND	<LOQ	0.76	<LOQ	ND	ND	1.05	<LOQ	ND
			AGSUN 8251	ND	6.17	ND	ND	ND	8.62	9.53	73.5	ND	ND	<LOQ	0.73	<LOQ	ND	ND	0.91	<LOQ	ND
			P 65 LL14	ND	5.79	ND	ND	ND	8.00	11.8	72.2	ND	ND	<LOQ	0.68	<LOQ	ND	ND	0.98	<LOQ	ND
			PAN 7170	ND	6.01	ND	ND	ND	6.52	12.68	72.7	ND	ND	<LOQ	0.58	<LOQ	ND	ND	0.94	<LOQ	ND
			SY 3975 CLOH	ND	3.29	ND	ND	ND	6.99	76.3	10.42	ND	ND	<LOQ	0.63	<LOQ	ND	ND	1.69	0.35	ND
			Min	-	3.29	-	-	-	6.52	9.53	10.42	-	-	-	0.58	-	-	-	0.91	-	-
			Max	-	6.17	-	-	-	9.15	76.3	73.5	-	-	-	0.76	-	-	-	1.69	0.35	-
			N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
			Min	-	3.29	-	-	-	6.52	9.53	10.42	-	-	-	0.58	-	-	-	0.91	-	-
			Max	-	6.17	-	-	-	9.15	76.3	73.5	-	-	-	0.76	-	-	-	1.69	0.35	-
			N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
RSA			*Min*	-	3.03	-	-	-	3.57	9.53	4.43	-	0.03	-	0.36	-	-	-	0.78	0.29	-
			Max	-	6.39	-	-	-	9.15	86.4	73.5	-	0.26	-	0.78	-	-	-	1.81	0.39	-
			N	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

Table 8: Fatty acid profile results per cultivar from the 2019/20 season

g Fatty acids/100 g Fatty Acids

Cultivar	Province	Region	C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1 c	C18:2 c	C18:3n6	C18:3n5	C18:3n3	C20:0	C20:1	C20:2	C21:0	C22:0	C24:0	C24:1
AGSUN 5106 CLP	North West	18	ND	5.38	ND	ND	ND	4.44	28.36	59.8	ND	<LOQ	ND	0.41	<LOQ	ND	ND	0.81	<LOQ	ND
		18	ND	5.16	ND	ND	ND	6.05	21.16	65.7	ND	<LOQ	ND	0.49	<LOQ	ND	ND	0.93	<LOQ	ND
	Free State	24	ND	6.39	ND	ND	ND	8.12	14.39	68.6	ND	ND	<LOQ	0.77	<LOQ	ND	ND	1.02	<LOQ	ND
		24	ND	5.81	ND	ND	ND	9.15	11.68	71.0	ND	ND	<LOQ	0.76	<LOQ	ND	ND	1.05	<LOQ	ND
	Min		-	5.16	-	-	-	4.44	11.68	59.8	-	-	-	0.41	-	-	-	0.81	-	-
	Max		-	6.39	-	-	-	9.15	28.36	71.0	-	-	-	0.77	-	-	-	1.05	-	-
	N		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
AGSUN 8251	North West	18	ND	4.80	ND	ND	ND	5.25	33.5	54.6	ND	ND	ND	0.45	<LOQ	ND	ND	0.90	<LOQ	ND
		18	ND	5.25	ND	ND	ND	6.37	22.36	64.0	ND	<LOQ	ND	0.53	<LOQ	ND	ND	0.88	<LOQ	ND
	Free State	24	ND	6.38	ND	ND	ND	8.42	11.81	71.1	ND	0.03	<LOQ	0.78	<LOQ	ND	ND	0.92	<LOQ	ND
		24	ND	6.17	ND	ND	ND	8.62	9.53	73.5	ND	ND	<LOQ	0.73	<LOQ	ND	ND	0.91	<LOQ	ND
	Min		-	4.80	-	-	-	5.25	9.53	54.6	-	0.03	-	0.45	-	-	-	0.88	-	-
	Max		-	6.38	-	-	-	8.62	33.5	73.5	-	0.03	-	0.78	-	-	-	0.92	-	-
	N		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
P 65 LL14	North West	18	ND	5.96	ND	ND	ND	3.94	22.15	66.0	ND	0.26	ND	0.42	<LOQ	ND	ND	0.78	<LOQ	ND
		18	ND	5.66	ND	ND	ND	5.08	18.08	69.1	ND	<LOQ	<LOQ	0.49	<LOQ	ND	ND	0.85	<LOQ	ND
	Free State	24	ND	6.26	ND	ND	ND	8.42	14.13	68.9	ND	ND	<LOQ	0.77	ND	ND	ND	1.13	0.29	ND
		24	ND	5.79	ND	ND	ND	8.00	11.81	72.2	ND	ND	<LOQ	0.68	<LOQ	ND	ND	0.98	<LOQ	ND
	Min		-	5.66	-	-	-	3.94	11.81	66.0	-	-	-	0.42	-	-	-	0.78	-	-
	Max		-	6.26	-	-	-	8.42	22.15	72.2	-	0.26	-	0.77	-	-	-	1.13	0.29	-
	N		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
PAN 7170	North West	18	ND	5.71	ND	ND	ND	3.57	23.50	65.5	ND	<LOQ	ND	0.38	<LOQ	ND	ND	0.78	<LOQ	ND
		18	ND	5.11	ND	ND	ND	4.71	20.67	67.5	ND	0.20	<LOQ	0.45	<LOQ	ND	ND	0.88	<LOQ	ND
	Free State	24	ND	6.33	ND	ND	ND	7.74	14.72	68.9	ND	ND	<LOQ	0.70	<LOQ	ND	ND	1.08	<LOQ	ND
		24	ND	6.01	ND	ND	ND	6.52	12.68	72.7	ND	ND	<LOQ	0.58	<LOQ	ND	ND	0.94	<LOQ	ND
	Min		-	5.11	-	-	-	3.57	12.68	65.5	-	0.20	-	0.38	-	-	-	0.78	-	-
	Max		-	6.33	-	-	-	7.74	23.50	72.7	-	0.20	-	0.70	-	-	-	1.08	-	-
	N		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
SY 3975 CLOH	North West	18	0.00	3.13	ND	ND	ND	3.61	86.4	4.43	ND	<LOQ	<LOQ	0.36	<LOQ	ND	ND	1.32	0.38	ND
		18	ND	3.03	ND	ND	ND	5.02	82.4	6.75	ND	0.20	<LOQ	0.47	<LOQ	ND	ND	1.60	0.39	ND
	Free State	24	ND	4.02	ND	ND	ND	7.57	71.2	13.98	ND	0.00	<LOQ	0.70	<LOQ	ND	ND	1.81	0.38	ND
		24	ND	3.29	ND	ND	ND	6.99	76.3	10.42	ND	ND	<LOQ	0.63	<LOQ	ND	ND	1.69	0.35	ND
	Min		-	3.03	-	-	-	3.61	71.2	4.43	-	0.20	-	0.36	-	-	-	1.32	0.35	-
	Max		-	4.02	-	-	-	7.57	86.4	13.98	-	0.20	-	0.70	-	-	-	1.81	0.39	-
	N		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
RSA	Min		-	3.03	-	-	-	3.57	9.53	4.43	-	0.26	-	0.36	-	-	-	0.78	0.35	-
	Max		-	6.39	-	-	-	9.15	86.4	73.5	-	0.26	-	0.78	-	-	-	1.81	0.39	-
	N		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

Note:
Limit of detection (LOD) = 0.09 g Fatty acid/100 g Fatty acids.
Limit of quantitation (LOQ) = 0.28 g Fatty acid/100 g Fatty acids.
Values below the limit of quantitation cannot be accurately quantified.
ND = Not detected

Methods

SAMPLING PROCEDURE:

A working group determined the procedure to be followed to ensure that the crop quality samples sent to the SAGL by the various grain silo owners, were representative of the total crop.

Each delivery was sampled as per the grading regulations for grading purposes.

After grading, the grading samples were placed in separate containers according to class and grade, per silo bin at each silo.

After 80% of the expected harvest had been received, the content of each container was divided with a multi slot divider in order to obtain a 3 kg sample.

If there were more than one container per class and grade per silo bin, the combined contents of the containers were mixed thoroughly before dividing it with a multi slot divider to obtain the required 3 kg sample.

The samples were marked clearly with the name of the depot, the bin/bag/bunker number(s) represented by each individual sample as well as the class and grade and were then forwarded to the SAGL.

GRADING:

Full grading was done in accordance with the Regulations relating to the Grading, Packing and Marking of Sunflower Seed intended for sale in the Republic of South Africa (Government Notice NO. 45 of 22 January 2016).

TEST WEIGHT:

Test weight provides a measure of the bulk density of grain and oilseeds.

Test weight does not form part of the grading regulations for sunflower seed in South Africa. An approximation of the test weight of South African sunflower seed is provided in this report for information purposes. The standard working procedure of the Kern 222 instrument, as described in ISO 7971-3:2019, was followed. The g/1 L filling mass of the sunflower seed samples was determined and divided by two. The test weight was then extrapolated by means of the following formulas obtained from the Test Weight Conversion Chart for Sunflower Seed, Oil of the Canadian Grain Commission: $y = 0.1936x + 2.2775$ (138 to 182 g/0.5 L) and $y = 0.1943x + 2.1665$ (183 to 227 g/0.5 L).

NUTRITIONAL ANALYSIS:

Milling
Prior to the chemical analyses, the sunflower seed samples were milled on a Retch ZM 200 mill fitted with a 1.0 mm screen.

Moisture
The moisture content of the samples was determined as a loss in weight when dried in an oven at 105 °C for 5 hours according to AgriLASA method 2.1, latest edition.

Crude Protein
The Dumas combustion analysis technique was used to determine the crude protein content, according to AACCI method 46-30.01, latest edition.

This method prescribes a generic combustion method for the determination of crude protein. Combustion at high temperature in pure oxygen sets nitrogen free, which is measured by thermal conductivity detection. The

total nitrogen content of the sample is determined and converted to equivalent protein by multiplication with a factor of 6.25 to obtain the crude protein content.

Crude Fat
In-House method 024 was used for the determination of the crude fat in the samples. After sample preparation the fat is extracted by petroleum ether with the aid of the Soxhlet extraction apparatus, followed by the removal of the solvent by evaporation and weighing the dried residue thus obtained. The residue is expressed as % crude fat.

Crude Fibre
In-House method 020 was used for the determination of the crude fibre in the samples. Crude fibre is the loss on ignition of the dried residue remaining after digestion of the sample with 1.25% Sulphuric acid (H_2SO_4) and 1.25% Sodium hydroxide (NaOH) solutions under specific conditions.

Ash
Ash is defined as the quantity of mineral matter which remains as incombustible residue of the tested substance, after application of the described working method. In-house method No. 011, based on AACCI method 08-03.01, was used for the determination. The samples were incinerated at 600 ± 15 °C in a muffle furnace for 2 hours.

PRECISION OIL LABORATORIES' FATTY ACID PROFILE METHODS:

Fat Extraction
In-House method POL 019 was used for the extraction of the crude fat from the samples. After sample preparation the fat is extracted by petroleum ether under reflux, followed by the removal of the solvent by evaporation. The residue obtained from the fat extraction is used for preparation of methyl esters for determination of the fatty acid profile

Fatty Acid Profile
In-House method POL 015 was used for determination of the fatty acid composition. Extracted fat is converted to methyl esters using an alkali catalyzed method. Methyl esters are injected into a Gas Chromatograph and an external fatty acid methyl ester standard is used to identify peaks based on retention times. The fatty acid composition is expressed as a total fatty acid content of 100% with different fatty acids representing a percentage of the total fatty acids.