



Magruder Fertilizer Proficiency Testing

METHOD Summary Statistics

251011 (Liquid Ammonium Polyphosphate, Regular Scheme)



Issue Date: 11/30/2025

Code	Analyte / Method	Trueness (Lab Value)							Precision (range)	
		Robust Mean	# Obs	Robust StDev	Robust Uncert.	Robust %RSD	Horwitz %RSD	IA ratio	Robust Mean	# Obs
001.10	Ammoniacal N, Magnesium Oxide Method (%)	11.01	5	0.1766	0.0987	1.6	2.78		0.076	5
001.99	Ammoniacal N, Other (%)	11.05	18	0.2093	0.0617	1.89	2.78		0.0909	18
010.60	Total N, Combustion (11%)	11.18	51	0.1999	0.035	1.79	2.78	0.78	0.1539	43
010.99	Total N, Other (11%)	11.02	11	0.2295	0.0865	2.08	2.78	0.90	0.0526	10
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	37.1	12	0.358	0.1292	0.97	1.64		0.1395	11
020.50	Total P2O5, ICP (%)	36.04	18	1.567	0.4618	4.35	1.67		0.5816	18
020.99	Total P2O5, Other (%)	36.32	5	1.641	0.9172	4.52	1.66		0.21	5
041.11	Direct Available P2O5, Gravimetric Quinolinium, Ci	37.12	6	0.2887	0.1473	0.78	1.64	0.93	0.0942	6
041.21	Direct Available P2O5, Spectrophotometric, Citrate	36.61	5	0.7658	0.4281	2.09	1.65	2.28	0.333	4
041.50	Direct Available P2O5, ICP (37%)	34.93	4	3.515	2.197	10.1	1.69	11.26	0.7487	3
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (37%	37.28	10	1.08	0.4268	2.9	1.64	3.59	0.7423	10
041.99	Direct Available P2O5, Other (37%)	37.21	6	0.167	0.0852	0.45	1.64	0.55	0.1277	6
050.99	Soluble K2O, Other (%)	0.1389	4	0.0155	0.0097	11.2	5.37		0.0231	4

Code	Analyte / Method	Trueness (Lab Value)							Precision (range)	
		Robust Mean	# Obs	Robust StDev	Robust Uncert.	Robust %RSD	Horwitz %RSD	IA ratio	Robust Mean	# Obs

Statistical parameters of the population: Robust statistics was used if number of observations ≥ 6 for estimate of trueness (blue background) and precision (green background). Classical statistics was used if number of observations = 3, 4, or 5 (no color background).

Horwitz %RSD and IA ratio: These values are benchmarks that can be used to evaluate the variability of a population of data in the round. Horwitz %RSD is a standard benchmark on variability from proficiency testing programs. IA ratio is population variability divided by variability expected from AAPFCO investigational allowance. IA ratios greater than 1 indicate population variability is greater than that expected from the IA.

Appendix

Content Description of Analyte and Method Summary Statistics Report

Data collected from all the labs provides an estimate of trueness and precision for determination of an analyte regardless of method (Analyte Summary Statistics) or for determination of analyte by specific methods (Method Summary Statistics). Determination of summary statistics followed protocols in ISO 13528:2015(E) (Statistical methods for use in proficiency testing by interlaboratory comparison). Robust statistics was used to determine statistical parameters for sets with 6 or more observations. Classical statistics was used for sets with 3, 4, or 5 observations. Robust statistics has an advantage of removing undesired influence outlying data can have on the mean and standard deviation without removing data from the statistical analysis.

For trueness, the mean and standard deviation are presented for the number of observations in the population. The uncertainty is a measure of where the “real” value for the concentration lies around the mean with a 68% certainty. The larger the number of observations, the smaller the uncertainty. The relative standard deviation (%RSD) is a percentage of the standard deviation divided by the mean. The Horwitz %RSD is a standard benchmark on variability developed by Horwitz (https://www.rsc.org/images/horwitz-function-technical-brief-17_tcm18-214859.pdf) that can be used to compare program results with Horwitz expectation. The IA ratio is a measure of how disperse the data is in a population compared to dispersion expected by the AAPFCO investigational allowance (IA). The ratio is the data dispersion in the population divided by IA expected data dispersion. Values greater than 1 indicate data dispersion was greater than IA expected dispersion.

Precision in the data populations is estimated by the range of duplicate results reported. The robust or classical mean is presented along with the number of observations. Any duplicate results that are exactly the same are removed in the determination of the mean to remove undue influence of entries from labs reporting one result twice.



Magruder Fertilizer Proficiency Testing

METHOD All Tests Report

251011 (Liquid Ammonium Polyphosphate, Regular Scheme)



Issue Date: 11/30/2025

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
Ammoniacal N, Magnesium Oxide Method (%)										
001.10	Ammoniacal N, Magnesium Oxide Method (%)	389	10.72	10.88	10.8	-1.18	11.01	0.1766	5	
001.10	Ammoniacal N, Magnesium Oxide Method (%)	498	10.8	10.9	10.85	-0.89	11.01	0.1766	5	
001.10	Ammoniacal N, Magnesium Oxide Method (%)	231	11.04	11.05	11.04	0.21	11.01	0.1766	5	
001.10	Ammoniacal N, Magnesium Oxide Method (%)	117	11.1	11.2	11.15	0.80	11.01	0.1766	5	
001.10	Ammoniacal N, Magnesium Oxide Method (%)	27	11.19	11.2	11.2	1.06	11.01	0.1766	5	
Ammoniacal N, Other (%)										
001.99	Ammoniacal N, Other (%)	368	9.942	10.025	9.984	-5.07	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	481	10.56	10.48	10.52	-2.51	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	524	10.764	10.894	10.83	-1.03	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	605	10.77	10.89	10.83	-1.03	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	423	10.93	10.97	10.95	-0.46	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	612	10.85	11.14	11	-0.24	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	584	10.92	11.14	11.03	-0.07	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	394	11.037	11.028	11.03	-0.06	11.05	0.2093	18	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
001.99	Ammoniacal N, Other (%)	553	11.08	11	11.04	-0.03	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	517	11.03	11.05	11.04	-0.03	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	220	11.09	11.05	11.07	0.12	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	476	11.1522	11.0496	11.1	0.27	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	169	11.09	11.12	11.1	0.29	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	136	11.1	11.2	11.15	0.50	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	559	11.22	11.23	11.22	0.86	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	602	11.26	11.31	11.28	1.15	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	255	11.45	11.17	11.31	1.27	11.05	0.2093	18	
001.99	Ammoniacal N, Other (%)	647	11.703	11.562	11.63	2.81	11.05	0.2093	18	

Nitrate N, Other (%)

002.99	Nitrate N, Other (%)	220	<0.01	<0.01	<0.01					6
002.99	Nitrate N, Other (%)	423	<0.01	<0.01	<0.01					6
002.99	Nitrate N, Other (%)	136	<0.1	<0.1	<0.1					6
002.99	Nitrate N, Other (%)	481	<0.1	<0.1	<0.1					6
002.99	Nitrate N, Other (%)	368	0.763	0.74	0.7515					

Urea N, Urease (as N) (%)

005.00	Urea N, Urease (as N) (%)	136	<0.1	<0.1	<0.1					6
005.00	Urea N, Urease (as N) (%)	368	0.0388	0.03	0.0344					

Urea N, Other (%)

005.99	Urea N, Other (%)	524	0.312	0.318	0.315					
005.99	Urea N, Other (%)	638	10.9	10.85	10.88					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Total N, Modified Comprehensive (11 %)									
010.11	Total N, Modified Comprehensive (%)	309	10.87	10.94	10.9					
	Total N, Salicylic (11 %)									
010.12	Total N, Salicylic (%)	602	11.26	11.31	11.28					
	Total N, Combustion (11 %)									
010.60	Total N, Combustion (%)	131	10.662	10.987	10.82	-1.76	11.18	0.1999	51	
010.60	Total N, Combustion (%)	102	10.82	10.89	10.86	-1.61	11.18	0.1999	51	
010.60	Total N, Combustion (%)	588	11.1	10.7	10.9	-1.38	11.18	0.1999	51	
010.60	Total N, Combustion (%)	423	10.92	10.95	10.94	-1.21	11.18	0.1999	51	
010.60	Total N, Combustion (%)	234	10.94	10.98	10.96	-1.08	11.18	0.1999	51	
010.60	Total N, Combustion (%)	390	11.02	10.91	10.96	-1.06	11.18	0.1999	51	
010.60	Total N, Combustion (%)	389	11.03	10.97	11	-0.88	11.18	0.1999	51	
010.60	Total N, Combustion (%)	42	11.1	10.9	11	-0.88	11.18	0.1999	51	
010.60	Total N, Combustion (%)	307	10.8	11.2	11	-0.88	11.18	0.1999	51	
010.60	Total N, Combustion (%)	35	11	11	11	-0.88	11.18	0.1999	51	
010.60	Total N, Combustion (%)	542	11.06	11.03	11.04	-0.66	11.18	0.1999	51	
010.60	Total N, Combustion (%)	612	10.95	11.15	11.05	-0.63	11.18	0.1999	51	
010.60	Total N, Combustion (%)	95	11.03	11.08	11.06	-0.61	11.18	0.1999	51	
010.60	Total N, Combustion (%)	422	11.06	11.06	11.06	-0.58	11.18	0.1999	51	
010.60	Total N, Combustion (%)	27	10.95	11.19	11.07	-0.53	11.18	0.1999	51	
010.60	Total N, Combustion (%)	43	11.17	10.98	11.08	-0.50	11.18	0.1999	51	
010.60	Total N, Combustion (%)	360	11.17	11.01	11.09	-0.43	11.18	0.1999	51	
010.60	Total N, Combustion (%)	472	11.13	11.06	11.1	-0.40	11.18	0.1999	51	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
010.60	Total N, Combustion (%)	260	11.4	10.8	11.1	-0.38	11.18	0.1999	51	
010.60	Total N, Combustion (%)	354	11.1	11.1	11.1	-0.38	11.18	0.1999	51	
010.60	Total N, Combustion (%)	624	11.108	11.1	11.1	-0.36	11.18	0.1999	51	
010.60	Total N, Combustion (%)	494	11.15	11.06	11.1	-0.35	11.18	0.1999	51	
010.60	Total N, Combustion (%)	356	11.08	11.14	11.11	-0.33	11.18	0.1999	51	
010.60	Total N, Combustion (%)	231	11.13	11.13	11.13	-0.23	11.18	0.1999	51	
010.60	Total N, Combustion (%)	521	11.1425	11.1425	11.14	-0.17	11.18	0.1999	51	
010.60	Total N, Combustion (%)	233	11.26	11.03	11.14	-0.15	11.18	0.1999	51	
010.60	Total N, Combustion (%)	34	11.14	11.15	11.14	-0.15	11.18	0.1999	51	
010.60	Total N, Combustion (%)	136	11	11.3	11.15	-0.13	11.18	0.1999	51	
010.60	Total N, Combustion (%)	543	11.15	11.16	11.16	-0.10	11.18	0.1999	51	
010.60	Total N, Combustion (%)	220	11.18	11.16	11.17	-0.03	11.18	0.1999	51	
010.60	Total N, Combustion (%)	527	10.936	11.41	11.17	-0.01	11.18	0.1999	51	
010.60	Total N, Combustion (%)	40	11.2	11.2	11.2	0.12	11.18	0.1999	51	
010.60	Total N, Combustion (%)	324	11.4	11	11.2	0.12	11.18	0.1999	51	
010.60	Total N, Combustion (%)	55	11.195	11.205	11.2	0.12	11.18	0.1999	51	
010.60	Total N, Combustion (%)	292	11.24	11.23	11.24	0.30	11.18	0.1999	51	
010.60	Total N, Combustion (%)	485	11	11.5	11.25	0.37	11.18	0.1999	51	
010.60	Total N, Combustion (%)	86	11.262	11.308	11.28	0.55	11.18	0.1999	51	
010.60	Total N, Combustion (%)	106	11.34	11.23	11.28	0.55	11.18	0.1999	51	
010.60	Total N, Combustion (%)	451	11.28	11.29	11.28	0.55	11.18	0.1999	51	
010.60	Total N, Combustion (%)	291	11.34	11.35	11.34	0.85	11.18	0.1999	51	
010.60	Total N, Combustion (%)	481	11.35	11.4	11.38	1.00	11.18	0.1999	51	
010.60	Total N, Combustion (%)	377	11.37	11.38	11.38	1.00	11.18	0.1999	51	
010.60	Total N, Combustion (%)	49	11.39	11.42	11.4	1.15	11.18	0.1999	51	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
010.60	Total N, Combustion (%)	23	11.473	11.368	11.42	1.22	11.18	0.1999	51	
010.60	Total N, Combustion (%)	29	11.5	11.5	11.5	1.62	11.18	0.1999	51	
010.60	Total N, Combustion (%)	73	11.8	11.24	11.52	1.72	11.18	0.1999	51	
010.60	Total N, Combustion (%)	402	11.422	11.654	11.54	1.81	11.18	0.1999	51	
010.60	Total N, Combustion (%)	25	11.85	11.25	11.55	1.87	11.18	0.1999	51	
010.60	Total N, Combustion (%)	255	11.685	11.611	11.65	2.36	11.18	0.1999	51	
010.60	Total N, Combustion (%)	368	11.91	11.702	11.81 †	3.15	11.18	0.1999	51	
010.60	Total N, Combustion (%)	561	11.89	11.89	11.89 †	3.57	11.18	0.1999	51	

Total N, Other (11 %)

010.99	Total N, Other (%)	558	9.63	9.89	9.76 †	-5.47	11.02	0.2295	11	
010.99	Total N, Other (%)	524	10.7523	10.7858	10.77	-1.07	11.02	0.2295	11	
010.99	Total N, Other (%)	605	10.77	10.89	10.83	-0.81	11.02	0.2295	11	
010.99	Total N, Other (%)	556	10.94	10.96	10.95	-0.29	11.02	0.2295	11	
010.99	Total N, Other (%)	538	10.95	11.05	11	-0.07	11.02	0.2295	11	
010.99	Total N, Other (%)	513	11.04	11.05	11.04	0.13	11.02	0.2295	11	
010.99	Total N, Other (%)	481	11.06	11.06	11.06	0.19	11.02	0.2295	11	
010.99	Total N, Other (%)	517	11.05	11.07	11.06	0.19	11.02	0.2295	11	
010.99	Total N, Other (%)	551	11.19	11.22	11.2	0.83	11.02	0.2295	11	
010.99	Total N, Other (%)	602	11.26	11.31	11.28	1.17	11.02	0.2295	11	
010.99	Total N, Other (%)	559	11.3	11.29	11.3	1.22	11.02	0.2295	11	
010.99	Total N, Other (%)	615	11	11.7	11.35	1.46	11.02	0.2295	11	1

Total P2O5, Gravimetric Quinolinium MolybdoP (%)

020.10	Total P2O5, Gravimetric Quinolinium MolybdoP (%)	49	35.59	35.25	35.42					
020.10	Total P2O5, Gravimetric Quinolinium MolybdoP (%)	95	36.94	37.04	36.99					

							Population of Lab Values			
Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Robust Mean	Robust StDev	# Obs	Flag
Total P2O5, Spectrophotometric MolybdovanadoP (%)										
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	324	36.7	35.6	36.15	-2.65	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	356	36.3	36.54	36.42	-1.89	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	498	36.7	36.6	36.65	-1.25	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	220	36.86	36.67	36.76	-0.93	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	481	37.13	36.69	36.91	-0.52	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	309	36.93	36.98	36.96	-0.40	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	602	37.15	37.25	37.2	0.29	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	561	37.23	37.25	37.24	0.40	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	394	37.341	37.323	37.33	0.65	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	169	37.3	37.37	37.34	0.66	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	231	37.34	37.34	37.34	0.68	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	292	37.42	37.39	37.4	0.86	37.1	0.358	12	
020.20	Total P2O5, Spectrophotometric MolybdovanadoP (%)	476	37.6768	37.2836	37.48	1.07	37.1	0.358	12	
Total P2O5, Automated (%)										
020.40	Total P2O5, Automated (%)	42	33.4	32.2	32.8					
020.40	Total P2O5, Automated (%)	35	38.1	38.7	38.4					
Total P2O5, ICP (%)										
020.50	Total P2O5, ICP (%)	389	30.7	31.5	31.1	-3.15	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	524	32.7968	34.5284	33.66	-1.52	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	543	33.822	33.983	33.9	-1.37	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	390	35.3	34.9	35.1	-0.60	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	433	35.02	35.29	35.16	-0.57	36.04	1.567	18	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
020.50	Total P2O5, ICP (%)	542	34.581	36.406	35.49	-0.35	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	612	34.76	36.73	35.74	-0.19	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	472	36	35.92	35.96	-0.05	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	422	36.114	35.908	36.01	-0.02	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	402	35.861	36.166	36.01	-0.02	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	356	36.28	36.5	36.39	0.22	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	588	36.81	36.42	36.62	0.37	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	527	36.8969	36.94	36.92	0.56	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	368	36.5844	37.3026	36.94	0.57	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	291	37.42	37.45	37.44	0.89	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	451	37.24	37.68	37.46	0.90	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	234	37.9	37.8	37.85	1.15	36.04	1.567	18	
020.50	Total P2O5, ICP (%)	255	39.732	37.419	38.58	1.62	36.04	1.567	18	1

Total P2O5, Other (%)										
020.99	Total P2O5, Other (%)	558	33	33.8	33.4	-1.78	36.32	1.641	5	
020.99	Total P2O5, Other (%)	638	36.79	36.88	36.84	0.31	36.32	1.641	5	
020.99	Total P2O5, Other (%)	513	37.1	37.07	37.08	0.46	36.32	1.641	5	
020.99	Total P2O5, Other (%)	517	37.09	37.12	37.1	0.48	36.32	1.641	5	
020.99	Total P2O5, Other (%)	602	37.15	37.25	37.2	0.53	36.32	1.641	5	

Citrate Insoluble P2O5, Spectrophotometric MolybdovanadoP (%)										
030.20	Citrate Insoluble P2O5, Spectrophotometric MolybdovanadoP	602	0.04	0.05	0.045					

Citrate Insoluble P2O5, Other (%)										
030.99	Citrate Insoluble P2O5, Other (%)	602	0.04	0.05	0.045					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
030.99	Citrate Insoluble P2O5, Other (%)	556	30.04	30.06	30.05					
Direct Available P2O5, Gravimetric Quinolinium (37 %)										
041.10	Direct Available P2O5, Gravimetric Quinolinium (%)	40	37.3	37.3	37.3	-0.61	37.35	0.0852	3	
041.10	Direct Available P2O5, Gravimetric Quinolinium (%)	102	37.19	37.42	37.3	-0.55	37.35	0.0852	3	
041.10	Direct Available P2O5, Gravimetric Quinolinium (%)	494	37.46	37.44	37.45	1.15	37.35	0.0852	3	
Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA Ext. (37 %)										
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	185	36.55	36.76	36.66	-1.45	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	485	37.8	36.1	36.95	-0.54	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	55	37.135	36.97	37.05	-0.22	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	513	37.15	37.09	37.12	-0.02	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	517	37.12	37.14	37.13	0.02	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	220	37.38	37.29	37.34	0.65	37.12	0.2887	6	
041.11	Direct Available P2O5, Gravimetric Quinolinium, Citrate-EDTA	73	37.41	37.43	37.42	0.91	37.12	0.2887	6	
Direct Available P2O5, Spectrophotometric (37 %)										
041.20	Direct Available P2O5, Spectrophotometric (%)	553	36.5	36.07	36.28					
041.20	Direct Available P2O5, Spectrophotometric (%)	602	37.11	37.2	37.16					
Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext. (37 %)										
041.21	Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext.	472	35.79	35.65	35.72	-1.16	36.61	0.7658	5	
041.21	Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext.	106	36.32	35.35	35.84	-1.01	36.61	0.7658	5	
041.21	Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext.	394	37.04	37.062	37.05	0.58	36.61	0.7658	5	
041.21	Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext.	354	37.2	37	37.1	0.64	36.61	0.7658	5	
041.21	Direct Available P2O5, Spectrophotometric, Citrate-EDTA Ext.	231	37.33	37.33	37.33	0.94	36.61	0.7658	5	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Direct Available P2O5, Automated (37 %)									
041.40	Direct Available P2O5, Automated (%)	34	36.5065	36.6392	36.57					
041.40	Direct Available P2O5, Automated (%)	29	36.92	37.01	36.96					
	Direct Available P2O5, ICP (37 %)									
041.50	Direct Available P2O5, ICP (%)	624	29.384	30.02	29.7	-1.49	34.93	3.515	4	
041.50	Direct Available P2O5, ICP (%)	131	36.8	35.69	36.24	0.37	34.93	3.515	4	
041.50	Direct Available P2O5, ICP (%)	521	36.5063	36.5063	36.51	0.45	34.93	3.515	4	
041.50	Direct Available P2O5, ICP (%)	605	37.53	37.03	37.28	0.67	34.93	3.515	4	
	Direct Available P2O5, ICP, Citrate-EDTA Ext. (37 %)									
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	360	33.25	32.51	32.88 †	-3.79	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	117	36.49	36.22	36.36 †	-0.79	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	25	35.1	37.9	36.5 †	-0.67	37.28	1.08	10	1
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	377	36.82	36.75	36.78	-0.42	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	136	36.7	37.5	37.1	-0.15	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	43	37.74	37.64	37.69	0.36	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	494	37.23	38.29	37.76	0.42	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	233	36.23	39.6	37.92	0.55	37.28	1.08	10	1
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	23	38.453	38.4455	38.45 †	1.01	37.28	1.08	10	
041.51	Direct Available P2O5, ICP, Citrate-EDTA Ext. (%)	423	38.63	38.47	38.55 †	1.10	37.28	1.08	10	
	Direct Available P2O5, Other (37 %)									
041.99	Direct Available P2O5, Other (%)	538	36.95	37.08	37.02	-1.02	37.21	0.167	6	
041.99	Direct Available P2O5, Other (%)	551	37.16	37.14	37.15	-0.30	37.21	0.167	6	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
041.99	Direct Available P2O5, Other (%)	602	37.11	37.2	37.16	-0.28	37.21	0.167	6	
041.99	Direct Available P2O5, Other (%)	559	37.21	37.2	37.2	-0.01	37.21	0.167	6	
041.99	Direct Available P2O5, Other (%)	584	37.57	36.95	37.26	0.28	37.21	0.167	6	
041.99	Direct Available P2O5, Other (%)	647	37.698	37.883	37.79	3.11	37.21	0.167	6	
Water Soluble P2O5, Spectrophotometric (%)										
048.20	Water Soluble P2O5, Spectrophotometric (%)	602	15.68	15.74	15.71					
048.20	Water Soluble P2O5, Spectrophotometric (%)	472	31.58	33.53	32.56					
Water Soluble P2O5, Other (%)										
048.99	Water Soluble P2O5, Other (%)	602	15.68	15.74	15.71					
Soluble K2O, AA (Citrate-EDTA) (%)										
050.32	Soluble K2O, AA (Citrate-EDTA) (%)	472	0.19	0.17	0.18					
Soluble K2O, ICP (Oxalate) (%)										
050.50	Soluble K2O, ICP (Oxalate) (%)	422	0.167	0.167	0.167					
Soluble K2O, ICP (Citrate-EDTA) (%)										
050.52	Soluble K2O, ICP (Citrate-EDTA) (%)	354	0.167	0.16	0.1635					
Soluble K2O, Other (%)										
050.99	Soluble K2O, Other (%)	524	0.1055	0.1519	0.1287	-0.66	0.1389	0.0155	4	
050.99	Soluble K2O, Other (%)	527	0.1309	0.1328	0.1318	-0.45	0.1389	0.0155	4	
050.99	Soluble K2O, Other (%)	542	0.136	0.13	0.133	-0.38	0.1389	0.0155	4	
050.99	Soluble K2O, Other (%)	588	0.181	0.143	0.162	1.49	0.1389	0.0155	4	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Ca, ICP, test portion inorganic 965.09 (%)									
101.30	Acid Soluble Ca, ICP, test portion inorganic 965.09 (%)	354	0.07	0.06	0.065					
	Acid Soluble Ca, ICP, test portion 2006.03A-C (%)									
101.32	Acid Soluble Ca, ICP, test portion 2006.03A-C (%)	423	<0.5	<0.5	<0.5				6	
	Acid Soluble Ca, ICP, 2017.02 (%)									
101.33	Acid Soluble Ca, ICP, 2017.02 (%)	527	<0.01	<0.01	<0.01				6	
	Acid Soluble Mg, ICP, test portion inorganic 965.09 (%)									
121.30	Acid Soluble Mg, ICP, test portion inorganic 965.09 (%)	354	0.12	0.12	0.12					
	Acid Soluble Mg, ICP, 2017.02 (%)									
121.33	Acid Soluble Mg, ICP, 2017.02 (%)	527	0.0782	0.0813	0.0798					
121.33	Acid Soluble Mg, ICP, 2017.02 (%)	472	0.08	0.08	0.08					
	Acid Soluble Mg, Other (%)									
121.99	Acid Soluble Mg, Other (%)	524	0.0841	0.0905	0.0873					
	Total S, ICP, test portion as in 2017.02 (%)									
148.07	Total S, ICP, test portion as in 2017.02 (%)	527	<0.01	<0.01	<0.01				6	
148.07	Total S, ICP, test portion as in 2017.02 (%)	472	0.572	0.576	0.574					
	Total S, Other (%)									
148.99	Total S, Other (%)	422	0.527	0.528	0.5275					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
148.99	Total S, Other (%)	354	0.82	0.79	0.805					
S - HNO3 soluble, ICP (%)										
149.04	S - HNO3 soluble, ICP (%)	524	0.5545	0.5927	0.5736					
Acid Soluble As, ICP (ppm)										
151.30	Acid Soluble As, ICP (ppm)	605	<6.25	<6.25	<6.25					6
151.30	Acid Soluble As, ICP (ppm)	524	1.0426	1.0542	1.048					
Acid Soluble As, ICP, 2006.03 (ppm)										
151.32	Acid Soluble As, ICP, 2006.03 (ppm)	220	0.35	0.44	0.395					
Acid Soluble As, ICP, 2017.02 (ppm)										
151.33	Acid Soluble As, ICP, 2017.02 (ppm)	527	<0.0001	<0.0001	<0.0001					6
Acid Soluble As, Other (ppm)										
151.99	Acid Soluble As, Other (ppm)	220	0.45	0.48	0.465					
Acid Soluble B, ICP, test portion in 982.01 (%)										
165.30	Acid Soluble B, ICP, test portion in 982.01 (%)	354	0.01	0.01	0.01					
Acid Soluble B, Other (%)										
165.99	Acid Soluble B, Other (%)	527	<0.01	<0.01	<0.01					6
165.99	Acid Soluble B, Other (%)	423	<5	<5	<5					6
165.99	Acid Soluble B, Other (%)	524	0.0078	0.008	0.0079					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Cd, ICP (ppm)									
181.30	Acid Soluble Cd, ICP (ppm)	605	10.51	10.95	10.73					
181.30	Acid Soluble Cd, ICP (ppm)	524	16.7854	17.1858	16.99					
	Acid Soluble Cd, ICP, 2006.03 (ppm)									
181.32	Acid Soluble Cd, ICP, 2006.03 (ppm)	220	12.9	12.8	12.85					
	Acid Soluble Cd, ICP, 2017.02 (ppm)									
181.33	Acid Soluble Cd, ICP, 2017.02 (ppm)	527	12.7461	12.6765	12.71					
	Acid Soluble Cd, Other (ppm)									
181.99	Acid Soluble Cd, Other (ppm)	220	12.9	12.7	12.8					
	Acid Soluble Cr, ICP (ppm)									
191.30	Acid Soluble Cr, ICP (ppm)	524	171.485	171.536	171.5					
191.30	Acid Soluble Cr, ICP (ppm)	605	184.67	191.13	187.9					
	Acid Soluble Cr, ICP, 2006.03 (ppm)									
191.32	Acid Soluble Cr, ICP, 2006.03 (ppm)	220	230	232	231					
	Acid Soluble Cr, ICP, 2017.02 (ppm)									
191.33	Acid Soluble Cr, ICP, 2017.02 (ppm)	527	246.718	240.073	243.4					
	Acid Soluble Cr, Other (ppm)									
191.99	Acid Soluble Cr, Other (ppm)	220	233	225	229					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Co, ICP (ppm)									
202.30	Acid Soluble Co, ICP (ppm)	605	<1.25	<1.25	<1.25				6	
202.30	Acid Soluble Co, ICP (ppm)	524	1.9747	2.8218	2.398					
	Acid Soluble Co, ICP, 2006.03 (ppm)									
202.32	Acid Soluble Co, ICP, 2006.03 (ppm)	220	<0.1	<0.1	<0.1				6	
202.32	Acid Soluble Co, ICP, 2006.03 (ppm)	423	4.8	4.91	4.855					
	Acid Soluble Co, ICP, 2017.02 (ppm)									
202.33	Acid Soluble Co, ICP, 2017.02 (ppm)	527	<0.0001	<0.0001	<0.0001				6	
	Acid Soluble Co, Other (ppm)									
202.99	Acid Soluble Co, Other (ppm)	220	<0.1	<0.1	<0.1				6	
	Acid Soluble Cu, ICP, test portion inorganic 965.09 (%)									
221.30	Acid Soluble Cu, ICP, test portion inorganic 965.09 (%)	354	<0.01	<0.01	<0.01				6	
221.30	Acid Soluble Cu, ICP, test portion inorganic 965.09 (%)	402	0.001	0.0011	0.001					
	Acid Soluble Cu, ICP, test portion 2006.03A-C (%)									
221.32	Acid Soluble Cu, ICP, test portion 2006.03A-C (%)	423	<0.01	<0.01	<0.01				6	
	Acid Soluble Cu, ICP, 2017.02 (%)									
221.33	Acid Soluble Cu, ICP, 2017.02 (%)	527	<0.0001	<0.0001	<0.0001				6	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Cu, Other (%)									
221.99	Acid Soluble Cu, Other (%)	524	0.0002	0.0002	0.0002					
	Acid Soluble Fe, ICP, test portion inorganic 965.09 (%)									
241.30	Acid Soluble Fe, ICP, test portion inorganic 965.09 (%)	354	0.4	0.39	0.395					
	Acid Soluble Fe, ICP, 2017.02 (%)									
241.33	Acid Soluble Fe, ICP, 2017.02 (%)	527	0.3973	0.3995	0.3984					
241.33	Acid Soluble Fe, ICP, 2017.02 (%)	472	0.403	0.402	0.4025					
	Acid Soluble Fe, Other (%)									
241.99	Acid Soluble Fe, Other (%)	524	0.3438	0.3949	0.3694					
	Acid Soluble Pb, ICP (ppm)									
251.30	Acid Soluble Pb, ICP (ppm)	605	<6.25	<6.25	<6.25				6	
251.30	Acid Soluble Pb, ICP (ppm)	524	1.2916	1.5052	1.398					
	Acid Soluble Pb, ICP, 2006.03 (ppm)									
251.32	Acid Soluble Pb, ICP, 2006.03 (ppm)	220	<0.5	<0.5	<0.5				6	
	Acid Soluble Pb, ICP, 2017.02 (ppm)									
251.33	Acid Soluble Pb, ICP, 2017.02 (ppm)	527	<0.0001	<0.0001	<0.0001				6	
	Acid Soluble Pb, Other (ppm)									
251.99	Acid Soluble Pb, Other (ppm)	220	<0.5	<0.5	<0.5				6	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Mn, ICP, test portion 972.02a (%)									
261.30	Acid Soluble Mn, ICP, test portion 972.02a (%)	354	<0.01	<0.01	<0.01				6	
	Acid Soluble Mn, ICP, 2017.02 (%)									
261.35	Acid Soluble Mn, ICP, 2017.02 (%)	527	0.0049	0.0048	0.0048					
	Acid Soluble Mn, Other (%)									
261.99	Acid Soluble Mn, Other (%)	524	0.0043	0.0049	0.0046					
	Acid Soluble Hg, ICP (ppm)									
281.30	Acid Soluble Hg, ICP (ppm)	527	<0.001	<0.001	<0.001				6	
281.30	Acid Soluble Hg, ICP (ppm)	605	<1.25	<1.25	<1.25				6	
	Acid Soluble Hg, Other (ppm)									
281.99	Acid Soluble Hg, Other (ppm)	220	0.02	0.01	0.015					
	Acid Soluble Mo, ICP (ppm)									
289.30	Acid Soluble Mo, ICP (ppm)	402	5	6	5.5					
289.30	Acid Soluble Mo, ICP (ppm)	524	8.3892	8.9936	8.691					
	Acid Soluble Mo, ICP, 2006.03 (ppm)									
289.32	Acid Soluble Mo, ICP, 2006.03 (ppm)	220	6.2	6.3	6.25					
	Acid Soluble Mo, ICP, 2017.02 (ppm)									
289.33	Acid Soluble Mo, ICP, 2017.02 (ppm)	527	5.5737	5.6127	5.593					

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Mo, Other (ppm)									
289.99	Acid Soluble Mo, Other (ppm)	220	6.3	6.3	6.3					
	Acid Soluble Ni, ICP (ppm)									
291.30	Acid Soluble Ni, ICP (ppm)	605	<1.25	<1.25	<1.25				6	
291.30	Acid Soluble Ni, ICP (ppm)	524	0.6284	0.6689	0.6486					
	Acid Soluble Ni, ICP, 2006.03 (ppm)									
291.32	Acid Soluble Ni, ICP, 2006.03 (ppm)	220	<0.1	<0.1	<0.1				6	
	Acid Soluble Ni, ICP, 2017.02 (ppm)									
291.33	Acid Soluble Ni, ICP, 2017.02 (ppm)	527	<0.0001	<0.0001	<0.0001				6	
	Acid Soluble Ni, Other (ppm)									
291.99	Acid Soluble Ni, Other (ppm)	220	<0.1	<0.1	<0.1				6	
	Acid Soluble Se, ICP (ppm)									
301.30	Acid Soluble Se, ICP (ppm)	605	<6.25	<6.25	<6.25				6	
301.30	Acid Soluble Se, ICP (ppm)	524	0.0584	0.0617	0.06					
	Acid Soluble Se, ICP, 2006.03 (ppm)									
301.32	Acid Soluble Se, ICP, 2006.03 (ppm)	220	<0.3	<0.3	<0.3				6	
	Acid Soluble Se, ICP, 2017.02 (ppm)									
301.33	Acid Soluble Se, ICP, 2017.02 (ppm)	527	<0.01	<0.01	<0.01				6	

Code	Analyte and Method	Lab Num	Result1	Result2	Lab Value	Z score	Population of Lab Values			
							Robust Mean	Robust StDev	# Obs	Flag
	Acid Soluble Se, Other (ppm)									
301.99	Acid Soluble Se, Other (ppm)	220	<0.3	<0.3	<0.3				6	
	Sodium, ICP, test portion as in 2017.02 (%)									
311.33	Sodium, ICP, test portion as in 2017.02 (%)	527	0.085	0.0883	0.0866					
	Sodium, Other (%)									
311.99	Sodium, Other (%)	354	0.1	0.1	0.1					
	Acid Soluble Zn, ICP, test portion inorganic 965.09 (%)									
321.30	Acid Soluble Zn, ICP, test portion inorganic 965.09 (%)	354	0.02	0.02	0.02					
321.30	Acid Soluble Zn, ICP, test portion inorganic 965.09 (%)	402	0.0299	0.03	0.03					
	Acid Soluble Zn, ICP, test portion 2006.03A-C (%)									
321.32	Acid Soluble Zn, ICP, test portion 2006.03A-C (%)	220	0.0249	0.025	0.025					
	Acid Soluble Zn, ICP, 2017.02 (%)									
321.33	Acid Soluble Zn, ICP, 2017.02 (%)	527	0.0268	0.0274	0.0271					
321.33	Acid Soluble Zn, ICP, 2017.02 (%)	472	0.03	0.03	0.03					
	Acid Soluble Zn, Other (%)									
321.99	Acid Soluble Zn, Other (%)	220	0.0255	0.0245	0.025					
321.99	Acid Soluble Zn, Other (%)	524	0.0256	0.0277	0.0266					

Lab Data: Value is the average of 2 reported lab results. † or ‡ beside Lab Value denotes the value exceeds the investigational allowance (IA) around the analyte mean. † denotes value is less than IA and ‡ denotes value is greater than IA. This is noted for guaranteed analytes with # of observations ≥ 6 . Method code and analyte name are shown in green for guaranteed analytes along with guaranteed concentration.

Statistical parameters of the population: Robust statistics was used to determine mean, %RSD, and range if number of observations ≥ 6 (blue background). Classical statistics was used if number of observations = 3, 4, or 5 (pink background). The number of observations in parentheses is the number of values used in the statistical calculation. Footnote on flags below identifies flag number where data was rejected and the reason why.

Z scores: Red = Z value >3 or <-3 (action required), Orange = Z value between 2 and 3 or -2 and -3 (warning), Green = Z value between -2 and 2 (pass). Z values are determined for data populations with number of observation ≥ 3 for values that are not an analytical limit or 0. Color ratings shown for number of observations ≥ 6 .

Flags: Flag number denotes whether or not Lab Value was used in the population to determine statistical parameters. No flag number indicates data was used, 1 = data rejected for dups too far apart, 2 = rejected as extreme outlier, 3 = rejected for both dups too far apart and extreme outlier, 4 = removed after manual inspection, 5 = rejected due to zero(s) submitted, 6 = rejected due to analytical limit submitted (eg "<0.1").

Other Method: Unspecified methods are shown without color ratings on Z-score.

Appendix

Content Description of Analyte and Method All Tests Report

The All Tests reports have results listed for every lab grouped by Analyte or by Method with data in each group sorted by lab value. The reports are helpful to see where your lab result fell within the whole set of data for the Analyte or Method by identifying your results by your lab number. Data on the right side of the report shows the mean, standard deviation, and number of observations (obs) used in the analysis of each group. An observation was a lab value for a test which was the average of reported duplicate results. Determination of mean and standard deviation followed protocols in ISO 13528:2015(E) (Statistical methods for use in proficiency testing by interlaboratory comparison) where robust statistics was used to determine the mean and standard deviation for 6 or more observations. Robust statistics has an advantage of removing undesired influence outlying data can have on the mean and standard deviation without removing data from the statistical analysis. Robust statistics is only appropriate for use on data sets with 6 or more observations. For data sets with 3, 4, or 5 observations, classical calculation of mean and standard deviation was performed. Z scores for data sets with a small number of observations are given less importance as indicated by no color coding of Z score with less than 6 observations. No Z scores were determined for 1 or 2 observations.

Before determining mean and standard deviation for a set of data, data was removed from statistical analysis for various reasons. Mandel statistical analysis was used to identify and remove extreme outliers and lab values from duplicate results that were too far apart (ISO 5725-2:1994, Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method.). Any individual result report of zero or less than a limit had lab value removed from analysis. The lab values removed from analysis are denoted with numerical flags on the far right-hand side of the report. Z scores are reported for data removed due to extreme outlier or duplicates too far apart even though data was not used in the determination of mean and standard deviation. However, Z scores are not reported for results reported as 0 or less than a limit. Also, any submission of just one lab result is removed for consideration in statistical analysis and presentation on reports.

The American Association of Plant Food Control Officials (AAPFCO) recommends limits around a nutrient guarantee that should initiate an investigation if observed nutrient concentration falls outside of the limits. These limits are referred to as Investigational Allowances (IAs). Lab Values that fall outside of the IA limits around the analyte mean are denoted with † (below limit) or ‡ (above limit). These same symbols are also used to denote Lab Values beyond IA limits on Laboratory Report Cards.