

Mining Labserve's data for your benefit

By Larne Auerswald
and Michael Bufé

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📍 STELLENBOSCH

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Layout

- Soils
- Leaves
- Compost
- Water
- MRLs



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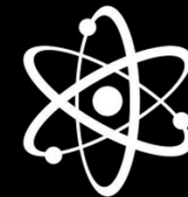
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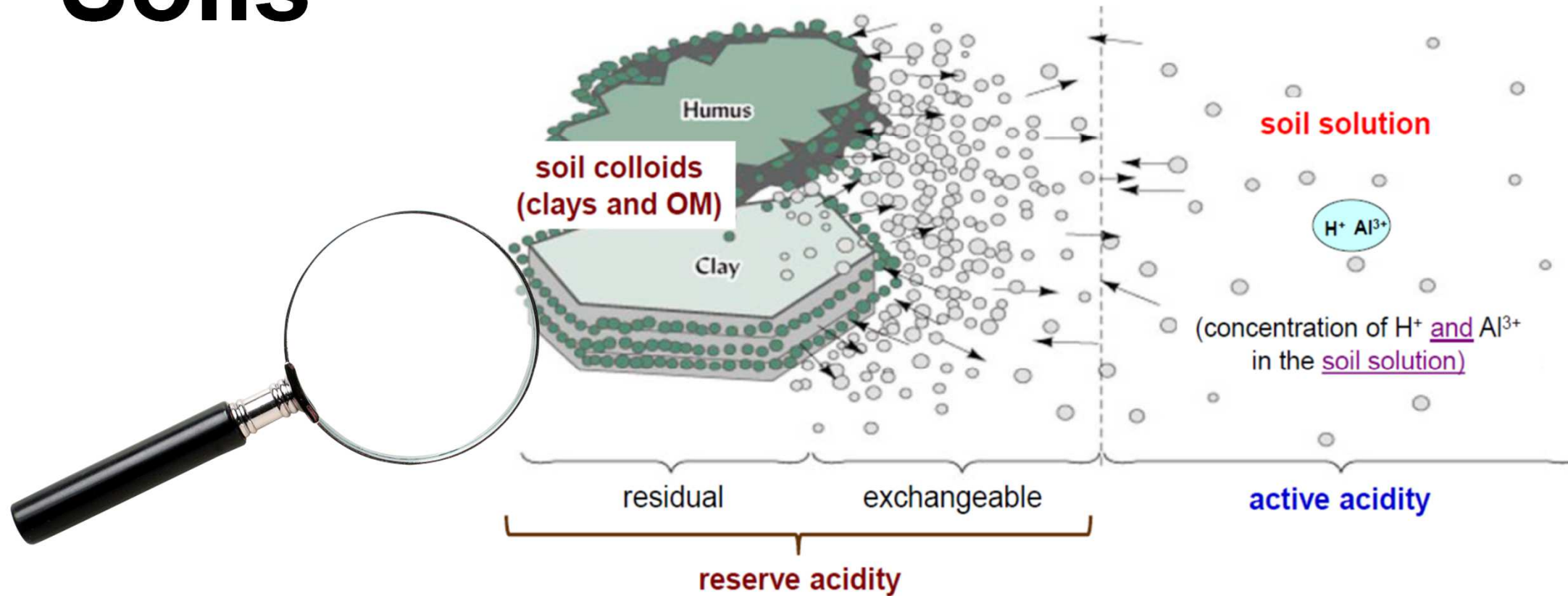
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Soils

$$\text{total acidity} = (\text{residual} + \text{exchangeable}) + \text{active}$$



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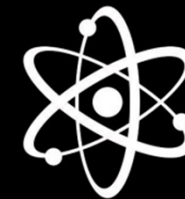
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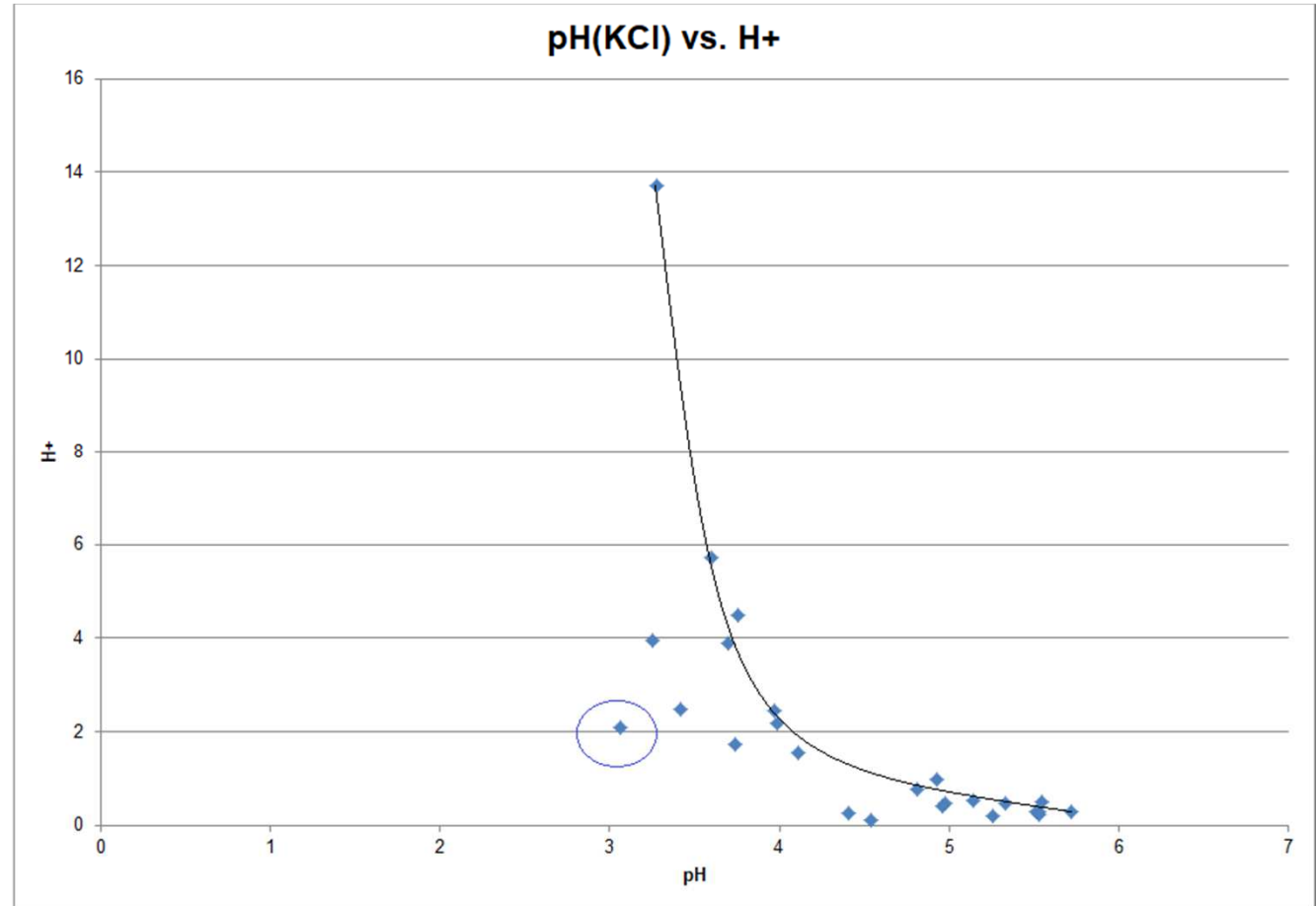
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Soils

- Titratable acidity and pH



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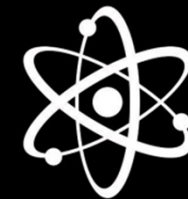
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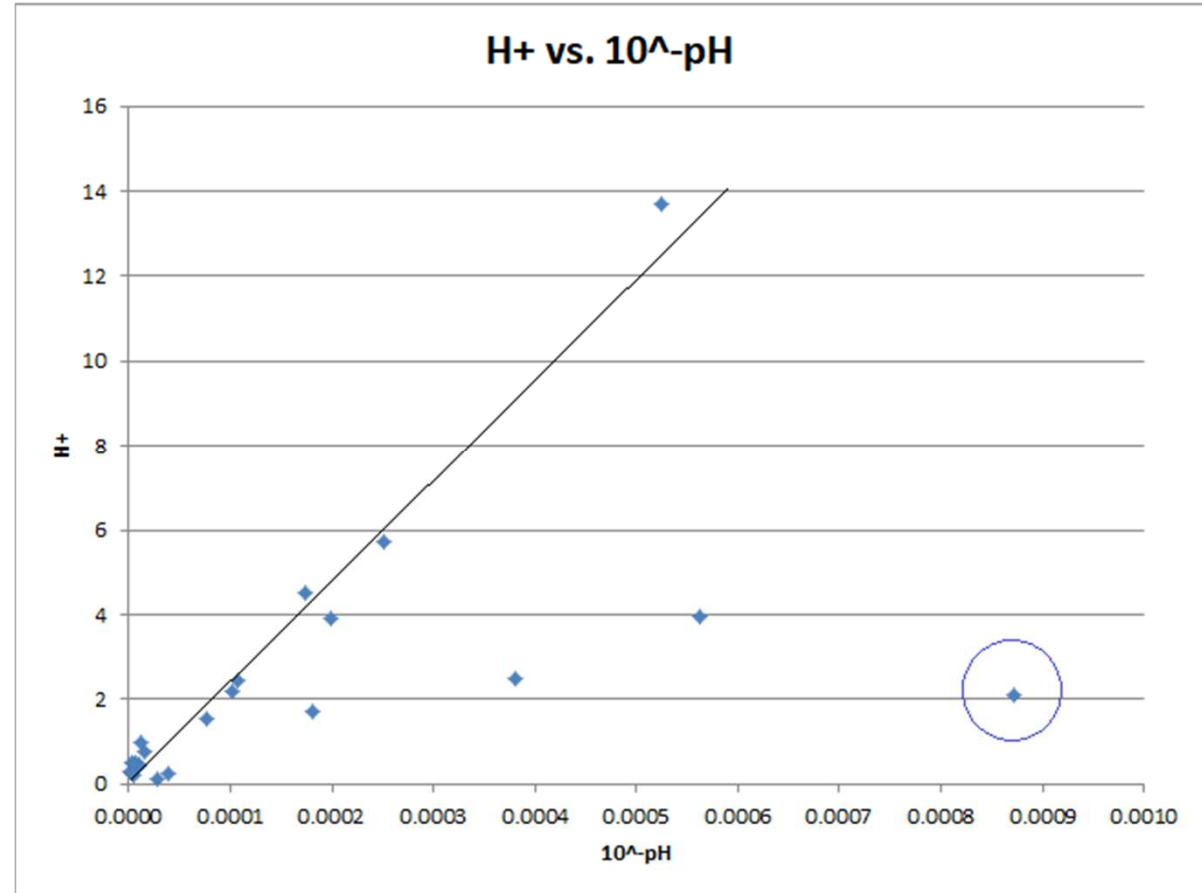
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Soils

- Titratable acidity and pH



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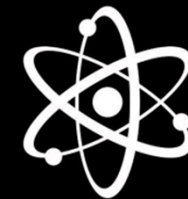
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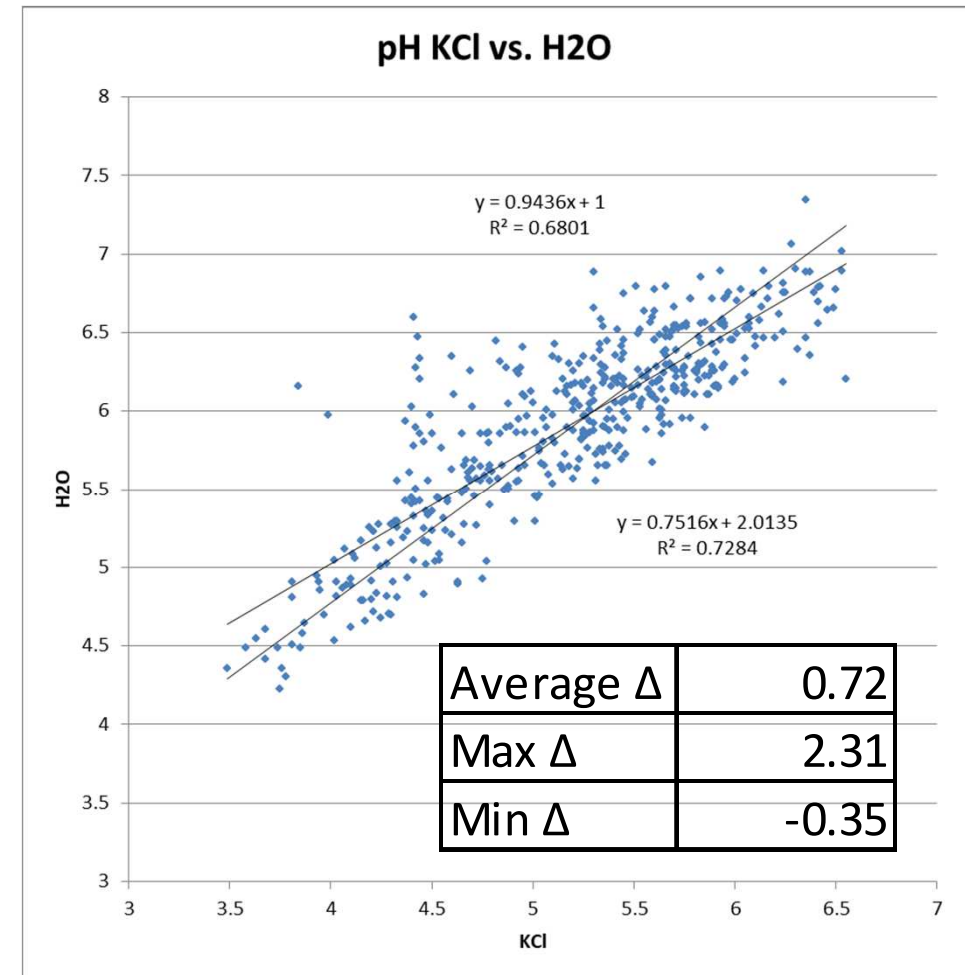
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Soils

- pH (H₂O) vs. (KCl)
- Average difference (468 samples) is 0.72



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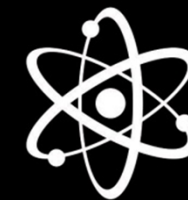
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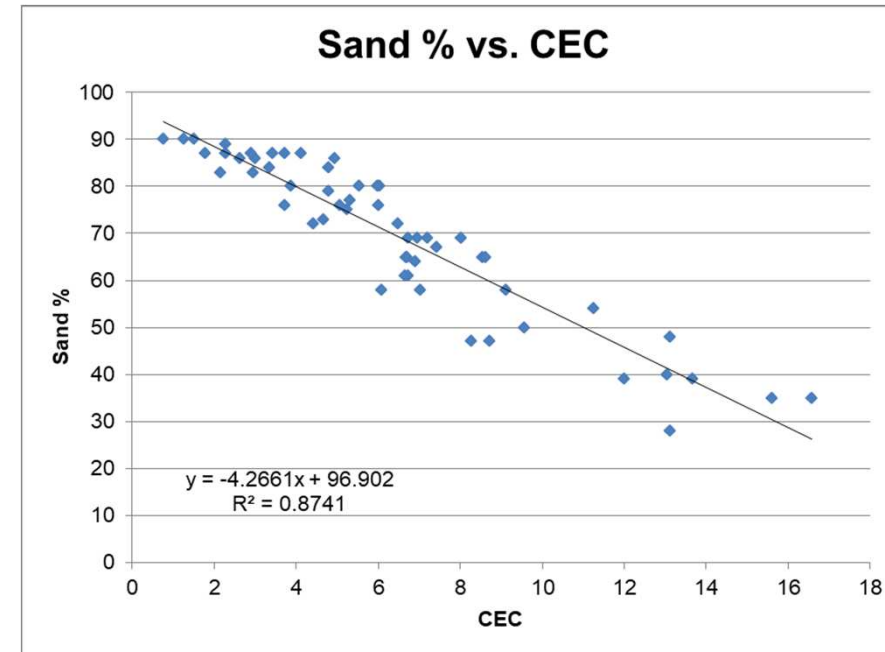
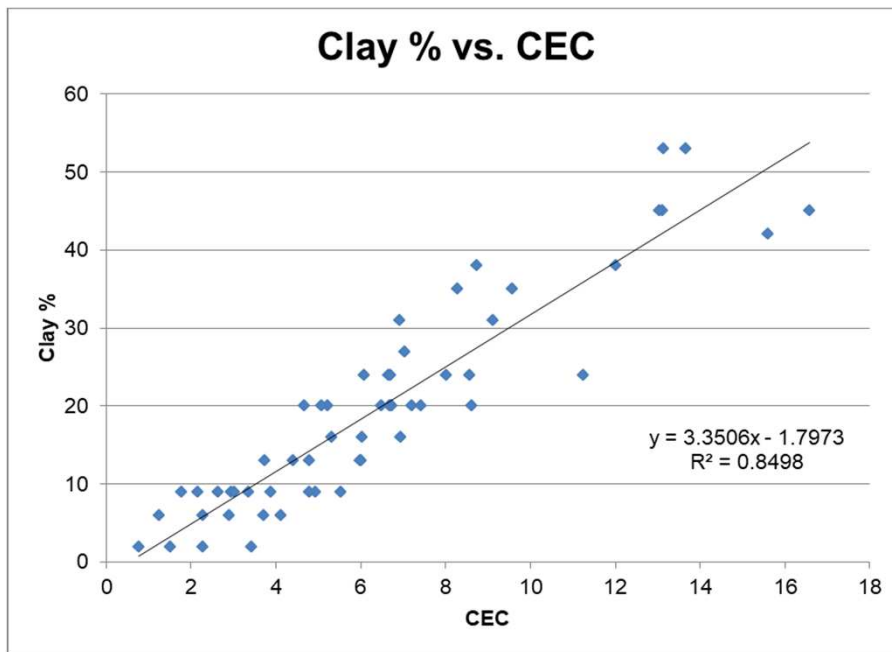
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Soils

- Texture vs. CEC (Ammonium acetate)



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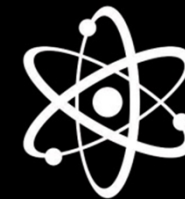
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Soils

- %C and [nutrients]

pH	P	K	Ca	Mg	Na	Zn	Cu	Mn	Fe	B	S	OrgC
7.18	104	108	2598	264	185	0.86	1.5	14	8.5	0.58	88	0.93
7.31	51	64	1909	182	136	0.62	0.73	6.6	6.8	0.65	52	0.19
7.38	49	61	2377	241	183	0.37	1.2	3.7	6	0.86	31	0.21



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Leaves

- Citrus
- Macadamia
- Avocado



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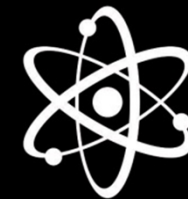
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Citrus

Low
Norm
High

	N%	P%	K%	Ca%	Mg%	S%	Na%	Zn ppm	Cu ppm	Mn ppm	Fe ppm	B ppm	Mo ppm	Cl ppm
2024	2.06	0.11	1.06	3.17	0.35	0.27	0.085	30.48	11.2	77	131	73	0.19	0.058
2025	2.52	0.13	1.34	3.05	0.33	0.27	0.050	31.28	14.7	100	150	81	0.33	0.134

- **2024 (505) + 2025 (455):**
 - February to April
 - Excluding the Cape, nurseries and possible chemical trials



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Citrus



A summary of the norms supplied in the CRI production guidelines (Coetzee, 2007)

Cultivar/ Selection	Norm	N	P	K	Ca	Mg
Valencias in hot areas	Deficient	<1.9	<0.10	<0.60	<2.50	<0.25
	Optimal	2.3-2.6	0.12-0.15	0.90-1.50	3.5-6.0	0.35-0.50
	Excess	>2.8	>0.17	>1.80	>7.00	>0.75
Valencias in other areas	Deficient	<1.9	<0.10	<0.60	<2.50	<0.25
	Optimal	2.1-2.3	0.12-0.15	0.90-1.50	3.5-6.0	0.35-0.50
	Excess	>2.5	>0.17	>1.80	>7.00	>0.75
Deltas & Mid- knights	Deficient	<2.10	<0.10	<0.60	<2.50	<0.25
	Optimal	2.4-2.6	0.12-0.15	0.90-1.50	3.5-6.0	0.35-0.50
	Excess	>2.8	>0.17	>1.80	>7.00	>0.75
Mandarins	Deficient	<1.9	<0.10	<0.60	<2.50	<0.25
	Optimal	2.3-2.5	0.12-0.15	0.90-1.50	3.5-6.0	0.35-0.50
	Excess	>2.75	>0.17	>1.80	>7.00	>0.75
Clementines	Deficient	<1.9	<0.10	<0.60	<2.50	<0.25
	Optimal	2.2-2.4	0.12-0.15	0.90-1.60	3.5-6.0	0.35-0.50
	Excess	>2.6	>0.17	>1.80	>7.00	>0.75
Navels	Deficient	<1.9	<0.10	<0.50	<2.50	<0.25
	Optimal	2.4-2.6	0.12-0.15	0.70-1.10	3.5-6.0	0.35-0.50
	Excess	>2.8	>0.17	>1.50	>7.00	>0.75
Lemons	Deficient	<1.9	<0.10	<0.60	<2.50	<0.25
	Optimal	2.3-2.6	0.12-0.15	0.80-1.20	3.5-6.0	0.35-0.50
	Excess	>2.8	>0.17	>1.50	>7.00	>0.75
Grapefruit	Deficient	<1.7	<1.20	<0.60	<2.50	<0.25
	Optimal	1.8-2.2	0.14-0.16	0.80-1.00	3.5-6.0	0.35-0.50
	Excess	>2.4	>0.18	>1.25	>7.00	>0.75

	S	Cl	Na	Cu	Fe	Mn	Zn	B	Mo
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	
	<0.15			<3	<40	<25	<15	<40	<0.05
	0.20-0.30			5-20		40-150	25-100	75-200	
	>0.50	>0.65	>4000	>40		>300	>200	>300	

Citrus Leaf Norms

Element	Unit	Norm
N	%	2.1 - 2.8
P	%	0.11 - 0.15
K	%	0.9 - 1.8
Ca	%	3.5 - 5.5
Mg	%	0.3 - 0.55
S	%	0.2 - 0.5
Zn	mg/kg	20 - 70
Cu	mg/kg	5.0 - 16
Mn	mg/kg	30 - 150
Fe	mg/kg	80 - 300
B	mg/kg	50 - 150

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Macadamia

Low
Norm
High

	N%	P%	K%	Ca%	Mg%	S%	Na%	Zn ppm	Cu ppm	Mn ppm	Fe ppm	B ppm	Si ppm	Mo ppm	Al ppm	Cl ppm
Early '24	1.47	0.09	0.57	0.73	0.10	0.17	0.036	15.70	14.9	736	73	48	2204	0.26	50	0.013
Late '24	1.44	0.07	0.61	0.70	0.08	0.14	0.017	15.00	9.7	728	95	49	2777	0.45	80	0.022
Early '25	1.53	0.09	0.62	0.64	0.09	0.15	0.012	13.98	8.7	669	80	31	2614	0.25	53	0.020

- **2024-2025:**
 - Early 2024 (541), late 2024 (2100) and early 2025 (698)
 - Early = January to March
 - Late = October to December
 - Excluding nurseries and possible chemical trials



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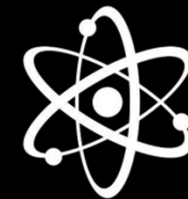
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Labserve Mac Leaf Data Trends

Low
Norm
High

Labserve MAC matrix QC samples:

	N	P	K	Ca	Mg	S	Na	Zn	Cu	Mn	Fe	B	Mo	Al	
MAC 2019	1,41	0,11	0,89	0,62	0,12	0,18	0,019	14	4,8	463	99	59	0,12	40	Average

	N	P	K	Ca	Mg	S	Na	Zn	Cu	Mn	Fe	B	Mo	Al	
MAC 2021	1,41	0,10	0,70	0,58	0,10	0,17	0,018	20	6,2	628	91	53	0,27	78	Average

	N	P	K	Ca	Mg	S	Na	Zn	Cu	Mn	Fe	B	Mo	Al	
MAC_2023	1,54	0,09	0,72	0,82	0,11	0,16	0,019	20	8,1	717	78	41	0,17	48	Average

	N	P	K	Ca	Mg	S	Na	Zn	Cu	Mn	Fe	B	Mo	Al	
MAC_2024	1,45	0,08	0,60	0,70	0,09	0,15	0,029	15	10,4	725	89	47	0,53	70	Average

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Interpretation

Various Macadamia leaf norms:



LABSERVE Macadamia Leaf Norms

Element	Unit	Norm
N	%	1.3 - 1.9
P	%	0.08 - 0.1
K	%	0.4 - 0.9
Ca	%	0.6 - 1.0
Mg	%	0.08 - 0.12
S	%	0.18 - 0.25
Na	%	0.01 - 0.10
Zn	mg/kg	8.0 - 50
Cu	mg/kg	5.0 - 10
Mn	mg/kg	50 - 1500
Fe	mg/kg	50 - 200
B	mg/kg	40 - 90
Cl	%	0.03 - 0.20

SAMAC-Best-Practices-in-a-Nutshell-Annual-leaf-and-soil-nutritional-analysis PDF from SAMAC website:

Kuperus and Abercrombie (2003).

Analysis result	NORM
LEAF	
N	1.2 – 1.5 %
P	0.07 – 0.09 %
K	0.4 – 0.6 %
Ca	0.6 – 0.9 %
Mg	0.09 – 0.11 %
S	0.2 – 0.4 %
B	50 – 90 ppm
Zn	15 – 30 ppm
Cu	5 – 10 ppm
Mn	150 – 250 ppm

*Multi Macs norms from Stephan Schoeman
Nov 2021 SAMAC day presentation:*

Dry leaf analysis	SAMAC	ARC-ITSC (1994)	Revised Aus Std (2007)
Nitrogen (%)	1.2 – 1.5	1.5 – 2.0	1.4 – 1.7
Potassium (%)	0.5 – 0.7	0.4 – 0.8	0.4 – 0.8
Phosphorus (%)	0.07 – 0.09	0.08 – 0.10	0.08 – 0.11
Sulphur (%)	0.2 – 0.3	–	0.15 – 0.21
Calcium (%)	0.6 – 0.9	0.4 – 1.0	0.6 – 0.9
Magnesium (%)	0.09 – 0.11	0.08 – 0.12	0.08 – 0.12
Zinc (ppm)	15 – 50	8 – 50	6 – 15
Boron (ppm)	50 – 90	30 – 70	40 – 80
Manganese (ppm)	150 – 1000	50 – 200	250 – 1850
Iron (ppm)	25 – 200	50 – 200	30 – 100
Copper (ppm)	5 – 12	5 – 10	5 – 10

Australian norms:

Nutrient	Acceptable
Nitrogen (% N)	1.40–1.80
Phosphorus (% P)	0.08–0.10
Potassium (% K)	0.60–0.70
Sulfur (% S)	0.18–0.25
Calcium (% Ca)	0.60–0.90
Magnesium (% Mg)	0.08–0.10
Boron (mg/kg B)	40–74
Zinc (mg/kg Zn)	15–50
Copper (mg/kg Cu)	4.50–10
Iron (mg/kg Fe)	40–200
Manganese (mg/kg Mn)	100–1,000
Chloride (% Cl ⁻)	0.00–0.20
Sodium (% Na)	0.01–0.10

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Avocado

Low
Norm
High

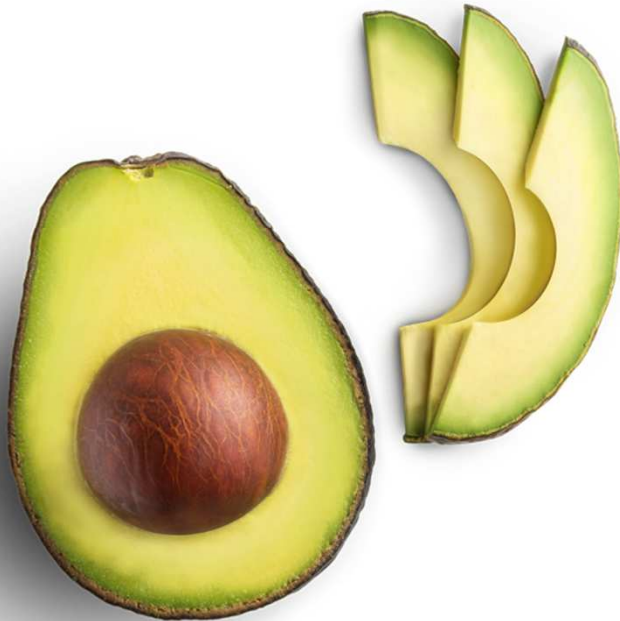
	N%	P%	K%	Ca%	Mg%	S%	Na%	Zn ppm	Cu ppm	Mn ppm	Fe ppm	B ppm	Mo ppm	Cl ppm
2024	2.25	0.11	0.78	1.12	0.50	0.23	0.06	29.25	176.1	308	97	38	1.20	0.051
2025	2.53	0.12	0.81	1.03	0.46	0.21	0.02	28.54	121.7	274	101	39	2.39	0.023

- **2024 (672) + 2025 (577):**
 - February to May
 - Excluding the Cape, nurseries and possible chemical trials

Soil ➡

Cu
mg/kg
257
468
393

Avocado



Avocado Leaf Norms

Element	Unit	Norm
N	%	1.7 - 2.6*
P	%	0.08 - 0.15
K	%	0.75 - 1.25
Ca	%	1.0 - 2.0
Mg	%	0.4 - 0.8
S	%	0.2 - 0.6
Zn	mg/kg	25 - 100
Cu	mg/kg	5.0 - 15
Mn	mg/kg	50 - 250
Fe	mg/kg	50 - 150
B	mg/kg	20 - 50
Cl	%	0.07-0.23

* Depends on cultivar and the age of the tree

	Leaf
Nitrogen (N)	1.7 – 1.9 % (Fuerte) 1.9 – 2.2 % (other) 2.2 – 2.4 % (Hass) 2.6 % (young trees prior to production, Southern Cape Hass and Lamb Hass)
Phosphate (P)	0.1 / 0.12 – 0.20 %
Potassium (K)	0.75 – 1.0 / 1.15 %
Calcium (Ca)	1.2 – 2.0 %
Magnesium (Mg)	0.5 – 0.6 %
Sulphur (S)	0.2 – 0.4 %
Zinc (Zn)	40 – 100 ppm
Copper (Cu)	5 – 15 ppm
Sodium (Na)	< 15 ppm
Chloride (Cl)	0.3 – 0.5 %
Iron (Fe)	75 / 100 – 150 ppm
Boron (B)	40 – 80 ppm
Manganese (Mn)	75 – 250 ppm
Aluminium (Al)	
Silica (Si)	
Molybdenum (Mo)	0.75 – 1.5 ppm

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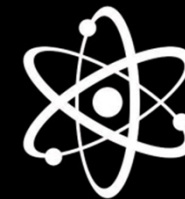
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Leaves - Mo

	B4200 - Full Leave (Std Leaf + Mo)	Total Leaf Samples received	% of Samples that included Mo	% increase in Mo request
March 2021 - Feb 2022	1,507	5368	28.07%	
March 2022 - Feb 2023	1,960	5397	36.32%	8.24%
March 2023 - Feb 2024	2,469	5341	46.23%	9.91%
March 2024 - Feb 2025	2,649	4714	56.19%	9.97%



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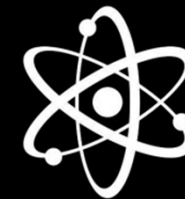
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Composts



Parameter:	Unit:	Results:
Nitrogen as N	%	1.63
Phosphorus as P	%	0.65
Potassium as K	%	1.59
Calcium as Ca	%	1.52
Magnesium as Mg	%	0.62
Zinc as Zn	mg/kg	234
Copper as Cu	mg/kg	54
Manganese as Mn	mg/kg	411
Iron as Fe	mg/kg	14607
Moisture	%	46
Boron as B	mg/kg	29
Sulphur as S	%	0.43
Sodium as Na	%	0.23
Aluminium as Al	mg/kg	8370
Carbon	%	45
Carbon:Nitrogen	Ratio	25
pH @ 25°C *	pH units	8.17
Conductivity @ 25°C *	mS/m	552

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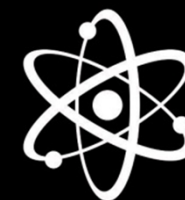
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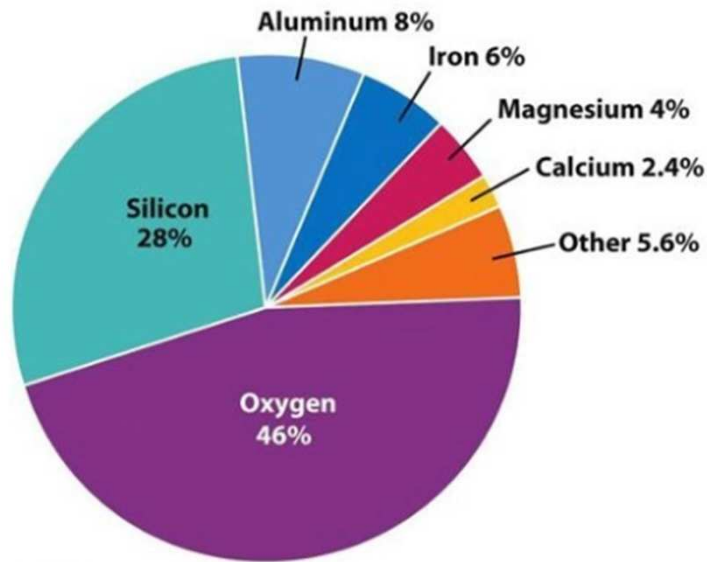
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Composts



Parameter	Aged manure	Compost
Dry matter (%)	63.2	74.0
Volatile solids (% db)	67.5	43.7
Total nitrogen (% db)	2.18	2.11
Total phosphorus (% db)	0.80	1.31
Potassium (% db)	1.86	2.49
Sodium (% db)	0.30	0.43
Sulfur (% db)	0.45	0.52
Calcium (% db)	2.22	1.91
Magnesium (% db)	0.86	0.93
EC1:5 (dS/m)	8.3	16.1
pH	7.2	7.3
Ammonia-N (mg/kg db)	1,431	1,016
Nitrate-N (mg/kg db)	307	714
Boron (mg/kg db)	22	23
Cobalt (mg/kg db)	7	-
Copper (mg/kg db)	35	37
Iron (mg/kg db)	11,700	5,300
Manganese (mg/kg db)	387	351
Molybdenum (mg/kg db)	4.3	5.7
Ortho-phosphate (mg/kg db)	944	3,100
Zinc (mg/kg db)	221	254

Organic Material	C:N ratio
Wood chips	700:1
Cardboard (corrugated)	560:1
Sawdust	500:1
Wood bark	300:1
Newspaper	150:1
Pine needles	80:1
Straw	75:1
Cornstalks	60:1
Peat moss	60:1
Leaves	55:1
Horse manure	25:1
Coffee grounds	25:1
Compost	20:1
Food waste	20:1
Grass clippings	15:1
Cow manure	15:1
Pig manure	15:1
Alfalfa hay	12:1
Poultry manure	6:1
Blood meal	4:1

Slower Decomposition
Faster Decomposition

Immobilization

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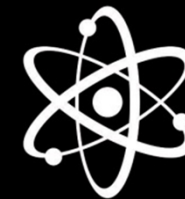
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Water

- Surface water
- Borehole water - remote



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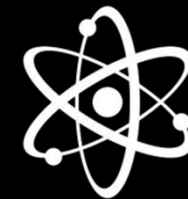
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Water

Key Performance Area	Weight	Elandshoek 	Hazyview 	White River 	White River Country & Golf Estates 
Bulk/WSP		-	-	-	-
Blue Drop Score 2023	%	20.45%	28.51%	27.40%	21.63%
Blue Drop Score 2014	%	71.47%	83.28%	75.33%	84.90%
Blue Drop Score 2012	%	50.04%	87.97%	90.06%	91.54%
Blue Drop Score 2011	%	74.61%	60.96%	81.76%	61.82%

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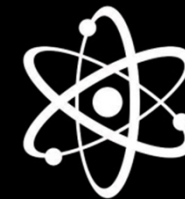
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Water

Key Performance Area	Weight	Karino	Matsulu	Nelspruit	Primkop
					
Bulk/WSP		-	-	-	-
Blue Drop Score 2023	%	96.64%	97.89%	97.27%	96.23%
Blue Drop Score 2014	%	95.81%	96.68%	97.13%	95.06%
Blue Drop Score 2012	%	98.25%	96.22%	99.15%	97.97%
Blue Drop Score 2011	%	N/A	95.56%	96.11%	91.13%

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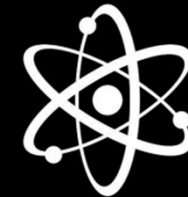
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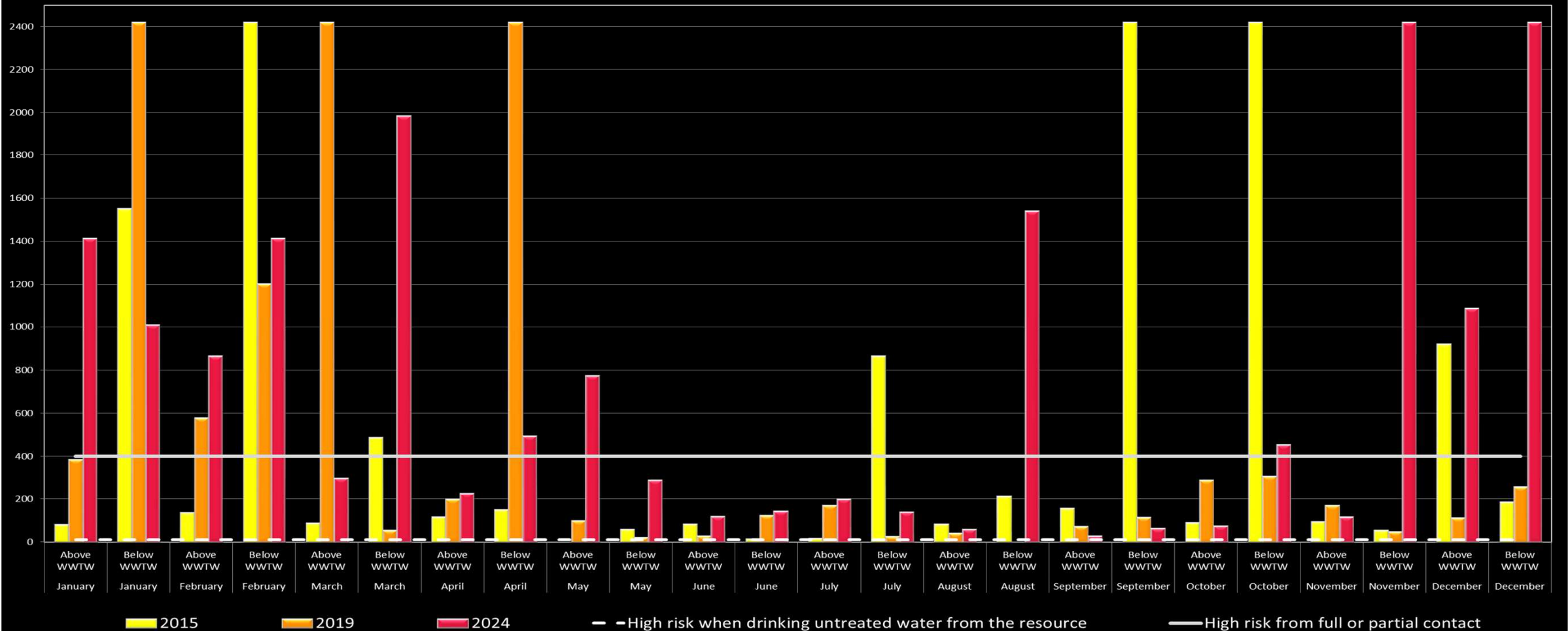
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E.coli (MPN/100ml)



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Water

		Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024
Parameter:	Unit:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:	Results:
Dissolved Sodium as Na	mg/l	265	304	247	325	339	298	331	99	91	89	181	237	80
Total Hardness as CaCO ₃	mg/l	452	497	407	472	497	466	478	284	266	261	389	446	192
Conductivity @ 25°C	mS/m	192	224	183	252	253	239	233	86	88	88	154	208	76
Total Alkalinity as CaCO ₃	mg/l	401	430	420	586	520	493	488	264	282	225	371	422	191
Chloride as Cl	mg/l	382.6	499.3	395.9	592.9	513.1	381.8	426.3	147.6	163.7	123.8	301.7	467.6	115.34
Langelier Index @ 25°C		0.74	0.18	0.15	0.84	0.48	0.53	0.73	0.40	0.31	0.58	0.83	0.40	-0.55
Total Coliform	MPN/100 ml	4	<1	2420	9	<1	165	<1	<1	<1	<1	<1	3	32
E. coli	MPN/100 ml	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

- Borehole - remote wildlife area



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Water

- **Spot problems early:** Long-term trends enable you to act before quality issues become a health or crop concern
- **Know your risk windows:** Identify vulnerable periods
- **Plan with confidence:** Use seasonal patterns to your advantage; decide when to irrigate, blend water, or monitor more closely



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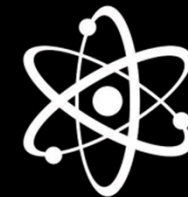
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MRLs

- Citrus: analytes detected



Year	2022	2023	2024
Analytes	2,4-D	Acetamiprid	Acetamiprid
	Azoxystrobin	Azoxystrobin	Azoxystrobin
	Bromophos-methyl	Buprofezin	Buprofezin
	Buprofezin	Carbendazim	Clothianidin
	Carbendazim	Clothianidin	Fenpyroximate
	Carbendazim (SUM)	Fenpyroximate	Fludioxonil
	Chlorantraniliprole	Fludioxonil	Imazalil
	Etoxazole	Imazalil	Imidacloprid
	Fenpyroximate	Imidacloprid	Malathion
	Fludioxonil	Malathion	Methoxyfenozide
	Imazalil	Methoxyfenozide	Prochloraz
	Imidacloprid	Prochloraz	Pyraclostrobin
	Malathion	Pyraclostrobin	Pyrimethanil
	Methidathion	Pyrimethanil	Pyriproxyfen
	Methoxyfenozide	Pyriproxyfen	Thiabendazole
	Propiconazole (SUM)	Sulfoxaflo (SUM)	Thiamethoxam
	Propoxur	Thiabendazole	Trifloxystrobin
	Pyraclostrobin	Trifloxystrobin	
	Pyrimethanil		
	Pyriproxyfen		
	Thiabendazole		
	Trifloxystrobin		
Total	22	18	17

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MRLs

- Citrus: exceedances



Analyte	2022	2023	2024	Limit
Prochloraz		EU x 1	EU x 1	0.005 ppm
Propoxur	EU x 1			0.005 ppm
Etoxazole	EU x 1			0.010 ppm
Imazalil		EU & SA x 1		5 ppm

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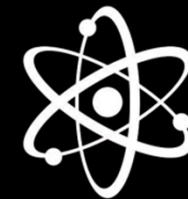
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- **Citrus: Most used analytes:**

Analyte
Imazalil
Methoxyfenozide
Pyraclostrobin
Pyrimethanil
Thiabendazole



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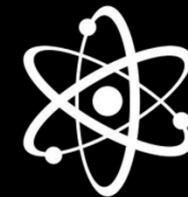
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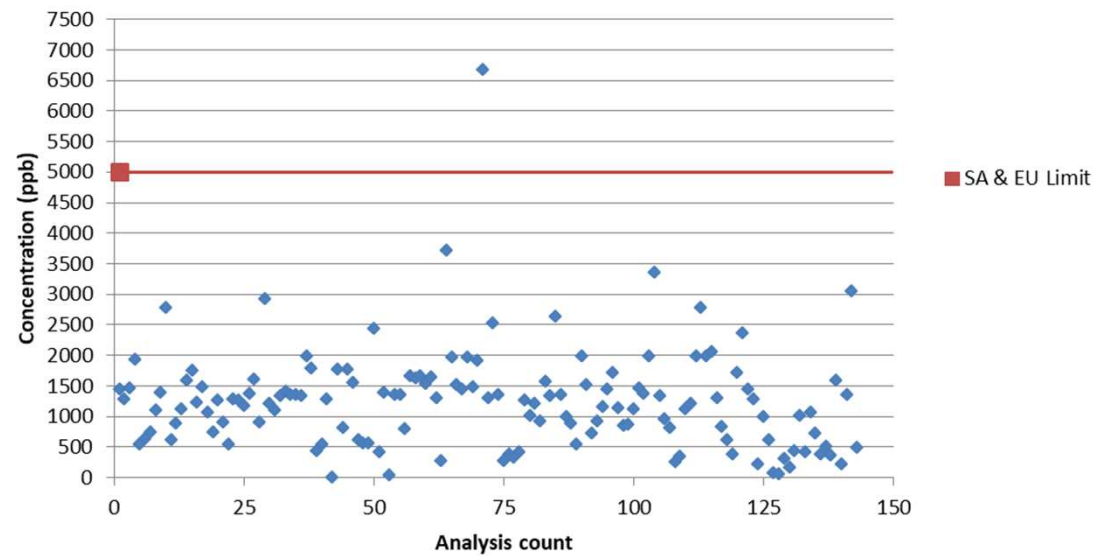


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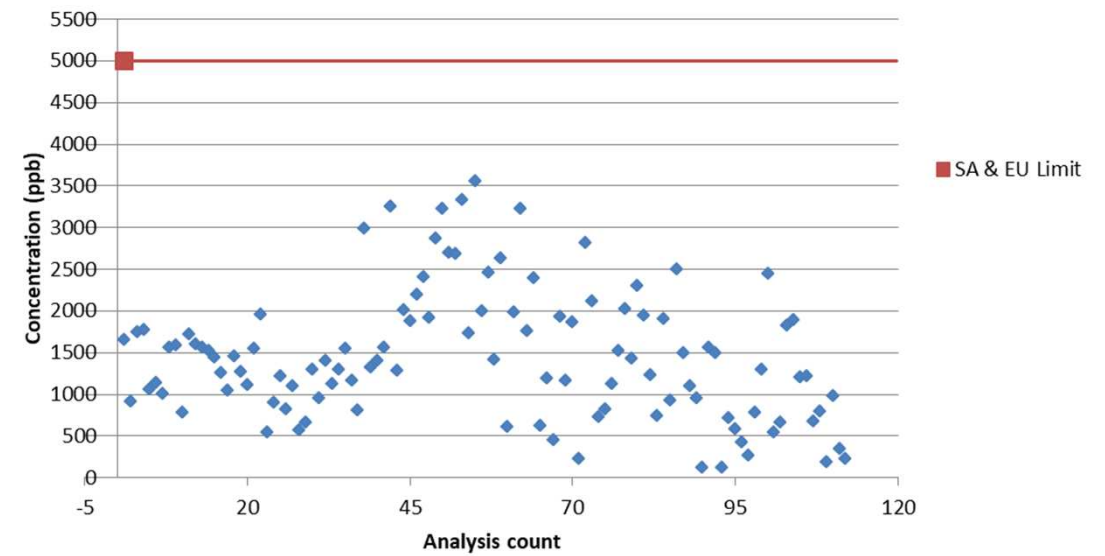
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2023: Imazalil



2024: Imazalil



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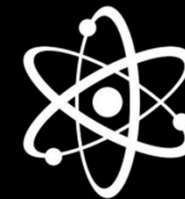
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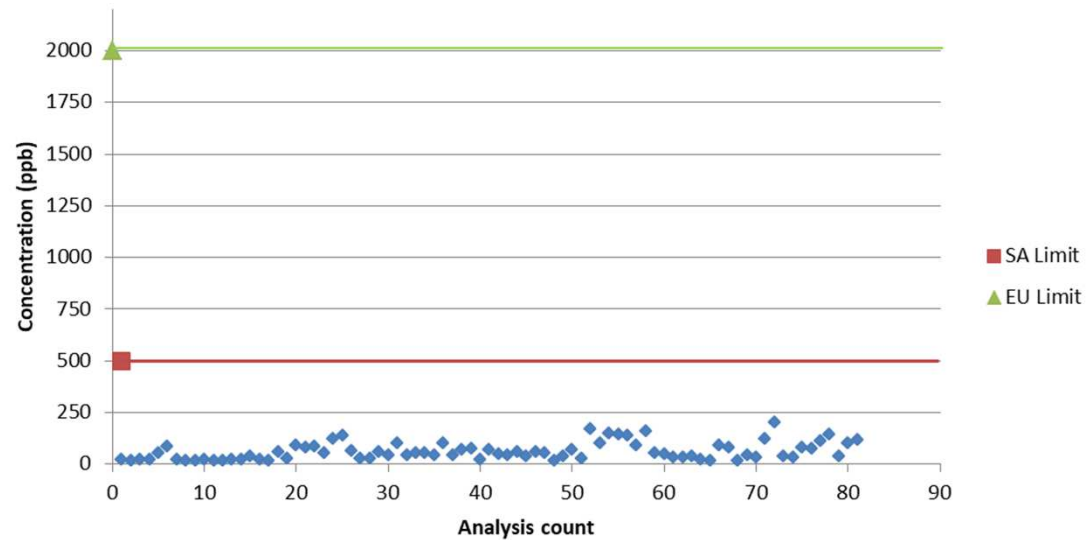


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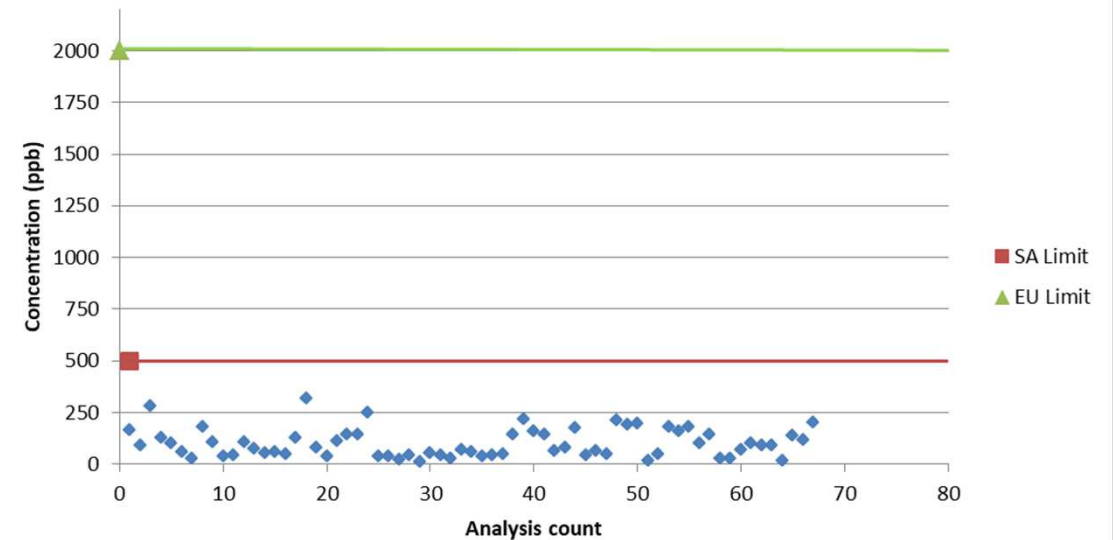
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2023: Methoxyfenozide



2024: Methoxyfenozide



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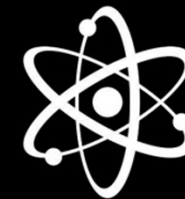
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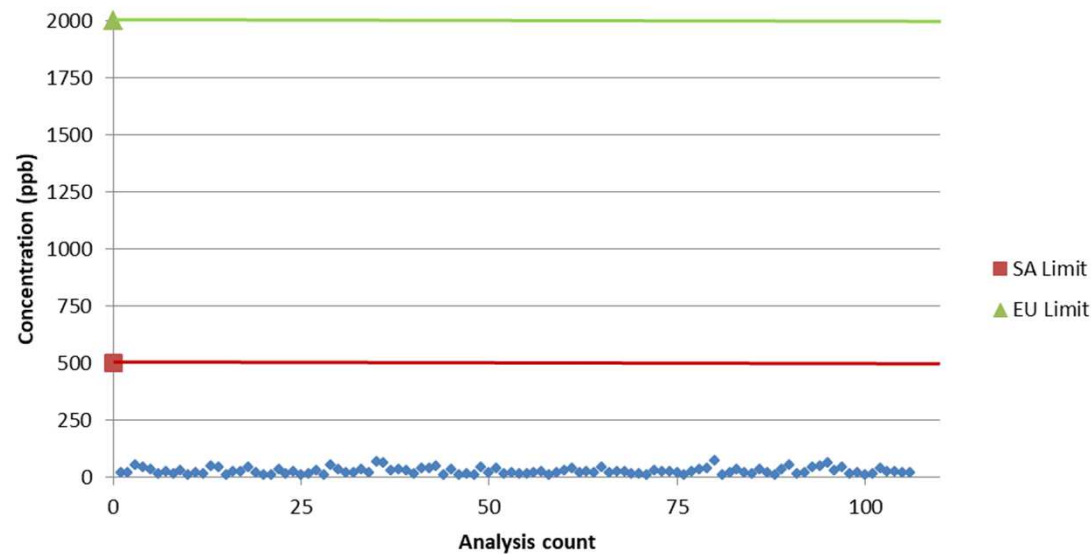


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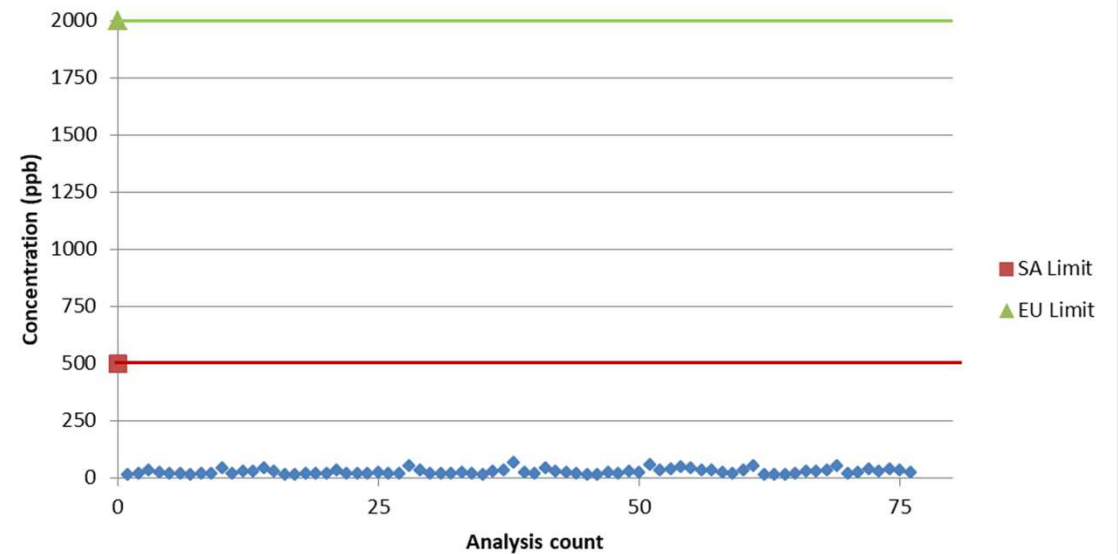
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2023: Pyraclostrobin



2024: Pyraclostrobin



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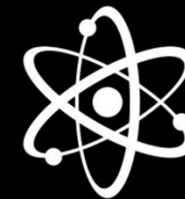
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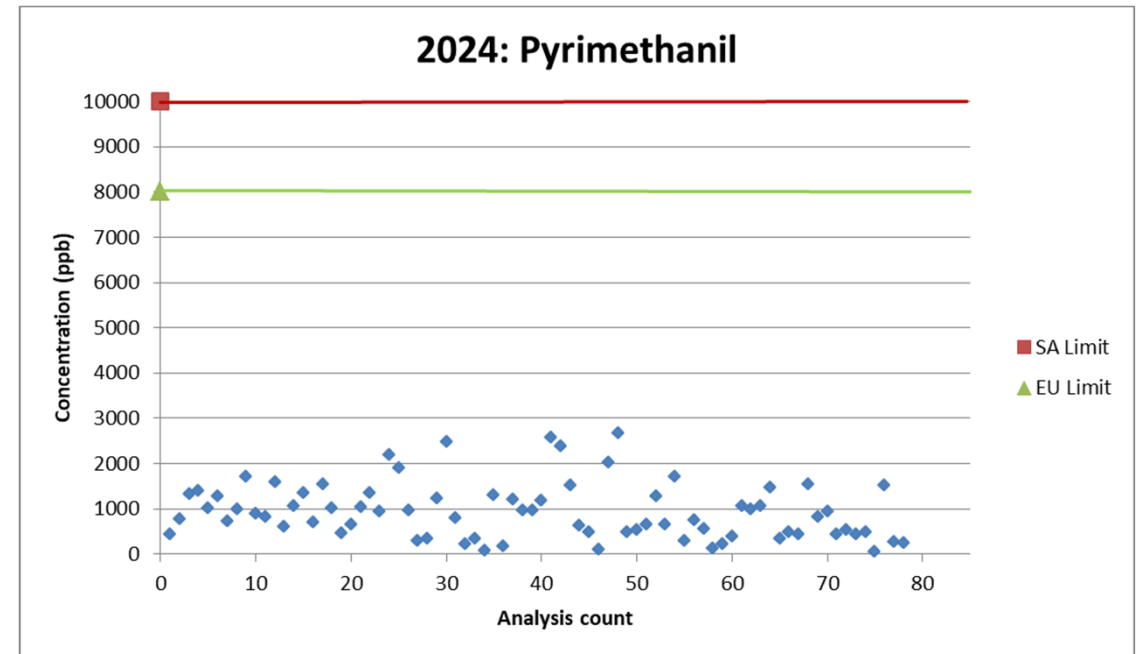
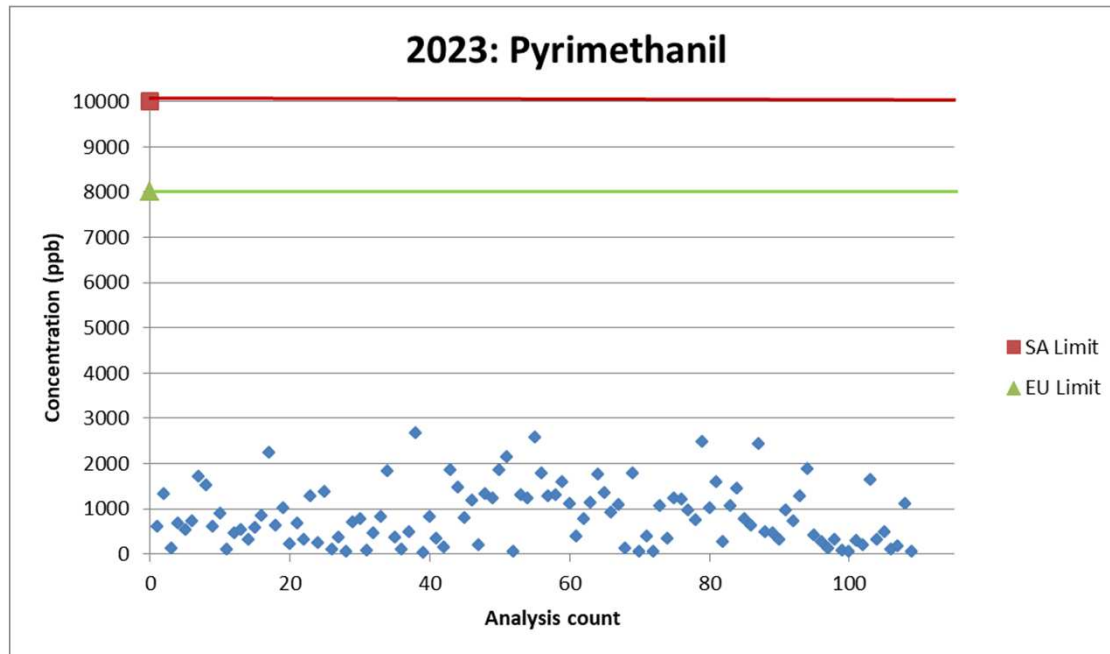
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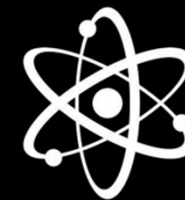
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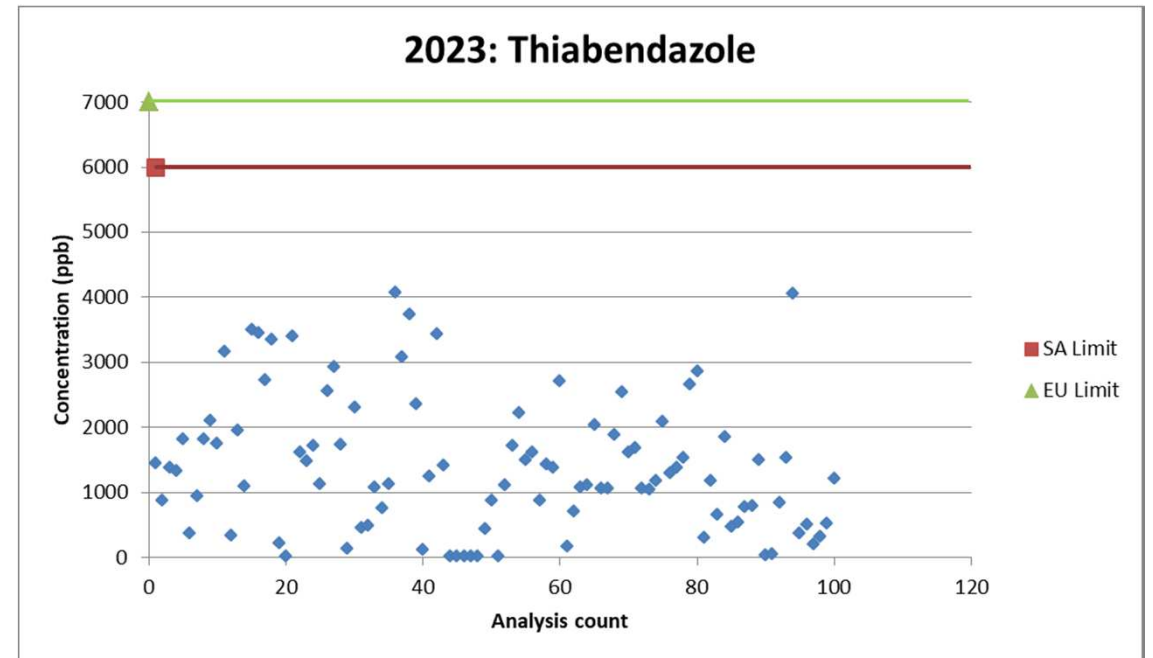
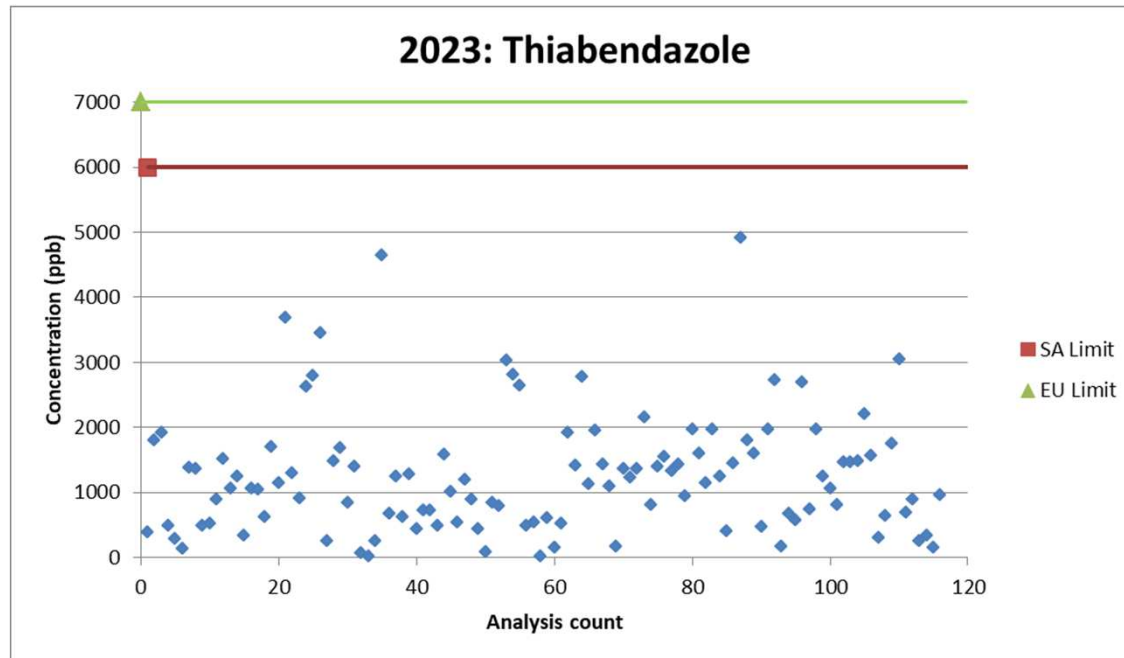
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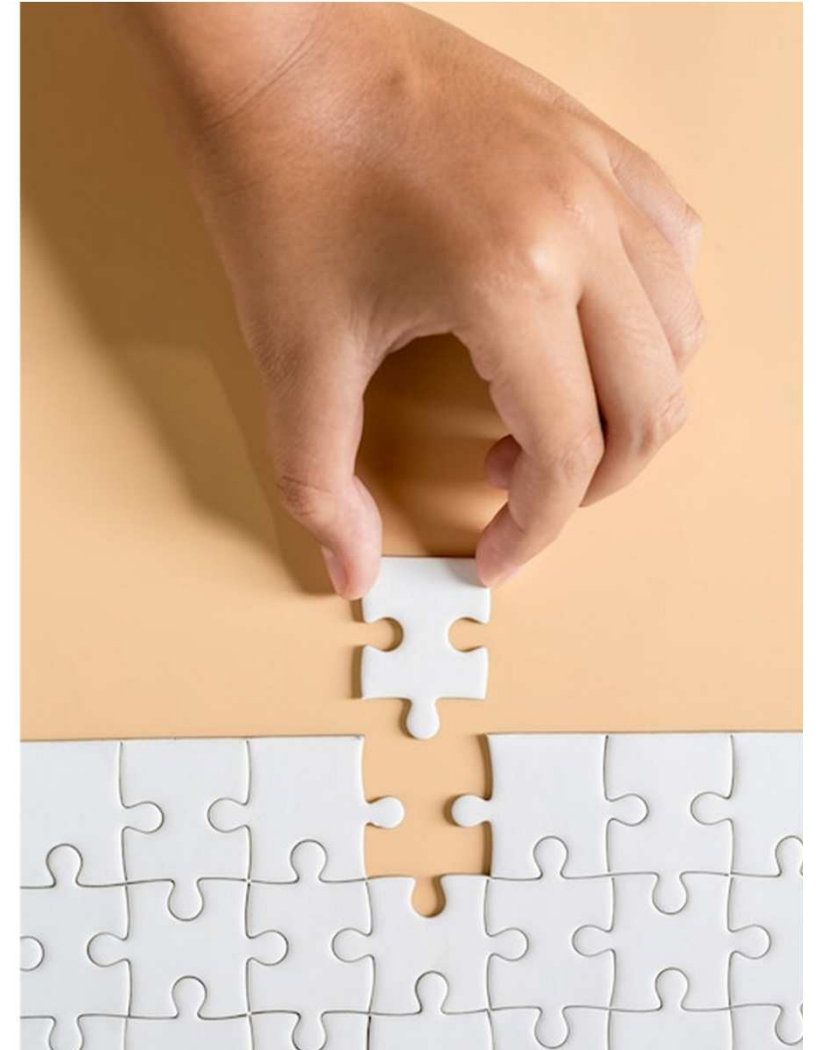
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Conclusion

- **We have the data – let us know if you want us to investigate**
- **Practice doesn't always align with theory**
- **We will continue to share, this was our first**



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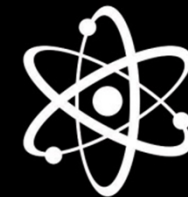
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