PATENSIE CITRUS TRIAL
HUMEFERT
2024/2025 SEASON

Dr. M. Southwood
Southern Cross Trust
1 November 2025

INDEX

- Products & application rates
- Trial layout
- Timeline
- In-season evaluation
  - Soil characteristics
  - Root characteristics
  - Stem & Foliage data
  - Fruit evaluation
- Before harvest evaluation
  - Soil characteristics
  - Root characteristics
  - Stem & Foliage data
  - Nematode & Soil health data
  - Orchard & packhouse data
- Final conclusions

PRODUCTS & APPLICATION RATES

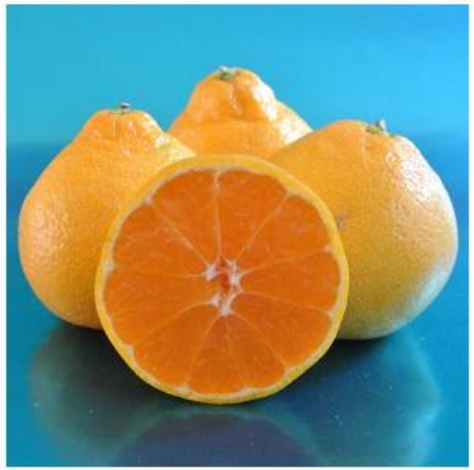
PRODUCTS & APPLICATION RATES

- The two Miho Wase Satsuma orchards that were used in this trial were established in 2012

- The Humefert treatment in orchard 16 consisted of three products: (i) Photocatalytic oxidation water treatment (HumeFlo™), MacroPlex™ and AminoFix™-3000. Applications started in the last week of August 2024.
- The HumeFlo™ system was used to oxidise the irrigation water, breaking down impurities that cause dripper blockages. This includes the reduction of organic fouling and assisting in the destabilisation of carbonate scaling (lime), thus liberating certain cations (Ca^{2+}), which is then complexed by MacroPlex™ to enhance solubility and plant availability. MacroPlex™ was injected into the irrigation water at 4 ppm during active irrigation.
- AminoFix™-3000 was applied at 10L/ha through the irrigation system at (i) flower set, (ii) fruit set, and (iii) post-harvest. AminoFix™-3000 is a mixture of simple and complex carbohydrates, and therefore a good organic carbon source.
- The control treatment (orchard 12) received no additional treatments apart from the standard fertiliser programme.

TRIAL VARIETY

MIHO WASE



VARIETY NAME: Miho Wase
CITRUS TYPE: Satsuma
ORIGIN: Japan

TREE CHARACTERISTICS

GROWTH HABIT

Semi-upright

BEARING HABIT

No alternate bearing

VIGOUR

Strong

PRODUCTION

Good

FRUIT CHARACTERISTICS

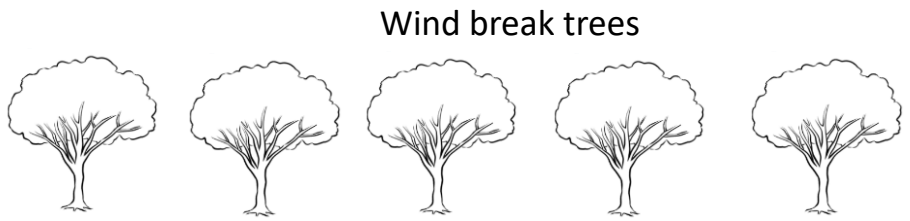
OPTIMAL RIPENING	Mid March to early April	FRUIT SHAPE	Oblate
EXTERNAL COLOUR	Pale orange	FRUIT SIZE	Medium
INTERNAL QUALITY	Higher sugar, low acid and juicy	FLAVOUR	Juicy
		SEED	Seedless
FLESH COLOUR	Deep orange		
PEELABILITY	Easy to peel		

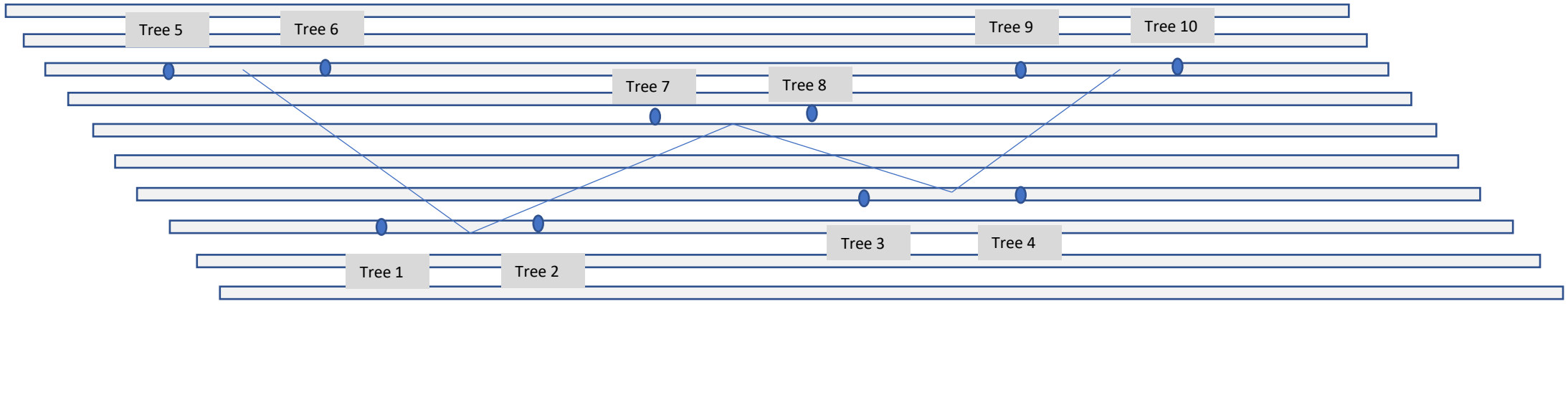
TRIAL LAYOUT

CITRUS TRIAL LAYOUT: MIHO WASE ORCHARD 12
CONTROL TREATMENT

Sampling positions for control treatment:

- Tree sampling positions were on a 'W' pattern over the full surface area of the orchard.
- There were therefore 10 sampling positions per treatment over the total orchard surface.
- The control treatment block had 1831 trees on 3.3ha, planted at a 6m x 3m spacing.

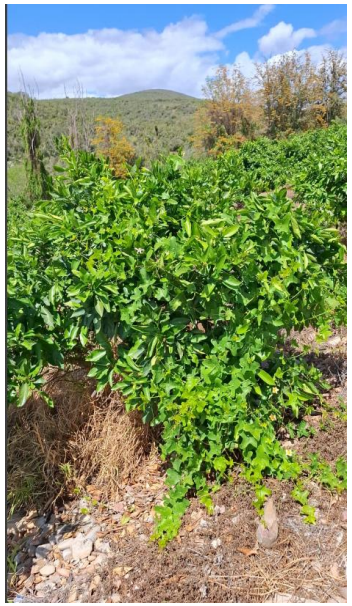




MIHO WASE ORCHARD: CONTROL TREATMENT

H1

H2



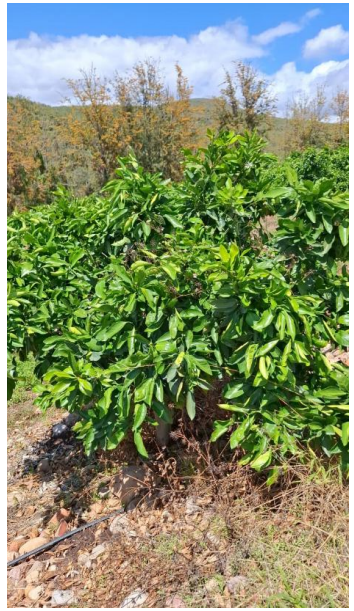
H3

H4

H5

H6

H7

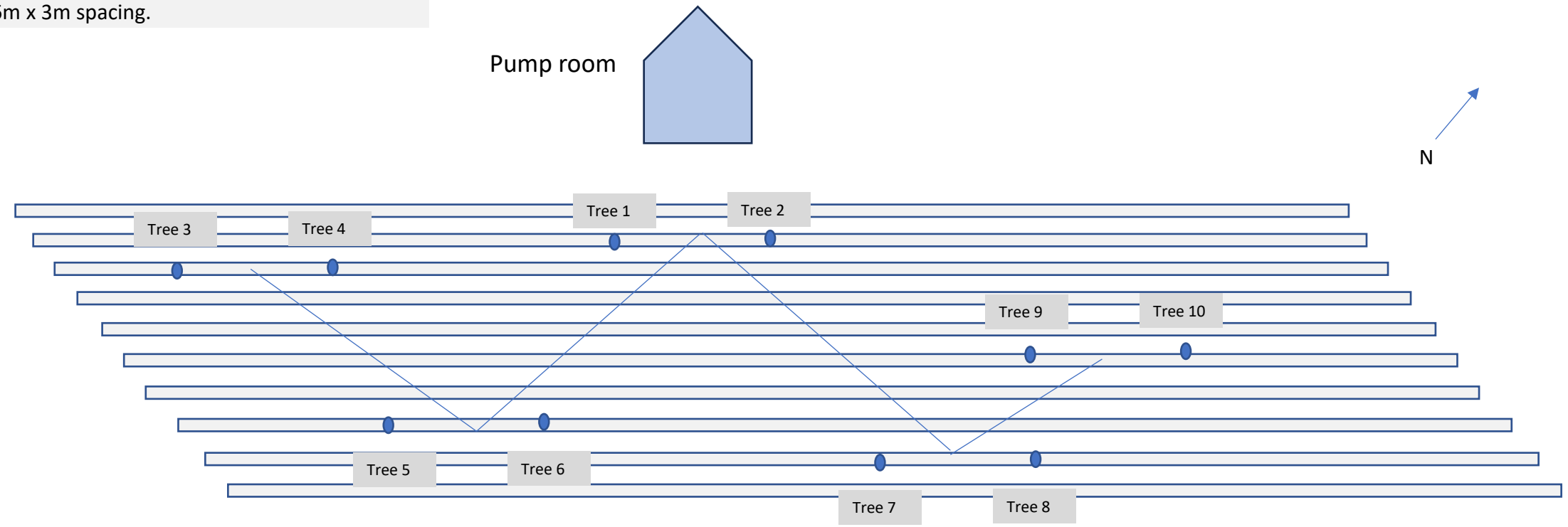


H8

SITRUS TRIAL LAYOUT: MIHO WASE ORCHARD 16
HUMEFERT TREATMENT

Sampling positions for Humefert treatment:

- Tree sampling positions were on a 'W' pattern over the full surface area of the orchard.
- There were therefore 10 sampling positions per treatment over the total orchard surface.
- The Humefert treatment block had 1998 trees on 3.6ha, planted at a 6m x 3m spacing.



MIHO WASE ORCHARD: HUMEFERT TREATMENT

H1

H2

H3

H4

H5

H6

H7

H8

H9

H10

TIMELINE

TIMELINE FOR APPLICATION AND EVALUATIONS

- 26 August 2024 ➢ Treatments commenced
- 31 October 2024 ➢ First evaluation
- 5 March 2025 ➢ Second evaluation
- 15 March 2025 ➢ First harvest

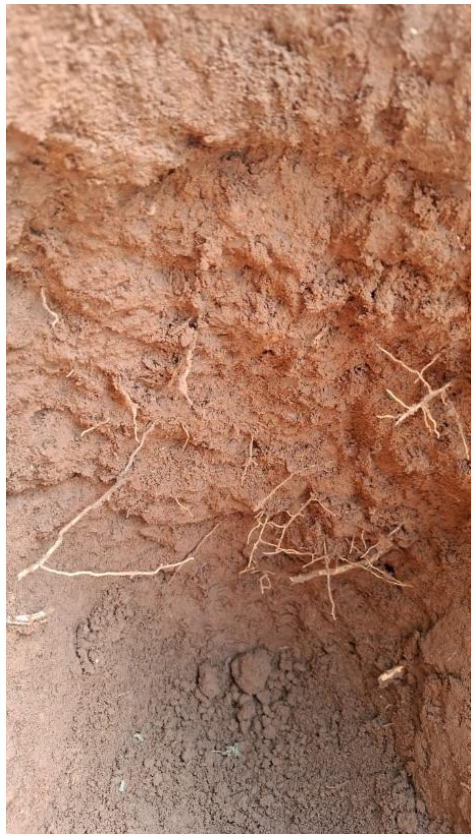
SUMMER EVALUATION

31 OCTOBER 2024

SOIL & ROOT CHARACTERISTICS
31 OCTOBER 2024

SOIL PROFILE PHOTOS: 31 OCTOBER 2024
CONTROL TREATMENT

C1



C2

C3

C4

C5

SOIL PROFILE PHOTOS: 31 OCTOBER 2024
CONTROL TREATMENT

C6

C7

C8

C9

C10

ROOT CHARACTERISTICS: 31 OCTOBER 2024

Control treatment

SOIL & ROOT EVALUATION: 31 OCTOBER 2024
CONTROL TREATMENT

Table 1: In field soil and root measurements

Treatment	Water infiltration (seconds/1L)	Number of earthworms/25L soil	Compaction depth (cm)	Root volume percentage /profile hole (0-60cm)	Fresh root weight (gr)	Dry root weight (gr)	Root health score (value/10)
Tree 1	75	0	25	30			
Tree 2	97	0	28	40			
Tree 3	77	0	36	75			
Tree 4	80	0	34	20			
Tree 5	44	0	28	35			
Tree 6	48	0	37	40			
Tree 7	**33**	0	24	30			
Tree 8	70	3	28	25			
Tree 9	32	0	13	35			
Tree 10	35	0	48	50			
Total	**591**	**3**	**301**	**380**	**141**	**69**	**7.5/10**
Average:	**59,1 seconds**	**0,3 earthworms**	**30,1 cm**	**38 %**			

Notes:
Water infiltration: Seconds it took for 1L water to completely infiltrate in to the top soil through a 20cm diameter PVC pipe
Earthworms: Number of earthworms counted in 25L soil at each of the evaluation points
Compaction depth: Soil depth where 300 psi (pounds per square inch) were measured with a Dicky John soil compaction tester

SOIL PROFILE PHOTOS: 31 OCTOBER 2024
HUMEFERT TREATMENT

H1

H2

H3

H4

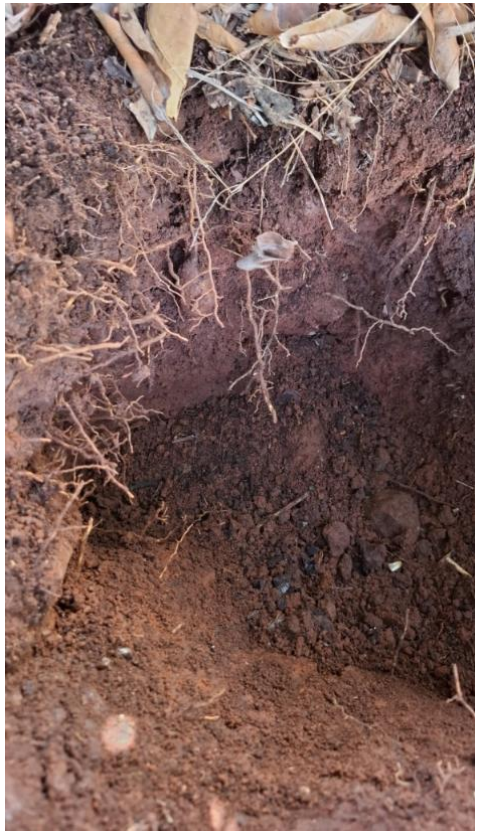
H5

SOIL PROFILE PHOTOS: 31 OCTOBER 2024
HUMEFERT TREATMENT

H6

H7

H8



H9

H10

ROOT CHARACTERISTICS: 31 OCTOBER 2024

Humefert treatment

SOIL & ROOT EVALUATION: 31 OCTOBER 2024
HUMEFERT TREATMENT

Table 2: In field soil and root measurements

Treatment	Water infiltration (second/1L)	Number of earthworms/25L soil	Compaction depth (cm)	Root volume percentage /profile hole (0-60cm)	Fresh root weight (gr)	Dry root weight (gr)	Root health score (value/10)
Tree 1	54	0	44	60			
Tree 2	51	0	48	45			
Tree 3	44	0	28	60			
Tree 4	60	0	17	55			
Tree 5	26	0	36	20			
Tree 6	34	2	41	55			
Tree 7	55	0	33	75			
Tree 8	65	0	22	65			
Tree 9	43	0	34	65			
Tree 10	41	0	49	70			
Total	**473**	**2**	**352**	**570**	**172**	**88**	**8/10**
Average:	**47,3 seconds**	**0,2 earthworms**	**35,2 cm**	**57 %**			

Notes:
Water infiltration: Seconds it took for 1L water to completely infiltrate in to the top soil through a 20cm diameter PVC pipe
Earthworms: Number of earthworms counted in 25L soil at each of the evaluation points
Compaction depth: Soil depth where 300 psi (pounds per square inch) were measured with a Dicky John soil compaction tester

DISCUSSION OF SOIL & ROOT EVALUATION

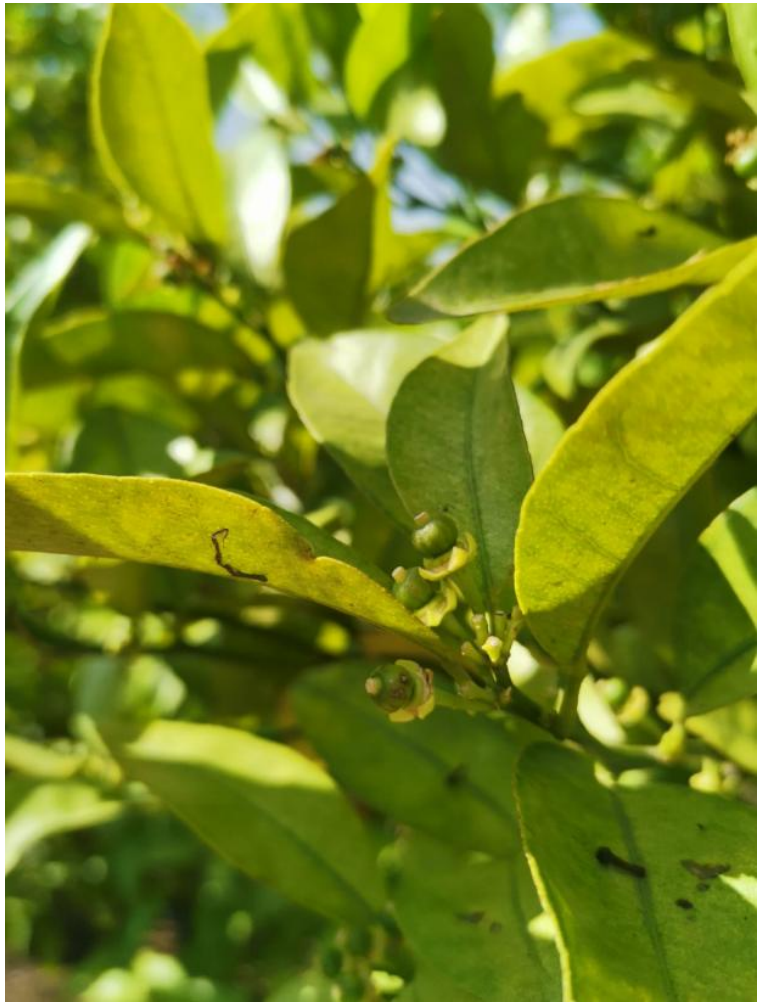
- Both orchards historically had low yields because of the plant stress experienced during the long drought after establishment in 2012

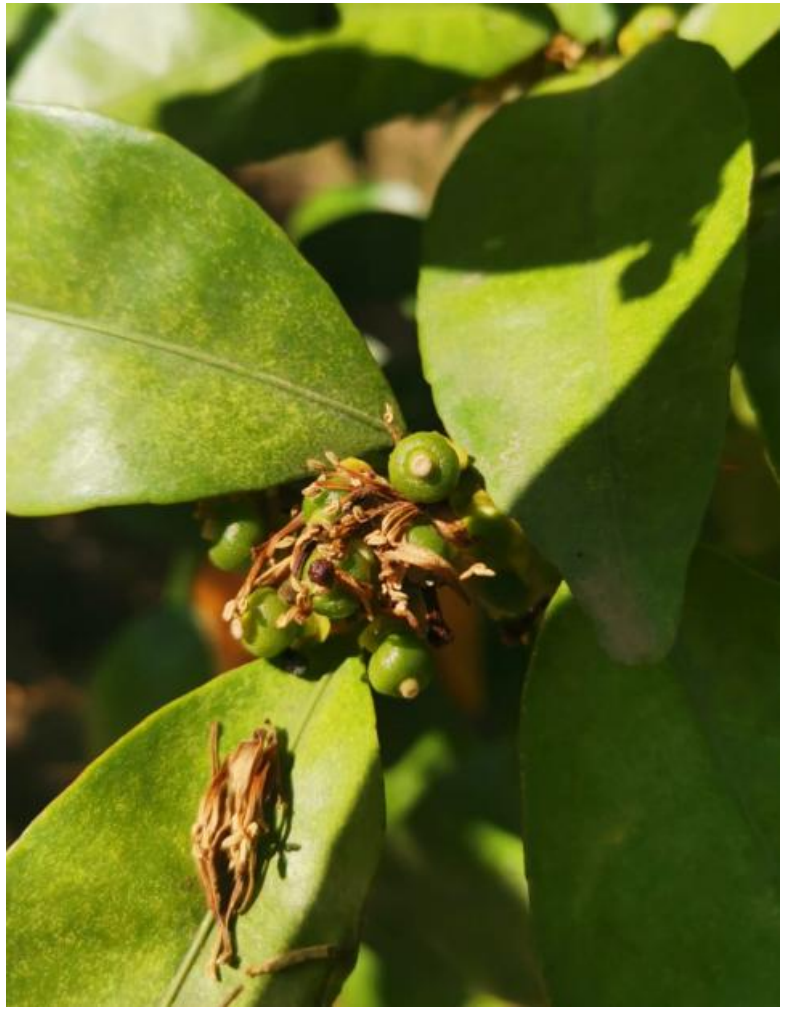
- Although the loam textured soil in the orchards were generally well aerated, the water infiltration after irrigation was poor in both blocks. The average time it took for 1L of water to completely infiltrate into the top soil after irrigation was 59.1 seconds in the control, and 47.3 seconds in the Humefert treatment. The control treatment demonstrated severe soil compaction (values above 300 psi) at a 30cm soil depth, whereas in the Humefert treatment this compaction level was measured deeper (at 35cm). Most plant roots cannot penetrate and develop normally in soil compaction values above 300 psi

- In both treatments there was a good balance between structural and finer feeder roots, but there was a lower root volume in the soil profile holes around the trees in the control treatment (38% vs 57% in the Humefert treatment). The roots in the Humefert treatment had a substantially better fresh weight (172g vs. 141g) and dry weight (88g vs. 69g). The root health score between the treatments was very similar, with no soil borne pathogens or nematode symptoms observed (see slides 15-17 and 19-21)

FLOWER & FRUIT EVALUATION
31 OCTOBER 2024

CROP PHOTOS AFTER FRUIT SET: 31 OCTOBER 2024





FLOWER & FRUIT DROP PHOTOS: 31 OCTOBER 2024

FLOWER & FRUIT DATA: 31 OCTOBER 2024

Table 3: Flower and Fruit evaluation data after flowering

Treatment	Flower & fruit drop counts under ten trees		Number of fruit on 40 stems/ treatment		Fresh fruit weight		Dry fruit weight	
	Control	Humefert	Control	Humefert	Control	Humefert	Control	Humefert
Tree 1	29	62	17	13	391	318,5	191,2	150
Tree 2	14	41	18	19	414	465,5	202,4	219,3
Tree 3	70	34	20	22	460	539	224,9	253,9
Tree 4	82	38	13	27	299	661,5	146,2	311,6
Tree 5	52	92	16	30	368	735	180,0	346,2
Tree 6	28	43	18	26	414	637	202,4	300
Tree 7	44	68	14	20	322	490	157,5	230
Tree 8	39	63	15	18	345	441	168,7	207,7
Tree 9	45	57	19	25	437	612,5	213,7	288,5
Tree 10	49	69	17	19	391	465,5	191,2	219,3
Total	**452**	**567**	**167**	**219**	**3841**	**5365,5**	**1878,2**	**2527,2**
Average:	**45,2**	**56,7**	**16,7**	**21,9**	**23**	**24,5**	**11,2**	**11,5**

Notes:
The severity of fruitlet drop was determined by counting all the aborted young fruit on the ground beneath the tree canopy in two 1 m^2 blocks on either side of the tree.
The number of fruit: Fruit counted on 40 stems per treatment, 4 stems per tree, 2 stem on either side of the tree.

FRUIT SAP ANALYSES: 31 OCTOBER 2024

Table 4: Fruit sap nutrient analyses

Treatment	Fruit sap analyses					
	N (ppm)	K (ppm)	Ca (ppm)	Na (ppm)	EC (ms/cm)	Brix (%)
Control	4200	1400	19	16	1,7	1,3
Humefert	6200	3000	22	18	1,8	1,3

Notes:
The above values represent the average nutrient sap concentrations of 40 fruit per treatment

DISCUSSION OF FLOWER & FRUIT EVALUATION
31 OCTOBER 2024

- The trees in both blocks were very generative, but with a higher fruit set noticeable in the Humefert treatment. On average, 31.3% more fruit were counted on the stems in the Humefert treatment. The average number of fruit, counted on forty stems per treatment, was 16.7 in the control and 21.9 in the Humefert treatment.

- The dropped fruit beneath the trees, most of them averaging between 4-8mm in diameter, was counted on the same date. The Humefert treatment had 25.4% more fruit on the ground, likely as a occurrence of the higher initial fruit set (56.7 fruit vs 45.2 fruit in the control treatment).

- There were only marginal differences in the fresh and dry fruit weights between the two treatments.

- In the fruit sap analyses, the Humefert treatment resulted in higher NO3-N, K, Ca and Na concentrations. Of these four, the NO3-N (6200ppm vs 4200ppm) and K (3000ppm vs 1400ppm) concentrations were significantly higher in the Humefert treatment.

STEM & FOLIAGE DATA
31 OCTOBER 2024

SHOOT & FOLIAGE DATA: 31 OCTOBER 2024

Table 5: Shoot and foliage data on 31 October 2024

Treatment	Shoot sap analyses						Chlorophyll concentration
	N (ppm)	K (ppm)	Ca (ppm)	Na (ppm)	EC (ms/cm)	Brix (%)	(ppm)
Control	5900	820	9	20	0.82	0.3	59.9 ppm
Humefert	5200	2600	13	16	0.85	0.35	57.2 ppm

Notes:
The above values represent the average sap nutrient concentrations of 40 new shoots per treatment
Chlorophyll readings were done on 20 randomly selected leaves from the 10 sampled trees per treatment

VIGOUR & SHOOT DATA: 31 OCTOBER 2024

Table 6: In field shoot and vigour measurements

Treatment	Tree vigour/10		New shoot length (cm)	
	Control	Humefert	Control	Humefert
Tree 1	6,5	2	15,5	12,3
Tree 2	6	4	14	13,9
Tree 3	7,5	3,5	16,5	16,5
Tree 4	5,5	4,5	14,3	12
Tree 5	6	5,5	13	12,5
Tree 6	7,5	4	17	12
Tree 7	5	5	17	16
Tree 8	6,5	5,5	18,5	14
Tree 9	4	8	21	14,4
Tree 10	3,5	8,5	18	13,8
Total	**58**	**50,5**	**164,8**	**137,4**
Average:	**5,8**	**5,05**	**16,48**	**13,74**

Notes:
The above values represent the average shoot length of four new shoots per tree, two shoots on either side of the selected trees

DISCUSSION OF SHOOT & FOLIAGE EVALUATION
31 OCTOBER 2024

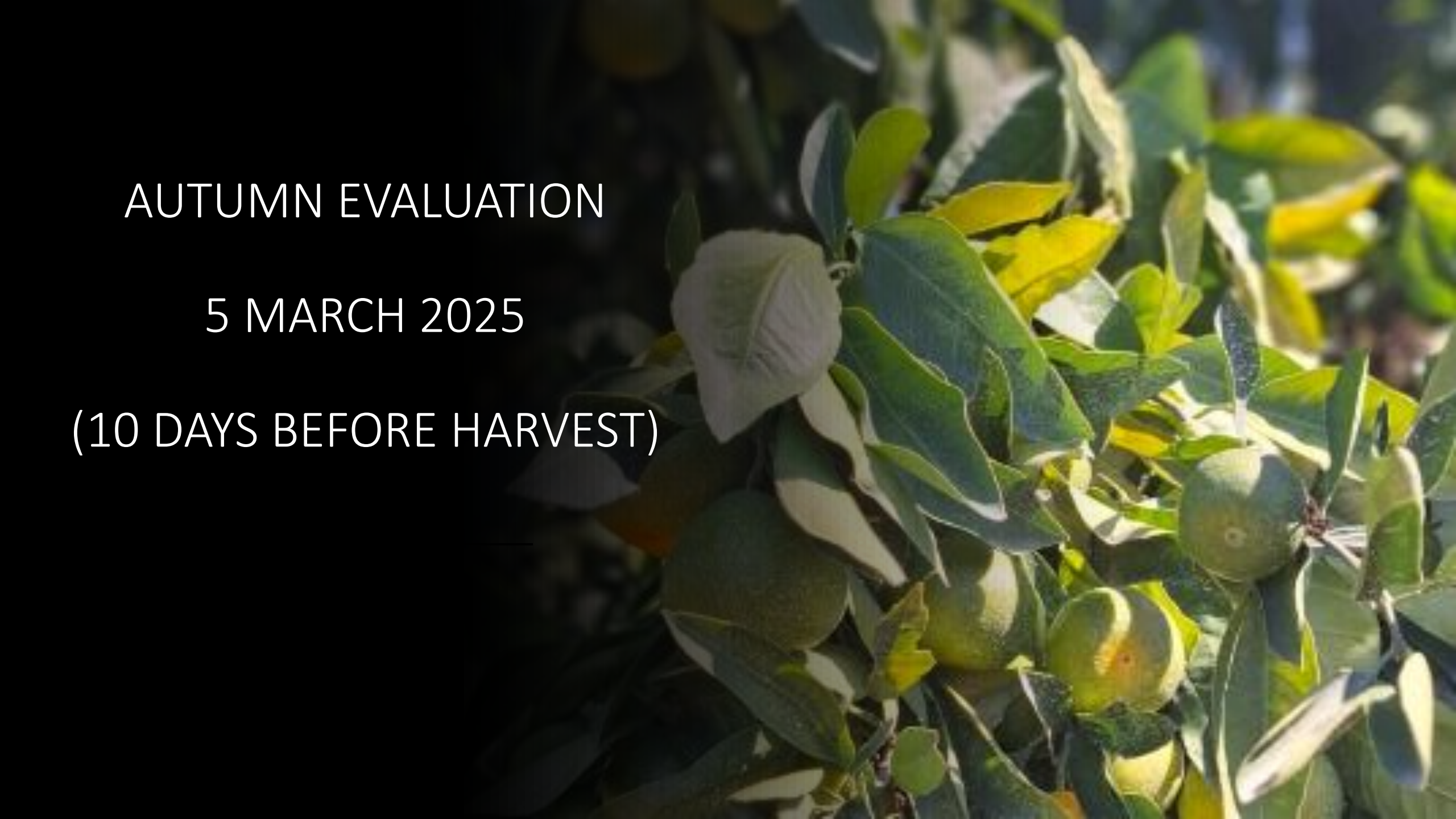
- As was seen in the fruit sap nutrient analyses at the same date, the Humefert treatment resulted in a significant increase of 1780ppm in the K sap concentration. There were smaller differences between the treatments in the Ca, Na, electrical conductivity and chlorophyll concentrations, as well as in the Brix percentages.

- The control treatment had a 700ppm higher NO3-N concentration. This increase corresponded well with the increased vegetative vigour and longer new shoot lengths measured in the control treatment. The tree vigour was noticeably higher in the control treatment block (5.8/10 vs. 5.05/10), and the new shoots were on average 20.4% longer (16.5cm vs. 13.7cm).

AUTUMN EVALUATION

5 MARCH 2025

(10 DAYS BEFORE HARVEST)



SOIL & ROOT CHARACTERISTICS
5 MARCH 2025

SOIL PROFILE PHOTOS: 5 MARCH 2025
CONTROL TREATMENT

C1

C2

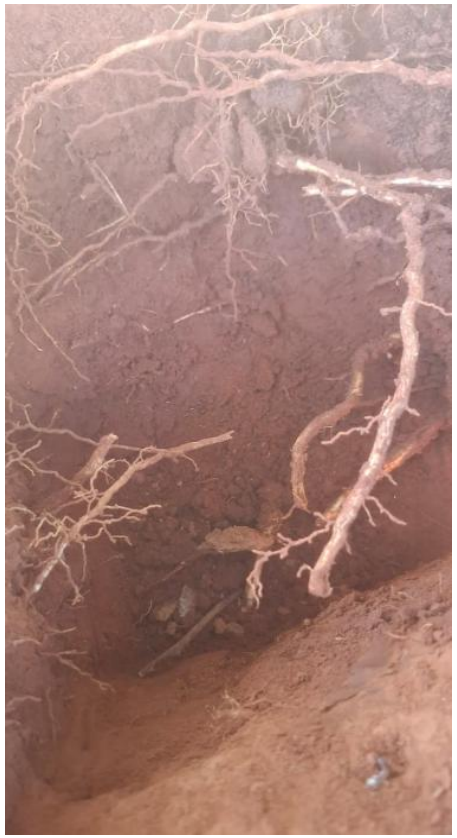
C3

C4

C5

SOIL PROFILE PHOTOS: 5 MARCH 2025
CONTROL TREATMENT

C6



C7

C8

C9

C10

SOIL PROFILE PHOTOS: 5 MARCH 2025
HUMEFERT TREATMENT

H1

H2

H3

H4

H5

SOIL PROFILE PHOTOS: 5 MARCH 2025
HUMEFERT TREATMENT

H6

H7

H8

H9

H10

LAND EVALUATION: 5 MARCH 2025
CONTROL TREATMENT

Table 7: In field soil and root measurements

Treatment	Root volume percentage / 60cm profile hole (%)		Fresh root weight (gram)		Water infiltration (seconds/1L water)		Number of earthworms (per 25L soil)		Compaction depth (depth in cm where 300 psi is reached)	
	Control	Humefert	Control	Humefert	Control	Humefert	Control	Humefert	Control	Humefert
Tree 1	60	70	195	225	88	30	5	4	36	32
Tree 2	30	60	179	200	75	10	5	8	35	37
Tree 3	40	70	206	225	80	15	4	6	13	22
Tree 4	50	80	210	244	85	17	4	3	14	18
Tree 5	40	60	202	225	22	18	5	3	33	29
Tree 6	20	50	190	219	25	19	0	5	25	31
Tree 7	80	50	189	205	28	22	5	4	32	27
Tree 8	50	80	215	245	73	19	1	7	26	22
Tree 9	45	70	209	239	18	23	5	5	14	30
Tree 10	75	50	200	233	27	21	0	2	18	15
Total	**490**	**640**	**1995**	**2260**	**521**	**194**	**34**	**47**	**246**	**263**
Average	**49**	**64**	**199,5**	**226**	**52,1**	**19,4**	**3,4**	**4,7**	**24,6**	**26,3**

Notes:
Water infiltration: Seconds it took for 1L water to completely infiltrate the top soil through a 20cm diameter PVC pipe
Earthworms: Number of earthworms counted in 25L soil at each of the evaluation points
Compaction depth: Soil depth where 300 psi (pounds per square inch) were measured with a Dicky John soil compaction tester

NEMLAB PARASITIC NEMATODE ANALYSIS: 5 MARCH 2025

Table 8: Nemlab parasitic nematode analysis on 5 March 2025

ONTLEDINGSVERSLAG												
RESULTAAT					Aalwurms per 250 cc grond						Wyfies per 10g wortels	AANBEVELING
Blok Nr	Kultivar	Onderstam	Plant-ouderdom	Lab Nr	Vry-lewende	Letsel	Knop-wortel	Dolk	Stomp-wortel	Sitrus	Sitrus-aalwurm	
Humefert Aminofix	Satsuma		10 jaar	HUM-03229N-25	10700	0	0	0	0	3730 (Hoog)	1640	Ja
Humefert Control	Satsuma		10 jaar	HUM-03230N-25	12000	0	0	0	0	6660 (Baie Swaar)	2720	Ja + 1

NEMLAB SOIL HEALTH NEMATODE FAMILY ANALYSIS: 5 MARCH 2025

Table 9: Nemlab soil health nematode family analysis on 5 March 2025

BLOCK NO: Humefert Aminofix	LAB NO: HUM-3229-25

NEMATODE BIO-INDICATORS

BIODIVERSITY

FEEDING GROUPS	NO	%
Plant parasites	4772	33,00
Bacterial feeders	9110	63,00
Fungal feeders	434	3,00
Omnivorous feeders	145	1,00
Nematode predators	0	0,00
Root exudate feeders	0	0,00
TOTAL	14460	100

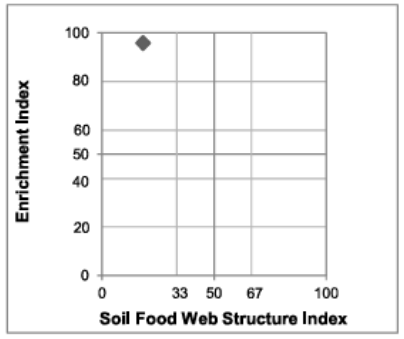
ECOLOGICAL FUNCTIONS

ECOLOGICAL INDICES

Index	Value	Explanation
Soil Food Web Structure Index (SI)	18,37	Few trophic linkages.
Enrichment Index (EI)	95,78	Enrichment highly N-enriched but not decomposed.
Basal Index (BI)	4,18	System with abundant resources and fast nutrient turnover, however dominated by bacterial feeders.
Maturity Index (MI2-5)	0,23	Nutrient-enriched, disturbed system.

SEE LEGEND ON PAGE 2

NEMATODE MATRIX



EXPLANATION

The enrichment is sufficient as shown by the Enrichment index, however still needs to be decomposed. There are very few connections between the feeding groups and thus a good soil food web structure is not present. There is a high number of bacterial feeders that are responsible for fast nutrient turnover. The percentage bacterial feeders is high compared to the other feeding groups, which creates an imbalance in the system. The number of plant parasites is very high and this needs to be addressed. The plant parasitic nematodes consist of citrus nematode.

BLOCK NO: Humefert Control	LAB NO: HUM-3230-25

NEMATODE BIO-INDICATORS

BIODIVERSITY

FEEDING GROUPS	NO	%
Plant parasites	7912	42,31
Bacterial feeders	9170	49,04
Fungal feeders	1618	8,65
Omnivore feeders	0	0,00
Nematode predators	0	0,00
Root exudate feeders	0	0,00
TOTAL	18700	100

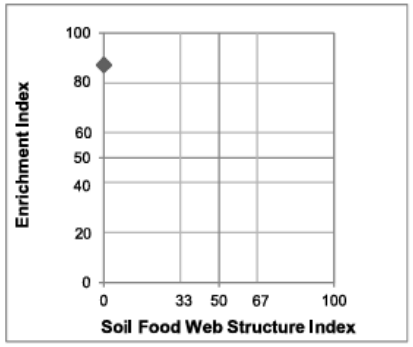
ECOLOGICAL FUNCTIONS

ECOLOGICAL INDICES

Index	Value	Explanation
Soil Food Web Structure Index (SI)	0,00	No trophic linkages.
Enrichment Index (EI)	87,22	Enrichment highly N-enriched but not decomposed.
Basal Index (BI)	12,78	System with abundant resources and fast nutrient turnover, however dominated by bacterial feeders.
Maturity Index (MI2-5)	0,44	Nutrient-enriched, disturbed system.

SEE LEGEND BELOW

NEMATODE MATRIX



EXPLANATION

The enrichment is sufficient as shown by the Enrichment index, however still needs to be decomposed. There are, however, no connections between the feeding groups and thus a good soil food web structure is not present. There is a high number of bacterial feeders that are responsible for fast nutrient turnover. The percentage bacterial feeders is high compared to the other feeding groups, which creates an imbalance in the system. The number of plant parasites is very high and this needs to be addressed. The plant parasitic nematodes consist mainly of citrus nematode.

DISCUSSION OF SOIL, NEMATODE & ROOT EVALUATION: 5 MARCH 2025

- As was seen in the October 2025 evaluation, there was a lower root volume in the soil profile holes around the trees in the control treatment when compared to the Humefert treatment. This was supported by an increase of 13.2% in the average root fresh weight in the Humefert treatment.

- The water infiltration speed increased significantly throughout the season, especially in the Humefert treatment. The average time it took for 1L of water to completely infiltrate into the top soil after irrigation was 52.1 seconds in the control, and 19.4 seconds in the Humefert treatment. In the October 2024 evaluation the corresponding values were 59.1 seconds in the control, and 47.3 seconds in the Humefert treatment.

- The compaction depth where most plant roots can not penetrate and develop normally (>300 psi) was surprisingly shallower in the March 2025 evaluation. The average depth was 32.5cm in the October 2024 evaluation compared to an average of 25.5cm in the March 2025 evaluation. There was an insignificant difference between the two treatments when this compaction depth was compared on 5 March 2025.

- Although the number of earthworms were low in both treatments, the Humefert treatment increased the numbers by 38.2% in the March 2025 evaluation.

- The plant parasitic nematode analysis at Nemlab only identified significant amounts of free living- and citrus- nematodes. Citrus nematode counts were high in the soil that received the Humefert treatment (3730 individuals/ 250cc soil + 1640 females/10gr roots), and severe in the control treatment (6660 individuals/ 250cc soil + 2720 females/10gr roots). This means that the ratio between beneficial free living nematodes and parasitic citrus nematodes was 2.87:1 in the Humfert treated soil, and 1.8:1 in the control treatment. The soil health analysis supported the lower parasitic citrus nematode counts in the Humefert treatment (33% of the total nematode population vs. 42.31% in the control treatment). Although the trophic links in the soil food web were slightly higher in the Humefert treatment, both treatments had a compromised soil food web structure with elevated numbers of bacterial feeders.

PETIOLE & LEAF NUTRIENT DATA, TEN DAYS BEFORE HARVEST

NVIROTEK PETIOLE AND LEAF NUTRIENT ANALYSES: 5 MARCH 2025

Table 10: Nvirotek petiole and leaf nutrient analyses

Lab Nommer	Verwysing #	Tipe	Aanvaar vir ontleding	Beskrywing	S - NuTest *	Cu - NuTest *	Fe - NuTest *	Mn - NuTest *	Na- NuTest *	Mo - NuTest *	Cl- NuTest *	Zn(W Fruit) *	Mo (WFuit) *	S(WFruit) *	B(WFruit) *	Fe(WFruit) *	Mn(W Fruit) *	Cu (W Fruit) *	Na (W Fruit) *	Mg (W Fruit) *	Ca (W Fruit) *	K (W Fruit) *	P (W Fruit) *	N (W Fruit) *
Lab Number	Reference #	Type	Accepted for testing	Description	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%
S25/1304/P1	Vrugte:Aminofix behandeling	Satsuma(citrus)	Acceptable									7.01	0	0.09	14.33	15.34	3.96	3.67	93.40	0.09	0.18	1.48	0.12	1.32
S25/1304/P3	Blaarstelle:Amonifix	Satsuma(citrus)	Acceptable		42.99	0.08	0.33	0.09	6.96	0.02	28.20													
S25/1304/P4	Vrugte:Kontrole	Satsuma(citrus)	Acceptable									4.94	0	0.10	17.54	20.71	5.27	3.00	92.60	0.10	0.38	1.13	0.12	1.15
S25/1304/P6	Blaarstelle:Kontrole	Satsuma(citrus)	Acceptable		18.34	0.27	1.18	0.42	17.70	0.02	89.10													
S25/1304/P2	Blare:Aminofix	Satsuma(citrus)	Acceptable																					
S25/1304/P5	Blare:Kontrole	Satsuma(citrus)	Acceptable																					

Lab Nommer	Verwysing #	Tipe	Aanvaar vir ontleding	Beskrywing	Moisture (W Fruit) *	Brix *	NH4 - NuTest *	NO3 - NuTest *	P - NuTest *	K- NuTest *	Ca- NuTest *	Mg - NuTest *	Zn - NuTest *	B- NuTest *	N *	P *	K	Ca	Mg	S *	Na	Fe	Mn	Zn	Cu mg/kg	B mg/kg
Lab Number	Reference #	Type	Accepted for testing	Description	%	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	%	%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg		
S25/1304/P1	Vrugte:Aminofix behandeling	Satsuma(citrus)	Acceptable		87.07																					
S25/1304/P3	Blaarstelle:Amonifix	Satsuma(citrus)	Acceptable			1.30	214.55	54.45	42.93	470.22	136.86	58.86	0.92	0.30												
S25/1304/P4	Vrugte:Kontrole	Satsuma(citrus)	Acceptable		86.28																					
S25/1304/P6	Blaarstelle:Kontrole	Satsuma(citrus)	Acceptable			4.50	577.45	162.47	190.22	2081.10	344.06	290.54	1.50	2.05												
S25/1304/P2	Blare:Aminofix	Satsuma(citrus)	Acceptable												2.65	0.16	1.43	4.27	0.22	0.27	420	114	29	21	<5	93.12
S25/1304/P5	Blare:Kontrole	Satsuma(citrus)	Acceptable												2.68	0.16	1.89	2.18	0.24	0.26	268	101	25	13	<5	119.51

DISCUSSION OF PETIOLE & LEAF NUTRIENT ANALYSES
5 MARCH 2025

- The Nvirotek leaf nutrient analyses in the previous table (blue arrows) demonstrated a significantly higher Ca concentration (4.27% vs. 2.18%), and notably higher micro nutrient concentrations (Fe, Mn, Zn) in the Humefert treatment. Out of all the micro nutrients, only the B had a higher concentration in the control treatment. The control treatment leaves also had a superior K concentration.

- The control treatment in the Nvirotek petiole sap analyses in the previous table (red arrows) demonstrated significantly higher macro- and micronutrient concentrations, as well as a higher Brix percentage. The one exception was the S levels that were significantly higher in the Humefert treatment.

FRUIT DATA TEN DAYS BEFORE HARVEST

CONTROL TREATMENT SATSUMA BLOCK: 5 MARCH 2025

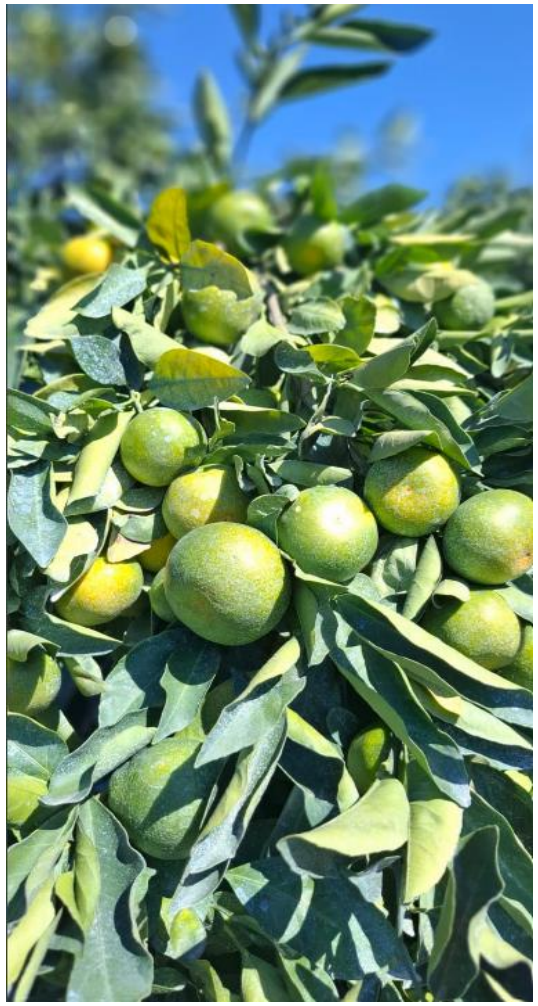
BRANCHES WITH SATSUMA FRUIT: 5 MARCH 2025
CONTROL TREATMENT




HUMEFERT TREATMENT SATSUMA BLOCK: 5 MARCH 2025

BRANCHES WITH SATSUMA FRUIT: 5 MARCH 2025
HUMEFERT TREATMENT






FRUIT DATA: 5 MARCH 2025 (A)

Table 11: Fruit data ten days before harvest

Treatment	Fruit uniformity (%)		Number of fruit on 4 stems/ tree		'One year shoot' length (cm)		'Two year wood' length (cm)		Tree vigour (%)	
	Control	Humefert	Control	Humefert	Control	Humefert	Control	Humefert	Control	Humefert
Tree 1	90	90	49	45	49	44	13	17	85	50
Tree 2	90	76	33	49	23	34	33	23	75	55
Tree 3	85	70	31	64	29	30	37	33	75	60
Tree 4	75	70	30	23	55	28	18	26	80	60
Tree 5	70	75	32	25	87	23	28	23	65	70
Tree 6	75	80	43	27	31	29	28	19	75	65
Tree 7	80	65	28	34	37	33	18	25	85	50
Tree 8	90	70	49	24	29	34	19	23	60	55
Tree 9	95	65	27	45	31	44	29	30	70	60
Tree 10	80	80	29	43	53	31	36	27	75	50
Total:	**830**	**741**	**351**	**379**	**424**	**330**	**259**	**246**	**745**	**575**
Average:	**83 %**	**74,1 %**	**35,1**	**37,9**	**42,4 cm**	**33 cm**	**25,9 cm**	**24,6 cm**	**74,5 %**	**57,5 %**

Notes:
The number of fruit is the average of forty stems per treatment, four stems per tree
Fruit uniformity: uniformity of fruit size distributed across the tree

MIHO WASE SATSUMA FRUIT ANALYSES: 5 MARCH 2025
CONTROL TREATMENT

MIHO WASE SATSUMA FRUIT ANALYSES: 5 MARCH 2025
HUMEFERT TREATMENT

FRUIT DATA: 5 MARCH 2025 (B)

Table 12: Analyses of fruit characteristics ten days before the onset of harvest

Treatment	Average fruit width	Average fruit depth	Average peduncle thickness	Average fruit weight
	(mm)	(mm)	(mm)	(gram)
Control	62,0	51,9	3,2	114,3
Humefert	65,4	54,9	3,2	133,5

Notes:
The above values represent the average of 30 fruit per treatment, harvested from 10 pre-selected trees

NVIROTEK FRUIT NUTRIENT ANALYSES: 5 MARCH 2025

Table 13: Nvirotek fruit nutrient analyses

Lab Nommer	Verwysing #	Tipe	Aanvaar vir ontleding	Beskrywing	S - NuTest *	Cu - NuTest *	Fe - NuTest *	Mn - NuTest *	Na- NuTest *	Mo - NuTest *	Cl- NuTest *	Zn(W Fruit) *	Mo (WFuit) *	S(WFruit) *	B(WFruit) *	Fe(WFruit) *	Mn(W Fruit) *	Cu (W Fruit) *	Na (W Fruit) *	Mg (W Fruit) *	Ca (W Fruit) *	K (W Fruit) *	P (W Fruit) *	N (W Fruit) *
Lab Number	Reference #	Type	Accepted for testing	Description	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%
S25/1304/P1	Vrugte:Aminofix behandeling	Satsuma(citrus)	Acceptable									7.01	0	0.09	14.33	15.34	3.96	3.67	93.40	0.09	0.18	1.48	0.12	1.32
S25/1304/P3	Blaarstelle:Amonifix	Satsuma(citrus)	Acceptable		42.99	0.08	0.33	0.09	6.96	0.02	28.20													
S25/1304/P4	Vrugte:Kontrole	Satsuma(citrus)	Acceptable									4.94	0	0.10	17.54	20.71	5.27	3.00	92.60	0.10	0.38	1.13	0.12	1.15
S25/1304/P6	Blaarstelle:Kontrole	Satsuma(citrus)	Acceptable		18.34	0.27	1.18	0.42	17.70	0.02	89.10													
S25/1304/P2	Blare:Aminofix	Satsuma(citrus)	Acceptable																					
S25/1304/P5	Blare:Kontrole	Satsuma(citrus)	Acceptable																					

Lab Nommer	Verwysing #	Tipe	Aanvaar vir ontleding	Beskrywing	Moisture (W Fruit) *	Brix *	NH4 - NuTest *	NO3 - NuTest *	P - NuTest *	K- NuTest *	Ca- NuTest *	Mg - NuTest *	Zn - NuTest *	B- NuTest *	N *	P *	K	Ca	Mg	S *	Na	Fe	Mn	Zn	Cu mg/kg	B mg/kg
Lab Number	Reference #	Type	Accepted for testing	Description	%	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	%	%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg		
S25/1304/P1	Vrugte:Aminofix behandeling	Satsuma(citrus)	Acceptable		87.07																					
S25/1304/P3	Blaarstelle:Amonifix	Satsuma(citrus)	Acceptable			1.30	214.55	54.45	42.93	470.22	136.86	58.86	0.92	0.30												
S25/1304/P4	Vrugte:Kontrole	Satsuma(citrus)	Acceptable		86.28																					
S25/1304/P6	Blaarstelle:Kontrole	Satsuma(citrus)	Acceptable			4.50	577.45	162.47	190.22	2081.10	344.06	290.54	1.50	2.05												
S25/1304/P2	Blare:Aminofix	Satsuma(citrus)	Acceptable												2.65	0.16	1.43	4.27	0.22	0.27	420	114	29	21	<5	93.12
S25/1304/P5	Blare:Kontrole	Satsuma(citrus)	Acceptable												2.68	0.16	1.89	2.18	0.24	0.26	268	101	25	13	<5	119.51

FRUIT SAP ANALYSES: 5 MARCH 2025

Table 14: Fruit sap analyses of the rind and endocarp fruit pieces ten days before final harvest

Treatment	Fruit part	N	K	Na	Ca	EC	Brix	Fruit pH
		(ppm)	(ppm)	(ppm)	(ppm)	(ms/cm)	(%)	
Control	Endocarp	90	1200	47	86	1316	8,6	4,9
Humefert	Endocarp	140	3200	50	80	1484	8,7	4,7
Control	Rind	510	400	67	380	974	3,5	
Humefert	Rind	310	1600	46	330	843	2,5	

Notes:
The above values represent the average fruit sap nutrient concentrations of 30 fruit per treatment, harvested from 10 pre-selected trees
The rind (or peel) represents both the exocarp (flavedo) and mesocarp (albedo)
The endocarp is the internal pulp segments filled with juice vesicles

DISCUSSION OF FRUIT EVALUATION
5 MARCH 2025

- During the 5 March 2025 evaluation, ten days before the onset of harvest, tree vigour and stem length were both superior in the control treatment. Although there wasn't much difference in the length of the two year old wood, the length of the one year old shoots were notably longer (42.4cm vs. 33cm) in the control treatment.

- The average number of fruit over forty stems per treatment was marginally (+7.9%) better in the Humefert treatment (37.9 fruit vs. 35.1 fruit). The average fruit weight was superior in the Humefert treatment with 16.8% (133.5gr vs. 114.3gr.) This was supported by an increase of 5.6% in the average fruit width and fruit depth. Although the fruit was smaller in the control treatment, its size distribution over the full volume of the tree was superior (83% uniformity vs. 74.1% uniformity in the Humefert treatment).

- From a nutrient sap perspective, the high K concentration and the superior K:N ratio in the Humefert treatment supported fruit quality. The K concentration was 2000 ppm higher in the endocarp sap and 1200 ppm higher in the rind sap. In the endocarp (internal pulp segments filled with juice vesicles) the K:N ratio was 22.8:1 in the Humefert treatment, and 13.3:1 in the control treatment. Fruit quality was also supported by a marginally better fruit sap electrical conductivity and Brix percentage. The whole fruit analyses done at Nvirotek supported the higher K in the Humefert treatment (1.48% vs. 1.13%), as well as the higher K:N ratio, and elevated Zn and Cu concentrations. In both analysis methods the Ca levels were notable higher in the control treatment.

PACKHOUSE DATA

PACKHOUSE DATA, YIELD & FRUIT SIZE: 1 AUGUST 2025

Table 15 : Packhouse data, yields and fruit size data

Treatment	Orchard nr.	Number of crates	Waste crates	Number of hectares	Number of crates/hectare	Average weight /crate	Total fruit weight/ hectare	Fruit too large for export (>72mm diameter)	Smaller fruit (45-59mm diameter)	Ideal export size (59-72mm diameter)
							(ton)	(%)	(%)	(%)
Control	12	265	19	3.3	80.3	408.30	32.78	0.97	41.22	57.81
Humefert	16	329	19	3.6	91.38	407.78	37.26 (+13,7%)	2.16	44.4	53.44

Notes:
The fruit in the waste crates was affected by sunburn, mechanical marks, cracks and secondary fruit fly damage

DISCUSSION PACKHOUSE DATA
1 AUGUST 2025

- Table 15 summarises the packhouse data from the fruit harvested in Miho Wase Satsuma block 16 (Humefert treatment), and Miho Wase Satsuma block 12 (Control treatment).

- The number of waste crates were 5.76 per hectare in the Control treatment, and 5.28 crates/hectare in the Humefert treatment. These were fruit affected by sunburn, mechanical marks, cracks and secondary fruit fly damage. The number of remaining crates per hectare were 80.3 in the Control treatment and 91.38 in the Humefert treatment, resulting in a total fruit weight of 32.78 ton/ha in the Control treatment, and 37.26 ton/ha in the Humefert treatment. This was an increase of 13.7% sound fruit available for fresh market sales.

- The Control treatment had 8.2% more fruit in the optimal export size class between 59-72mm diameter (57.8% vs. 53.4% in the Humefert treatment). This means that 18.94 ton fruit from the Control treatment was in the optimum export class, compared to 19.9 ton fruit in the Humefert treatment.

FINAL CONCLUSIONS

FINAL CONCLUSIONS

- The effect of the Humefert treatment on soil physical and biological properties resulted in a faster water infiltration rate and less soil compaction in the top 35cm of the soil. This was supported by a significant increase in root volume, fresh root weight, and dry root weight during both the early and latter season evaluations. The Humefert treatment also had a positive effect on soil biology. This treatment resulted in a notable increase in earthworm numbers, a significant decrease in the parasitic citrus nematode counts and a significantly higher ratio between beneficial and parasitic nematodes in the soil around the roots.

- The young shoots in the control treatment showed an increase in vegetative vigour and a notably higher NO3-N concentration in the shoot sap early season. The late season sap analyses supported this vegetative vigour with a notable increase in one year old shoot length and significantly higher macro- and micronutrient concentrations. It is interesting to note that in the standard leaf analysis, the Humefert treatment resulted in a significantly higher Ca concentration, and notably higher micro nutrient concentrations. In both the early and late season nutrient analyses, the Humefert fruit showed a significant increase in especially the K concentration, the K:N ratio, and Zn and Cu concentrations. The nutrient make up of the Humefert treated fruit, and the vegetative vigour in the control treatment, supported fruit quality and nutrient density in block 16.

- Early fruit set counts showed an increase of 31.3% in fruit numbers in the Humefert treatment, although there were no noticeable differences in the fresh and dry fruit weights between the treatments at that stage. In the late season orchard evaluation the Humefert treatment showed a 7.9% increase in fruit numbers and a 16.8% increase in fruit weight. Packhouse data confirmed that the Humefert treatment did in fact increase the number of fruit with 13.7% from 32.78 ton/ha to 37.26 ton/ha. This also resulted in an increase in the number of fruit per hectare having the optimum export size of 59-72mm diameter.