MagrowTec

UV Dye Visual Analysis Report

Farmers2Founders

TekFarm® project

Dryland cotton

“Morven”, NSW

Byron Birch

22nd April 2025

(2025-157-AU-AU)

Study Overview	
Study Director: Dan Corfe – Crop Science Specialist, MagrowTec **Study Monitor:** James Dolman – Senior Crop Science Specialist, MagrowTec **Date of Trial:** 22nd April 2025 **Location:** "Morven". Bellata, NSW. Australia. **Study Sponsor #1:** MagrowTec Orchard House, Block 2 Clonskeagh Square, Road, Dublin 14, D14 CD72, Ireland **Study Sponsor #2:** Farmers2Founders and Croplands.	**Overview:** MagrowTec conducted a Crop Science field study in a dryland cotton crop at "Morven," located near Bellata, NSW, to compare spray coverage and droplet distribution. This study benchmarked spray performance at both full and reduced water application rates while varying speeds, using TeeJet AIXR-110-015 + 02 nozzles. The research involved a comparison between a 36-meter Goldacres boom sprayer equipped with the MagrowTec system and a conventional Goldacres G4 Crop Cruise spray boom. It examined various canopy positions that are crucial to the agronomic practices of dryland cotton defoliation in this side-by-side comparison. To assess spray coverage, droplet distribution, and spray quality, a qualitative UV dye was utilised during a nighttime field trial. Spray coverage and distribution were evaluated through a field trial method that included a qualitative UV tracer test. This trial aimed to determine the most effective spraying parameters, including forward speed and boom line pressure. **The trial was conducted by:** *David McGrath: Regional Business Development Manager (Australia / New Zealand), MagrowTec* *Dan Corfe: Crop Science Specialist (Australia / New Zealand), MagrowTec* *Byron Birch: Farm Owner, "Morven", NSW, and Agronomist, B&W Rural.* *David Oliver: Territory Manager, South-East Queensland / Northern NSW, Croplands.* **Study Outline:** Farmers2Founders (F2F) Tekfarm® project, in collaboration with Byron Birch, submitted a funding grant to improve spray efficiency on Byron Birch's farm, "Morven," located in Bellata, NSW. Byron provides agronomic services through B&W Rural for a variety of crops, including cotton, sorghum, wheat, canola, and chickpeas. MagrowTec's Crop Science evaluation ensured precision in spray applications, resulting in enhanced agronomic outcomes for the business. **Primary Objectives:** The goal was to qualitatively evaluate the spray coverage and droplet distribution of MagrowTec spray technology compared to conventional spraying methods. This assessment focused on visual differences in coverage, quality, and uniformity at both full and reduced application rates, specifically in a dryland cotton crop at "Morven", Bellata, NSW.

Qualitative Assessment Procedure:

Take a high-resolution picture in the middle of the plot, with the camera oriented horizontally, from hip height.

Then, make a visual observation regarding:

1. **Spray coverage% -** What coverage% has been achieved for key targets in the agronomy strategy? Is the coverage suitable for the category of chemistry being applied (systemic, contact, defoliant, etc.)?

2. **Spray distribution** – Where is the spray? If there is a high/low distribution. Is the spray fluid where it needs to be?

3. **Spray quality** – Compare the average size of spray droplets at key target areas to identify treatment differences.

4. **Canopy penetration** – Discussion of the dispersion of spray fluid in the mid and lower canopy regions.

5. **Endo drift/runoff** – Are spray droplets reaching the soil directly, or is the application volume so high that it causes runoff from the saturated crop canopy?

6. **Miscellaneous observations** – Noteworthy observations include coverage comparisons with other treatments, and pooling of spray fluid in stem axils or leaf rolls.

Calibration procedure and details: Four TeeJet AIXR-110-015 nozzles were calibrated at 50 cm spacings, followed by four TeeJet AIXR-110-02 nozzles, also spaced 50 cm apart, at a pressure of 4 bar on the right side of each boom. After this, the same nozzles were calibrated at a pressure of 5 bar. These nozzles were aligned with the treatment zone specified in the study protocol (refer to *Figure One: Treatment List from the UV Study Protocol*). To calibrate the nozzles, both boom's internal rate controllers were disabled, or set to manual mode to simulate the application rates outlined in the Treatment List. All nozzles were calibrated within the 10% expected output allowance according to the manufacturer's ISO charts.

NOTE: The MagrowTec boom is equipped with a three-tier nozzle system. Each AIXR-110-015 and AIXR-110-02 nozzle alternates at a spacing of 25 cm, respectively, along each boom. All nozzles were operated at the designated speeds of 17 km/hr and 20 km/hr during the calibration and the trial, with a total combined nozzle size of 035, distributed every 50 cm across both booms.

Figure One: Trial Treatment List

Treatment List.									
Treatment Number	Spraying Configuration	Nozzle type (at 25cm)	Nozzle type (at 50cm)	Pressure (Bar)	Speed (km/hr)	Nozzle Application Rate at 25cm (L/ha)	Nozzle Application Rate at 50cm (L/ha)	Combined Nozzle App. Rate (L/ha)	Rate (%)
T1	Conventional	AIXR-110-**015**	**035**	4.00	17.00	97.80	48.90	114.10	100
		AIXR-110-**02**				130.40	65.20		
T2	MagrowTec	AIXR-110-**015**	**035**	4.00	17.00	97.80	48.90	114.10	100
		AIXR-110-**02**				130.40	65.20		
T3	Conventional	AIXR-110-**015**	**035**	4.00	20.00	83.10	41.55	97.00	85
		AIXR-110-**02**				110.90	55.45		
T4	MagrowTec	AIXR-110-**015**	**035**	4.00	20.00	83.10	41.55	97.00	85
		AIXR-110-**02**				110.90	55.45		
T5	Conventional	AIXR-110-**015**	**035**	**5.00**	20.00	93.00	46.50	108.45	95
		AIXR-110-**02**				123.90	61.95		
T6	MagrowTec	AIXR-110-**015**	**035**	**5.00**	20.00	93.00	46.50	108.45	95
		AIXR-110-**02**				123.90	61.95		

Figure Two: Calibration and Spray Quality details

Calibration			
Nozzle	**Pressure (Bar)**	**Expected Output (L/min)**	**Spray Quality Classification**
TeeJet AIXR-110-015	4.00	0.69	Medium
TeeJet AIXR-110-02	4.00	0.92	Medium
TeeJet AIXR-110-015	5.00	0.77	Medium
TeeJet AIXR-110-02	5.00	1.03	Medium
Speed Calibration Check:	17.00kph operating speed / 50m calibration check = 11 seconds 20.00kph operating speed / 50m calibration check = 9 seconds		

A speed calibration was successfully conducted at 20 km/hr to confirm the accuracy and consistency of the internal speedometers in both booms, ensuring they provided identical speed-over-time responses, which is crucial as speed can impact application rates.

Figure Three: Teejet AIXR-110-015 and AIXR-110-02 ISO nozzle chart (2025)

TIP PART NO. (STRAINER MESH SIZE)	bar	DROP SIZE	CAPACITY ONE TIP IN l/min	APPLICATION RATE FOR 50 cm SPRAY TIP SPACING l/ha												
				4 km/h	5 km/h	6 km/h	7 km/h	8 km/h	10 km/h	12 km/h	16 km/h	18 km/h	20 km/h	25 km/h	30 km/h	35 km/h
AIXR110015 (100)	1.0	VC	0.34	102	81.6	68.0	58.3	51.0	40.8	34.0	25.5	22.7	20.4	16.3	13.6	11.7
	2.0	C	0.48	144	115	96.0	82.3	72.0	57.6	48.0	36.0	32.0	28.8	23.0	19.2	16.5
	3.0	C	0.59	177	142	118	101	88.5	70.8	59.0	44.3	39.3	35.4	28.3	23.6	20.2
	4.0	M	0.68	204	163	136	117	102	81.6	68.0	51.0	45.3	40.8	32.6	27.2	23.3
	5.0	M	0.76	228	182	152	130	114	91.2	76.0	57.0	50.7	45.6	36.5	30.4	26.1
	6.0	M	0.83	249	199	166	142	125	99.6	83.0	62.3	55.3	49.8	39.8	33.2	28.5
AIXR11002 (50)	1.0	XC	0.46	138	110	92.0	78.9	69.0	55.2	46.0	34.5	30.7	27.6	22.1	18.4	15.8
	2.0	VC	0.65	195	156	130	111	97.5	78.0	65.0	48.8	43.3	39.0	31.2	26.0	22.3
	3.0	C	0.79	237	190	158	135	119	94.8	79.0	59.3	52.7	47.4	37.9	31.6	27.1
	4.0	M	0.91	273	218	182	156	137	109	91.0	68.3	60.7	54.6	43.7	36.4	31.2
	5.0	M	1.02	306	245	204	175	153	122	102	76.5	68.0	61.2	49.0	40.8	35.0
	6.0	M	1.12	336	269	224	192	168	134	112	84.0	74.7	67.2	53.8	44.8	38.4

Figure Four: Nozzle calibration section.

(Refer to *Figure Two: Calibration and Spray Quality*.)

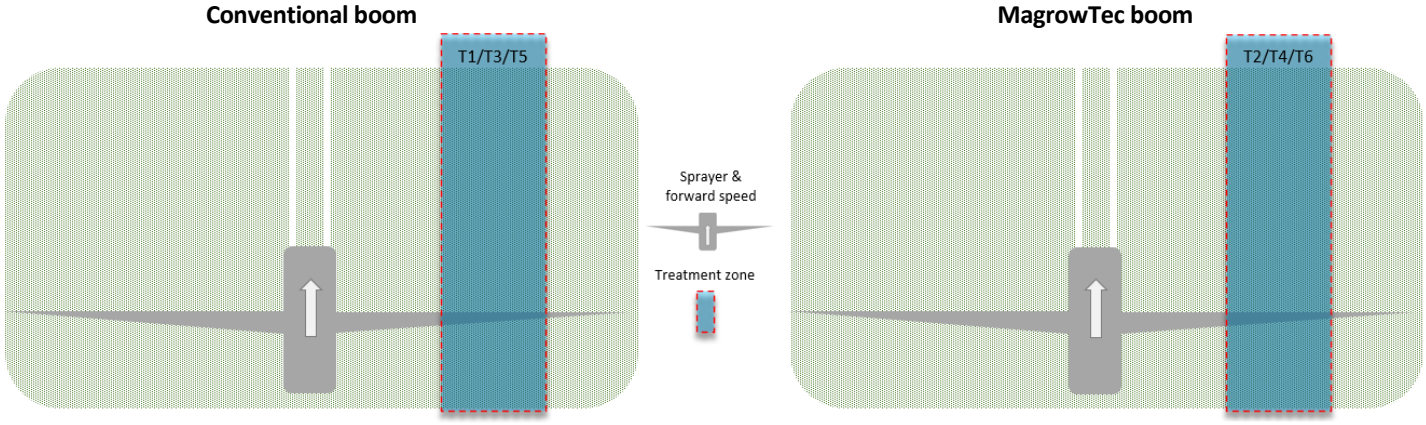
Note: Nozzle calibrations were successfully undertaken as shown above, on the right wing of both the conventional and MagrowTec booms.

Figure Five: Nozzle calibration results.

	1	2	3	4	5	6	7	8
Output (L/min) > TeeJet AIXR-110-015 @ 4 bar	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
MagrowTec (MGT)	0.67	0.66	0.67	0.66	0.67	0.66	0.67	0.68
Variance (%)	-2%	-3%	-2%	-3%	-2%	-3%	-2%	-1%
Conventional	0.68	0.70	0.69	0.67	0.69	0.69	0.69	0.69
Variance (%)	-1%	1%	0%	-3%	0%	0%	0%	0%
Output (L/min) > TeeJet AIXR-110-02 @ 4 bar	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
MagrowTec (MGT)	0.82	0.87	0.88	0.87	0.86	0.88	0.86	0.86
Variance (%)	-10%	-5%	-4%	-5%	-6%	-4%	-6%	-6%
Conventional	0.92	0.87	0.92	0.92	0.92	0.92	0.92	0.91
Variance (%)	0%	-5%	0%	0%	0%	0%	0%	-1%
Output (L/min) > TeeJet AIXR-110-015 @ 5 bar	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
MagrowTec (MGT)	0.75	0.75	0.82	0.75	0.75	0.75	0.75	0.75
Variance (%)	-2%	-2%	5%	-2%	-2%	-2%	-2%	-2%
Conventional	0.76	0.69	0.69	0.70	0.69	0.70	0.71	0.74
Variance (%)	-1%	-8%	-8%	-7%	-8%	-7%	-6%	-3%
Output (L/min) > TeeJet AIXR-110-02 @ 5 bar	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
MagrowTec (MGT)	0.97	0.97	1.07	0.97	0.97	1.00	1.03	1.03
Variance (%)	-6%	-6%	4%	-6%	-6%	-3%	0%	0%
Conventional	1.06	1.00	0.97	1.03	0.99	1.06	1.00	1.00
Variance (%)	3%	-3%	-6%	0%	-4%	3%	-3%	-3%

Note: Nozzle calibrations: 1 to 16 (8 X AIXR-110-015 and 8 X AIXR-110-02) nozzles alternating every 25 cm's.

Figure Six: Trial treatment zone by each spray boom



- *T1 (Conv.) was run first, followed by T2 (MGT), then T3 (Conv.), T4 (MGT), followed by T5 (Conv.) and T6 (MGT).*
- *T1 and T2, T3 and T4, then T5 and T6, were run downward through the field as separate samples to minimise UV dye contamination.*
- *Only one rep was undertaken for each treatment.*

Figure Seven: Weather observations.

Treatment	Date	Time	Temp - C	Relative Humidity %	Wind - km/h	Rain - mm
1	22/04/2025	7:20:00 PM	18.6	52	6.0	0.0
2	22/04/2025	7:35:00 PM	18.1	57	6.0	0.0
3	22/04/2025	7:50:00 PM	15.3	60	6.0	0.0
4	22/04/2025	8:00:00 PM	15.3	60	6.0	0.0
5	22/04/2025	8:15:00 PM	14.8	60	6.0	0.0
6	22/04/2025	8:30:00 PM	14.8	62	5.0	0.0

Source: https://www.wunderground.com

Treatment: T1 - Conventional	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality:** Medium @ 4 bar pressure	**Speed**: 17 km/hr

Comments and criteria.

Spray Coverage:

The spray coverage is very good and even.

Spray Distribution:

Approximately 90% of the spray coverage is on the top of the plant.

About 50% coverage is achieved one-third further down the plant.

This coverage decreases further down, with the bottom third receiving only around 10% spray coverage.

Spray Quality:

The spray quality is fairly even.

Canopy Pen:

The spray penetration is noted to only reach halfway through the plant canopy. (Upper only)

Run Off:

Nil.

Other observations:

From halfway, the spray pattern is directional and comes in from the side.

Treatment: T1 - Conventional	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality:** Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T1 - Conventional	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality:** Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T1 - Conventional	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality:** Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T2 - MagrowTec	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 17 km/hr

Comments and criteria.

Spray Coverage:

Droplets are less defined, creating an even, closely spaced droplet pattern, ensuring close droplet spacing for maximum coverage.

There is a better spread of droplets, including finer droplets. They're nearly coalescing.

It's a better spread of droplets, so the coverage looks better.

Spray Distribution:

The MagrowTec spray distribution on the top 2/3$^{rd's}$ of the plant is the same as the top 1/3rd on the conventional comparative crop.

Spray Quality:

Close droplet spacing for maximum coverage

Canopy Penetration:

Consistently deeper

Run Off:

Nil.

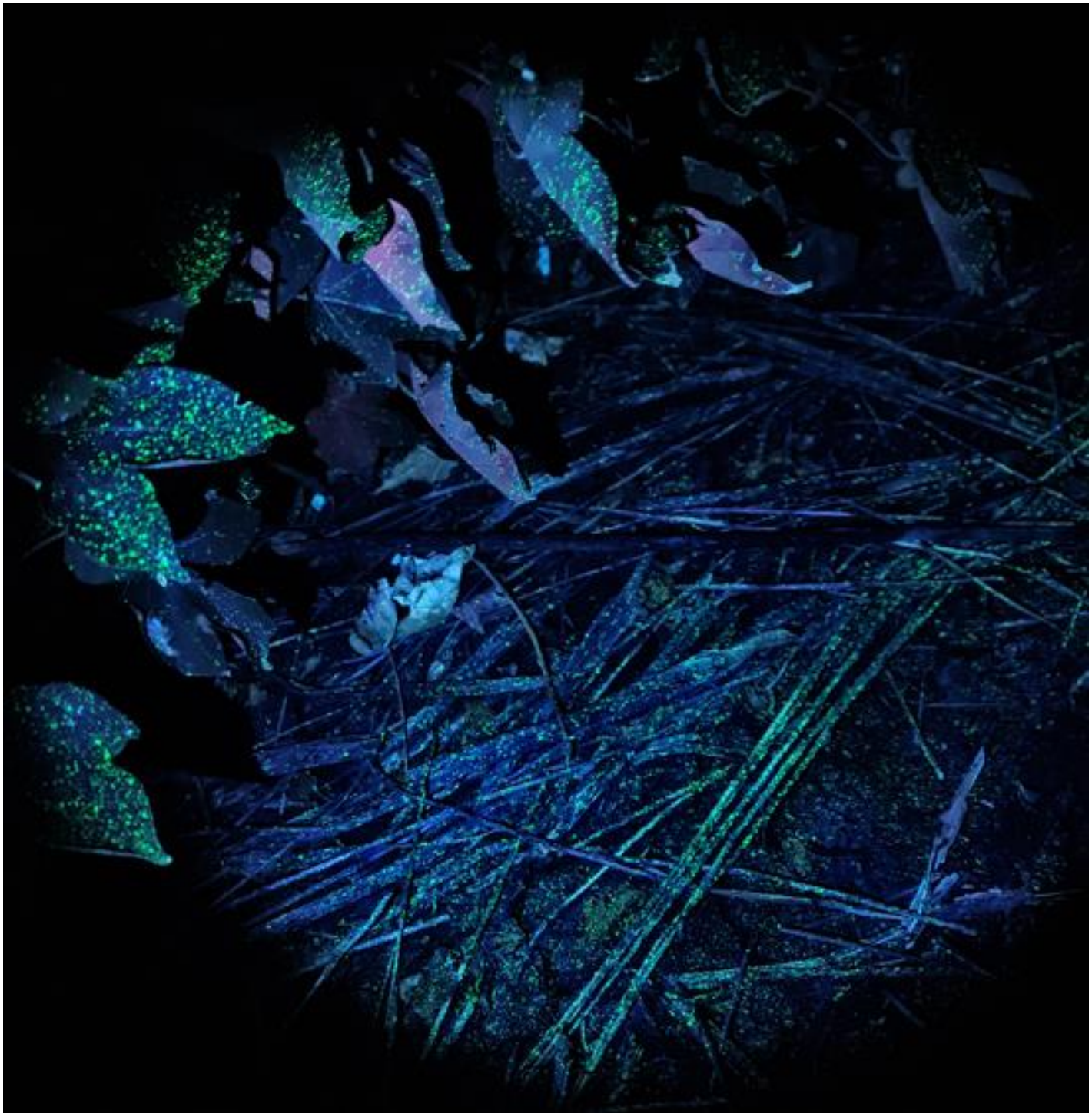
Other comments:

Overall, there is a much higher glow from MagrowTec, returning so many more droplets all over the plant – it's a noticeable improvement.

Treatment: T2 - MagrowTec	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T2 - MagrowTec	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T2 - MagrowTec	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 17 km/hr



Treatment: T2 - MagrowTec	**Combined Application rate:** 114.10 L/Ha - (100% Full rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 17 km/hr

Treatment: T3 - Conventional	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr

Comments and criteria.

The commentary is essentially the same as T1 - Conventional.

Spray Coverage:

The slight increase in speed has been a factor in spray quality.

Back to individual droplets, which are the same as what was found in the first conventional spray treatment.

Spray Distribution:

Fairly even droplets across the top of the plant only.

The stem has a few more droplets than in previous observations

Spray Quality:

None gathered.

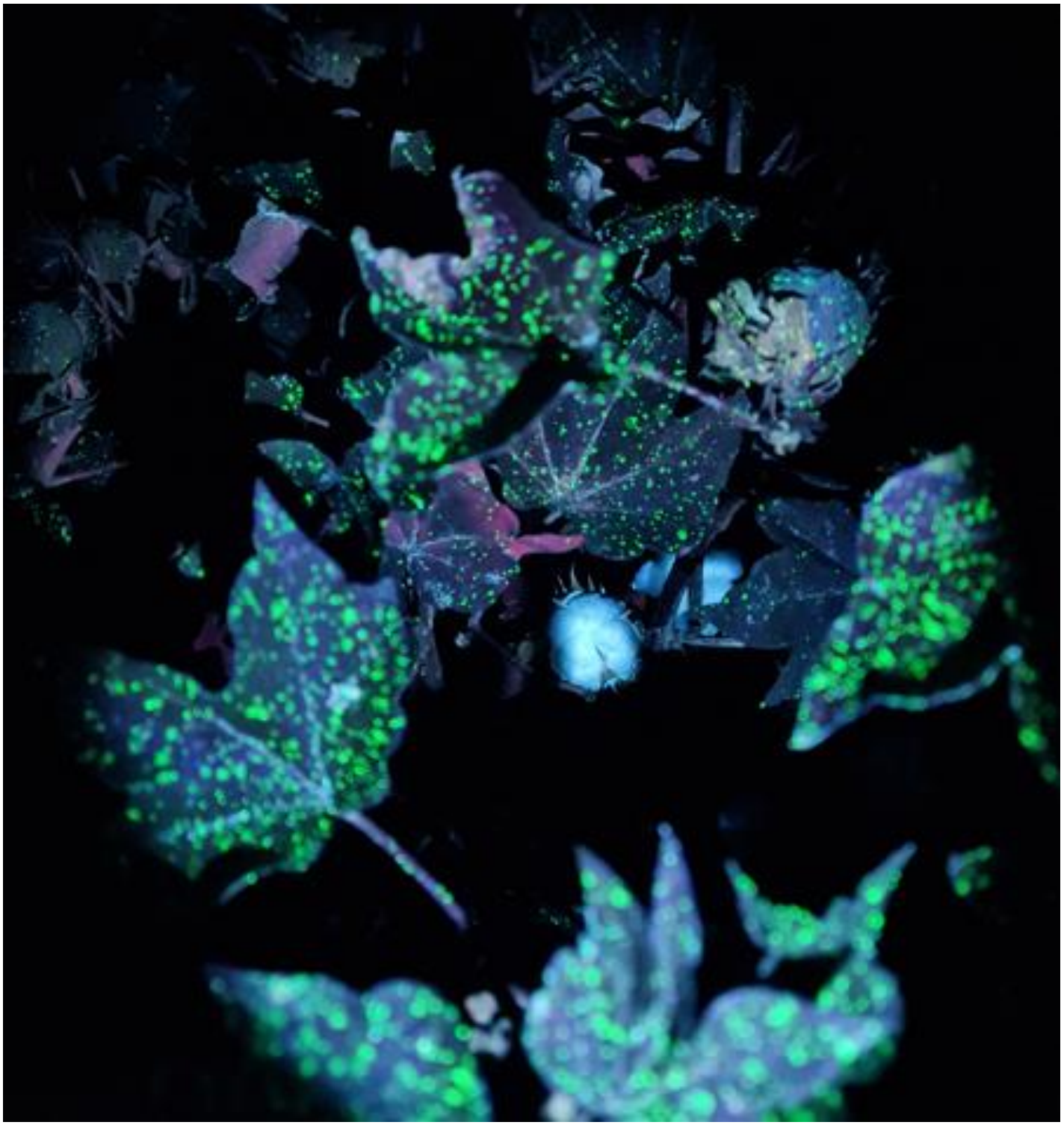
Canopy Penetration:

None gathered.

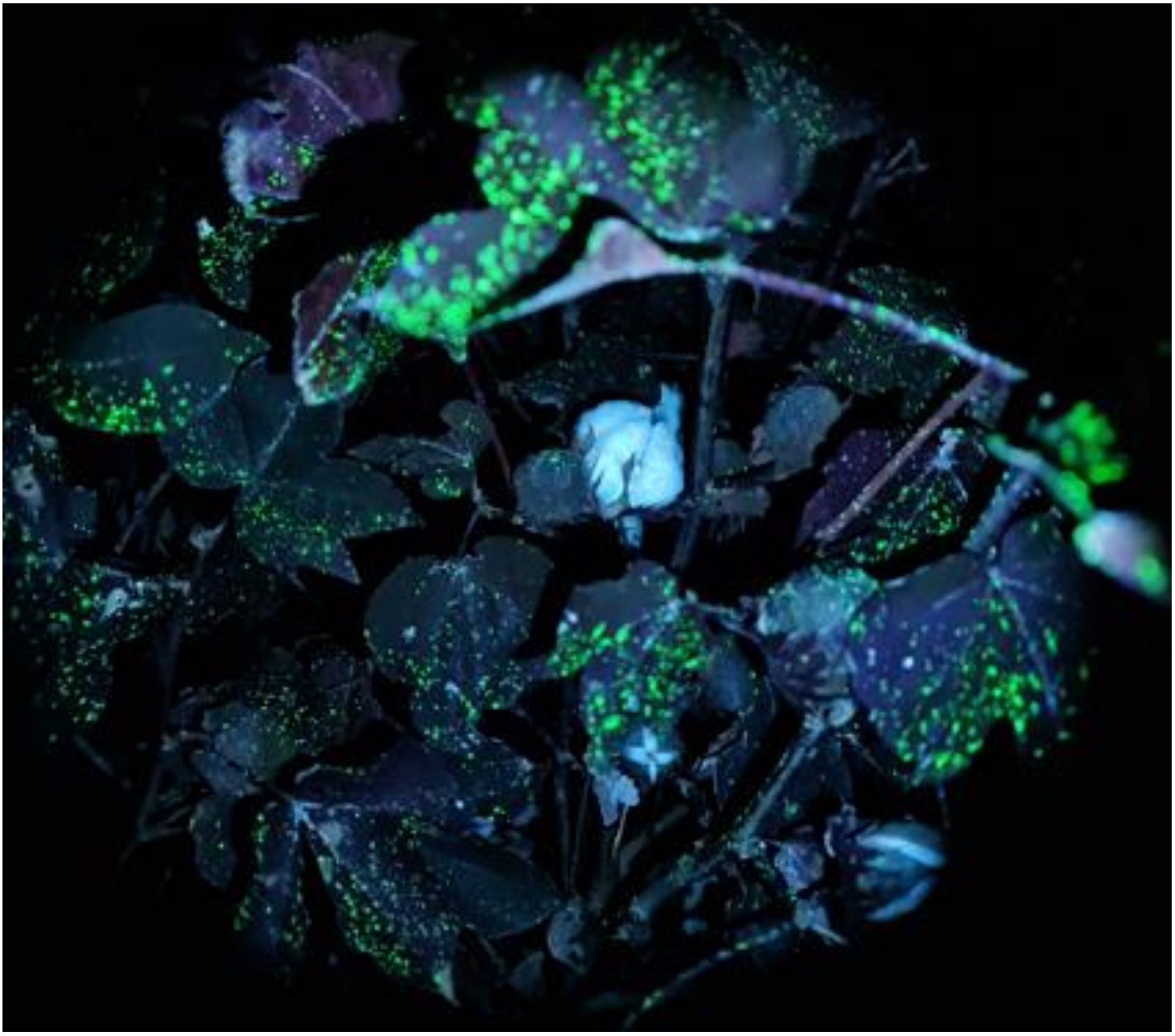
Run Off:

Nil.

Treatment: T3 - Conventional	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr



Treatment: T3 - Conventional	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr



Treatment: T4 - MagrowTec	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr

Comments and criteria.

* Refer to previous Treatment 2 comments

The top 2/3rd of the target with MagrowTec looks like the top 1/3rd with the conventional.

Spray Coverage:

All the baby [finer] droplets are still hitting the plant Vs the conventional treatment, where they were barely visible (T3).

Still delivering a dense spray with droplets in close proximity, but not as close as T2 [slower speed with MagrowTec]

Spray Distribution:

There are still reasonably good droplets in the lower half of the plant.

Spray Quality:

Even with the higher forward speed, the application is still better than Treatment 1 (Conventional).

Canopy Penetration:

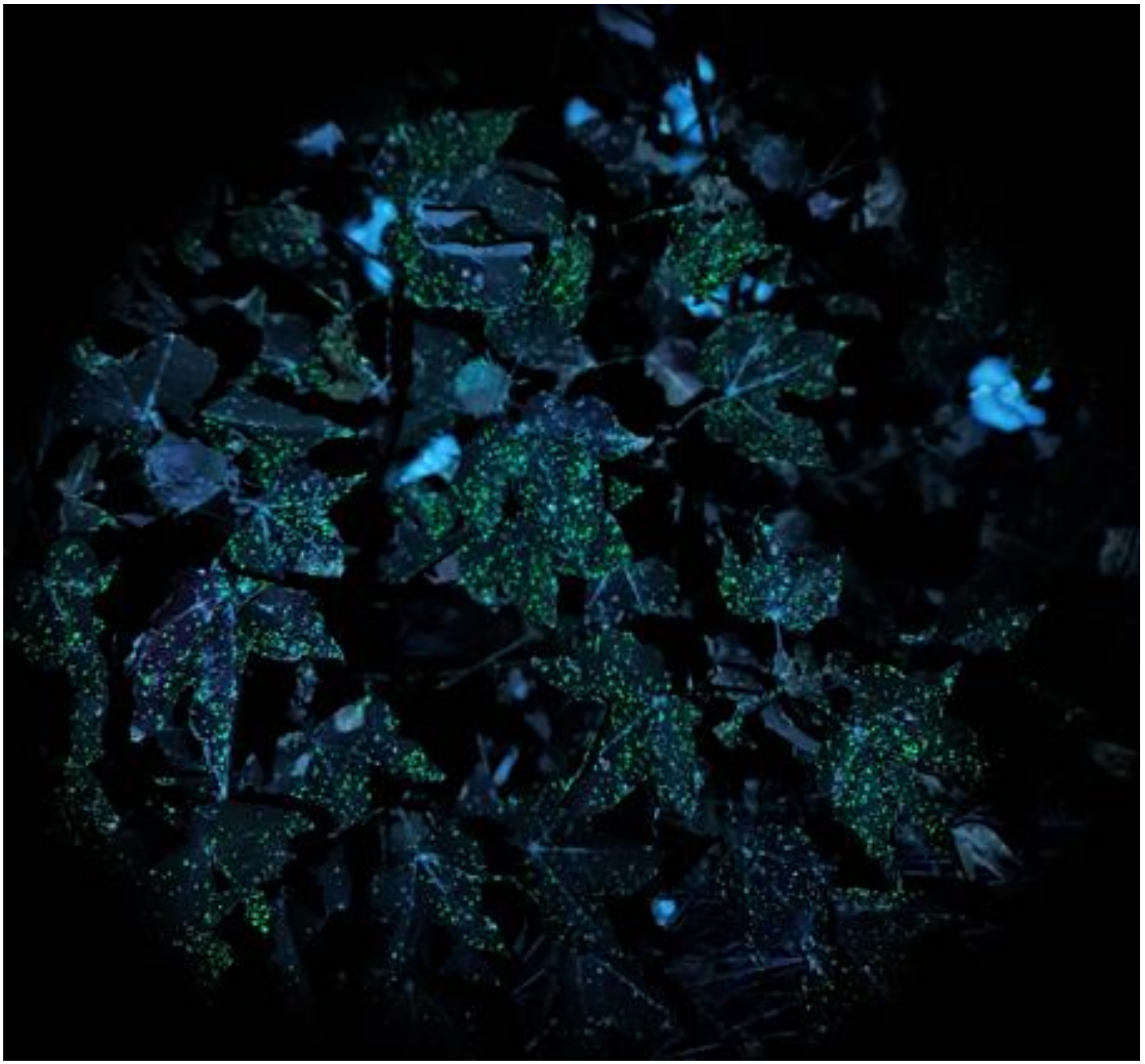
Droplets are hitting and pulling around the stem lower down the plant, indicating that the droplets have velocity and were sticking and wrapping around the stem through the canopy, instead of directional spray - bouncing and shattering with the conventional application.

Run Off:

Nil.

Treatment: T4 - MagrowTec	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr

Treatment: T4 - MagrowTec	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr



Treatment: T4 - MagrowTec	**Combined Application rate:** 97.00 L/Ha - (85% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 4 bar pressure	**Speed**: 20 km/hr

Treatment: T5 - Conventional	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr

Comments and criteria:

* Refer to previous Treatment 2 comments

The top 2/3rd of the target with MagrowTec looks like the top 1/3rd with the conventional.

Spray Coverage:

The smaller [droplets] are working a bit better on this treatment Vs T1 and T3 (conventional)

Spray Distribution:

There are more visible [droplets], and they are hitting lower.

Spray Quality:

None gathered.

Canopy Penetration:

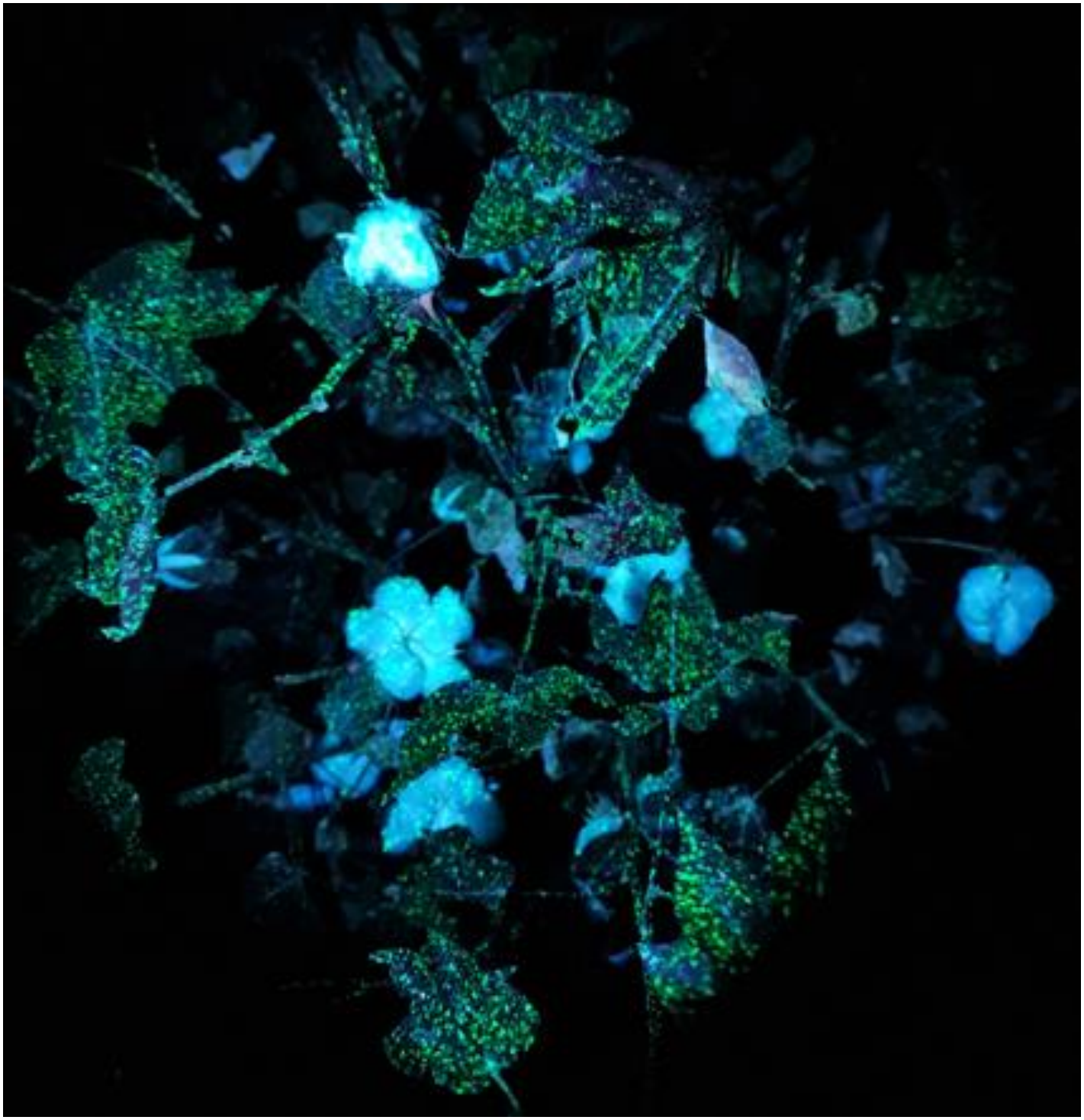
The droplets on the conventional side could not be found deeper down Vs. MagrowTec.

Run Off:

Nil.

Treatment: T5 - Conventional	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr

Treatment: T5 - Conventional	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr



Treatment: T5 - Conventional	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr

Treatment: T6 - MagrowTec	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr

Comments and criteria:

* Refer to previous Treatment 2 comments

The top 2/3rd of the target with MagrowTec looks like the top 1/3rd with the conventional.

Spray Coverage:

Top droplets are at saturation point, achieving near-total surface coverage with individual droplets

Spray Distribution:

All the way down spray.

Spray Quality:

Treatment 2 is still the favourite from this UV trial.

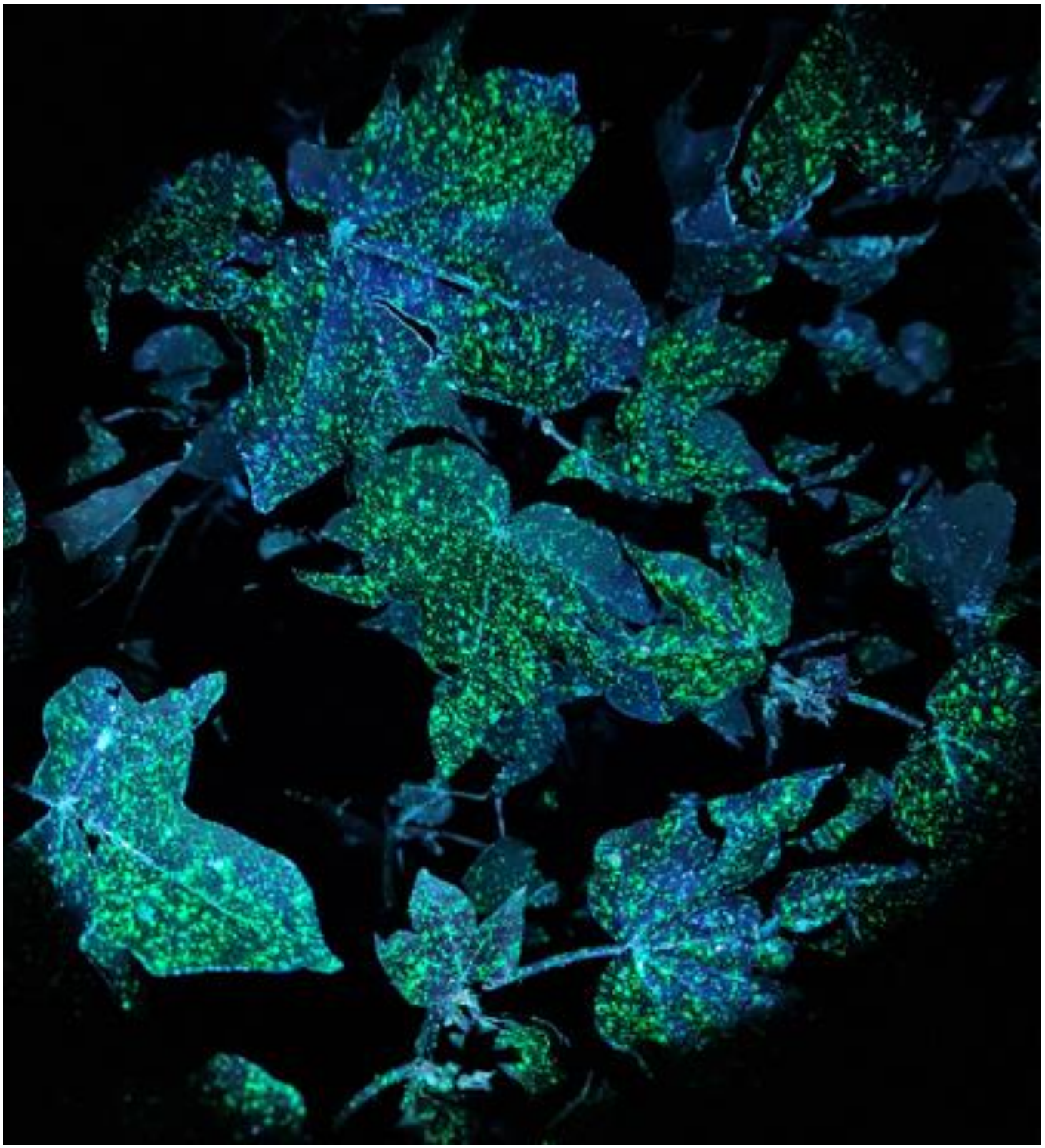
Canopy Penetration:

None gathered.

Run Off:

Nil.

Treatment: T6 - MagrowTec	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr



Treatment: T6 - MagrowTec	**Combined Application rate:** 108.45 L/Ha - (95% Reduced rate)	
Nozzle: TeeJet AIXR-110-015 + 02 (alternating)	**Spray Quality**: Medium @ 5 bar pressure	**Speed**: 20 km/hr

Crop Science Research Study Report Acknowledgment Form

Study Code	2025-157-AU-AU
External Partner	*Birch, F2F TekFarm Project. Dryland cotton, UV dye Research Study > MagrowTec Vs. Conventional*

By my signature, I agree to the sharing of ***Birch, F2F TekFarm Project. Dryland cotton, UV dye Research Study > MagrowTec Vs. Conventional*** *document, with relevant contacts external to MagrowTec.*

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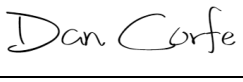
Personnel	Name	Signature	Date (dd/mm/yyyy)
Study Director	Dan Corfe		Jun 12 2025
Study Monitor	James Dolman		Jun 13 2025
Head of Crop Science	Nick Jessop		Jun 14 2025
Commercial Lead	David McGrath		Jun 12 2025
External Partner #1	Byron Birch		Jun 13 2025
External Partner #2	David Oliver		Jun 12 2025