Effect of Aerial Application Rate on Fungicide Efficacy for Control of Sheath Blight in Rice

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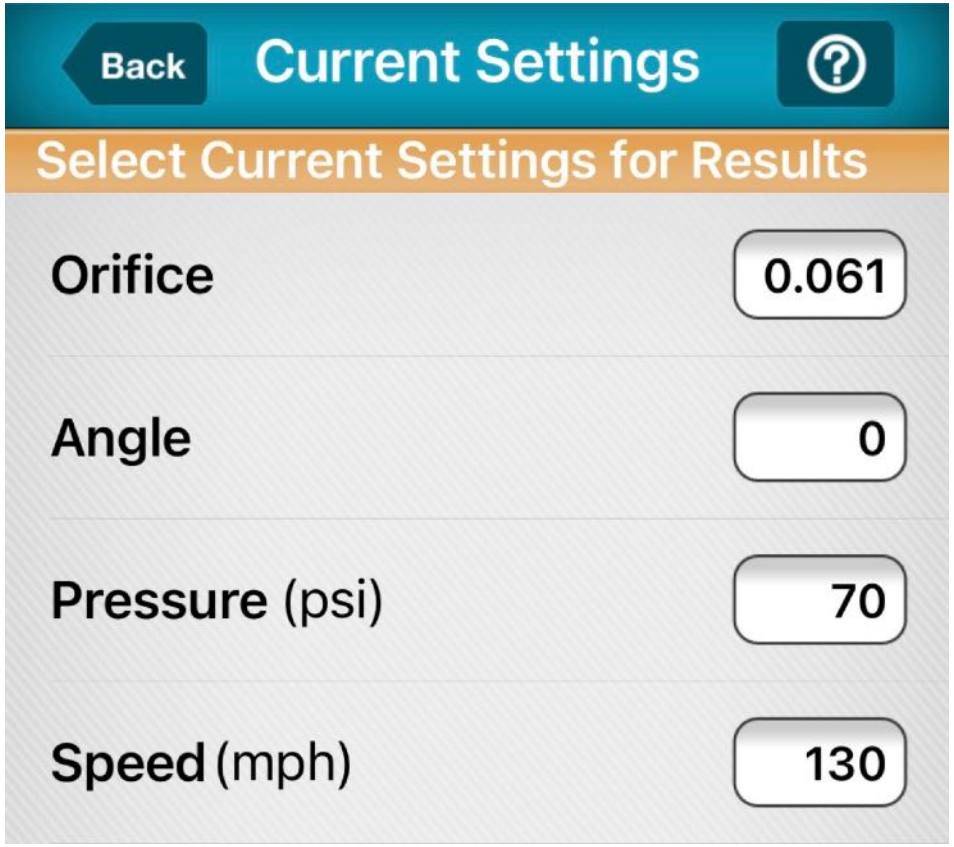
Rice Sheath Blight

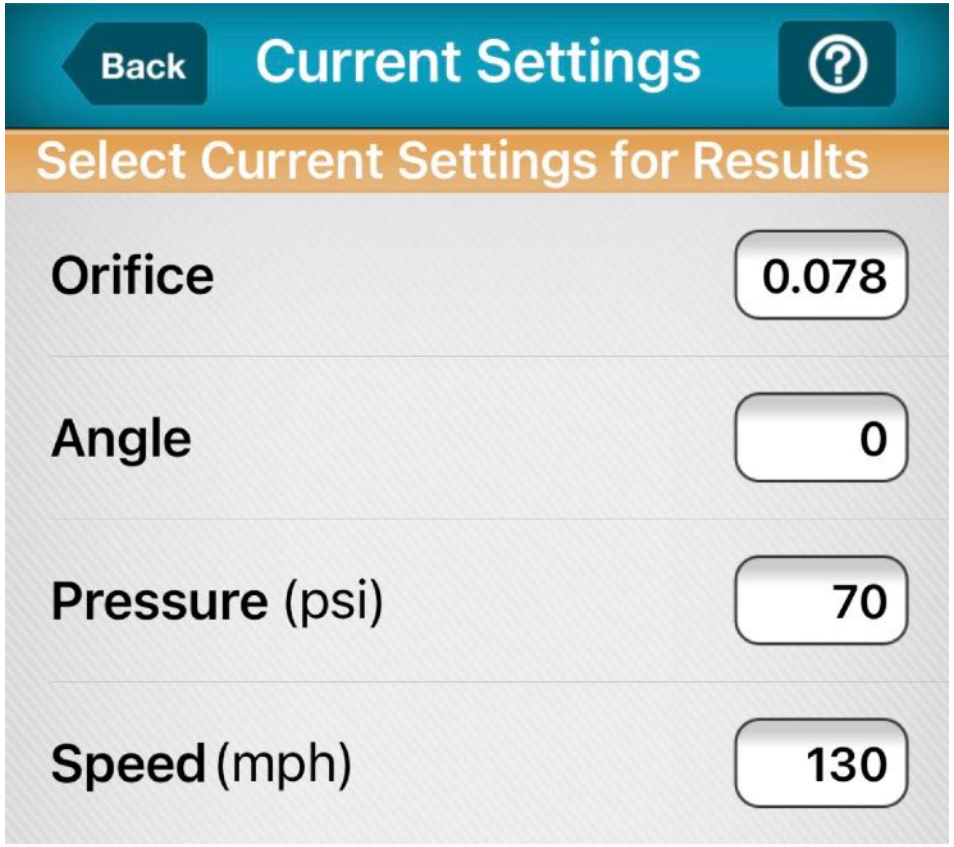
- Fungus
- *Rhizoctonia solani*
- Global pathogen
- Infected plants found in circular pattern (“Birds Nest”)
- Causes significant yield losses (up to 50%) and quality degradation


N6133R

Davidon Tri-Set Nozzle with 0° Deflection



Davidon Tri-Set Nozzle with 0° Deflection



N-Number
N6133R

Pattern Testing Research

Date
6/9/21

USDA-ARS Aerial Application Technology Research College Station, TX

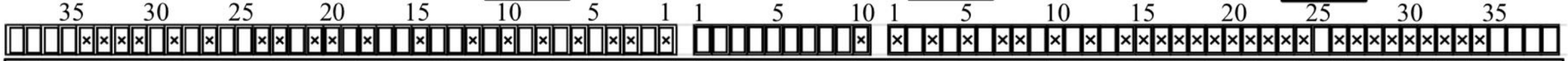
Aircraft Type AT502
Orifice Size 1 0.061
Nozzles 1 47
Nozzle Spacing _____
% Boom Width _____
Wingtip Type _____

Nozzle Type Davidon TriSet
Orifice Size 2 _____
Nozzles 2 _____
Target Rate(GPA) 2.0

Airspeed (mph) 130
Target Swath (ft) 64
Pressure (psi) 70
Deflection (°) 0

Boom Layout

Left Boom 19
Center Boom 1
Right Boom 27



Swath RTCV BFCV

Test # ____ Time:_____ Notes:

N-Number
N6133R

Pattern Testing Research

Date
6/9/21

USDA-ARS Aerial Application Technology Research College Station, TX

Aircraft Type AT502

Orifice Size 1 0.078

Nozzles 1 64

Nozzle Spacing _____

% Boom Width _____

Wingtip Type _____

Nozzle Type Davidon TriSet

Orifice Size 2 _____

Nozzles 2 _____

Target Rate(GPA) 6.0

Airspeed (mph) 130

Target Swath (ft) 64

Pressure (psi) 70

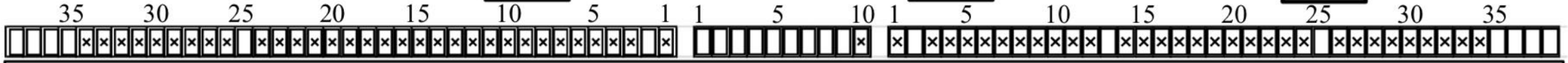
Deflection (°) 0

Boom Layout

Left Boom 32

Center Boom 1

Right Boom 31



Swath RTCV BFCV

Test # 1 Time: 13:30 Notes:


N8803Z
RESTRICTED

StreamJet Solid Stream Spray Nozzles

Stainless Steel for Banding Fertilizers

- Permits banding fluids at high rig speeds.
- Large orifices with no internal obstructions permit non-clogging suspension applications.
- Lower drift potential.
- See page 141 for liquid density conversion

	PSI	CAPACITY ONE NOZZLE IN GPM	GPA 30" 4 MPH	6 MPH	8 MPH	10 MPH	12 MPH	14 MPH	16 MPH	18 MPH	20 MPH
TP0001-SS	10	0.050	2.5	1.7	1.2	0.99	0.83	0.71	0.62	0.55	0.50
	20	0.071	3.5	2.3	1.8	1.4	1.2	1.0	0.88	0.78	0.70
	30	0.087	4.3	2.9	2.2	1.7	1.4	1.2	1.1	0.96	0.86
	40	0.10	5.0	3.3	2.5	2.0	1.7	1.4	1.2	1.1	0.99
TP00015-SS	10	0.075	3.7	2.5	1.9	1.5	1.2	1.1	0.93	0.83	0.74
	20	0.11	5.4	3.6	2.7	2.2	1.8	1.6	1.4	1.2	1.1
	30	0.13	6.4	4.3	3.2	2.6	2.1	1.8	1.6	1.4	1.3
	40	0.15	7.4	5.0	3.7	3.0	2.5	2.1	1.9	1.7	1.5
H1/4U-SS0002 TP0002-SS	10	0.10	5.0	3.3	2.5	2.0	1.7	1.4	1.2	1.1	0.99
	20	0.14	6.9	4.6	3.5	2.8	2.3	2.0	1.7	1.5	1.4
	30	0.17	8.4	5.6	4.2	3.4	2.8	2.4	2.1	1.9	1.7
	40	0.20	9.9	6.6	5.0	4.0	3.3	2.8	2.5	2.2	2.0
H1/4U-SS0003 TP0003-SS	10	0.15	7.4	5.0	3.7	3.0	2.5	2.1	1.9	1.7	1.5
	20	0.21	10.4	6.9	5.2	4.2	3.5	3.0	2.6	2.3	2.1
	30	0.26	12.9	8.6	6.4	5.1	4.3	3.7	3.2	2.9	2.6
	40	0.30	14.9	9.9	7.4	5.9	5.0	4.2	3.7	3.3	3.0
H1/4U-SS0004 TP0004-SS	10	0.20	9.9	6.6	5.0	4.0	3.3	2.8	2.5	2.2	2.0
	20	0.28	13.9	9.2	6.9	5.5	4.6	4.0	3.5	3.1	2.8
	30	0.35	17.3	11.6	8.7	6.9	5.8	5.0	4.3	3.9	3.5
	40	0.40	19.8	13.2	9.9	7.9	6.6	5.7	5.0	4.4	4.0
H1/4U-SS0006 TP0006-SS	10	0.30	14.9	9.9	7.4	5.9	5.0	4.2	3.7	3.3	3.0
	20	0.42	21	13.9	10.4	8.3	6.9	5.9	5.2	4.6	4.2
	30	0.52	26	17.2	12.9	10.3	8.6	7.4	6.4	5.7	5.1
	40	0.60	30	19.8	14.9	11.9	9.9	8.5	7.4	6.6	5.9
H1/4U-SS0008	10	0.40	19.8	13.2	9.9	7.9	6.6	5.7	5.0	4.4	4.0
	20	0.57	28	18.8	14.1	11.3	9.4	8.1	7.1	6.3	5.6

N-Number
N8803Z

Pattern Testing Research

Date
6/9/21

USDA-ARS Aerial Application Technology Research College Station, TX

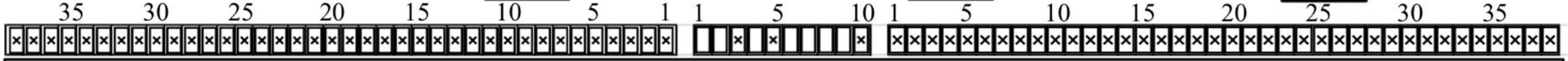
Aircraft Type Eagle
Orifice Size 1 0.061
Nozzles 1 85
Nozzle Spacing
% Boom Width
Wingtip Type

Nozzle Type SS0.5gpm
Orifice Size 2
Nozzles 2
Target Rate(GPA) 2.0

Airspeed (mph) 95
Target Swath (ft) 60
Pressure (psi) 30
Deflection (°) 0

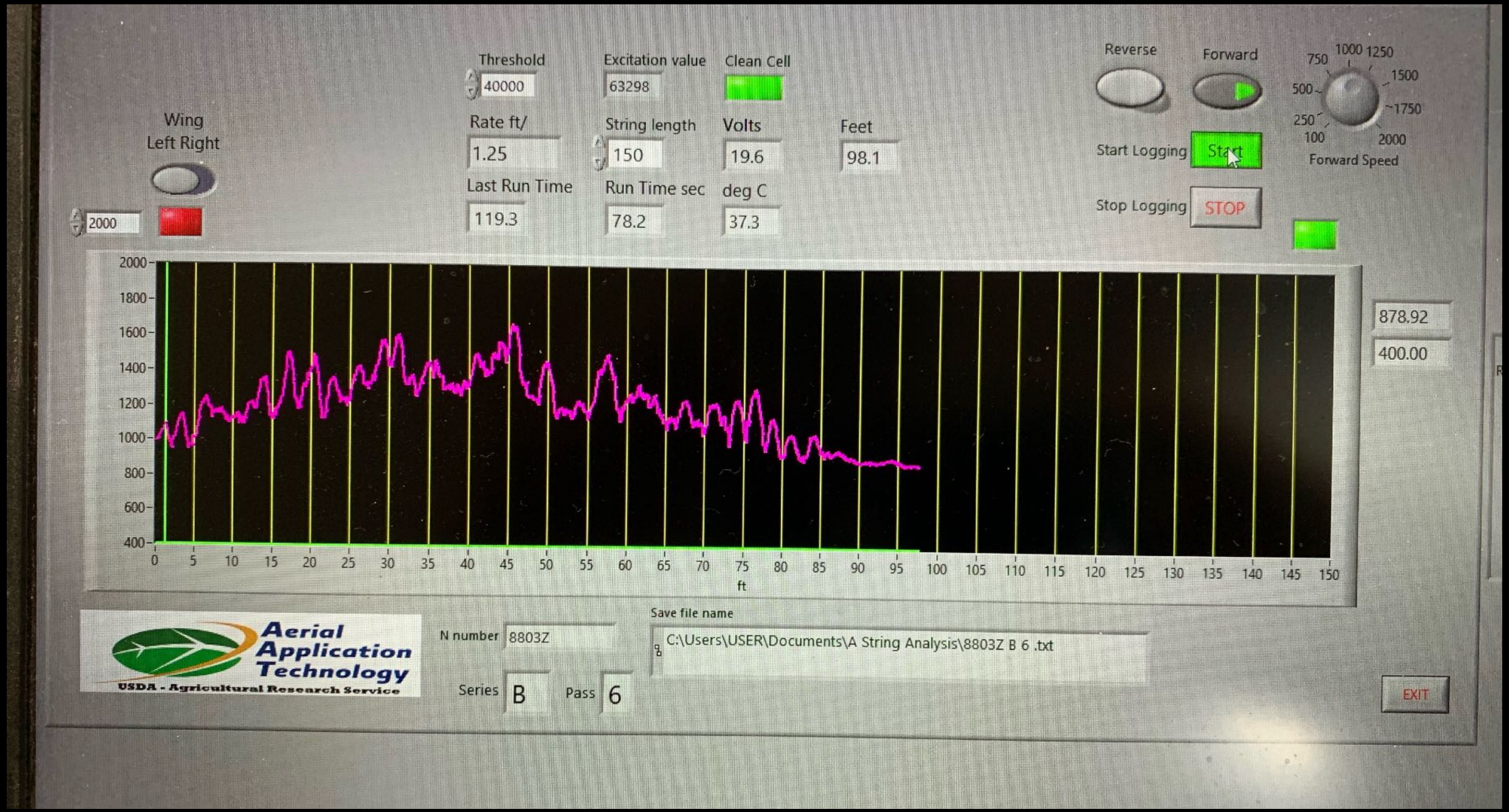
Boom Layout

Left Boom 41
Center Boom 3
Right Boom 41



Test # 1 Time: 13:30 Notes:

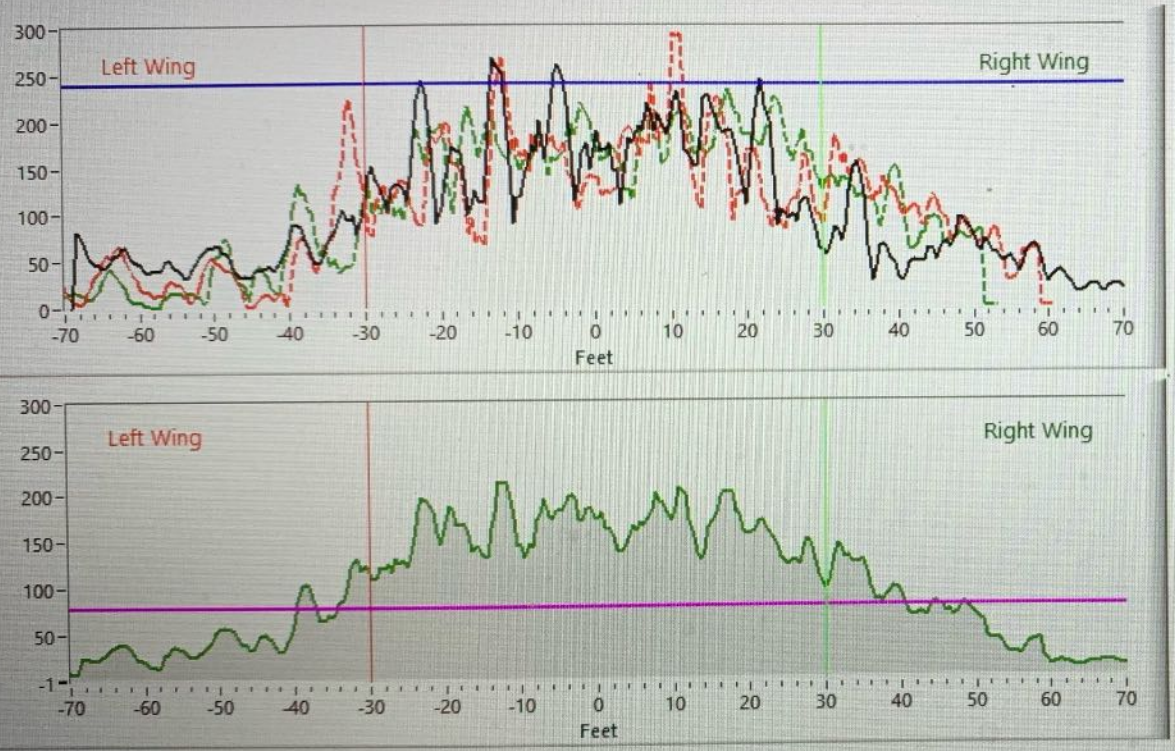
Swath	RTCV	BFCV
78		


Threshold
40000
Excitation value
63298
Clean Cell
Reverse
Forward
750
1000
1250
1500
500
1750
250
100
2000
Forward Speed
Wing
Left Right
2000
Rate ft/
1.25
String length
150
Volts
19.6
Feet
98.1
Start Logging
Start
Stop Logging
STOP
Last Run Time
119.3
Run Time sec
78.2
deg C
37.3
2000
1800
1600
1400
1200
1000
800
600
400
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150
ft
878.92
400.00
Aerial Application Technology
USDA - Agricultural Research Service
N number
8803Z
Save file name
C:\Users\USER\Documents\A String Analysis\8803Z B 6 .txt
Series
B
Pass
6
EXIT

Swath Analysis 2014 v1.1

Pilot Information | Process

N number 8803Z Series A



8803Z A 1 .txt
8803Z A 2 .txt
8803Z A 5 .txt
8803Z A 6 .txt

	Swath (ft)	CV (%)
	50	12
	52	11
	54	12
	56	13
	58	12
Target Swath	60	13
	62	13
	64	12
	66	12
	68	12
	70	13

Print

EXIT

Aerial Application Technology
USDA - Agricultural Research Service

N8803Z - 6

Pilot

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Analyst

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Aircraft

Reg. #:	N8803Z
Series #:	6
Make:	Eagle Aircraft
Model:	Eagle

Notes:

Configuration

Spray: Water & Rhodamine Dye
Target Rate: 2.0 GPA
Boom Press: 16 psi

Straight Stream (x85)
Orif. #: 0.061, Def. = 0°

Flight Data

Airspeed:	70 mph
Spray Height:	35 ft
Wind Speed:	10 mph
Cross-Wind:	0.0 mph
Ambient Temp:	85 °F
Humidity:	70%

Measured Data

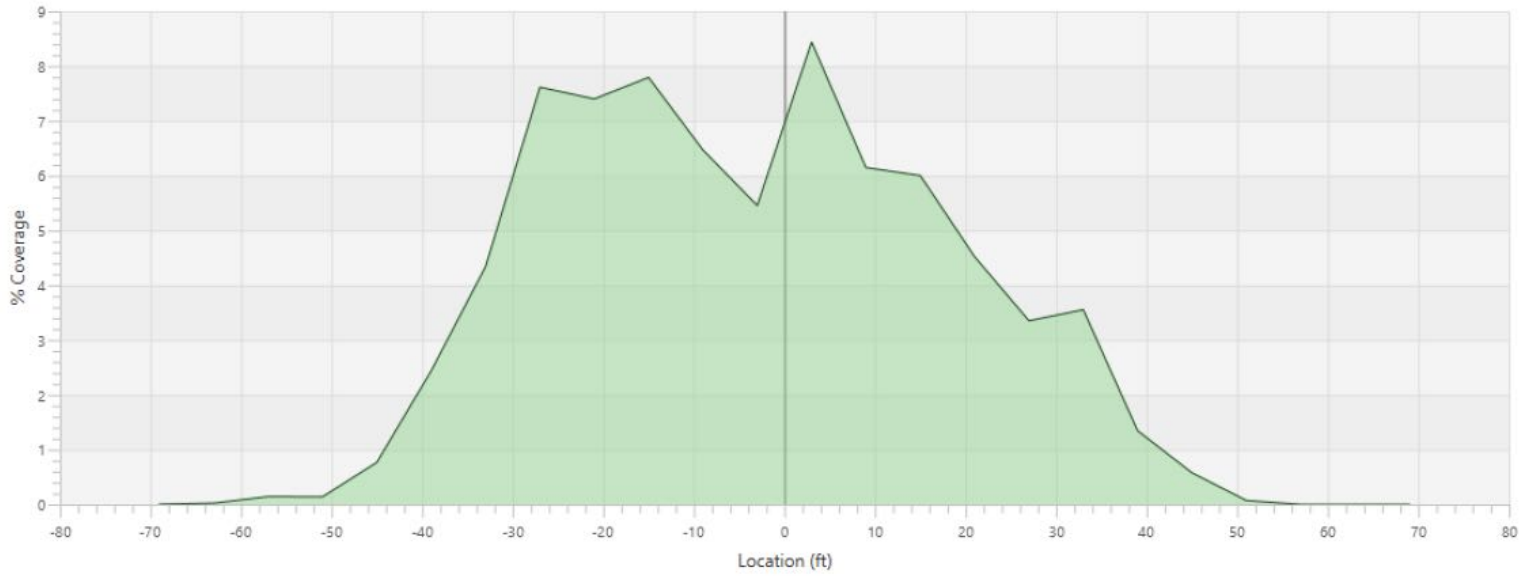
VMD:	566 µm
Dv01:	297 µm
Dv09:	769 µm
RS:	0.83
DSC:	XC
Drops/in²:	28
Coverage:	3.2%

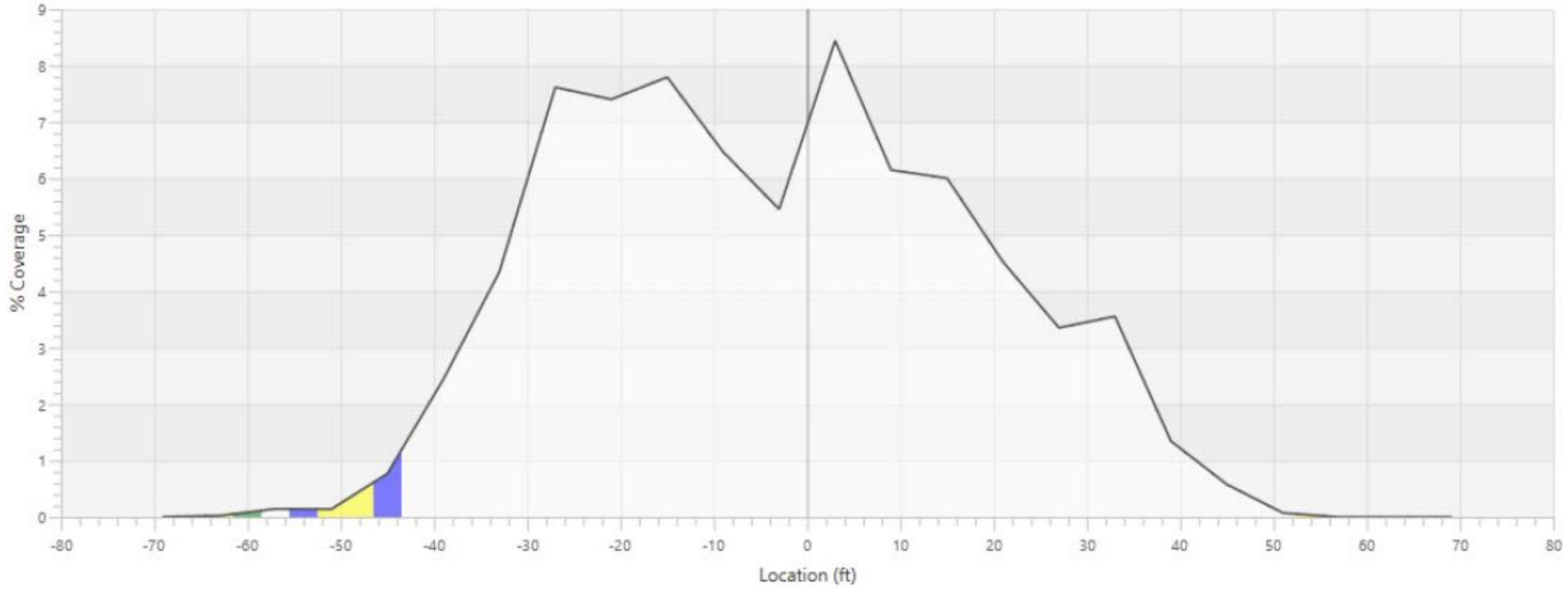
USDA Model

VMD:	*****
Dv01:	*****
Dv09	*****
RS:	*****
DSC:	*****

Computed based on reported nozzles

-- % Coverage vs. In-Swath Location (ft) --

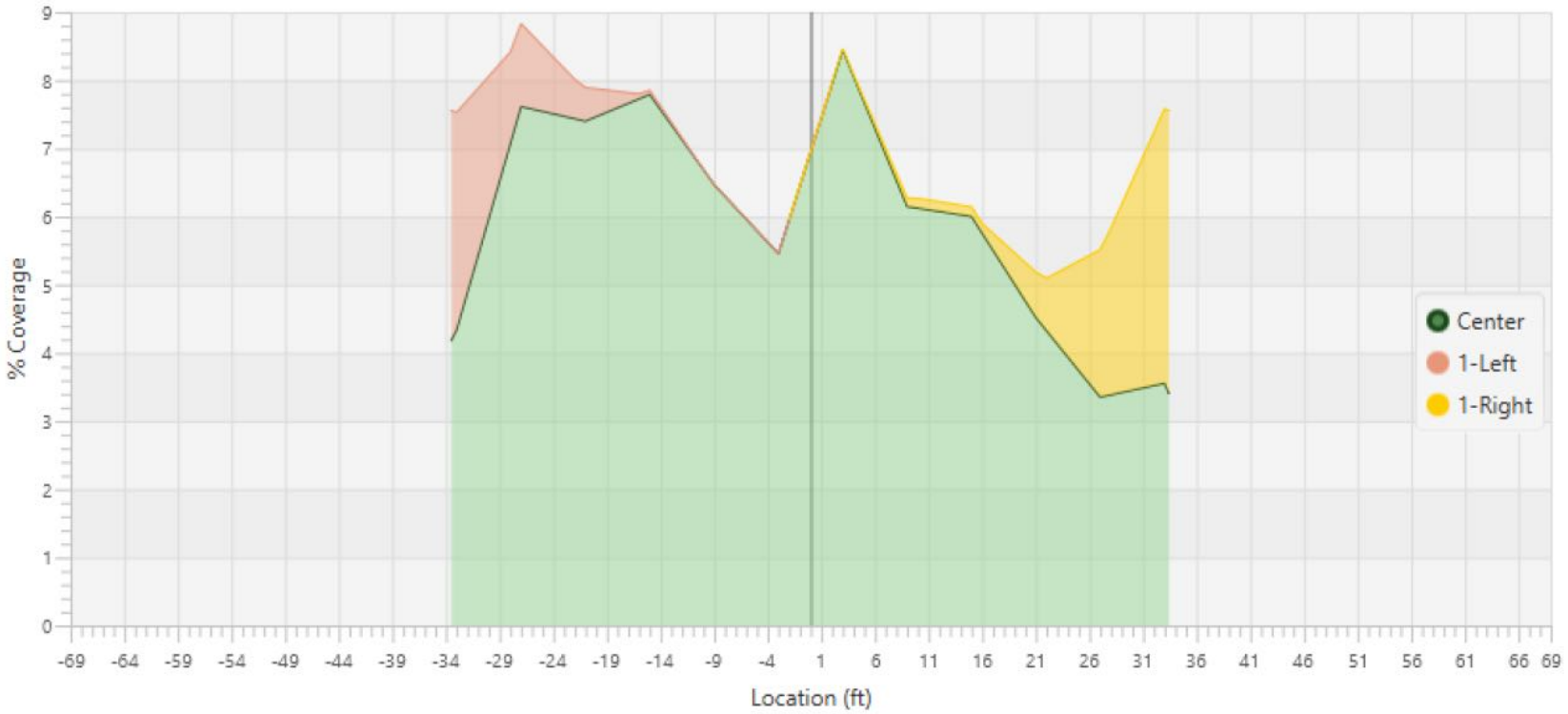




Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse

-- Simulated Overlap, In-Field Uniformity --

Racetrack



Swath	CV
61 FT	17%
63 FT	16%
65 FT	16%
67 FT	15%
69 FT	16%
71 FT	17%
73 FT	19%

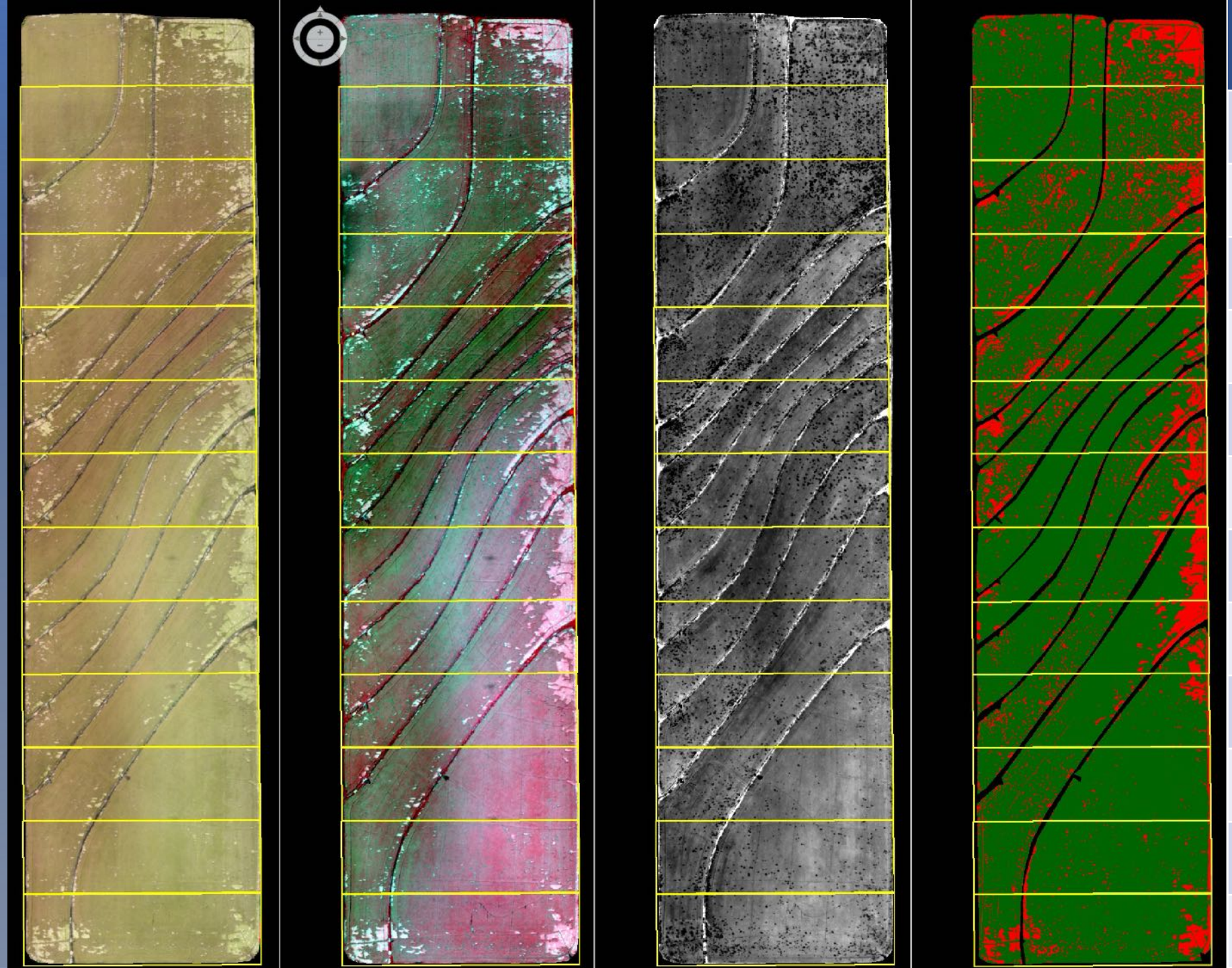

by HOODMAN
Patent Pending USA

The Mix (2021)

Chemical	Rate (oz./acre)
Artisan	21.74
Trevop	21.74
Verifact	4.03
Penetrator Plus	6.00
Control	0.16

The Mix (2022)

Chemical	Rate (oz./acre)
Elegia	32.0
Vigil	10.0
Verifact	4.0
Penetrator Plus	6.0



T3 R4

T1 R4

T2 R4

T3 R3

T2 R3

T1 R3

T1 R2

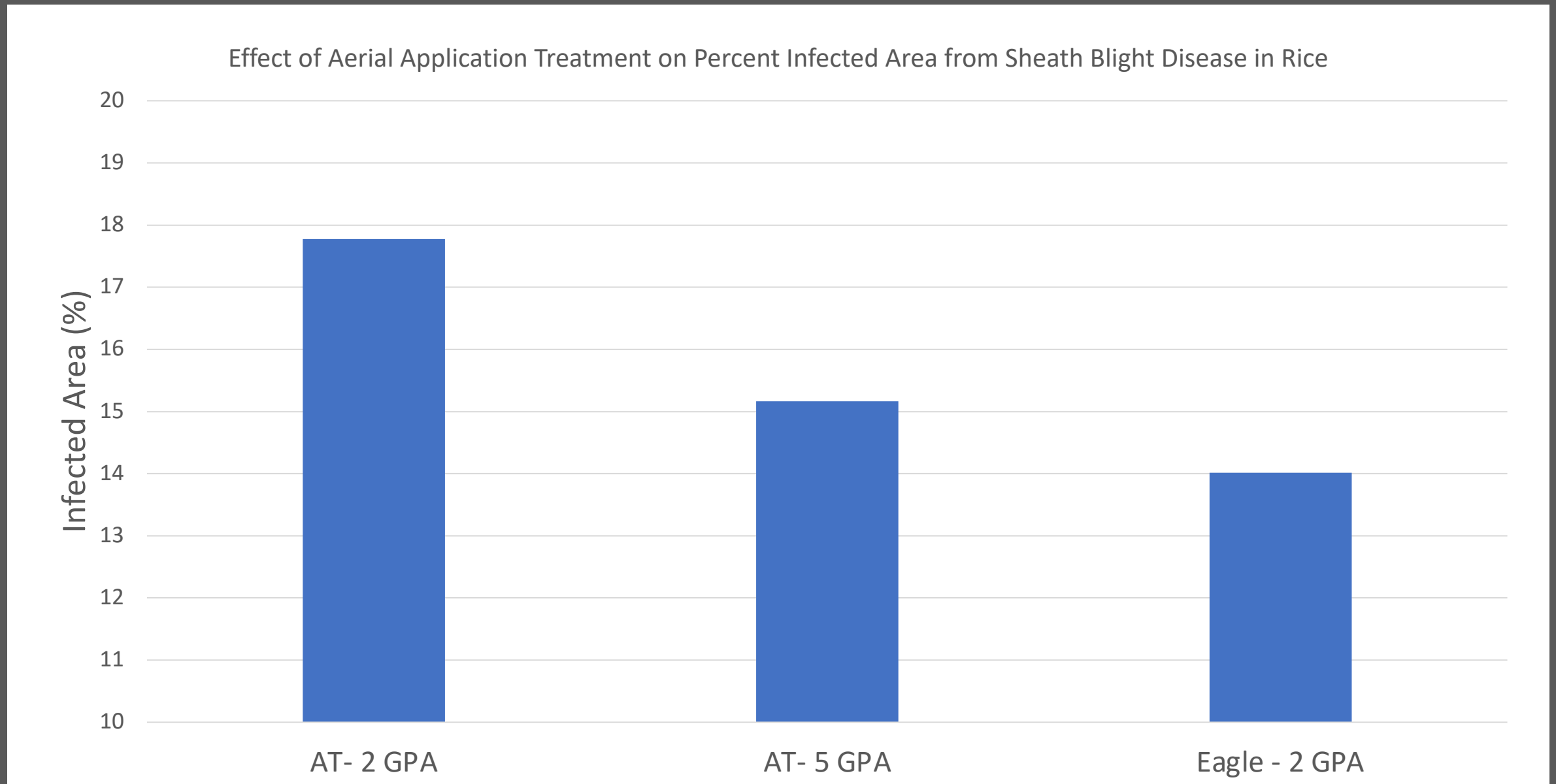
T3 R2

T2 R2

T2 R1

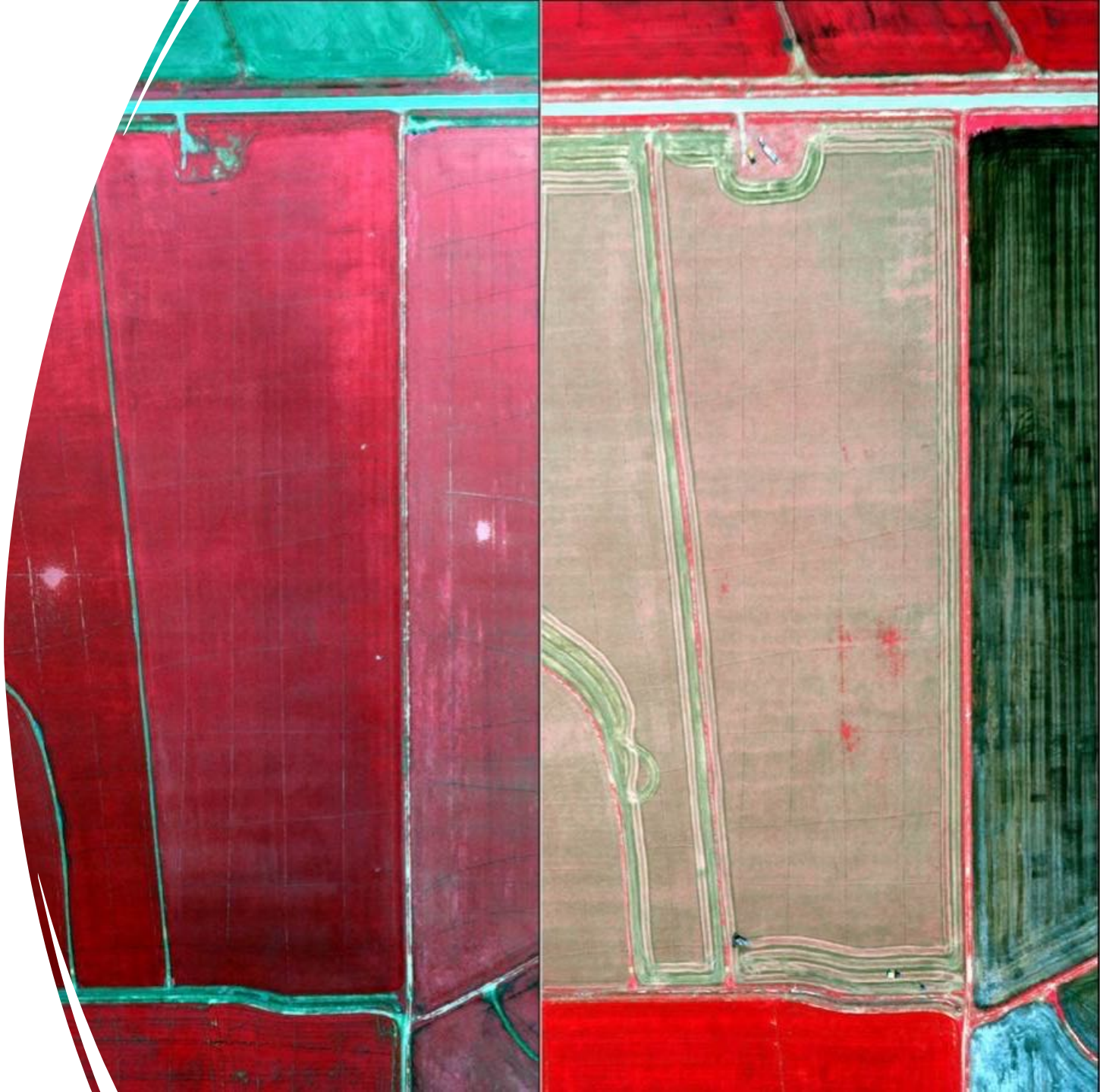
T1 R1

T3 R1


Effect of Aerial Application Treatment on Percent Infected Area from Sheath Blight Disease in Rice
Infected Area (%)
20
19
18
17
16
15
14
13
12
11
10
AT- 2 GPA
AT- 5 GPA
Eagle - 2 GPA

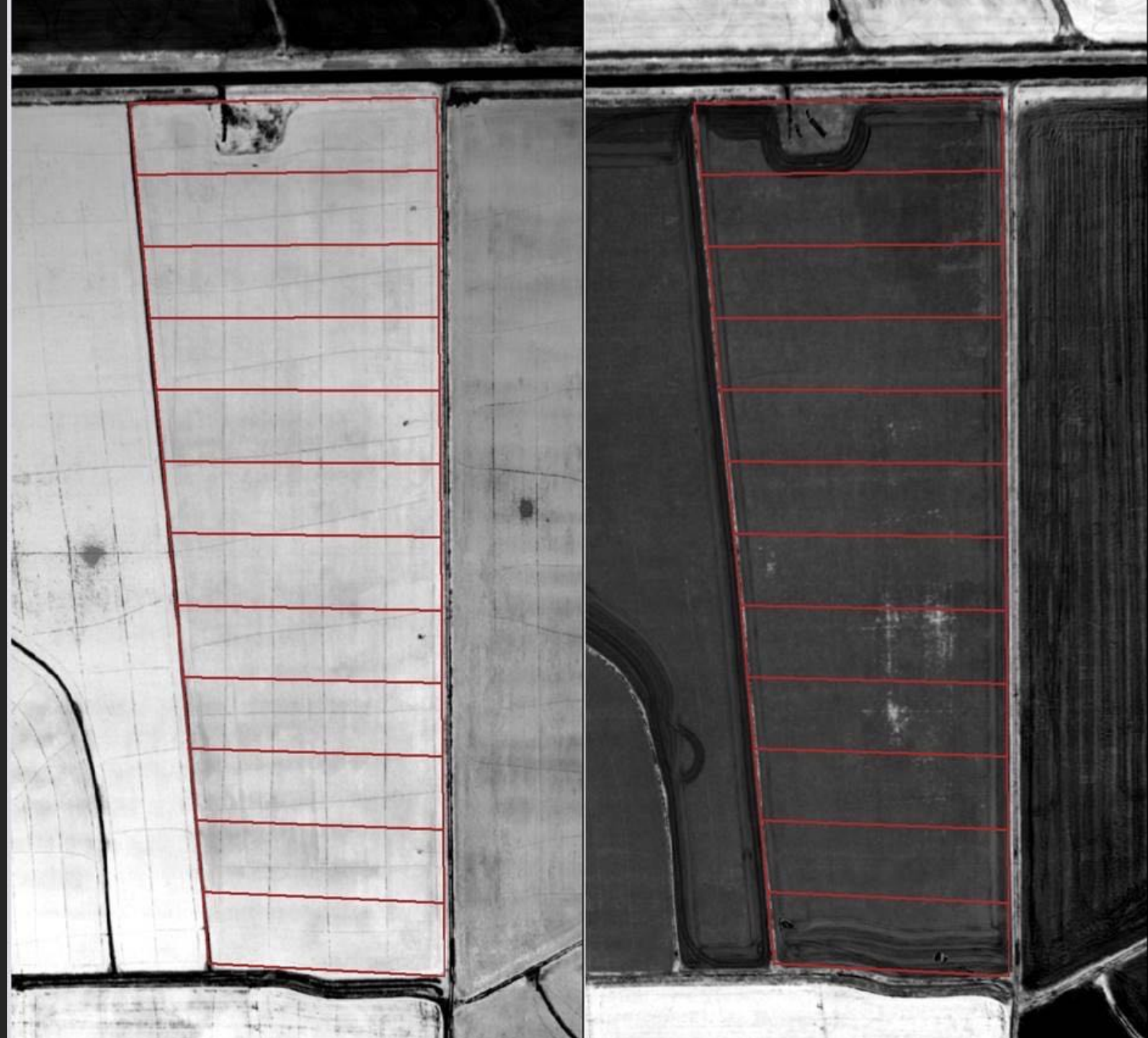
Color-Infrared Images for the Rice Field (2022)

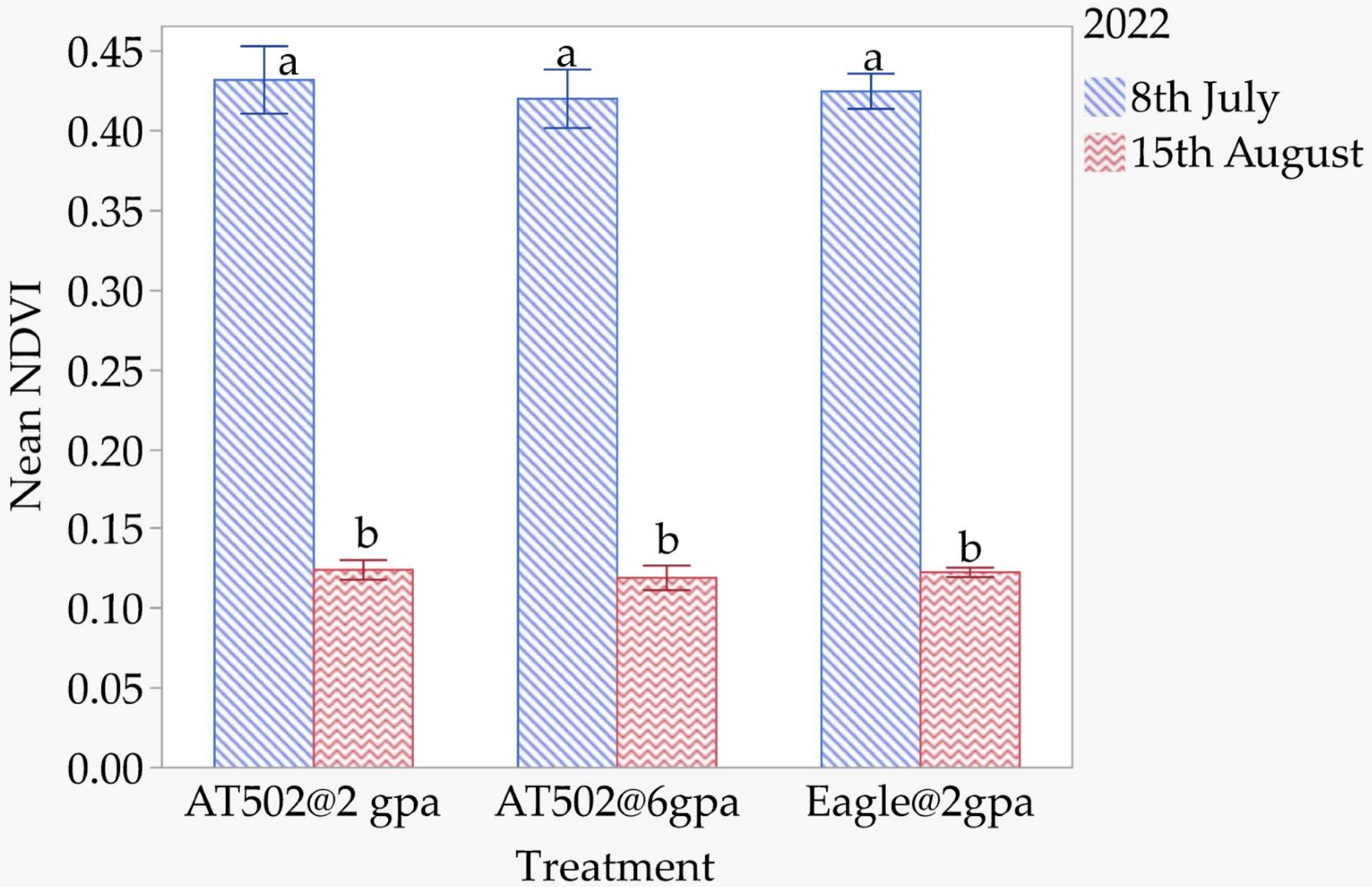
Left - July 8
Right - August 15

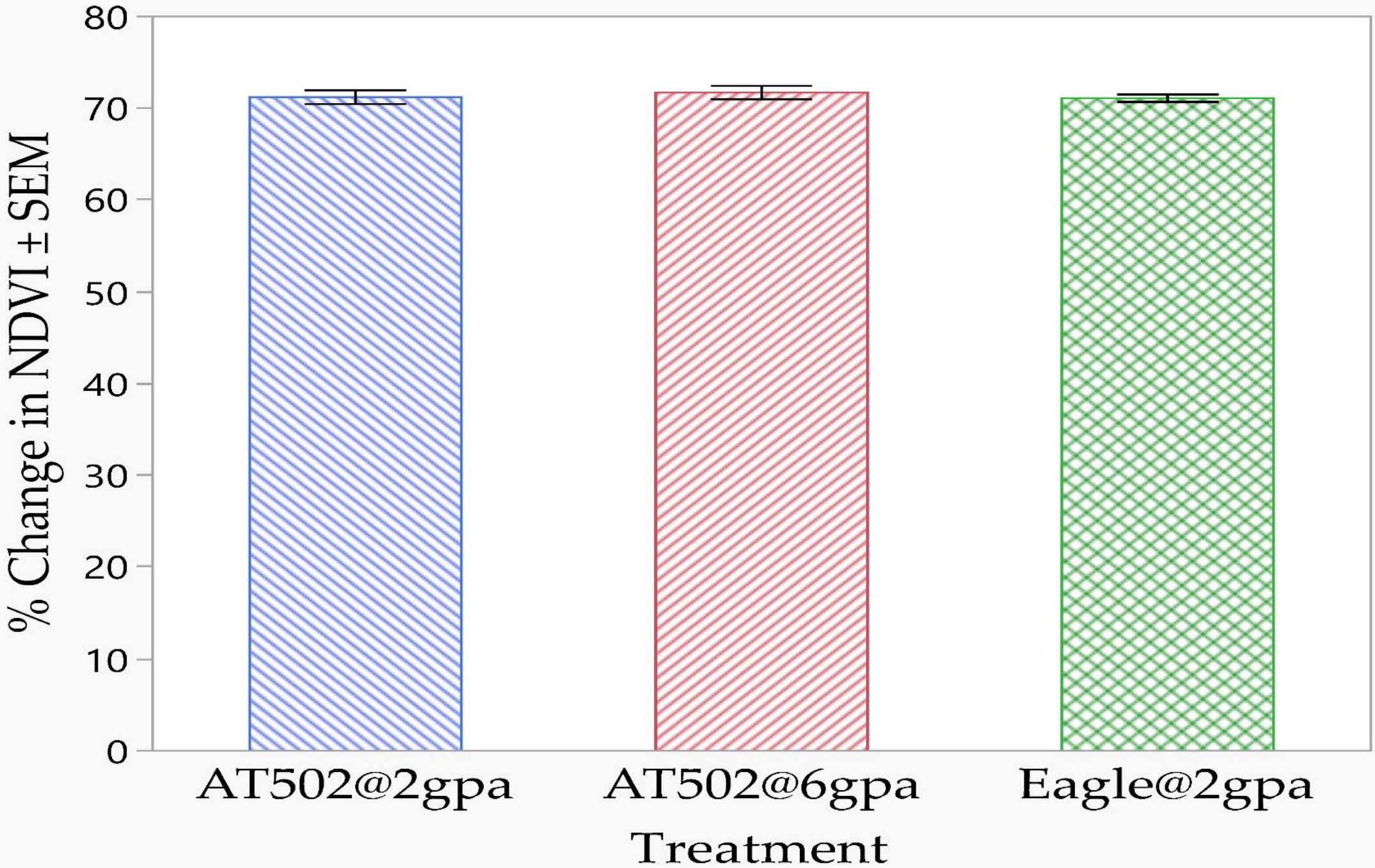


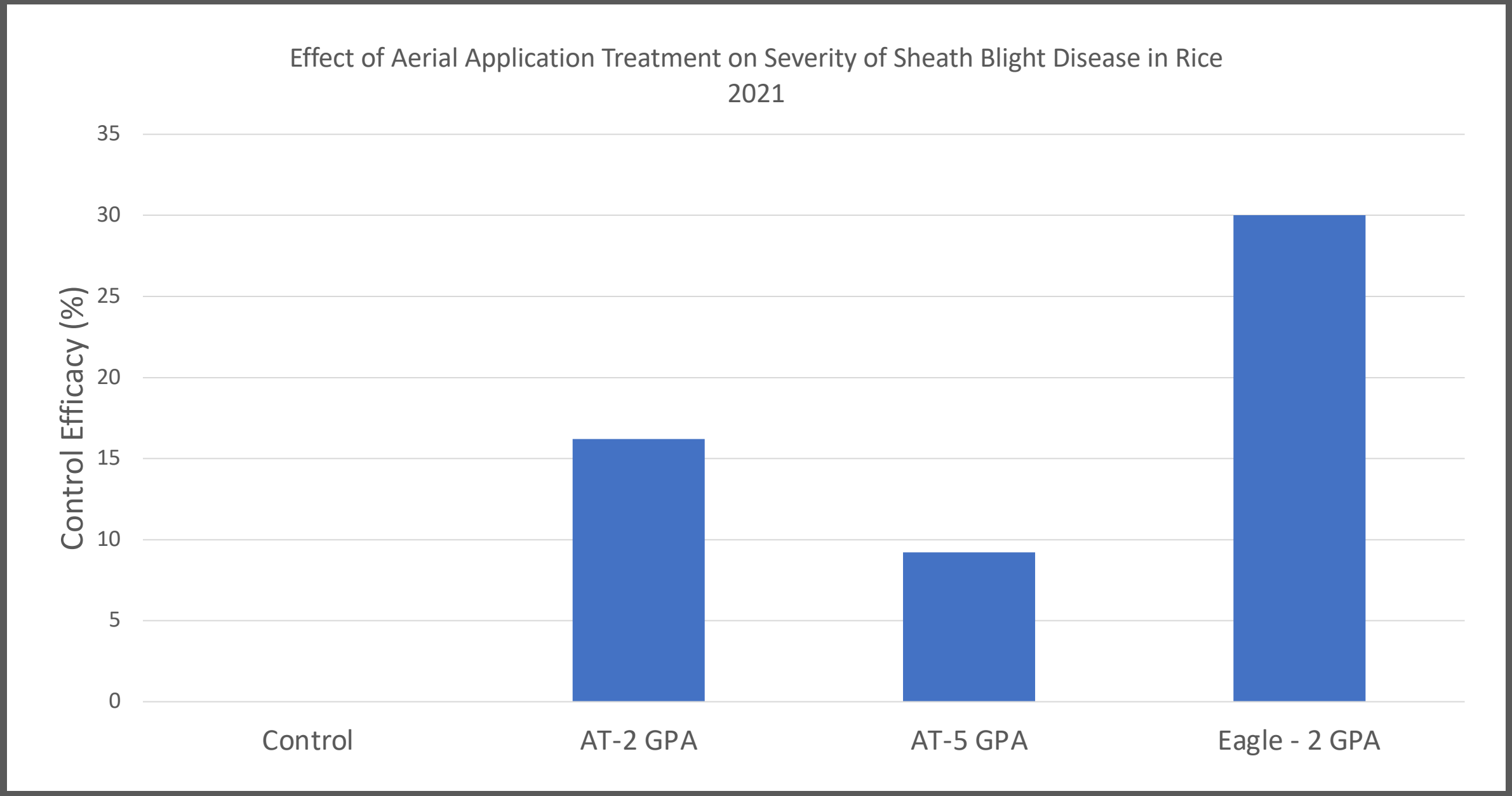
NDVI Images for the Rice Field (2022)

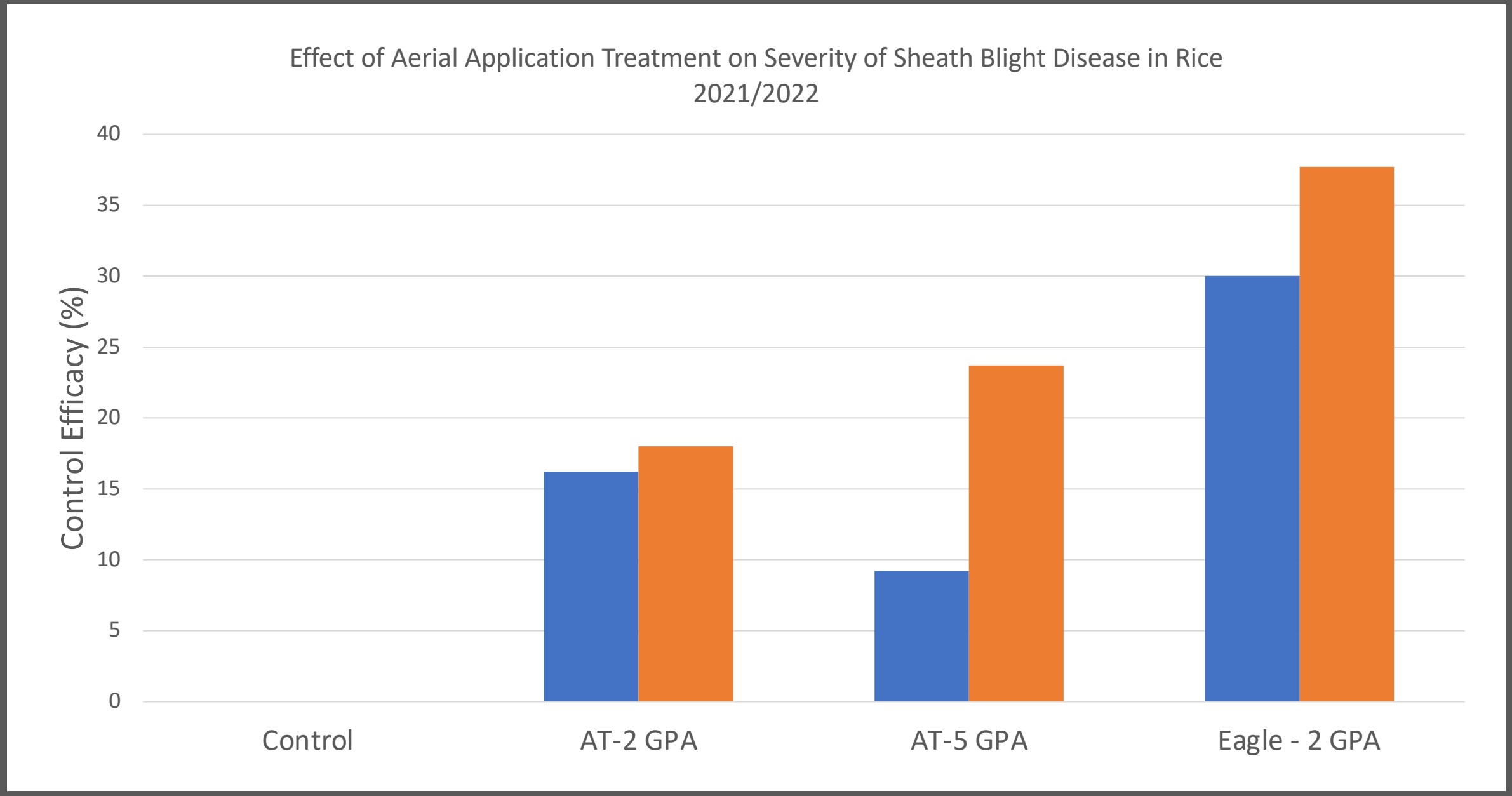
Left - July 8
Right - August 15




2022
8th July
15th August
Nean NDVI
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
a
a
a
b
b
b
AT502@2 gpa
AT502@6gpa
Eagle@2gpa
Treatment

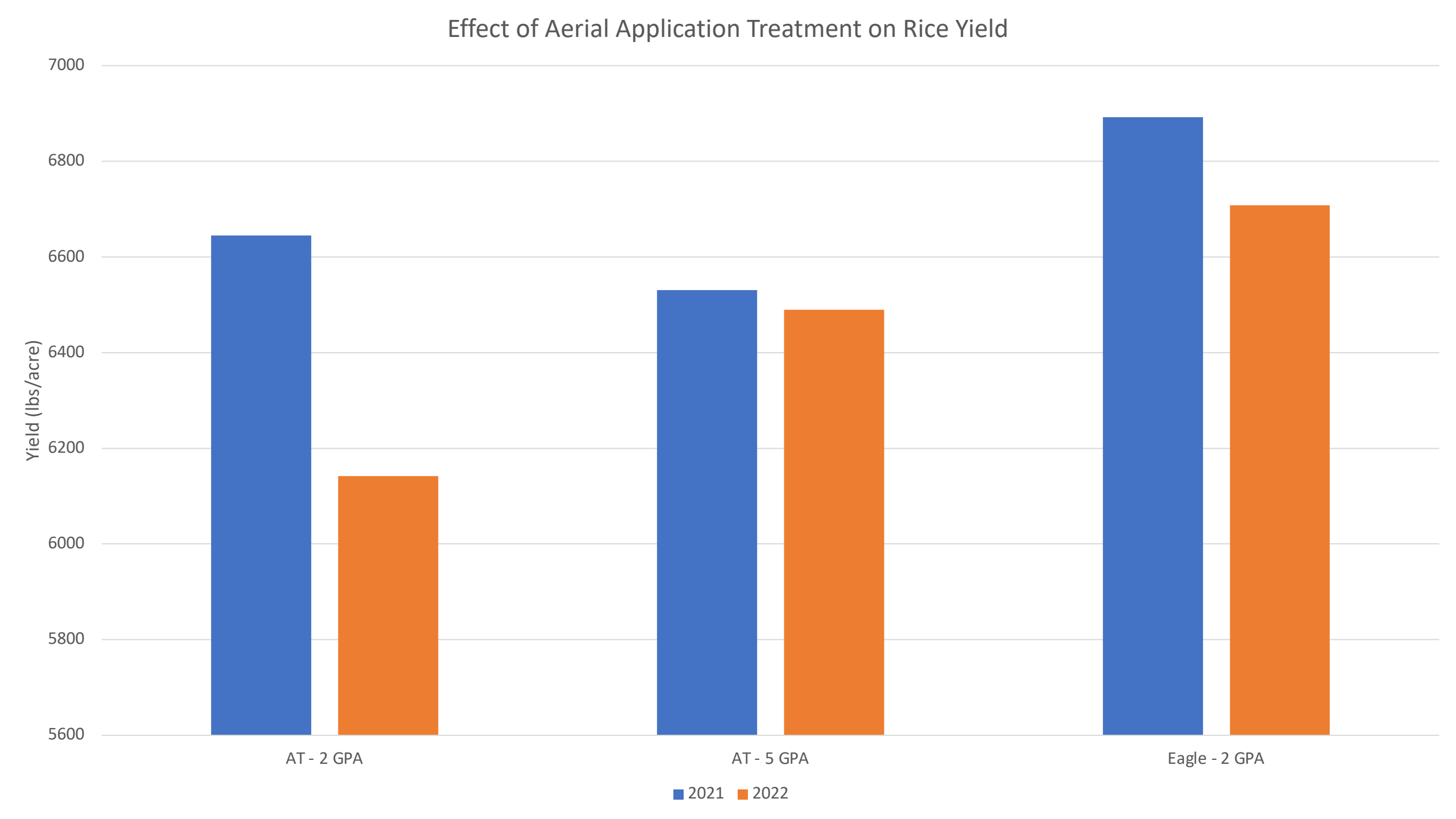

80
70
60
50
40
30
20
10
0
% Change in NDVI ± SEM
AT502@2gpa
AT502@6gpa
Eagle@2gpa
Treatment


Effect of Aerial Application Treatment on Severity of Sheath Blight Disease in Rice
2021
Control Efficacy (%)
35
30
25
20
15
10
5
0
Control
AT-2 GPA
AT-5 GPA
Eagle - 2 GPA


Effect of Aerial Application Treatment on Severity of Sheath Blight Disease in Rice
2021/2022
Control Efficacy (%)
40
35
30
25
20
15
10
5
0
Control
AT-2 GPA
AT-5 GPA
Eagle - 2 GPA


JOHN DEERE
9650STS


JOHN DEERE


Effect of Aerial Application Treatment on Rice Yield
7000
6800
6600
6400
6200
6000
5800
5600
Yield (lbs/acre)
AT - 2 GPA
AT - 5 GPA
Eagle - 2 GPA
2021
2022

Conclusions

- Aerial fungicide applications with an extremely coarse droplet spectrum applied at 20-30’ above ground with an Eagle aircraft at 90 knots produced the following:
- As good or better control of rice sheath blight than conventional aerial methods.
- As good or better yields of commercial field rice infected with sheath blight compared to conventional aerial methods.
- In addition, 2 GPA aerial applications provided as good or better control of rice sheath blight and yield than 5 GPA aerial applications.
- Additional research is needed to confirm these initial findings.