2026 Spinach Industry Field Day
March 3, 2026
10:00 a.m. – 1:00 p.m.
Tiro Tres Farms – Crystal City, TX

2025 Spinach Field Day

Coordinated by: Larry Stein, Paige Ritchie and Maribel Alonzo
Texas A&M AgriLife Extension Service
All photos provided by Paige Ritchie, Tiro Tres Farms

Agenda
10:00 a.m. – 1:00 p.m.

10:00 am
Leslie Dominguez, MC
Introduction
Texas A&M AgriLife Extension Service

Ed Ritchie
Welcome
President of Wintergarden Spinach Producers Board

Leslie Dominguez
CEUs
Zavala County, CEA Agriculture
Texas A&M AgriLife Extension Service

10:15
Larry Stein
Overview of the Research Trials
Texas A&M AgriLife Extension Service, Uvalde

10:45
Lindsey Du Toit
Stemphylium Screening Trials'
Washington State University

11:15
Mike Phillips
Fungicide Control Trial Stemphylium
Cargile Consulting

11:45
Marcel Valdez
Food Safety Issues
Texas A&M AgriLife Extension Service, Emeritus

12:15
Carlos Avila
SCRI spinach grant
Texas A&M AgriLife Research, Weslaco

Field Tour of Research Plots

Lunch

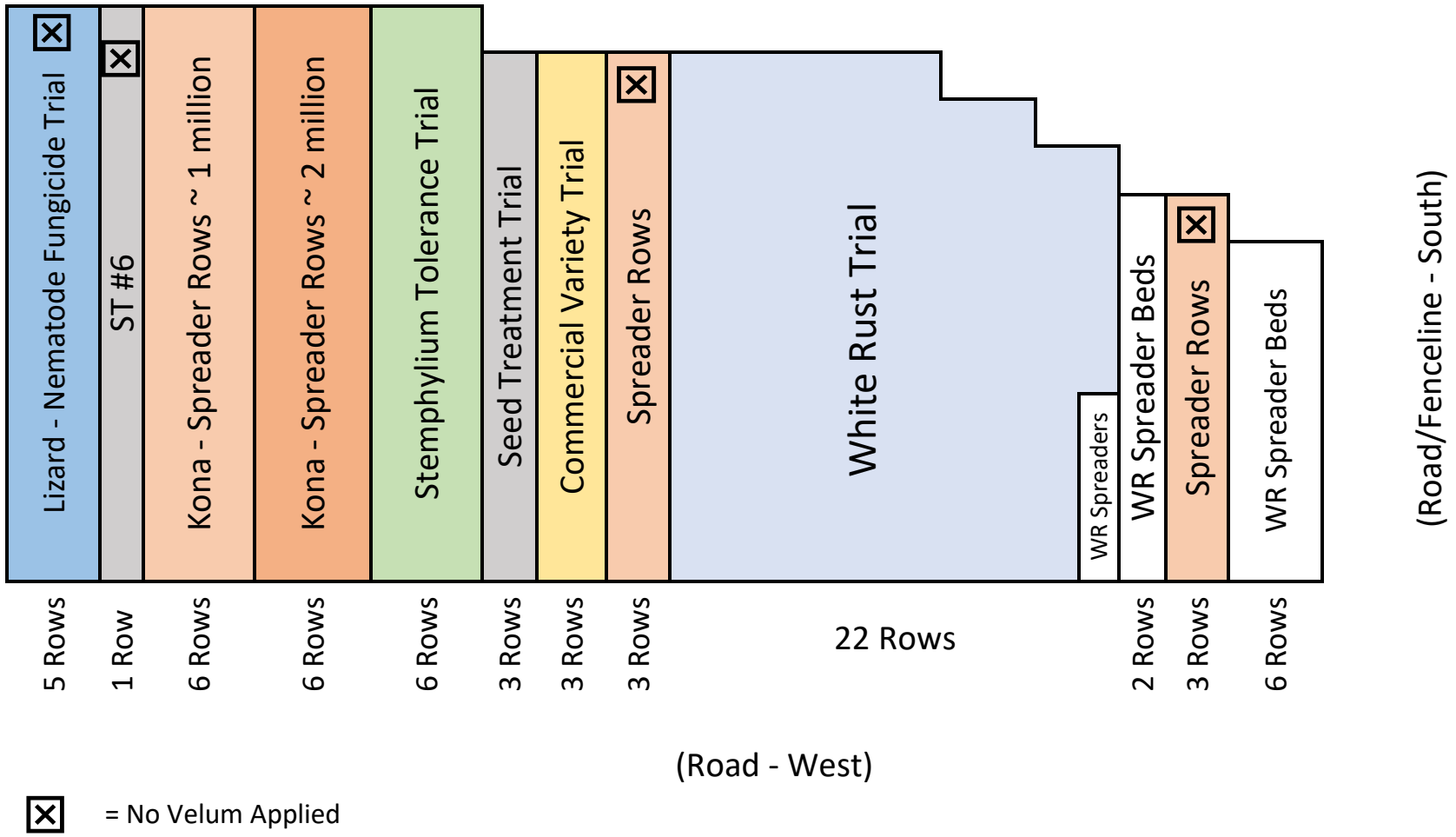
Recognition of Sponsors

Group Photo

Evaluation

You are welcome to stay after 1:00 pm

Research Plot Layout 2025-26



= No Velum Applied

WHITE RUST TRIAL 2025-26

Plant Date: 11/25/2025

Row 1

A73	A74
A71	A72
A69	A70
A67	A68
A65	A66
A63	A64
A61	A62
A59	A60
A57	A58
A55	A56
A53	A54
A51	A52
A49	A50
A47	A48
A45	A46
A43	A44
A41	A42
A39	A40
A37	A38
A35	A36
A33	A34
A31	A32
A29	A30
A27	A28
A25	A26
A23	A24
A21	A22
A19	A20
A17	A18
A15	A16
A13	A14
A11	A12
A9	A10
A7	A8
A5	A6
A3	A4
A1	A2

Row 2

CHK1	A75
B2	B1
B4	B3
B6	B5
B8	B7
C2	C1
C4	C3
CHK2	C5
D2	D1
D4	D3
D6	D5
D8	D7
D10	D9
D12	D11
D14	D13
D16	D15
D18	D17
D20	D21
D22	D21
D24	D23
D26	D25
D28	D27
D30	D29
D32	D31
D34	D33
D36	D35
D38	D37
D40	D39
D42	D41
D44	D43
D46	D45
D48	D47
D50	D49
D52	D51
D54	D53
D56	D55
D58	D57

Row 3

D129	D130
D127	D128
D125	D126
D123	D124
D121	D122
D119	D120
D117	D118
D115	D116
D113	D114
D111	D112
D109	D110
D107	D108
D105	D106
D103	D104
D101	D102
D99	D100
D97	D98
D95	D96
D93	D94
D91	D92
D89	D90
D87	D88
D85	D86
D83	D84
D81	D82
D79	D80
D77	D78
D75	D76
D73	D74
D71	D72
D69	D70
D67	D68
D65	D66
D63	D64
D61	D62
D59	D60

Row 4

D132	D131
D134	D133
D136	D135
D138	D137
D140	D139
D142	D141
D144	D143
D146	D145
D148	D147
D150	D149
E2	E1
E4	E3
F2	F1
CHK3	F3
G2	G1
G4	G3
G6	G5
G8	G7
G10	G9
G12	G11
G14	G13
G16	G15
G18	G17
G20	G19
G22	G21
G24	G23
G26	G25
G28	G27
G30	G29
G32	G31
G34	G33
G36	G35
G38	G37
G40	G39
G42	G41

Row 5

G109	G110
G107	G108
G105	G106
G103	G104
G101	G102
G99	G100
G97	G98
G95	G96
G93	G94
G91	G92
G89	G90
G87	G88
G85	G86
G83	G84
G81	G82
G79	G80
G77	G78
G75	G76
G73	G74
G71	G72
G69	G70
G67	G68
G65	G66
G63	G64
G61	G62
G59	G60
G57	G58
G55	G56
G53	G54
G51	G52
G49	G50
G47	G48
G45	G46
G43	G44

Row 6

G112	G111
G114	G113
G116	G115
G118	G117
G120	G119
G122	G121
G124	G123
G126	G125
G128	G127
G130	G129
G132	G131
G134	G133
G136	G135
G138	G137
G140	G139
G142	G141
G144	G143
G146	G145
G148	G147
G150	G149
A2	A1
A4	A3
A6	A5
A8	A7
A10	A9
A12	A11
A14	A13
A16	A15
A18	A17
A20	A19
A22	A21
A24	A23
A26	A25

Row 7

D1	D2
C5	CHK2
C3	C4
C1	C2
B7	B8
B5	B6
B3	B4
B1	B2
A75	CHK1
A73	A74
A71	A72
A69	A70
A67	A68
A65	A66
A63	A64
A61	A62
A59	A60
A57	A58
A55	A56
A53	A54
A51	A52
A49	A50
A47	A48
A45	A46
A43	A44
A41	A42
A39	A40
A37	A38
A35	A36
A33	A34
A31	A32
A29	A30
A27	A28

Row 8

D4	D3
D6	D5
D8	D7
D10	D9
D12	D11
D14	D13
D16	D15
D18	D17
D20	D19
D22	D21
D24	D23
D26	D25
D28	D27
D30	D29
D32	D31
D34	D33
D36	D35
D38	D37
D40	D39
D42	D41
D44	D43
D46	D45
D48	D47
D50	D49
D52	D51
D54	D53
D56	D55
D58	D57
D60	D59
D62	D61
D64	D63
D66	D65

Row 9

D127	D128
D125	D126
D123	D124
D121	D122
D119	D120
D117	D118
D115	D116
D113	D114
D111	D112
D109	D110
D107	D108
D105	D106
D103	D104
D101	D102
D99	D100
D97	D98
D95	D96
D93	D94
D91	D92
D89	D90
D87	D88
D85	D86
D83	D84
D81	D82
D79	D80
D77	D78
D75	D76
D73	D74
D71	D72
D69	D70
D67	D68

Row 10

D130	D129
D132	D131
D134	D133
D136	D135
D138	D137
D140	D139
D142	D141
D144	D143
D146	D145
D148	D147
D150	D149
E2	E1
E4	E3
F2	F1
CHK3	F3
G2	G1
G4	G3
G6	G5
G8	G7
G10	G9
G12	G11
G14	G13
G16	G15
G18	G17
G20	G19
G22	G21
G24	G23
G26	G25
G28	G27
G30	G29
G32	G31

Row 11

G91	G92
G89	G90
G87	G88
G85	G86
G83	G84
G81	G82
G79	G80
G77	G78
G75	G76
G73	G74
G71	G72
G69	G70
G67	G68
G65	G66
G63	G64
G61	G62
G59	G60
G57	G58
G55	G56
G53	G54
G51	G52
G49	G50
G47	G48
G45	G46
G43	G44
G41	G42
G39	G40
G37	G38
G35	G36
G33	G34

WHITE RUST TRIAL 2025-26

Plant Date: 11/25/2025

Row 12

G94	G93
G96	G95
G98	G97
G100	G99
G102	G101
G104	G103
G106	G105
G108	G107
G110	G109
G112	G111
G114	G113
G116	G115
G118	G117
G120	G119
G122	G121
G124	G123
G126	G125
G128	G127
G130	G129
G132	G131
G134	G133
G136	G135
G138	G137
G140	G139
G142	G141
G144	G143
G146	G145

Row 13

A49	A50
A47	A48
A45	A46
A43	A44
A41	A42
A39	A40
A37	A38
A35	A36
A33	A34
A31	A32
A29	A30
A27	A28
A25	A26
A23	A24
A21	A22
A19	A20
A17	A18
A15	A16
A13	A14
A11	A12
A9	A10
A7	A8
A5	A6
A3	A4
A1	A2
G149	G150
G147	G148

Row 14

A52	A51
A54	A53
A56	A55
A58	A57
A60	A59
A62	A61
A64	A63
A66	A65
A68	A67
A70	A69
A72	A71
A74	A73
CHK1	A75
B2	B1
B4	B3
B6	B5
B8	B7
C2	C1
C4	C3
CHK2	C5
D2	D1
D4	D3
D6	D5
D8	D7
D10	D9
D12	D11
D14	D13

Row 15

D67	D68
D65	D66
D63	D64
D61	D62
D59	D60
D57	D58
D55	D56
D53	D54
D51	D52
D49	D50
D47	D48
D45	D46
D43	D44
D41	D42
D39	D40
D37	D38
D35	D36
D33	D34
D31	D32
D29	D30
D27	D28
D25	D26
D23	D24
D21	D22
D19	D20
D17	D18
D15	D16

Row 16

D70	D69
D72	D71
D74	D73
D76	D75
D78	D77
D80	D79
D82	D81
D84	D83
D86	D85
D88	D87
D90	D89
D92	D91
D94	D93
D96	D95
D98	D97
D100	D99
D102	D101
D104	D103
D106	D105
D108	D107
D110	D109
D112	D111
D114	D113
D116	D115
D118	D117
D120	D119

Row 17

G11	G12
G9	G10
G7	G8
G5	G6
G3	G4
G1	G2
F3	CHK3
F1	F2
E3	E4
E1	E2
D149	D150
D147	D148
D145	D146
D143	D144
D141	D142
D139	D140
D137	D138
D135	D136
D133	D134
D131	D132
D129	D130
D127	D128
D125	D126
D123	D124
D121	D122

Row 18

G14	G13
G16	G15
G18	G17
G20	G19
G22	G21
G24	G23
G26	G25
G28	G27
G30	G29
G32	G31
G34	G33
G36	G35
G38	G37
G40	G39
G42	G41
G44	G43
G46	G45
G48	G47
G50	G49
G52	G51
G54	G53
G56	G55
G58	G57
G60	G59

Row 19

G107	G108
G105	G106
G103	G104
G101	G102
G99	G100
G97	G98
G95	G96
G93	G94
G91	G92
G89	G90
G87	G88
G85	G86
G83	G84
G81	G82
G79	G80
G77	G78
G75	G76
G73	G74
G71	G72
G69	G70
G67	G68
G65	G66
G63	G64
G61	G62

Row 20

G110	G109
G112	G111
G114	G113
G116	G115
G118	G117
G120	G119
G122	G121
G124	G123
G126	G125
G128	G127
G130	G129
G132	G131
G134	G133
G136	G135
G138	G137
G140	G139
G142	G141
G144	G143
G146	G145
G148	G147
G150	G149
W2	W1
W4	W3

Row 21

W45	W46
W43	W44
W41	W42
W39	W40
W37	W38
W35	W36
W33	W34
W31	W32
W29	W30
W27	W28
W25	W26
W23	W24
W21	W22
W19	W20
W17	W18
W15	W16
W13	W14
W11	W12
W9	W10
W7	W8
W5	W6

Row 22

W48	W47
W50	W49
W52	W51
W54	W53
W56	W55
W58	W57
W60	W59
W62	W61
W64	W63
W66	W65
W68	W67
W70	W69
W72	W71
W74	W73
W76	W75
W78	W77
W80	W79
W82	W81

White Rust Trial Bed

Example Diagram

White rust susceptible varieties were chosen as the spreader rows in the bed, which are located on the outside and center of the bed. The spinach cultivars submitted for entry in the trial are located in between the spreaders.

STEMPHYLIUM/SEED TREATMENT/COMMERCIAL TRIAL LAYOUT 2025-26

Plant Date: 1/6/2026

Stemphylium
Inoculated 2/3/2026
2/16/2026

Commercial

28	29	30
25A|25B	26	27
22	23	24
19	20	21
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
49	50	51
46	47	48
43	44	45
40	41	42
37	38	39
34	35	36
31	32	33
28	29	30
25A|25B	26	27
22	23	24
19	20	21
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3

33	32	31
36	35	34
39	38	37
42	41	40
45	44	43
48	47	46
51	50	49
3	2	1
6	5	4
9	8	7
12	11	10
15	14	13
18	17	16
21	20	19
24	23	22
27	26	25B|25A
30	29	28
33	32	31
36	35	34
39	38	37
42	41	40
45	44	43
48	47	46
51	50	49

ST4	ST5	ST6
ST1	ST2	ST3

28	29	30
25	26	27
22	23	24
19	20	21
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
28	29	30
25	26	27
22	23	24
19	20	21
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
28	29	30
25	26	27
22	23	24
19	20	21
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3

Stemphylium Leaf Spot Trial

Plant Date: 1/6/2026
Inoculation Dates: 2/3/2026, 2/16/2026
Target Plant Population: 2 million seeds/acre

#	Seed Company	Variety	Germ	Seedcount	Treated	Treatment
1	Nunhems/BASF	NUN 07557 (Castula)		20,412	NO	
2	Nunhems/BASF	Crater		21,503	NO	
3	Rijk Zwaan	Gerenuk	94%	23,210	NO	
4	KWS	KSP0141	97.50%	23,237	NO	
5	Rijk Zwaan	Tigon	86%	23,764	NO	
6	Rijk Zwaan	Diamondback	85%	23,782	NO	
7	Check	Mandolin	88%	24,674	NO	
8	Nunhems/BASF	NUN 075761 Arakas		25,815	NO	
9	Enza	Longhorn	91%	26,045	NO	
10	Enza	Jeep	96%	26,211	NO	
11	KWS	Gold/KSP0002	96%	26,729	NO	
12	KWS	Diamond/KSP0014	94%	26,856	NO	
13	Nunhems/BASF	NUN 07560 Seginus		27,259	NO	
14	Enza	Pathfinder	93%	28,444	NO	
15	Rijk Zwaan	Boomslang	88%	29,359	NO	
16	Enza	Crosstrek	94%	29,550	NO	
17	KWS	KSP0151	95&	30,019	NO	
18	KWS	Ice/KSP0019	97.50%	30,079	NO	
19	Nunhems/BASF	NUN 07580 SPS		31,100	NO	
20	Maraldi	Zagor	85%	31,391	NO	
21	Nunhems/BASF	NUN 07573 SPS		32,727	NO	
22	Rijk Zwaan	Fireback		32,857	NO	
23	Nunhems/BASF	NUN 07577 SPS		33,147	NO	
24	Rijk Zwaan	Reindeer	87%	33,858	NO	
25A	Syngenta	LSPH-0299	85%	33,935	NO	
25B	Syngenta	LSPH23-0307	89%	34,225	NO	
26	Nunhems/BASF	NUN 07581 SPS		36,323	NO	
27	Nunhems/BASF	Volans		36,370	NO	
28	Rijk Zwaan	Ovenbird	85%	37,592	NO	
29	Rijk Zwaan	Bonnethead	95%	37,986	NO	
30	Nunhems/BASF	NUN 07578 SPS		38,082	NO	
31	KWS	Celestine/KSP0038	90%	38,440	NO	
32	Rijk Zwaan	Galago	94%	39,154	NO	
33	Rijk Zwaan	Prairiedog	85%	39,733	**YES**	**42 S Thiram**
34	Enza	Escape	85%	40,562	NO	
35	Check	Kona	90%	41,094	**YES**	**Thiram Metalaxyl**
36	KWS	Amathyst/KSP0045	90.50%	41,614	NO	
37	Rijk Zwaan	Yakalo	90%	41,713	NO	
38	KWS	Kryptonite/KSP0068	99%	43,657	NO	
39	KWS	Aquamarine/KSP0136	88.50%	43,910	NO	
40	Enza	Traverse	97%	43,962	NO	
41	Maraldi	35087	97%	45,757	NO	
42	Enza	Kingranch	95%	46,201	NO	
43	Enza	GTO	90%	46,643	NO	
44	Nunhems/BASF	NUN 07576 SPS		47,699	NO	
45	KWS	KSP0018	94.50%	48,513	NO	
46	Rijk Zwaan	Dibbler	89%	48,926	NO	
47	KWS	Thorite/KSP0059	97.50%	49,358	NO	
48	KWS	Graphite/KSP0068	92.50%	50,176	NO	
49	Check	Lizard		52,866	**YES**	**Thiram 480 DP**
50	Maraldi	Parker	85%	53,877	NO	
51	Nunhems/BASF	NUN 07575 SPS		58,198	NO	

Commercial Showcase

Plant Date: 1/6/2026
Target Plant Population: 2 million seeds/acre

#	Seed Company	Variety	Germ	Seedcnt	Treated	Treatment
1	Syngenta	El Bolero	95%	19,523	NO	
2	Rijk Zwaan	Gerenuk	87%	22,779	**YES**	
3	Nunhems/BASF	UT Seginus	90%	24,141	NO	
4	KWS	Diamond/KSP0014	84.50%	24,479	NO	
5	Bejo	Summerfall	90%	24,613	NO	
6	KWS	Chlorite/PV-1990	92.50%	24,814	NO	
7	Rijk Zwaan	Diamondback	88%	25,278	**YES**	**Thiram 480 DP**
8	Enza	Jeep	96%	26,211	NO	
9	KWS	Gold/KSP0002	91%	26,356	NO	
10	Bejo	EXP 3816	88%	27,538	NO	
11	Enza	Pathfinder	93%	28,444	NO	
12	Nunhems/BASF	Acrux	90%	28,909	NO	
13	KWS	Ice/KSP0019	97.50%	30,079	NO	
14	Maraldi	Zagor	85%	31,391	NO	
15	Nunhems/BASF	NUN 07571 SPS	93%	31,494	NO	
16	Syngenta	El Capoeira	96%	33,109	NO	
17	Nunhems/BASF	NUN 07575 SPS		**35,000?**	NO	
18	Rijk Zwaan	Ovenbird	95%	37,593	NO	
19	Bejo	Thurman	90%	39,553	NO	
20	Rijk Zwaan	Prairiedog	85%	39,733	**YES**	**42 S Thiram**
21	KWS	Obsidian/ PV-1980	95%	39,789	NO	
22	Enza	Escape	85%	40,562	NO	
23	Bejo	Marshall	90%	43,355	NO	
24	Enza	Traverse	97%	43,962	NO	
25	Bejo	Patton	90%	44,355	**YES**	**Thiram/Metalaxyl**
26	Maraldi	35087	97%	45,757	NO	
27	Enza	Kingranch	95%	46,201	NO	
28	Nunhems/BASF	Zedaron	91%	48,955	NO	
29	Rijk Zwaan	Bonnethead	92%	50,726	**YES**	**Thiram 480 DP**
30	Maraldi	Parker	85%	53,877	NO	

Seed Treatment Trial

Plant Date: 1/6/2026
Target Plant Population: 2 million seeds/acre

#	Company	Variety	Germ	Seedcnt	Treated	Treatment
ST1	Heads Up Plant Protectant	Onyx/PV 1713	96%	24,868	**YES**	**Heads Up Plant Protectant**
ST2	Heads Up Plant Protectant	Onyx/PV 1713	96%	24,868	NO	
ST3	Heads Up Plant Protectant	Onyx/PV 1713	96%	24,868	**YES**	**42-S Thiram/Metalaxyl**
ST4	Gowan	Traverse	88%	41,158	**YES**	**Farmore F400**
ST5	Gowan	Traverse	88%	41,158	NO	
ST6	Gowan	Traverse	88%	41,158	**YES**	**42-S Thiram/Apron XL LS**

2026 SPINACH FUNGICIDE TRIAL											
Entry	Entry/Trt.	Form.	AI	AI Conc.	Dose	Dose	SPRAY	Rep			
No.	Description	Type	Conc.	Unit		Unit	DATE	1	2	3	4
1	UNTREATED							101	206	310	409
2	MANZATE 2	WG	75	%AW/W	32	OZ/A	A	102	211	304	407
	REVUS 250	SC	25	%AW/W	8	OZ/A	BC				
	ZAMPRO	SC	47.2	%AW/W	14	OZ/A	BC				
	REASON	SC	44.25	%AW/W	8.2	OZ/A	BC				
3	XIVANA PRI	SC	1.905	%AW/W	13.7	OZ/A	ABD	103	205	311	408
	REVUS 250	SC	25	%AW/W	8	OZ/A	ABD				
	ZAMPRO	SC	47.2	%AW/W	14	OZ/A	BC				
	REASON	SC	44.25	%AW/W	8.2	OZ/A	BC				
4	XIVANA PRI	SC	1.905	%AW/W	13.7	OZ/A	A	104	204	305	406
	REASON	SC	44.25	%AW/W	8.2	OZ/A	A				
	ZAMPRO	SC	47.2	%AW/W	14	OZ/A	BC				
	REASON	SC	44.25	%AW/W	8.2	OZ/A	BC				
5	ORONDIS U	SC	25.85	%AW/W	8	OZ/A	A	105	210	307	404
	ZAMPRO	SC	47.2	%AW/W	14	OZ/A	BC				
	REASON	SC	44.25	%AW/W	8.2	OZ/A	BC				
6	XIVANA PRI	SC	1.905	%AW/W	13.7	OZ/A	AC	106	209	303	410
	PREVICUR F	SL	66.24	%AW/W	32	OZ/A	AC				
	ZAMPRO	SC	47.2	%AW/W	14	OZ/A	BD				
	LUNA SENS	SC	42.37	%AW/W	7.6	OZ/A	BD				
7	REASON	SC	44.25	%AW/W	7	OZ/A	ABCD	107	201	301	402
	ACTIGARD 5	WG	50	%AW/W	0.5	OZ/A	A				
8	REASON	SC	44.25	%AW/W	7	OZ/A	'ABCD	108	207	309	401
	ACTIGARD 5	WG	50	%AW/W	0.25	OZ/A	A				
9	CABRIO EG	WG	20	%AW/W	16	OZ/A	'ABCD	109	202	306	405
10	ACTIGARD 5	WG	50	%AW/W	0.5	OZ/A	A	110	208	302	403
	ORONDIS U	SC	25.85	%AW/W	8	OZ/A	B				
	INDUCE 90	SL	90	%AW/W	0.25	% V/V	B				
	RIDOMIL G(	WG	45	%AW/W	32	OZ /A	C				
11	ACTIGARD 5	WG	50	%AW/W	0.5	OZ /A	A	111	203	308	411
	ORONDIS U	SC	25.85	%AW/W	8	OZ /A	B				
	ACTIGARD 5	WG	50	%AW/W	0.33	OZ /A	B				
	INDUCE 90	SL	90	%AW/W	0.25	% V/V	B				
	RIDOMIL G(	WG	45	%AW/W	32	OZ /A	C				
	ACTIGARD 5	WG	50	%AW/W	0.33	OZ /A	C				
12	REASON	SC	44.25	%AW/W	7	OZ /A	'ABCD	112	212	312	412
SPRAY DATES											
A	1/30/2026		ALL SPRAYS IN 20 GALLONS PER ACRE								
B	2/9/2026										
C	2/19/2026										
D	3/2/2026										

2025-2026 SPINACH NEMATODE TEST							
TREATMENT #	DESCRIPTION		COLOR FLAG				
1	UNTREATED		WHITE				
2	VELUM @6.5 FL. OZ/A		RED				
3	VELUM @6.5 FL. OZ/A + ATROFORCE 3 OZ+3OZ		YELLOW				
4	SALIBRO 15 OZ/A FB SALIBRO 15 OZ/A		BLUE				
5	ATROFORCE 3 OZ.+3 OZ		5TH RING FROM NORTHEAST				
		NOT RANDOMIZED					
PLOT #		**PLOT PLAN**					
101		WHITE					
102		RED					
103		YELLOW					
104		BLUE					
201		YELLOW	SOUTH END				
202		BLUE	201 (3)	302 (3)	403 (3)	504 (2)	505 (5)
203		WHITE	104 (4)	301 (1)	402 (4)	503 (3)	405 (5)
204		RED	103 (3)	204 (2)	401 (2)	502 (1)	305 (5)
301		WHITE	102 (2)	203 (1)	304 (2)	501 (4)	205 (5)
302		YELLOW	101 (1)	202 (4)	303 (4)	404 (1)	105 (5)
303		BLUE	NORTHWEST END				
304		RED					
401		RED					
402		BLUE					
403		YELLOW					
404		WHITE					
501		BLUE					
502		WHITE					
503		YELLOW					
504		RED					
TREATMENT 5 (105, 205, 305, 405, 505) WERE SOLID-PLANTED							
ON THE FIFTH BED FROM THE OUTSIDE. 5 RANDOM							
SAMPLES WERE TAKEN FROM THIS BED AT SAMPLING							
APPLLIED 25 NOV 2025 1200-1400							
SPINACH SEED 'LIZARD' 1M SEEDS/A							
DEPTH OF SEEDING 0.3IN							
AIR TEMP 83; SOIL TEMP 92							
CLEAR; ENE 4 WIND. HUMID 31							
TREATMENT 4 FOLIAR SPRAY APPLIED IN 15 GPA 12/23/2026 0830-0855							
AIR AND SOIL TEMP 67F							
HUMID 98	WIND ESE 5						
70% COTYLEDON; 30% 2LF		IRRIGATION FOLLOWED 0.3 INCHES					

SAMPLED 8 PLANTS PER PLOT 2/12/2026			SHOOT WEIGHT				
TREATMENT			GRAMS PER PLANT				
UNTREATED			8.3				
VELUM 6.5 OZ/A INFURROW			9.83				
VELUM 6.5 OZ/A INFURROW+ ATROFORCE 3 OZ+3 O			9.53				
SALIBRO 15OZ/A INFURROW FB 15 OZ/A FOLIAR			8.88				
ATROFORCE 3 OZ + 3 OZ			7.67				
			NOT SIGNIFICANT				

Screening Spinach Cultivars for Resistance to Stemphylium Leaf Spot Caused by *Stemphylium vesicarium*

Lindsey du Toit (Washington State University) and Larry Stein (Texas A&M AgriLife)
Funded by a Texas Department of Agriculture Specialty Crop Block Grant
Updated 3 April 2026

Objective:

Identify spinach cultivars with excellent resistance to Stemphylium leaf spot caused by *Stemphylium vesicarium* to reduce: 1) the need for fungicide applications to manage this disease, and 2) losses to this disease in spinach production in the Wintergarden region of Texas.

Materials and Methods:

To help growers identify spinach cultivars with high levels of resistance to *S. vesicarium*, a baby leaf spinach cultivar trial was planted on 6 January 2026 in a field at Tiro Tres Farms by Larry Stein, Ed Ritchie, Paige Ritchie, Jimmy Crawford, Mike Phillips, and others. This was a repeat of trials completed in 2020-2021, 2021-2022, 2022-23, 2023-24, 2024-25 near Crystal City in the Wintergarden region of Texas. In fall 2025, Paige, Ed, and Larry invited seed companies to submit seed of spinach cultivars to evaluate in the 2026 TX Spinach Stemphylium Leaf Spot Field Trial. Seed samples for 52 cultivars were submitted by six national and international seed companies to Paige. The trial was planted at a baby-leaf seeding rate of ~2 million seeds/acre.

At WSU, inoculum was produced in Lindsey du Toit's lab for three Texas isolates of *Stemphylium vesicarium* using the same protocol from previous trials. Approximately 1,800 petri plates of inoculum produced on clarified V8 agar medium were shipped to Larry in Uvalde in Jan. 2026. Inoculum was applied to plots on 3 and 16 February 2026. For each inoculation, the agar medium in ~450 plates was blended in water, screened through a filter, and applied in a ~2.5-foot-wide band down the center of each plot using a backpack sprayer

Severity of Stemphylium leaf spot was rated in each plot on 2 March 2026 by Lindsey, Larry, and Leslie Dominguez on a scale of 1 (no symptoms) to 10 (90 to 100% of the foliage symptomatic). White rust (caused by *Albugo occidentalis*) was moderate to severe in many plots. This confounded rating severity of Stemphylium leaf spot. Samples of symptomatic leaves were shipped to Lindsey's lab at WSU, and isolations completed. DNA was extracted from the isolates, and the calmodulin gene sequenced to determine the species of *Stemphylium*.

Results:

Severity of Stemphylium leaf spot for the 52 cultivars averaged 4.2 ± 1.9 and ranged from 1.0 to 10.0 for individual plots (**Fig. 1**), with a mean ranging from 1.3 to 9.0 across the three replicate plots for each cultivar. There were significant differences among cultivars. White rust was widespread throughout the trial and moderate to severe on many cultivars. This confounded

rating severity of Stemphylium leaf spot. Only 7 of the 52 cultivars displayed symptoms typical of Stemphylium leaf spot caused by *S. vesicarium* (smaller lesions with a distinct, usually darker margin - **Fig. 3 left**). Mean severity ranged from 6.3 to 9.0 for these cultivars (yellow bars in **Fig. 1**). These 7 cultivars had little to no white rust. The other 45 cultivars (green bars in **Fig. 1**) displayed leaf spots that were more typical of those caused by *S. beticola* – rapidly expanding lesions with a diffuse margin (**Fig. 3 center**). Some had both types of leaf spots (**Fig. 3 right**). The mean leaf spot severity ratings for the 45 cultivars with the larger lesions ranged from 1.3 (cv. Diamondback) to 9.0 (cv. Volans). However, all 45 these cultivars had white rust. Importantly, the severity of white rust appeared to be correlated with severity of Stemphylium leaf spot. Symptoms were not observed in two of three plots with Diamondback and one of three plots with LPSH-0299. Unlike previous results (2025 results in **Fig. 2**), no cultivar displayed complete resistance, but there was a wide range in Stemphylium leaf spot severity among cultivars.

Based in DNA sequencing, every isolate obtained from the Stemphylium leaf spot lesions was identified as *S. vesicarium*, regardless of cultivar or size of lesions. Therefore, there is no evidence that the larger lesions were caused by *S. beticola*. Instead, it appears that **co-infection of spinach leaves by the white rust pathogen and *S. vesicarium* resulted in Stemphylium leaf spot lesions that resembled those caused by *S. beticola***. This was a valuable lesson in confirming field diagnosis with laboratory assays, and the influence of co-infection of leaves by multiple pathogens on the appearance of symptoms!

Revised Discussion:

All 52 cultivars evaluated displayed some degree of susceptibility to *S. vesicarium*, including some cultivars considered resistant to *S. vesicarium*. Diamondback had the least severe Stemphylium leaf spot (only one of three plots) and very little white rust, followed by LSPH-0299, Boomslang, Bonnethead, Gerenuk, KSP0141, Arakas, Ovenbird, and NUN 07575 SPS. The larger leaf spots with diffuse margins observed on a majority of the cultivars were always associated with white rust lesions, which confounded rating Stemphylium leaf spot in plots with moderate to severe white rust. All isolates of *S. vesicarium* tested to date have proven resistant to fungicides in FRAC group 11 (e.g., Quadris or Amistar with the active ingredient azoxystrobin, or Cabrio with the active ingredient pyraclostrobin), but all isolates of *S. beticola* tested to date have been susceptible to these fungicides. Growers of conventional spinach should use fungicides in FRAC groups 3 or 7 to control Stemphylium leaf spot when *S. vesicarium* is the predominant species. There is evidence that FRAC group 3 and 7 fungicides have efficacy against both species. *NOTE: Follow federal and state fungicide labels and regulations*.

Acknowledgements:

The trial was a collaboration of Lindsey du Toit (Washington State University), Larry Stein (Texas A&M AgriLife), Ed and Paige Ritchie (Tiro Tres Farms), Jimmy Crawford (Crawford Farms), Mike Phillips, and the Texas Wintergarden Spinach Producers' Board. The project was funded by a Texas Department of Agriculture Specialty Crop Block Grant. We thank Leslie Dominguez for assistance with rating the trial.

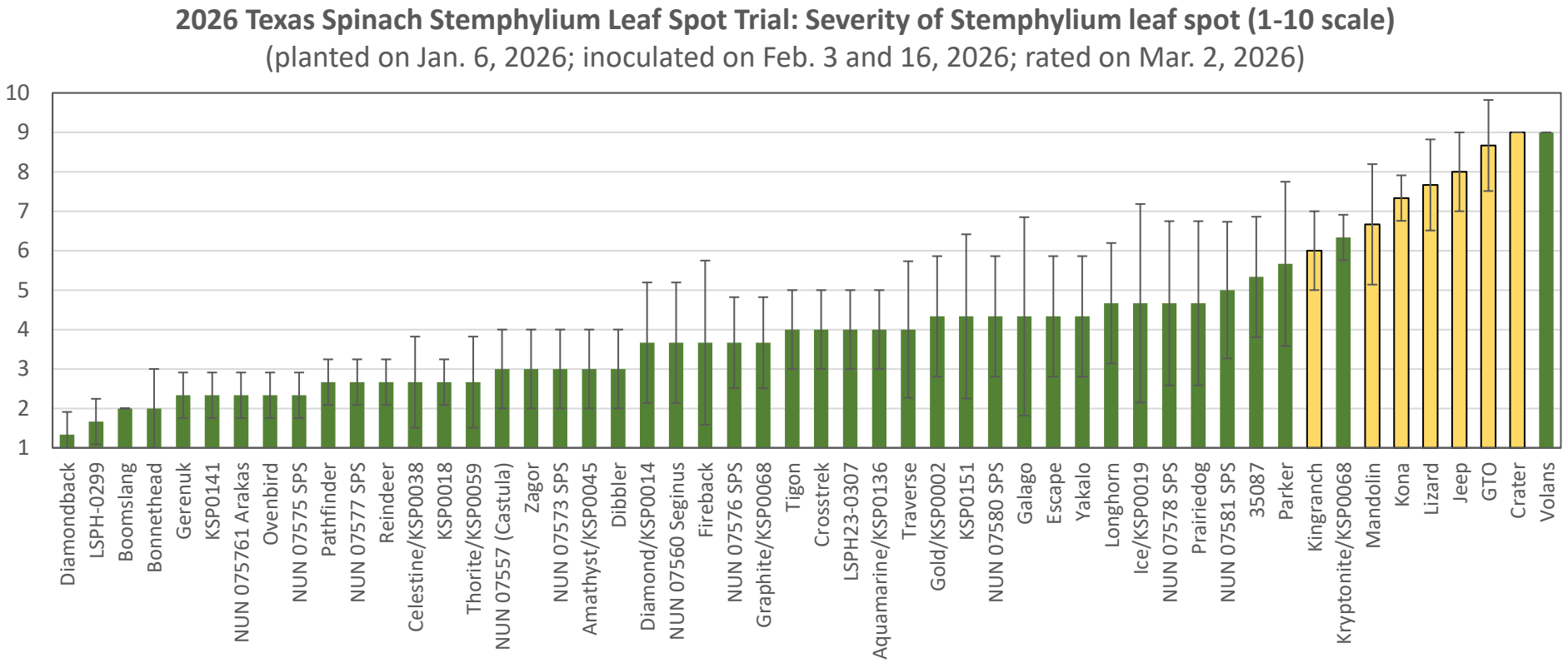


Fig. 1. Mean severity of Stemphylium leaf spot on spinach cultivars evaluated in a baby leaf field trial in Crystal City, TX in 2026. Three replicate plots of each cultivar were inoculated with a spore suspension of three Texas isolates of *Stemphylium vesicarium*. The severity rating for plots ranged from 1 (no symptoms) to 10 (most severe Stemphylium leaf spot). Yellow bars show the mean ± standard deviation of symptoms typical of those caused by *S. vesicarium*, the pathogen inoculated twice in February 2026. Green bars show the mean ± standard deviation of severity of leaf spot symptoms on cultivars that had moderate to severe white rust and leaf spots more typical of those caused by *Stemphylium beticola*. Some had leaf spots with discrete margins and leaf spot with diffuse margins (Fig. 3). Plots with moderate to severe white rust tended to have leaf spots with diffuse margins that were, initially, misidentified as being caused by *S. beticola*. However, isolations from lesions in these plots, followed by DNA sequencing, confirmed that both types of lesions were caused by *S. vesicarium*, not *S. beticola*. NOTE: Seed of Prairiedog, Kona, and Lizard was treated with fungicides (thiram for all 3 and metalaxyl for Kona). For all other cultivars, the seed planted was not treated with fungicides. The trial was a collaboration of Lindsey du Toit (Washington State University), Larry Stein (Texas A&M AgriLife), Ed and Paige Ritchie (Tiro Tres Farms), Jimmy Crawford (Crawford Farms), Mike Phillips, and the Texas Wintergarden Spinach Producers' Board. The project was also funded by the TX Department of Agriculture Specialty Crop Block Grant program.

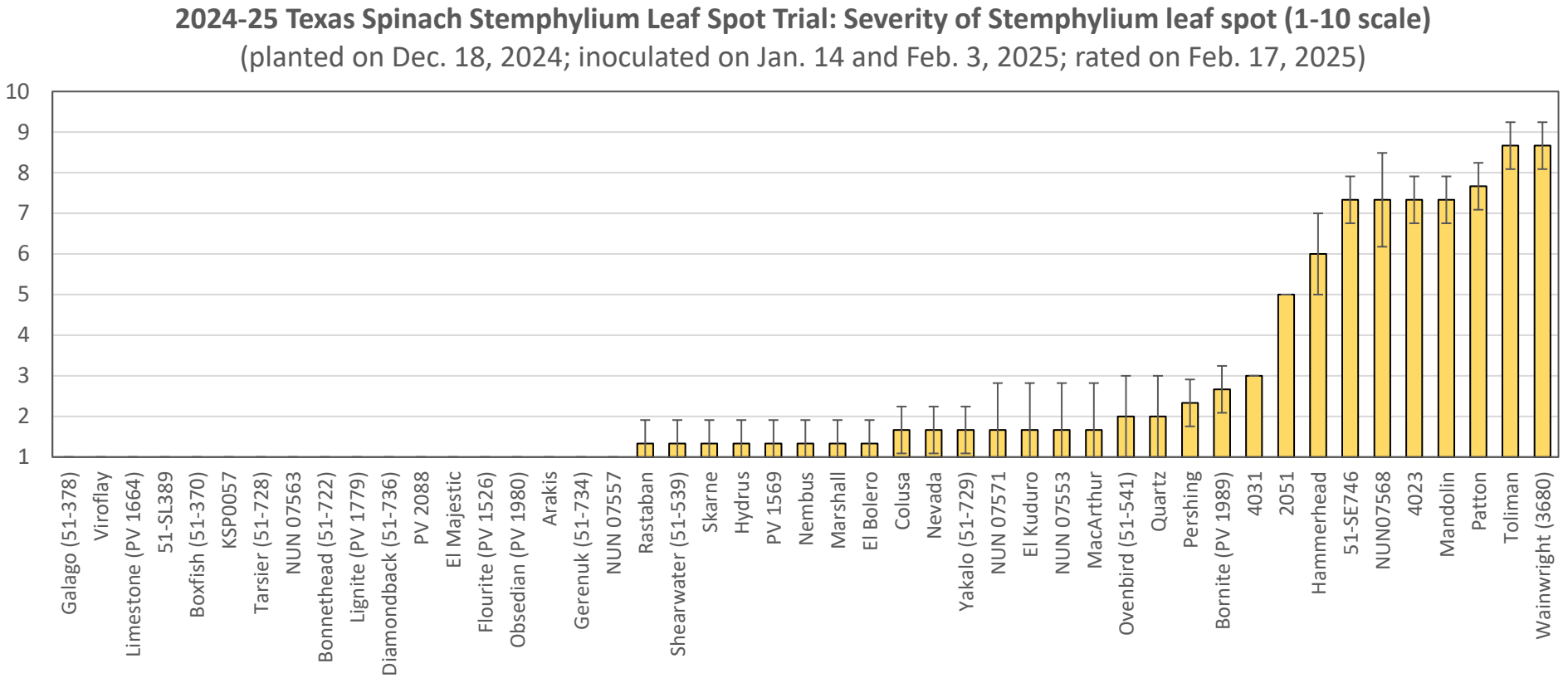


Fig. 2. Mean severity of Stemphylium leaf spot on spinach cultivars evaluated in a baby leaf field trial in Crystal City, TX in 2024-25. Three replicate plots of each cultivar were inoculated with a spore suspension of three Texas isolates of *Stemphylium vesicarium*. The trial was a collaboration of Lindsey du Toit (Washington State University), Larry Stein (Texas A&M AgriLife), Ed and Paige Ritchie (Tiro Tres Farms), Jimmy Crawford (Crawford Farms), Mike Phillips, and the Texas Wintergarden Spinach Producers' Board. The project was funded by a Texas Department of Agriculture Specialty Crop Block Grant. The severity rating for plots ranged from 1 (no symptoms) to 10 (most severe Stemphylium leaf spot).

Fig. 3. Symptoms of Stemphylium leaf spot typical of those caused by *Stemphylium vesicarium* (left). Stemphylium leaf spot on leaves infected with white rust (*Albugo occidentalis*) developed much larger lesions with diffuse margins (middle) or both types of lesions (right). These larger lesions initially were misidentified as being caused by *S. beticola*, but isolations from both types of lesions, followed by DNA sequencing for species determination, revealed both types of lesions were caused by *S. vesicarium*. We did not isolate *S. beticola*. Therefore, co-infection of spinach leaves by the white rust pathogen and *S. vesicarium* appears to have affected the appearance of lesions caused by *S. vesicarium.* These photos were taken during the 2026 Texas Spinach Field Day on March 3, 2026. NOTE: The leaves also were infected with white rust seen on the upper leaf surface as yellow (chlorotic) areas.

Lindsey du Toit, Washington State University (dutoit@wsu.edu, 360-391-2407)

Food Safety Overview and Current Efforts In The Texas Winter Garden

Presented by Marcel Valdez- MV Consulting

2006

E. coli O157:H7 outbreak linked to bagged spinach resulted in over 200 illnesses, 100+ hospitalizations, and 3 deaths across 26 U.S. states. Traced to contaminated products from Natural Selection Foods in California's Salinas Valley, the incident led to a national recall of all spinach, bagged and bulk by the FDA thus food safety standards began to surface.

2011

The Food Safety Modernization Act **(FSMA)** was signed into law by the President on January 4, 2011. FSMA has given the Food and Drug Administration (FDA) new authority to regulate the way foods are grown, harvested and processed. Shifting the focus from reaction to an outbreak to Prevention. Preventing foodborne contamination by requiring preventive controls, setting produce safety standards and implementing safety rules.

2015

The Final Produce Safety Rule (PSR), part of FSMA was made publicly available on November 13, 2015. This rule establishes science-based, enforceable, minimum standards for growing, harvesting, packing, and holding produce for human consumption. It focuses on preventing contamination through standards for agricultural water, biological soil amendments (manure), worker hygiene, animal intrusion, and equipment sanitation.

Current Efforts In The Texas Winter Garden

*Food Safety Education Program Focuses on PSR sec.112.21 sub part C)
Sponsored by the Winter Garden Spinach Producers Board

*Topics of training include worker health, worker hygiene, handwashing techniques and procedures, equipment cleaning and sanitation, food safety requirements of workers and packing facilities rules and expectations. Participants an evaluation to get knowledge gained data.

*To date over 765 packing shed workers, harvesting crews and other handlers of fresh produce have been trained by these efforts

MV Agricultural Consulting

"Providing Educational Needs To The Agricultural Industry"

Worker Food Safety Training Outline and Agenda Of Training

Trainer: Marcel Valdez, MV Agricultural Consulting/Certified Produce Safety Alliance (PSA) Trainer

Date of Training: _____**2026**____ Commodity: Spinach

Training Conducted in: A. English B. Bilingual C. Spanish (Required by food safety rule sec.112.21 sub part C)

Facility and location of training: _____**Packing Facility**

Training Focus: *Worker Hygiene, handwashing, identifying potential product contamination and Preventing Microbial contamination of Spinach/Leafy Greens, Workforce Harassment and culture*

Training Outline and Topics Covered

1. Introduction and purpose of training-Why are you here?
2. Equipment Cleanliness and sanitation to prevent contamination of spinach and produce
3. Packing Shed Worker health, hygiene for preventing food borne illnesses
4. Proper handwashing steps to prevent food borne contamination of products(video)
5. Proper handwashing video and demonstration using glow germ/black light
6. Identifying produce that can contaminate batches of produce before shipping
7. Preventing sexual harassment and conflict in the workplace
8. Post Test-Conduct a post test to determine knowledge and understanding gained

Resources Used For This Training:

Worker Food Safety and Worker Health and Hygiene (Spanish) Cornell University
Texas Department of Agriculture-Office of Food Safety (Spanish Videos)
A Guide to Minimize Microbial Food Safety Hazards in Fresh Produce USDA
Food Safety Materials Texas A&M University Center for Food Safety
USDA Basta Preventing Sexual Harassment the U.S. Agricultural Safety and Health Center

Sponsor: Winter Garden Spinach Producers Board Food Safety Program and TDA Commodity Grant in collaboration with MV Agricultural Consulting

Certification Statement: *I hereby certify that I have personally conducted the training as described above and can attest that participant's demonstrated knowledge gained as a result of this training. This training complies with section 112.21 and 112.32 of the Food Safety Modernization Act (FSMA) Food Safety Rule related to worker hygiene and worker health and sanitation*. Signed this _____day *of 2026*

_____ _____

Signature of Trainer Printed Name of Trainer

Food Safety Trainer/Food Safety Training Consultant

Certified Produce Safety Alliance (PSA) Trainer

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We extend our sincere gratitude to everyone involved in the preparation of this field day. The support of our sponsors, the commitment of our farm laborers, and the efforts of our cooks have made this event possible. Thank you for your continued dedication.

2025 Spinach Field Day

We Appreciate You Joining Us in the Field!