

Biology and Epidemiology of Verticillium Wilt of Leafy Vegetables

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Objectives

- Develop a PCR assay to rapidly identify race 3.
- Investigate a possible race 3 in lettuce.
- Map gene(s) governing resistance to the possible new race of *V. dahliae*.

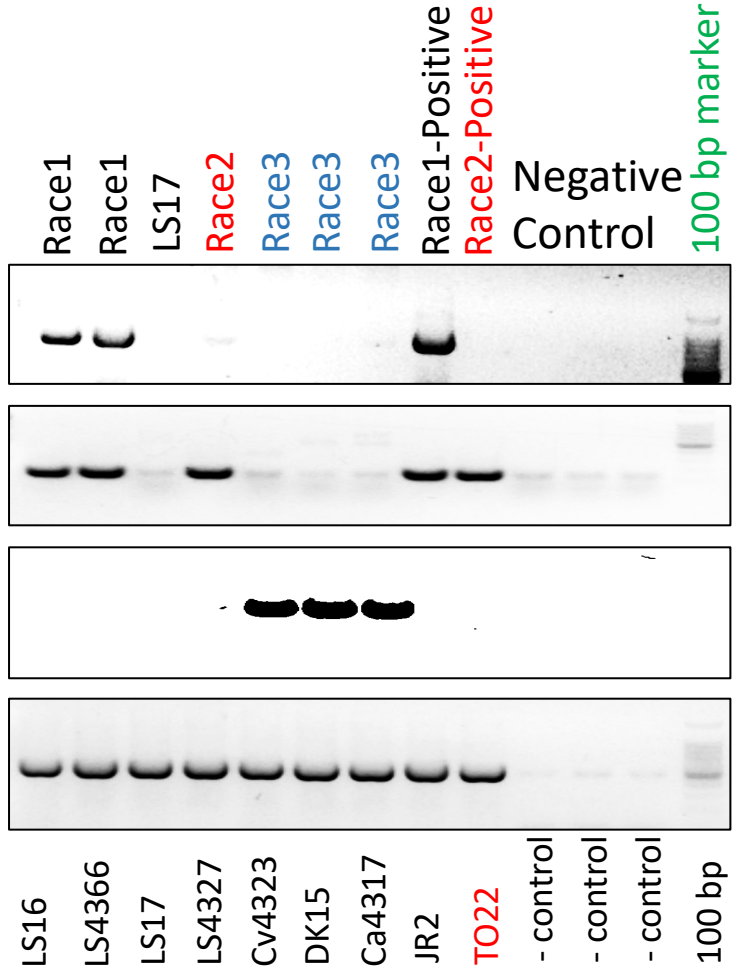
Verticillium isolates collected from lettuce in 2020

Number	Host	Species	Race	Mating type
Ls4288	Head Lettuce	<i>V. dahliae</i>	1	2
Ls4289	Head Lettuce	<i>V. dahliae</i>	1	2
Ls4290	Head Lettuce	<i>V. dahliae</i>	1	2
Ls4291	Head Lettuce	<i>V. dahliae</i>	1	2
Ls4292	Romaine	<i>V. klebahnii</i>	N/A	N/A
Ls4293	Head Lettuce	<i>V. dahliae</i>	1	2
Ls4294	Head Lettuce	<i>V. dahliae</i>	1	2

Crop	Month	Isolates
Head Lettuce	May	5
Head Lettuce	June	4
Head Lettuce	July	15
Romaine	July	1
Artichoke	July	1
Pepper	July	2
Head Lettuce	August	11
Romaine	August	3
Watermelon	August	1
Head Lettuce	September	26
Romaine	September	2
Pepper	September	1
Head Lettuce	October	14
Tomato	November	1
	Total	85

Data

- *Verticillium* species
- Mating type
- Race



VdAve1 – 686 bp

VdR2e-141 bp

VdR3e-345 bp

Vd species-490 bp

	Race 1	Race 2	Race 3
<i>VdAve1</i>	+	-	-
<i>VdR2e</i>	+/-	+	-
<i>VdR3e</i>	-	-	+

Crop	Isolates	Month	Characterized	Species
Head Lettuce	5	May	5	<i>V. dahliae</i>
Head Lettuce	4	June	4	<i>V. dahliae</i>
Head Lettuce	15	July	15	<i>V. dahliae</i> /1 <i>V. klebahnii</i>
Romaine	1	July	1	<i>V. dahliae</i>
Artichoke	1	July	1	<i>V. dahliae</i>
Pepper	2	July	2	<i>V. dahliae</i>
Head Lettuce	11	August	12	<i>V. dahliae</i> /1 <i>V. klebahnii</i>
Romaine	3	August	3	<i>V. dahliae</i>
Watermelon	1	August	1	<i>V. dahliae</i>
Head Lettuce	26	September	26	<i>V. dahliae</i> / 1 <i>V. klebahnii</i>
Romaine	2	September	2	<i>V. dahliae</i>
Pepper	1	September	1	<i>V. dahliae</i>
Head Lettuce	12	October	12	<i>V. dahliae</i> (10)
Tomato	1	November	1	<i>V. dahliae</i>
Total	85	Total	85	

Crop	Race 1	Race 2	Race 3	None	<i>V. klebahnii</i>	Total
Lettuce	56	3	0	6	3	68
Artichoke	1	1				2
Pepper		2	1	2		5
Watermelon		1	1			2
Tomato		3				3
Grand Total						80

What race does VdLs17 belong to?

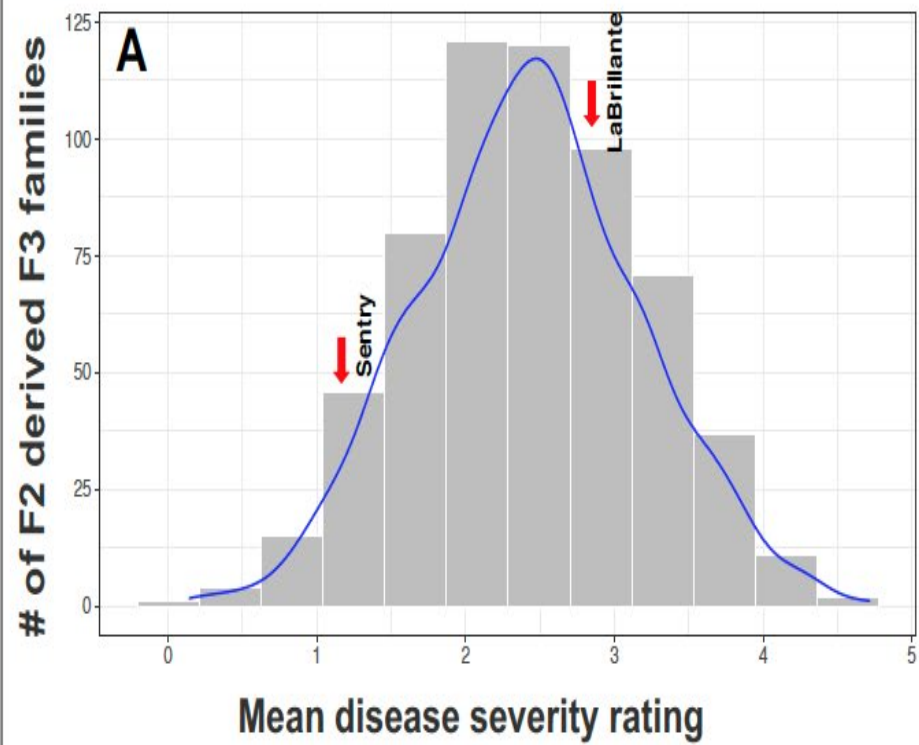
- It has none of the markers (developed based on effectors) that define races 1, 2, and 3!
- VdLs17 was isolated from lettuce and remains the most challenging isolate to identify resistance.
- Progress achieved thus far is likely to benefit resistance breeding against the newly defined races.

Objectives

- Map gene(s) governing resistance to the race 3 of *V. dahliae*.



~200 F₃ seeds were screened for *V. dahliae* isolates in replicated trial



F3 population in greenhouse

Genotyping by sequencing analyses

- QTL mapping identified three QTLs.
- One was located on LG 2 and two on LG 4.
- All were contributed by the moderately resistant Sentry and each explained 10% of the variation in resistance.
- Additional loci may also be present in the transgressive segregants and these may originate from La Brillante.

Objective for 2022-23

- Screen commercial lettuce cultivars and the newly available race-1 resistant cultivars for their responses to races 2, 3, and VdLs17.

ACKNOWLEDGMENTS

California Leafy Greens Board
CDFA-SCBGP
Grower cooperators

University of California, Davis - Richard Michelmore

USDA-ARS – Ivan Simko, Steve Klosterman

UCD Plant Pathology

- Mihir Mandal
- Nikhil Dhar
- Rosa Marchebout

Tri-Cal Diagnostics

Steve Koike