

**Project Title: Race diversity and the biology of the spinach downy mildew pathogen.  
CLGRB Progress Report  
March 16, 2010**

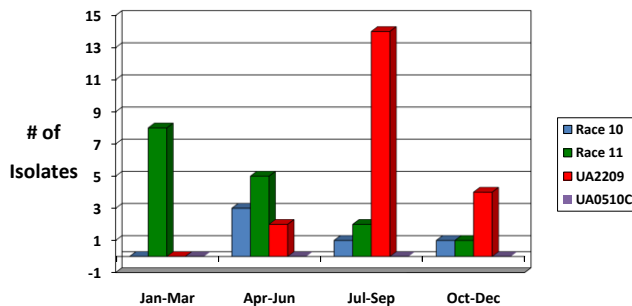
Jim Correll  
Department of Plant Pathology  
University of Arkansas  
Fayetteville, AR 72701  
479-283-1628  
[jcorrell@uark.edu](mailto:jcorrell@uark.edu)

Steve Koike  
University of California Coop. Extension  
1432 Abbott Street  
Salinas, CA 93901  
831-759-7356  
[stkoike@ucdavis.edu](mailto:stkoike@ucdavis.edu)

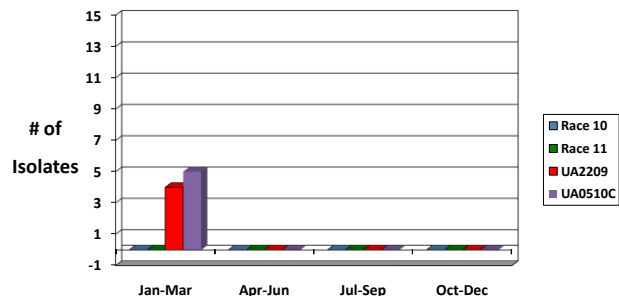
**Summary**

A total of 42 downy mildew isolates were examined in 2009 and 5 in 2010 thus far. Two deviating strains were identified in 2009. One deviating isolate, UA0209D was similar to race 11 but was unable to infect Lazio. A second deviating isolate, UA2209, was able to infect a wide range of contemporary spinach cultivars except those which contained the *RPF-3* locus like that in Califlay. This strain was designated as a UA2209 type. Additional isolates with the same reaction type on the differentials as UA2209 were recovered from multiple locations within the Salinas Valley and a single location in Fresno County in 2009. The IWGP met in January 2010 and recommended that this isolate not be sanctioned as a “new” race at this point in time due to the limited distribution of this strain. In 2010, thus far, 5 isolates have been examined from the Yuma, AZ and Holtville, CA growing areas and 3 isolates have been examined in detail. These isolates are all appear to be deviating isolates on the standard set of differentials (Table 1) and have been given the type designation “UA0510C.” Work continues on screening spinach lines to isolate UA0510C to confirm which resistance loci are holding up to this deviating isolate. It appears that these isolates are able to overcome a wide range of race 1-11 and race 1-11 plus UA2209 resistant lines. In particular UA0510C is able to overcome lines with the resistance loci *RPF-2* (1-10 resistance), *RPF-3* (1, 3, 5, 8, 9, 11, and UA2209 resistance), *RPF-4* (1-4 resistance) and *RFP-5* (1-2 resistance). Initial evidence indicates that any lines with *RFP-1* (1-7, 9, 11, UA2209, and UA0510C) either singly or in hybrid combination are resistant to this deviating isolate. Also, *RPF-6* appears to provide partial resistance to this new deviating strain. There is some indication by others that UA0510C may represent a more aggressive variant of race 11 than a qualitatively distinct strain.

**Mildew Races Identified  
2009**



**Mildew Races Identified  
2010**



**Table 1. Disease responses of spinach differentials to selected isolates of *Pfs* in 2009 and 2010.**

Isolate	Origin			Differentials													Type
	Cultivar	Area		Viroflay	Resistoflay	Califlay	Polka	Bolero	Campania	Dolphin	Avenger	Lion	Lazio	Clermont	Boeing	Whale	
UA0309	Thames	CA		+	+	-	-	+	-	-	-	-	+	+	-	-	race 11
UA2708PL	Pelican	CA		+	+	-	-	+	-	-	-	-	+	+	-	-	race 11
UA0209B	Misano	AZ		+	+	-	-	+	-	-	-	-	+				race 11
UA0209D	Ottawa	AZ		+	+	-	-	+	-	-	-	-	-				UA0209D <sup>1</sup>
UA1509A	Cannon	CA		+	+	-	-	+	-	-	-	-	+				race 11
UA2209	Mississippi	CA		+	+	-	-	+	+	+	+	-	+	+	+	-	UA2209
UA2509B	Tbird	CA		+	+	-	-	+	+	+	+	-	+	+	+	-	UA2209
UA2509A	Whale	CA		+	+	+	+	+	+	+	+	+	-	+	+	+	race 10
UA3309A	PV7154	CA		+	+	-	-	+	+	+	+	-	+				UA2209
UA3409	Missouri	CA		+	+	-	-	- <sup>2</sup>	+	+	+	-	+				UA2209
UA3209	Vigore	CA		+	+	-	-	- <sup>2</sup>	+	+	+	-	+				UA2209
UA0510C	Charger	AZ		+	+	+	+	+	+/- <sup>3</sup>	-	-	-	+				UA0510C
UA0510	Flamingo	AZ		+	+	+	+	+	+/- <sup>3</sup>	-	-	-	+				UA0510C
UA0710	El Patriot	CA		+	+	+	+	+	+/- <sup>3</sup>	-	-	-	+				UA0510C

<sup>1</sup> UA0209D was similar to race 11 except it was not able to infect Lazio.

<sup>2</sup> Bolero seed was treated with metylaxyl and likely influenced the disease reaction.

<sup>3</sup> Disease reactions on Campania have been variable based on individual tests.