

Breeding for Resistance to New Races of Anthracnose

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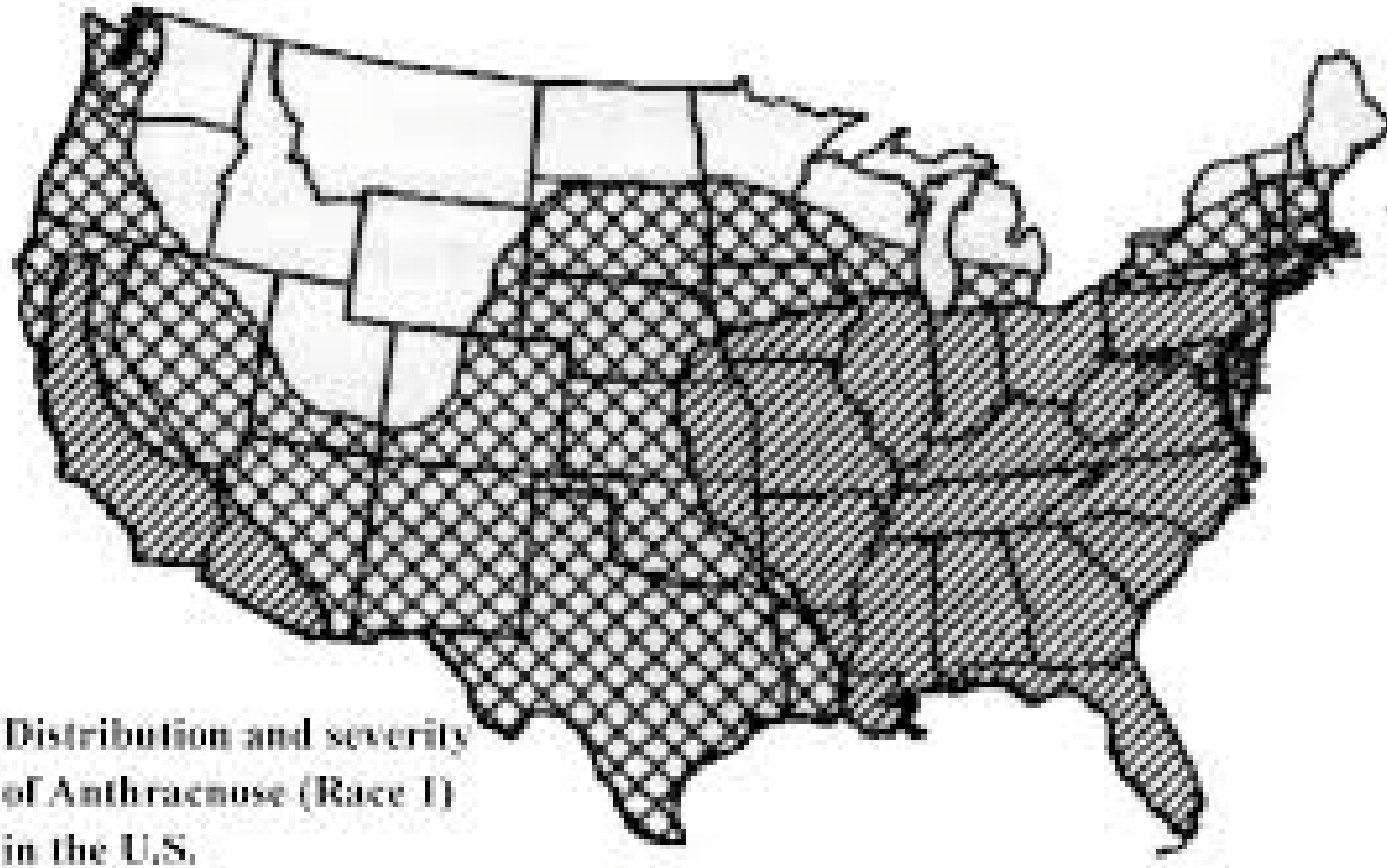
Forage Genetics International



HISTORY AND RANGE OF ANTHRACNOSE RACES

- Race 1 of Anthracnose (*Colletotrichum trifolii*) is common and widespread.
- Race 2 has been reported in a limited geography limited mostly in mid-Atlantic States (1979-1982)
- Race 3 in Oklahoma in 1982 – no cultures were maintained
- Race 4 in Ohio and Australia (2007)

DISTRIBUTION OF ANTHRACNOSE IN THE U.S.



EXPECTED RESPONSES OF CHECKS TO RACE1 AND RACE2 ANTHRACNOSE

	Race 1	Race 2
Check	Expected	Expected
Saranac	1	~0
Saranac AR	45	45
Arc	65-70	~0

ANTHRACNOSE SYMPTOMS



FIELD OBSERVATIONS

- In the Spring of 2012 Anthracnose infestations were observed with uncharacteristic timing and severity (2012 Isolate - Samac, et. al., Plant Dis. 98:843, 2014. First Report of Race 2 of *Colletotrichum trifolii* Causing Anthracnose on Alfalfa in Wisconsin).
- In 2014, there was another occurrence of Anthracnose, and diseased stems were harvested and anthracnose was isolated and cultured.
- After the 2014 infestation it was decided to initiate a breeding strategy to introduce resistance to these new isolates.

METHODS

STANDARD TESTS - NAAIC

- Greenhouse Screen
 - 10" x 20" Flats with Potting Soil (200 seedlings per flat)
 - Spray seedlings at 7-10 days, 1st trifoliolate leaf
- Inoculum
 - 2012 and 2014 Isolates from FGI - West Salem.
 - 7 day old cultures 1/2 strength oatmeal agar
 - Conidia concentration 2×10^6 per mL
 - Spray to point of runoff ~ 10 mL Flat
- Incubation
 - 2 days ~ 48 hrs at 23C 100 humidity
 - Score 14 days after inoculation



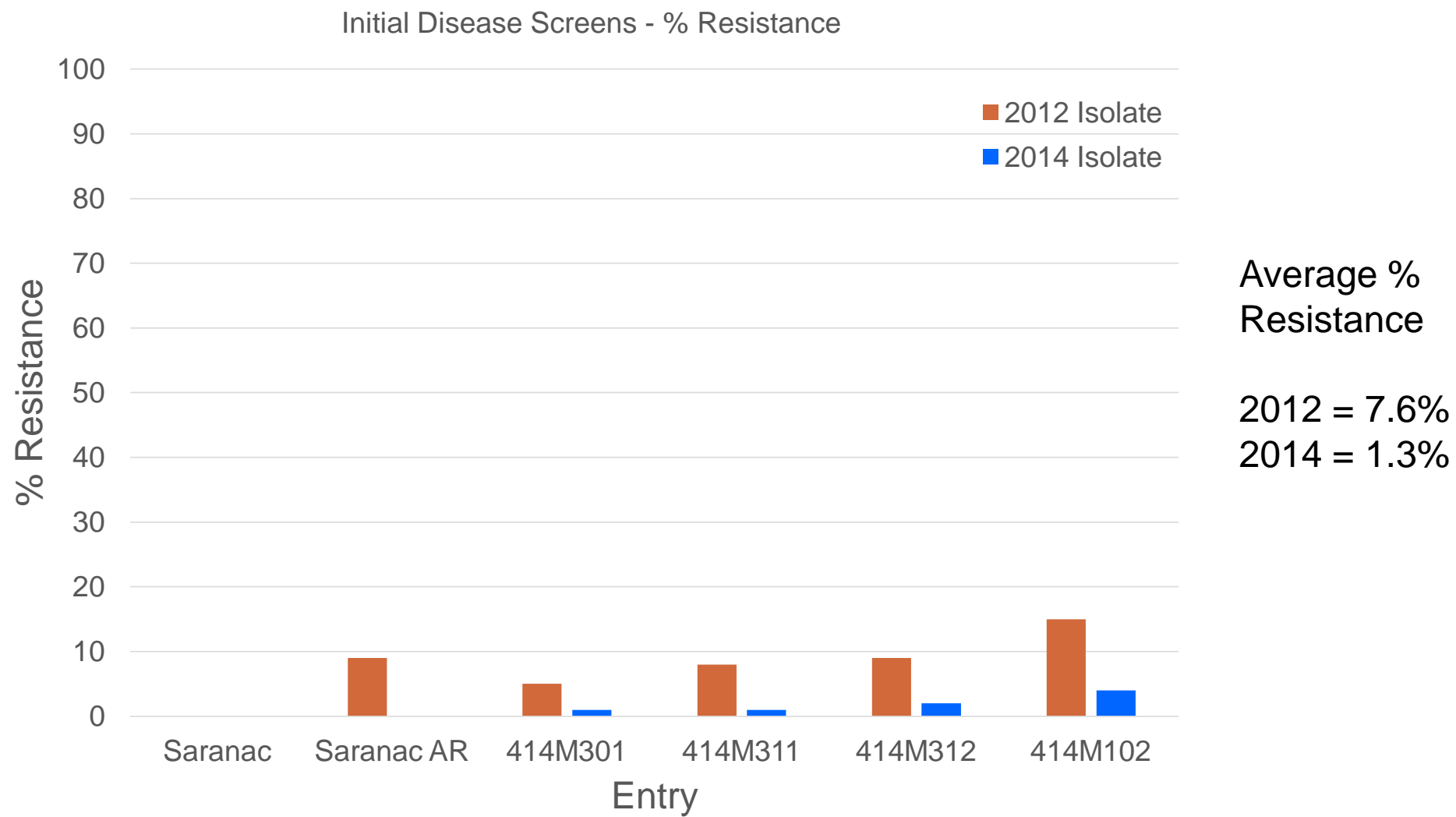
ANOVA: Split-Plot. Main Plot = Isolate, Subplot = Entry

Factor	Type	Levels	Values
Rep	random	2	1, 2
Isolate	fixed	2	2012, 2014
Entry	random	6	414M102, 414M301, 414M311, 414M312, Saranac, Saranac AR

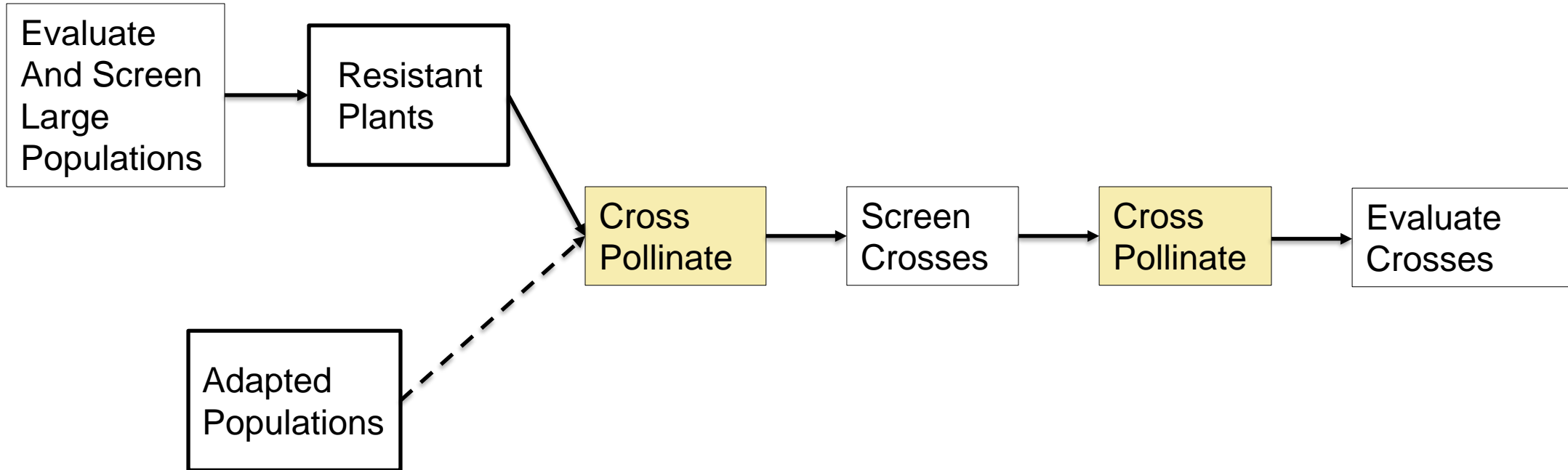
Analysis of Variance for %Resis

Source	DF	SS	MS	F	P
Rep	1	9.375	9.375	1.33	0.455
Isolate	1	273.375	273.375	16.76	0.034*
Isolate(Rep)	1	7.042	7.042	1.13	0.312
Entry	5	202.708	40.542	2.62	0.157
Isolate*Entry	5	77.375	15.475	2.49	0.103
Error	10	62.083	6.208		
Total	23	631.958			

2014 FALL ANTHRACNOSE SCREENS



BREEDING STRATEGY



NEEDLE INOCULATION TO PREVENT ESCAPES

SCORED 7 DAYS AFTER INOCULATION



CROSSING

First round of crossing done in greenhouse.



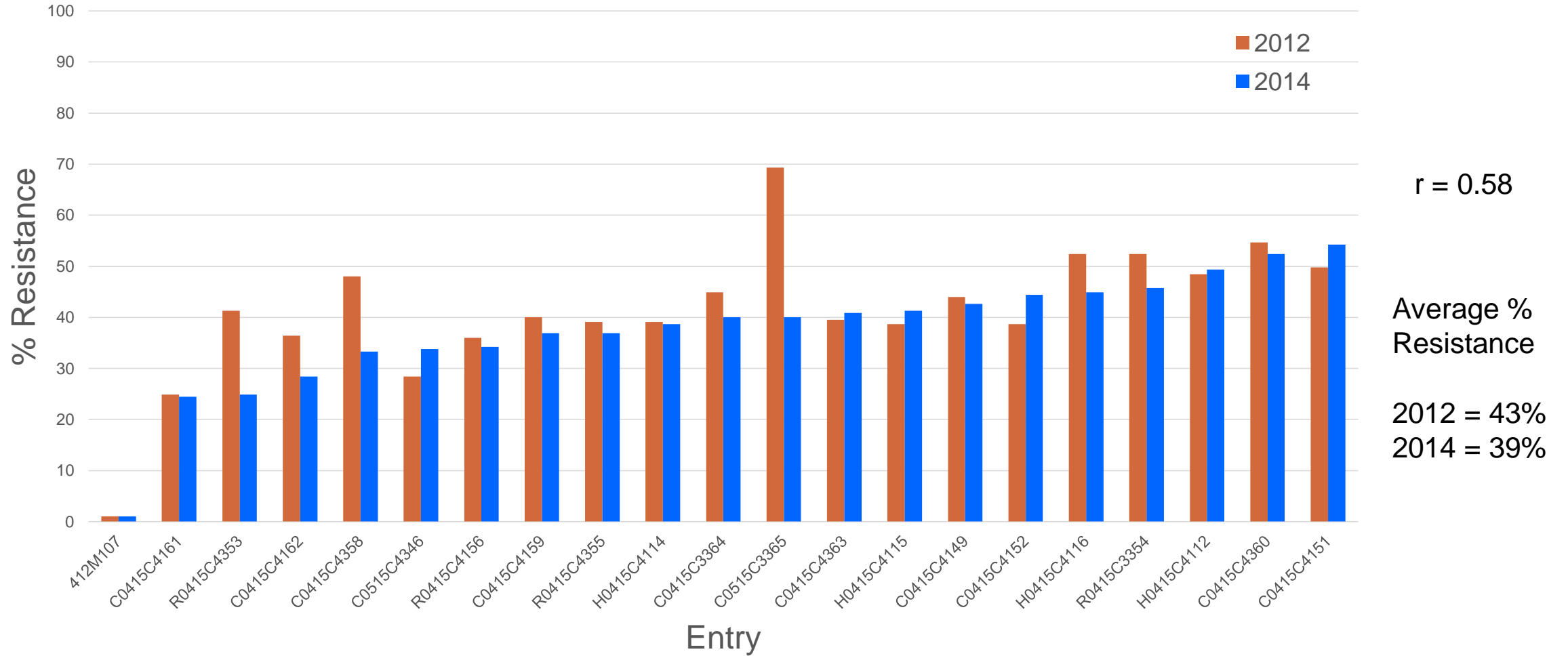
Second round of crossing done under cage.



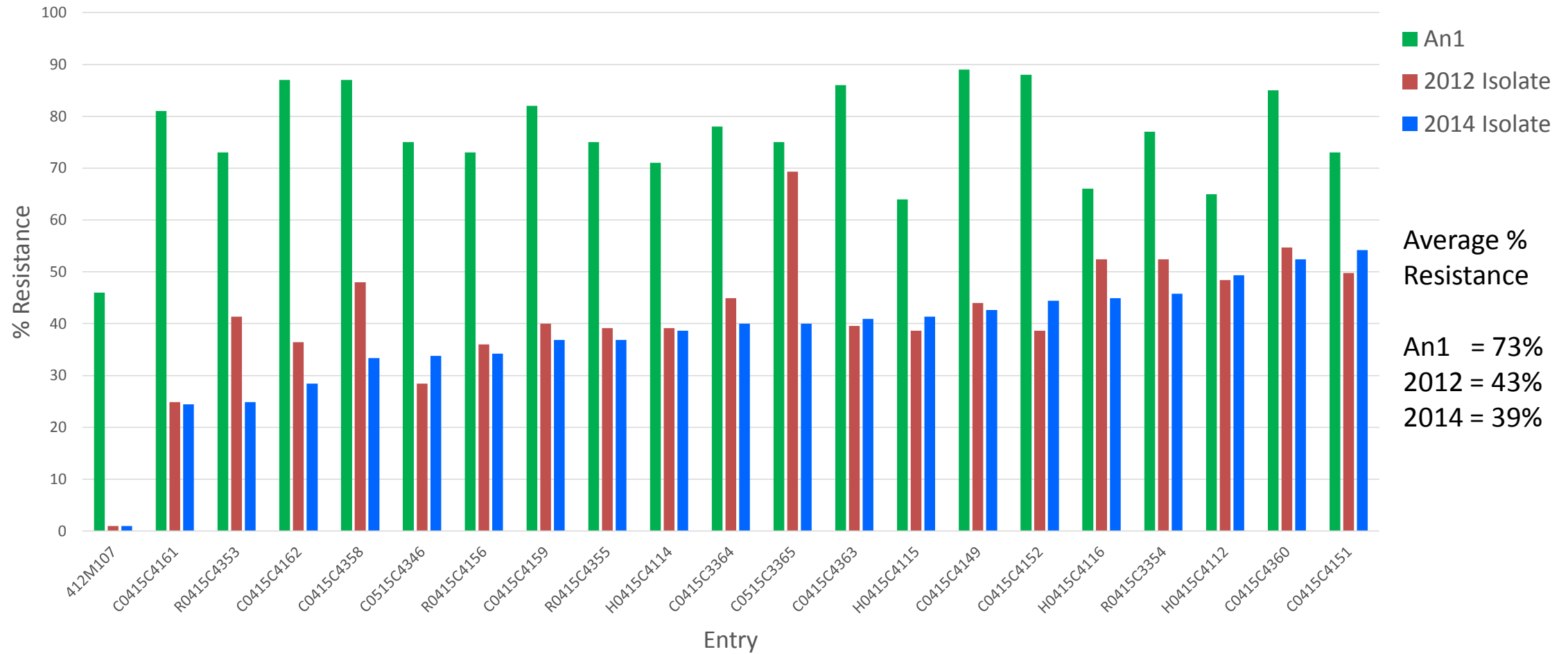
2 Cycles of Selection for Anthracnose Resistance have provided tremendous gains.



Fall 2015 Screens - % Resistance



% RESISTANCE TO AN1, 2012 AND 2014 ISOLATES



QUESTIONS ?