Evaluation of local strains of *Beauveria bassiana* to control the coffee berry borer

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MAIN QUESTIONS

1. How was the CBB distributed in Puerto Rico in 2014?(seven years after its first report)

2. Are there differences in virulence among local strains of *B. bassiana* and the Mycotrol ® strain?

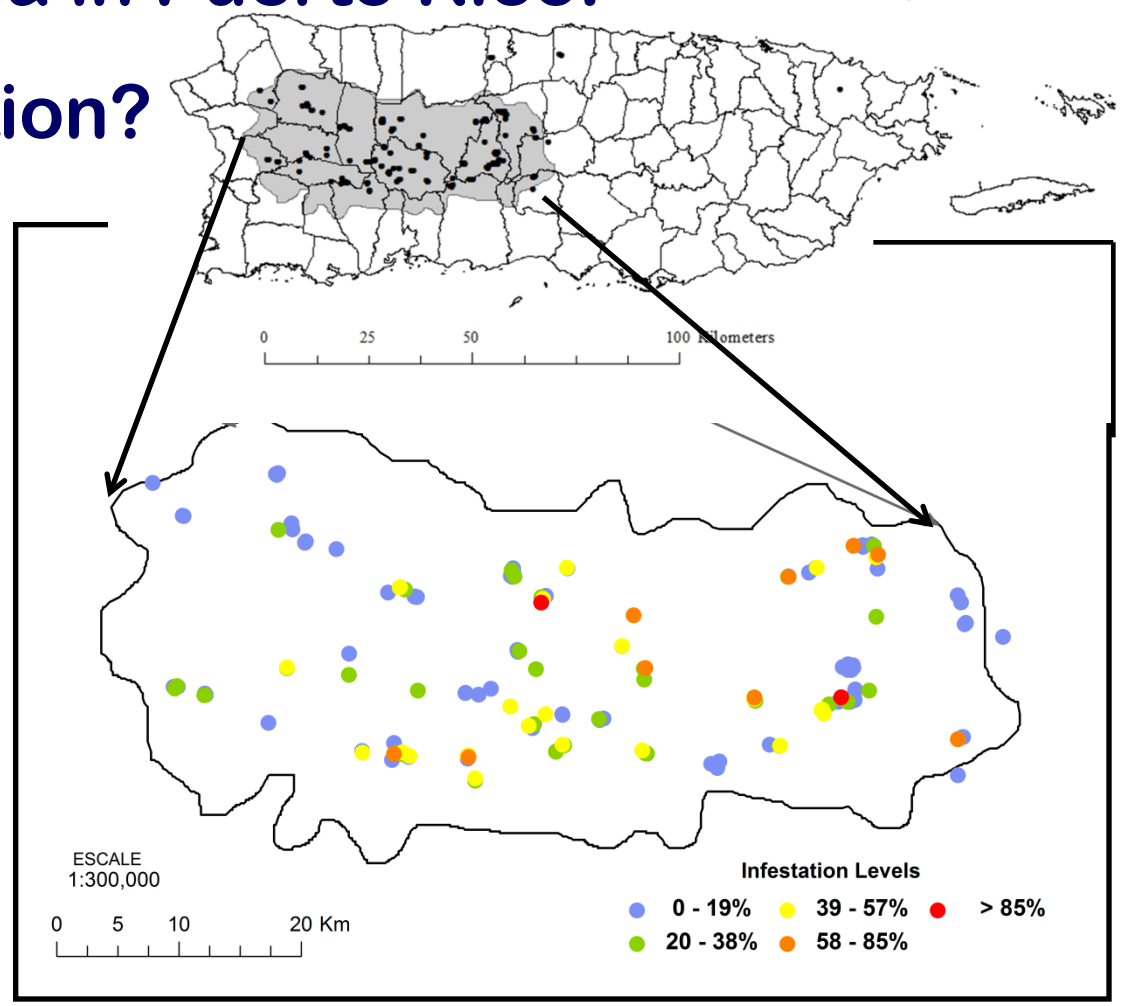
3. How do the survival and persistence of local strains and Mycotrol® strain compare?

4. Can *B. bassiana* control the coffee berry disease?

CBB in Puerto Rico

The CBB is well-established throughout the coffee-growing area in Puerto Rico.

- how much infestation?
- where?
- when?

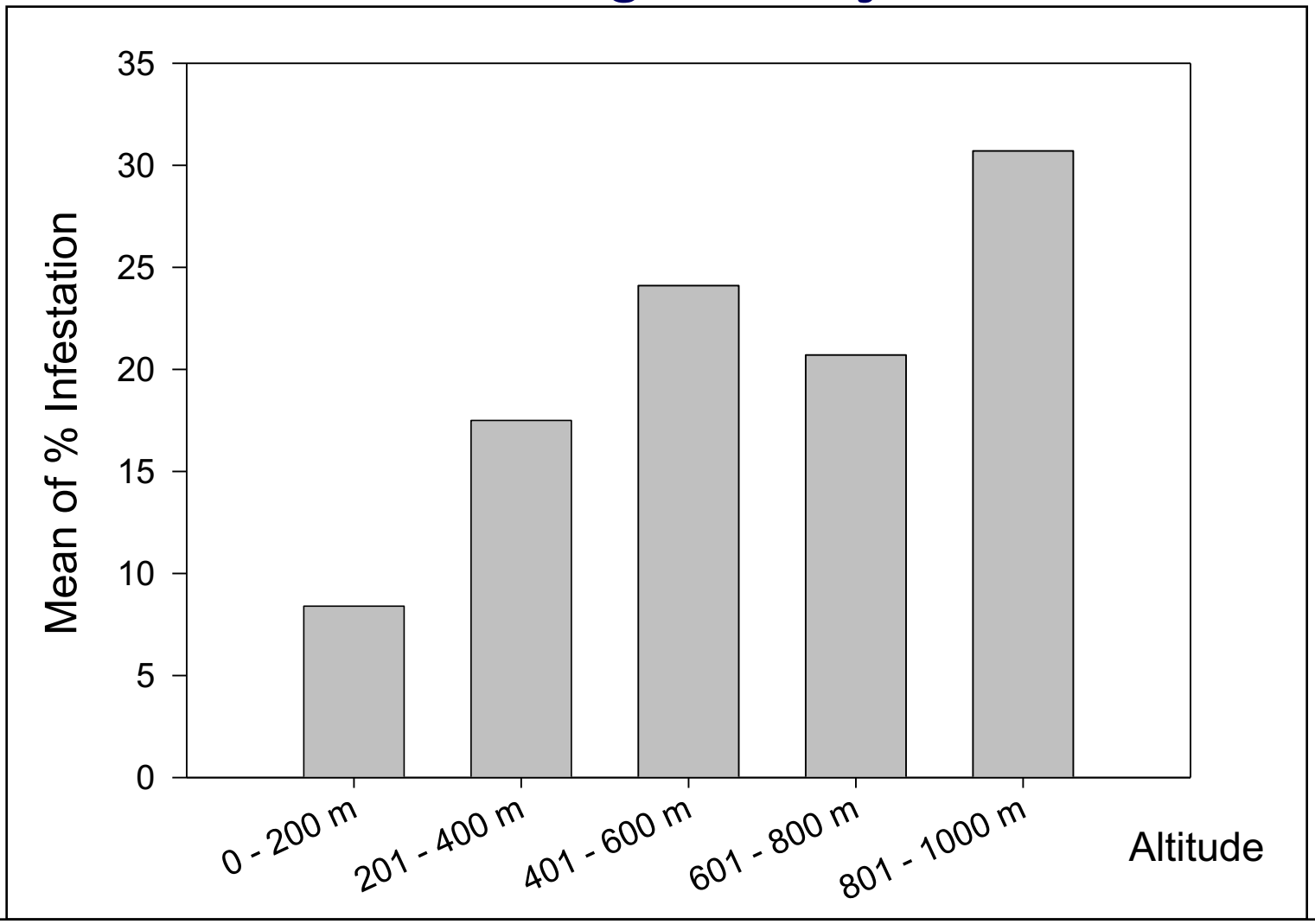


We sampled 214 sites in 97 farms and rural areas of 17 municipalities.

Mariño et al. 2017. Journal of Insect Science 12 (2) 58: 1-8

CBB Infestation in Puerto Rico

Infestation increased significantly with altitude.



Mariño et al. 2017. Journal of Insect Science 12 (2) 58: 1-8

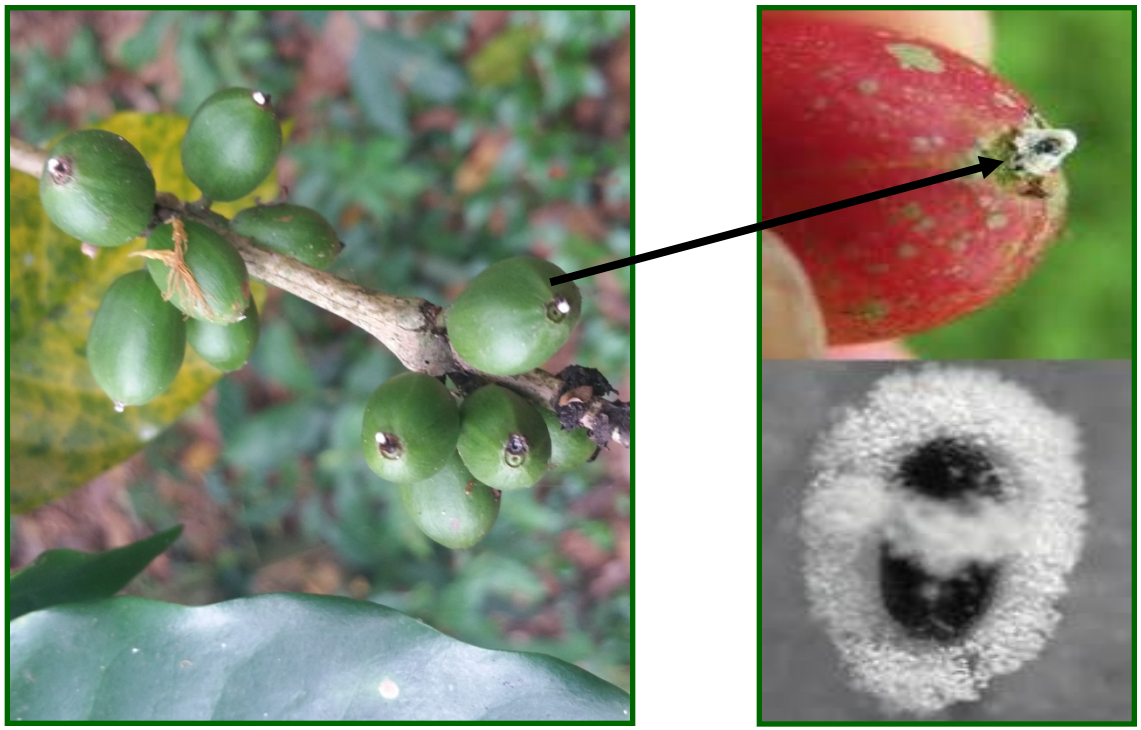
CBB infestation in Puerto Rico

CBB infestation is higher inPuerto Rico than other coffee-producing countries.

Country	Year	% Infestation	Authors
Brasil	1992 -93	21 – 32%	Cure *et al.* 1998
Colombia	1995 - 96	<2 – 25 %	Benavides *et al.* 2003
México	1978	10 – 15 %	Barrera, 1983
México	2008	5 – 35 %	Larsen and Philpott, 2010
Costa Rica	2010	2 – 10%	Sánchez *et al.* 2013
Africa	2009-11	< 1 - 15%	Jaramillo *et al.* 2013
Hawaii	2015	3 – 81 %	Aristizábal *et al.* 2016
Hawaii	2017	< 3 – 20 %	Aristizábal, pers. commu.
Puerto Rico	2010 -11	2 – 68 %	Mariño *et al.* 2016
Puerto Rico	2014	0 – 85 %	Mariño *et al.* 2017

The CBB and *B. bassiana*

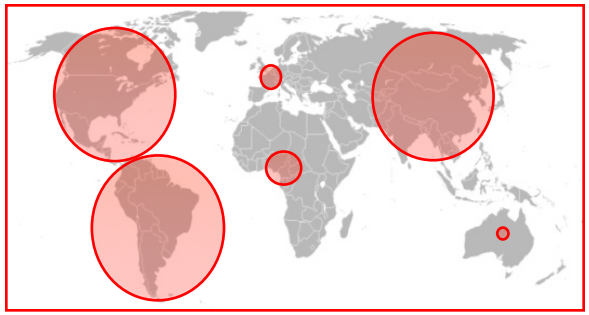
B. bassiana in Puerto Rico

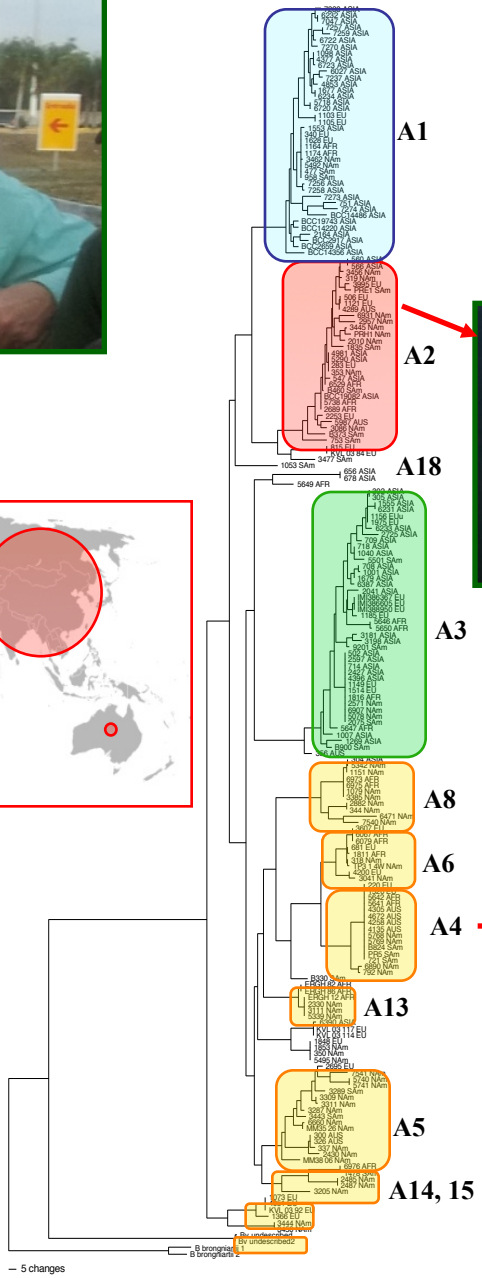


In Puerto Rico, *B. bassiana* is applied using the commercial product Mycotrol®; however, local strains are common on coffee farms.

Genetic characterization of *B. bassiana*

Dr. Stephen Rehner



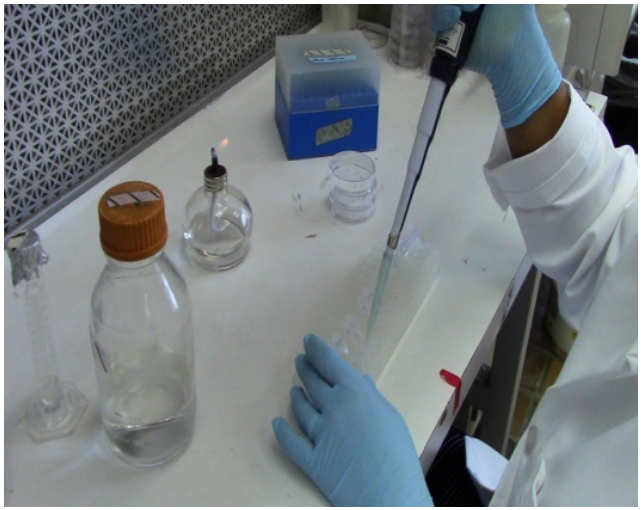


Local strains were grouped into the Haplotype A2

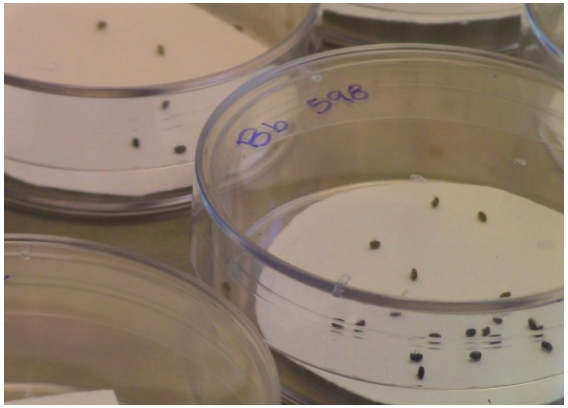
Mycotrol ® strain was grouped into the Haplotype A4

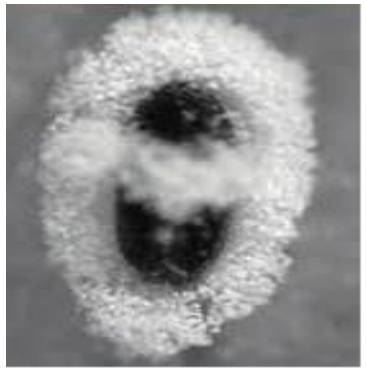
Laboratory experiments

1. Strains of *B. bassiana* were isolated on PDA

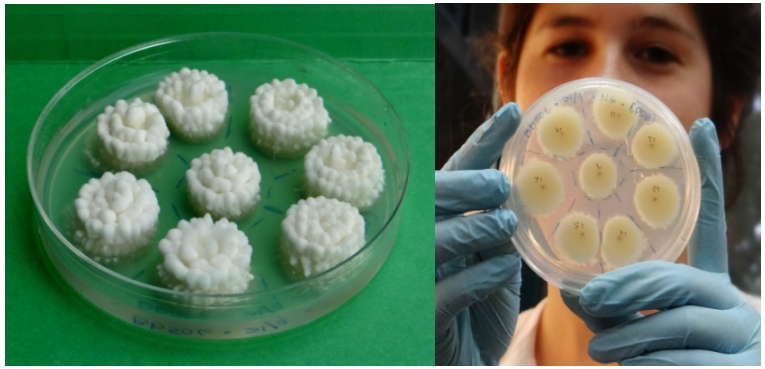


2. Conidial suspensions 4 x 10^6 con/mL were prepared in Tween 0.02 %.





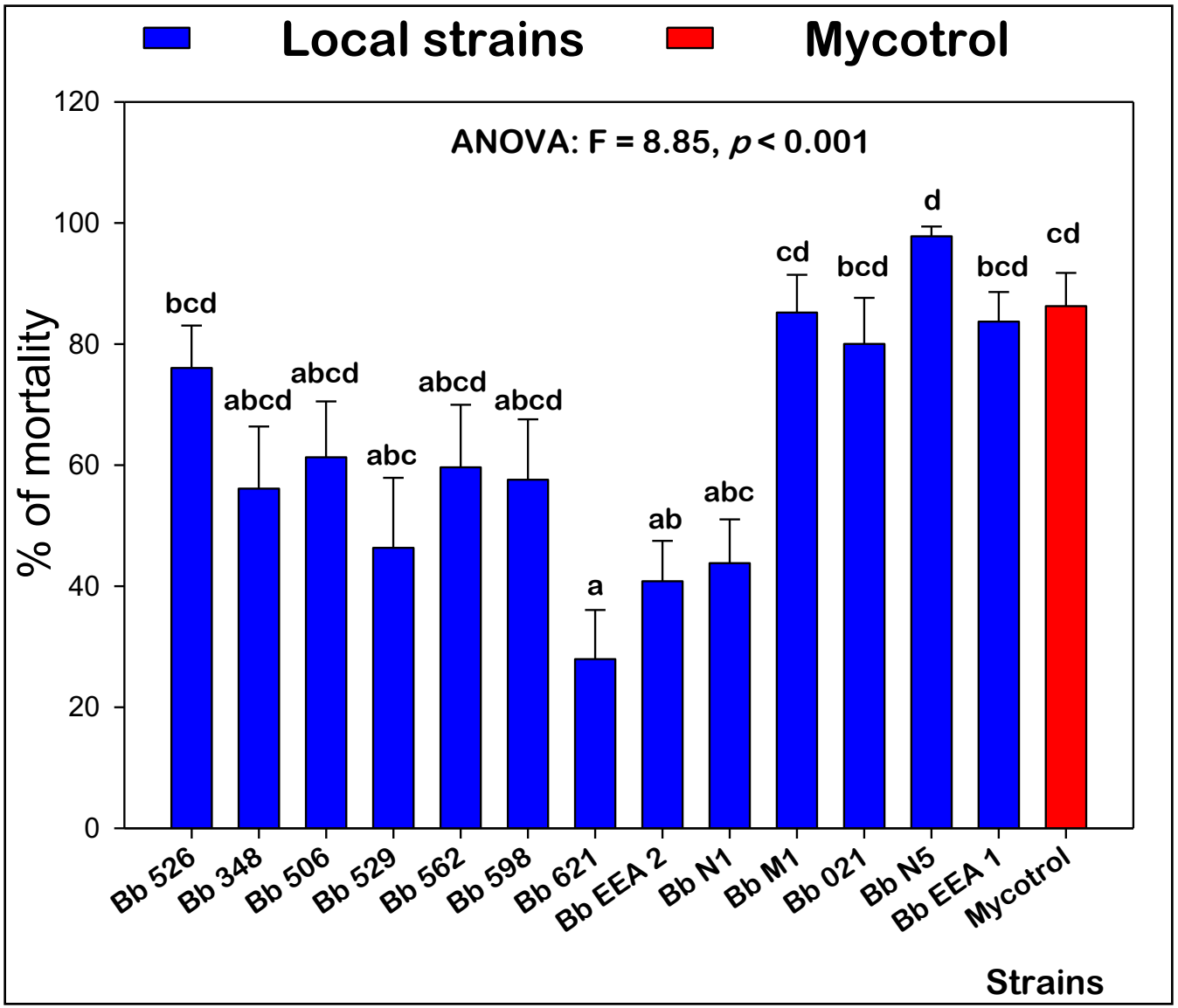
3. Groups of ten CBB adult females were exposed to the suspensions, mortality was registered daily for 8 days.



4. Fungal infection was confirmed by plating dead adults on PDA.

Laboratory experiments

Some local strains were as virulent as Mycotrol ®



Field experiments

Bb strains were grown on rice

500mL/ tree (1 X 10^9 con/ 100 mL) were applied every two weeks

Bb infection and CBB infestation were evaluated every two weeks

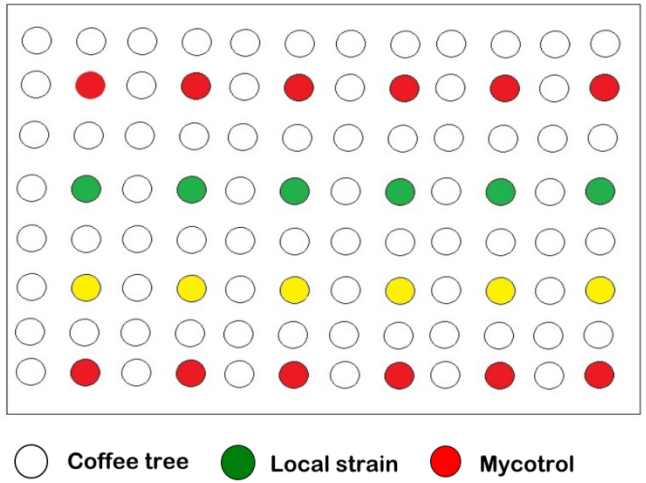
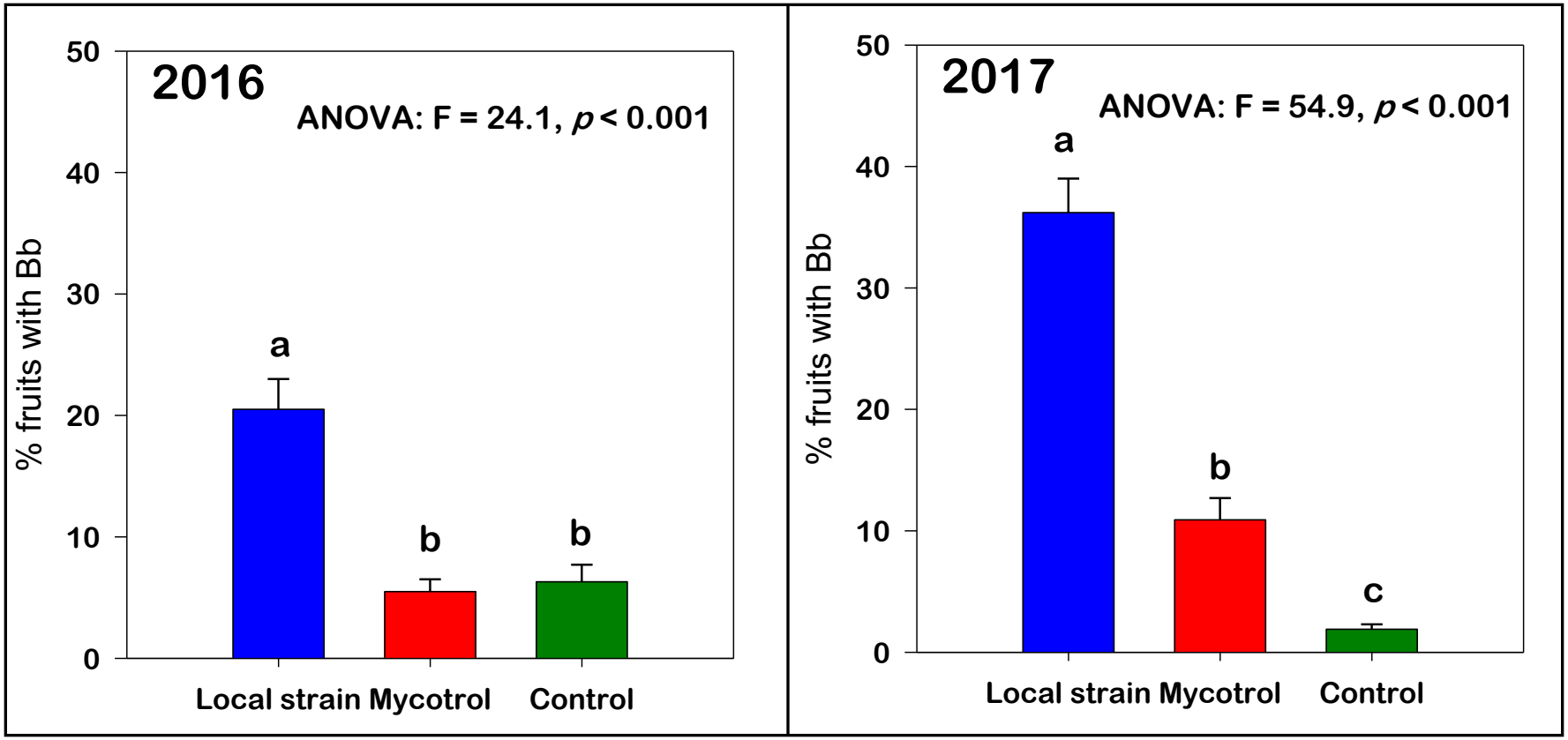


Diagram for application of Bb

Field experiments

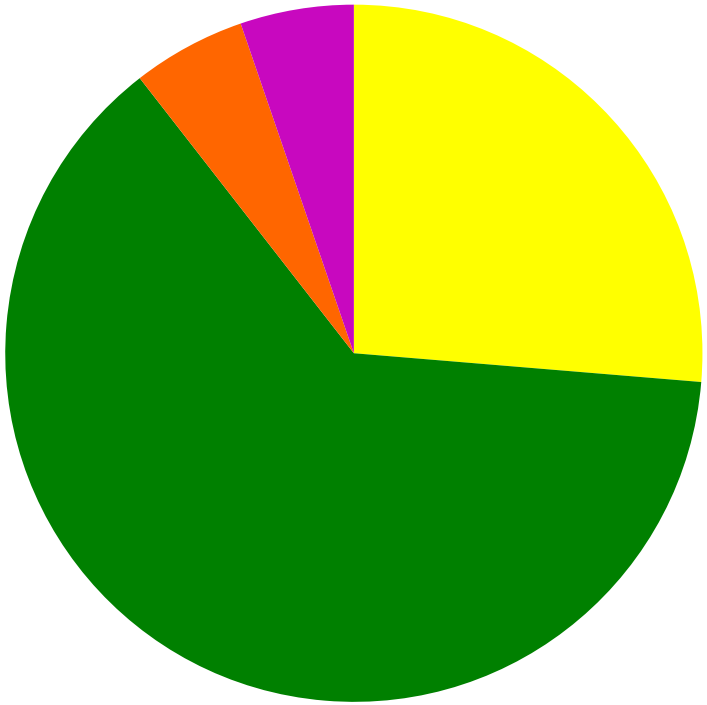
Coffee trees sprayed with the local strains has more fruits colonized with Bb than Mycotrol®



Environmental conditions:
Coffee sun plot, Min temp: 15.4 ºC, Max temp: 35.3 ºC, Mean temp: 23.1 ºC

Genotypes of Bb strains before application

Before the application, neither the local strain we applied nor Mycotrol® strain was present.



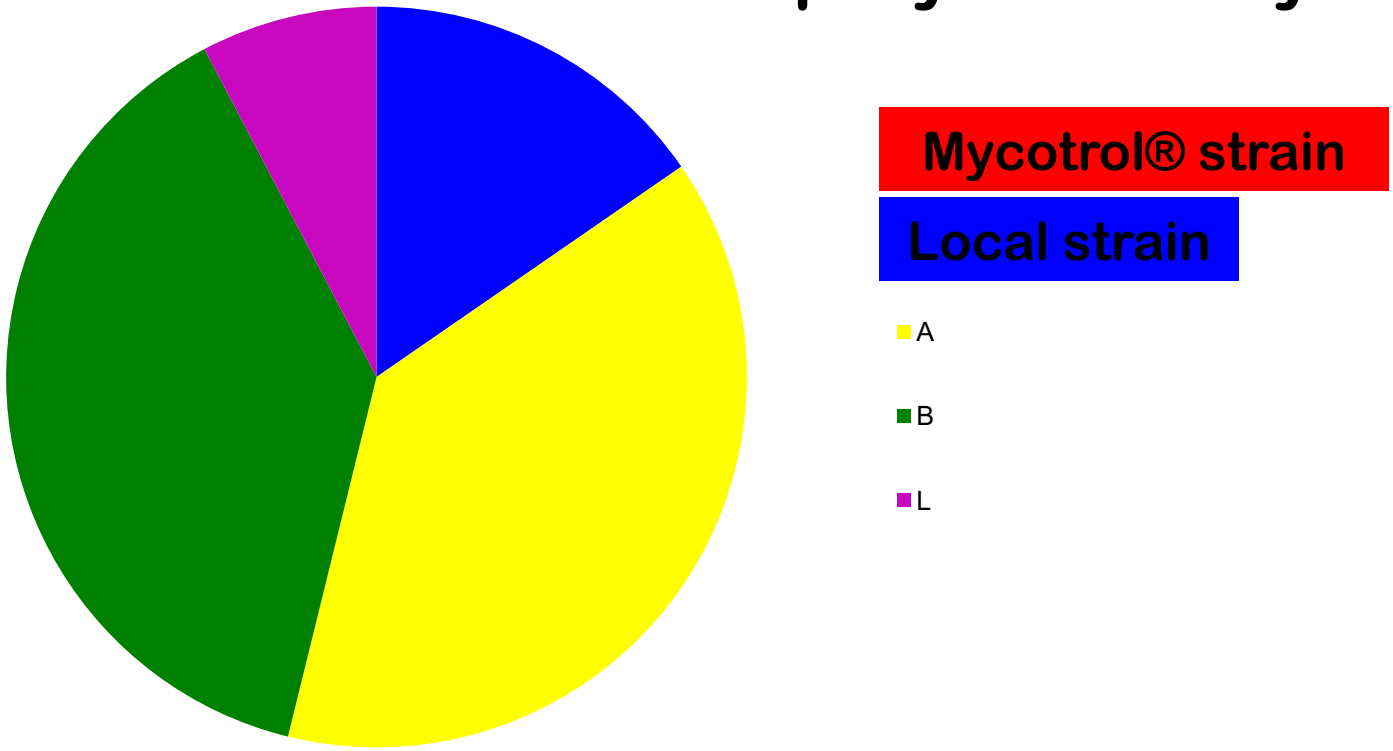
Local strain

Mycotrol® strain

N = 14

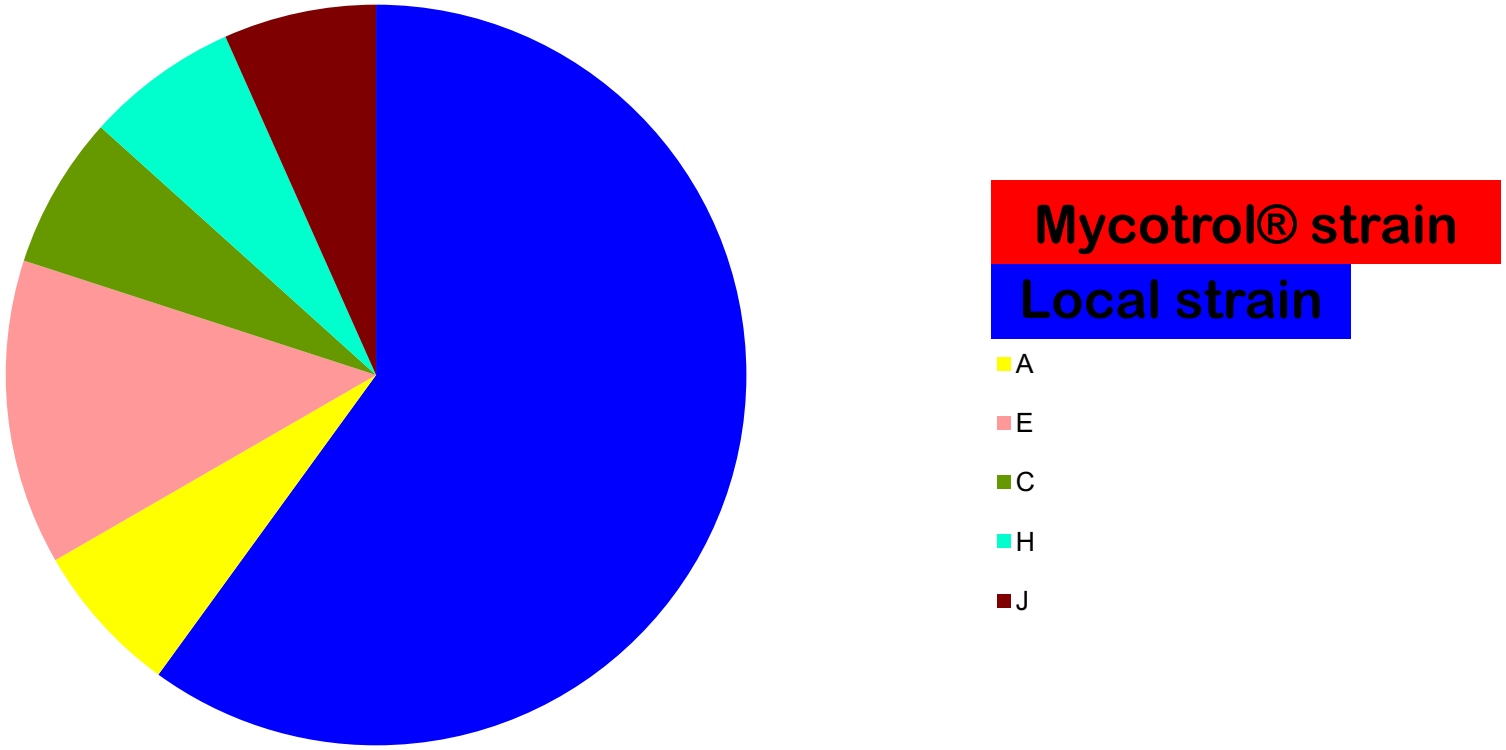
Persistence of Bb strains after the application

In control trees (sprayed only with water and Tween), the local strain was present; probably colonized from where it was sprayed nearby.



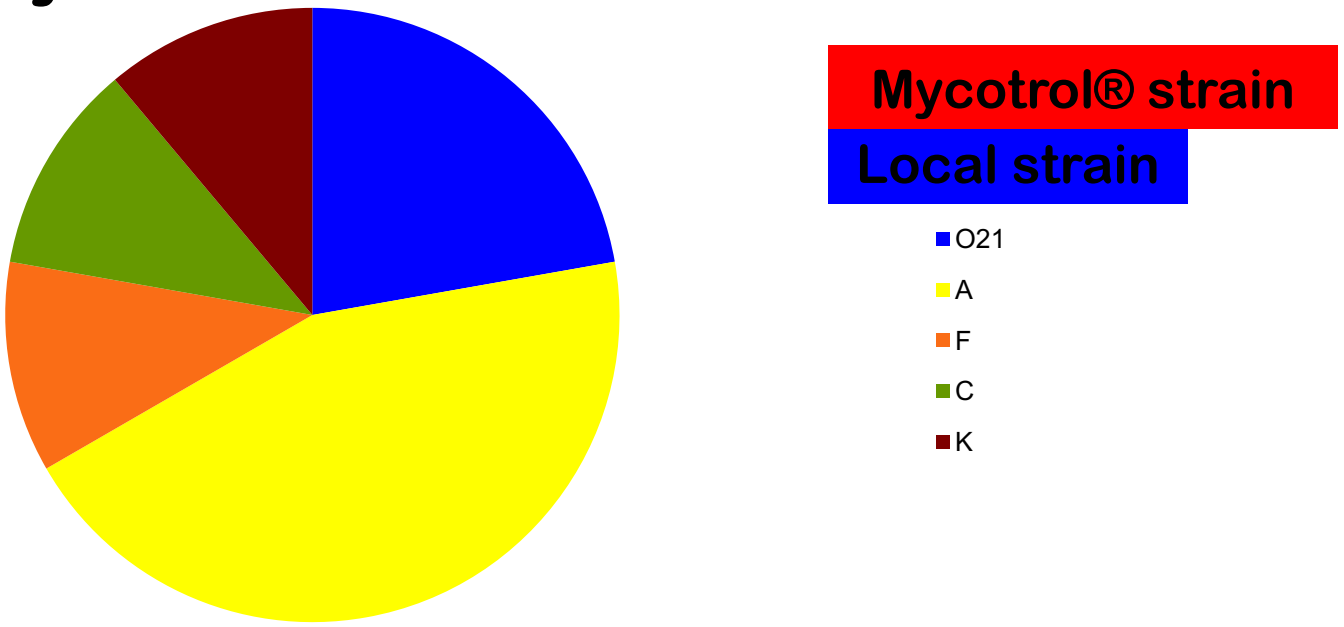
Persistence of Bb strains after the application

In trees sprayed with the local strain, it was the most common but not the only one.



Persistence of Bb strains after the application

In trees sprayed with Mycotrol®, this strain didn't persist. The local strain was recovered; it may have colonized from nearby plants where it was sprayed.



Coffee berry disease and *B. bassiana*

Can *B. bassiana* control coffee berry disease?

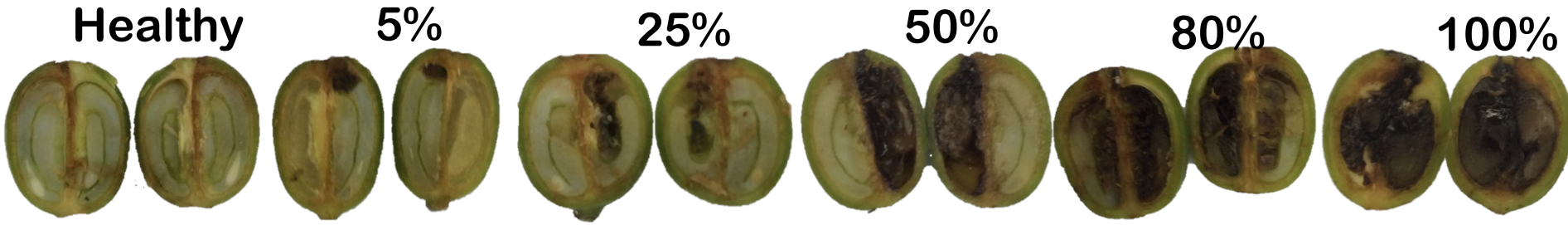
Luz Miryam Serrato
Doctoral student

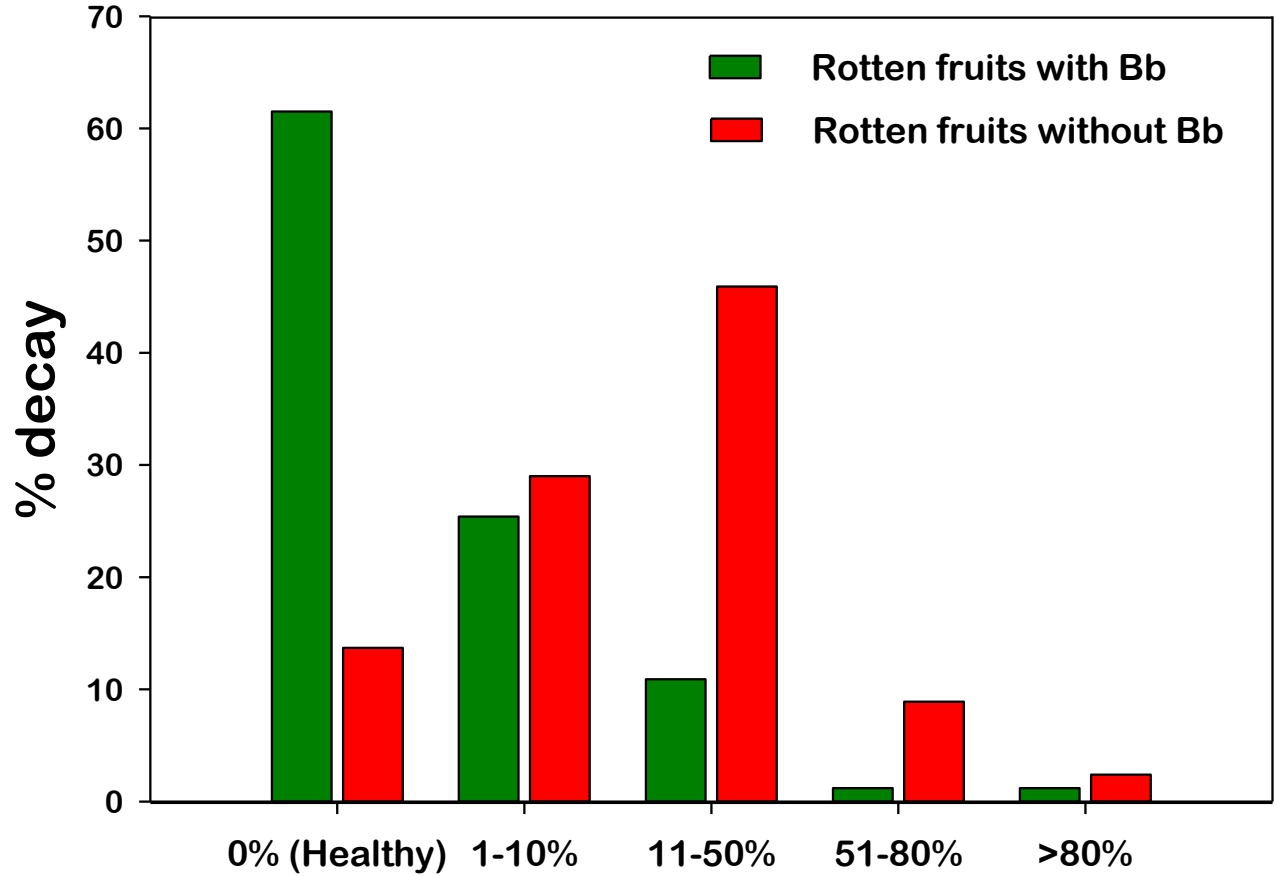
-Coffee berry disease has been reported only in Africa

-The disease is caused by *Colletotrichum*

-We isolated *C. siamense, C. fruticola, C. tropicale, C. theobromae* from rotten fruits in Puerto Rico.

Can *B. bassiana* control coffee berry disease?





CONCLUSIONS

1. Laboratory experiments showed that local strains of *B. bassiana* were similar in virulence to the Mycotrol® strain.

2. Local strains survived and persisted better in field than the Mycotrol® strain.

3. *B. bassiana* can reduce coffee fruit rot.

4. Competition among strains of Bb and between Bb and *Colletotrichum* could be managed to reduce damage to the crop.

ACKNOLEDGEMENTS

USDA ARS

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QUESTIONS?