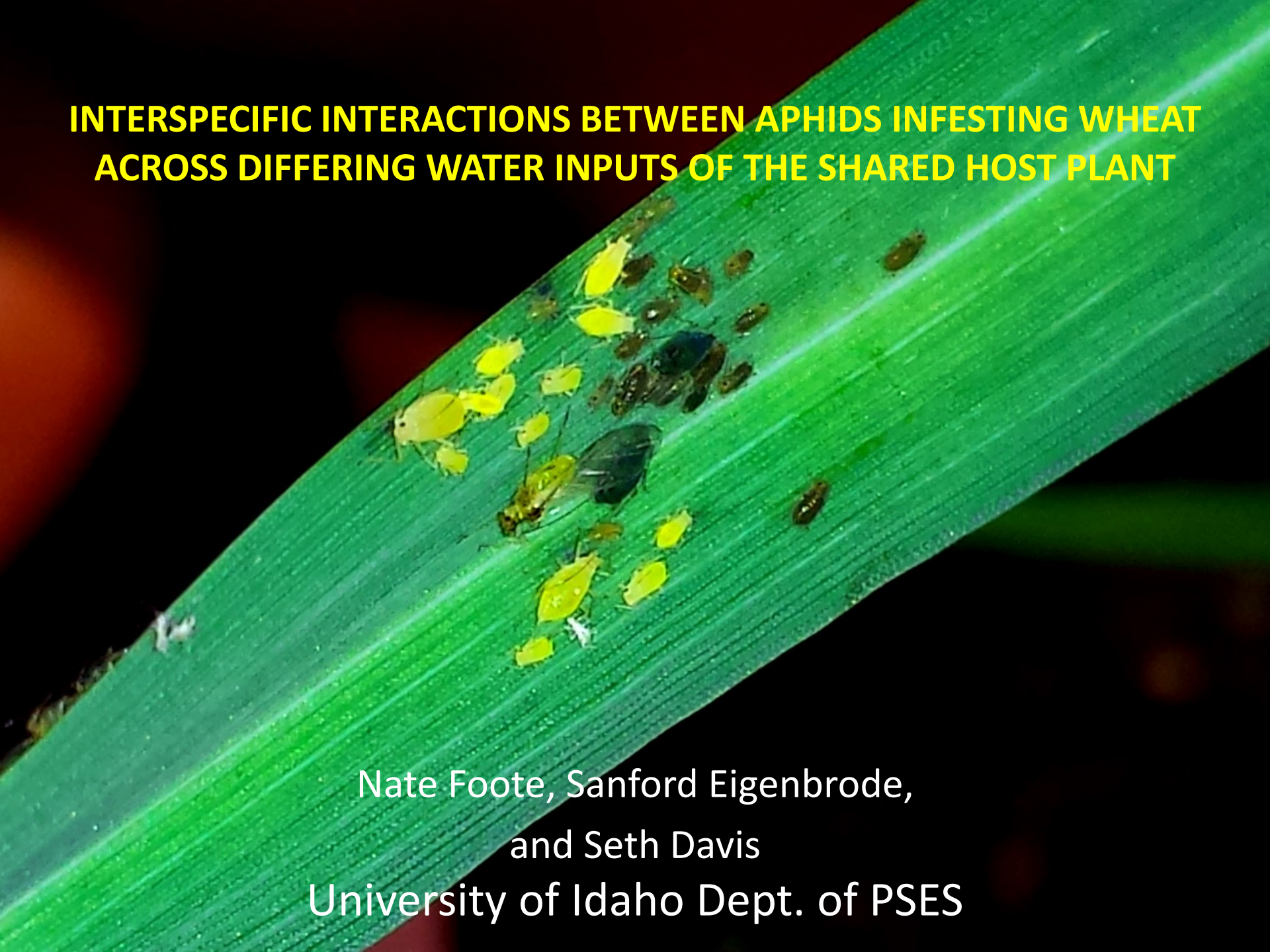
INTERSPECIFIC INTERACTIONS BETWEEN APHIDS INFESTING WHEAT ACROSS DIFFERING WATER INPUTS OF THE SHARED HOST PLANT



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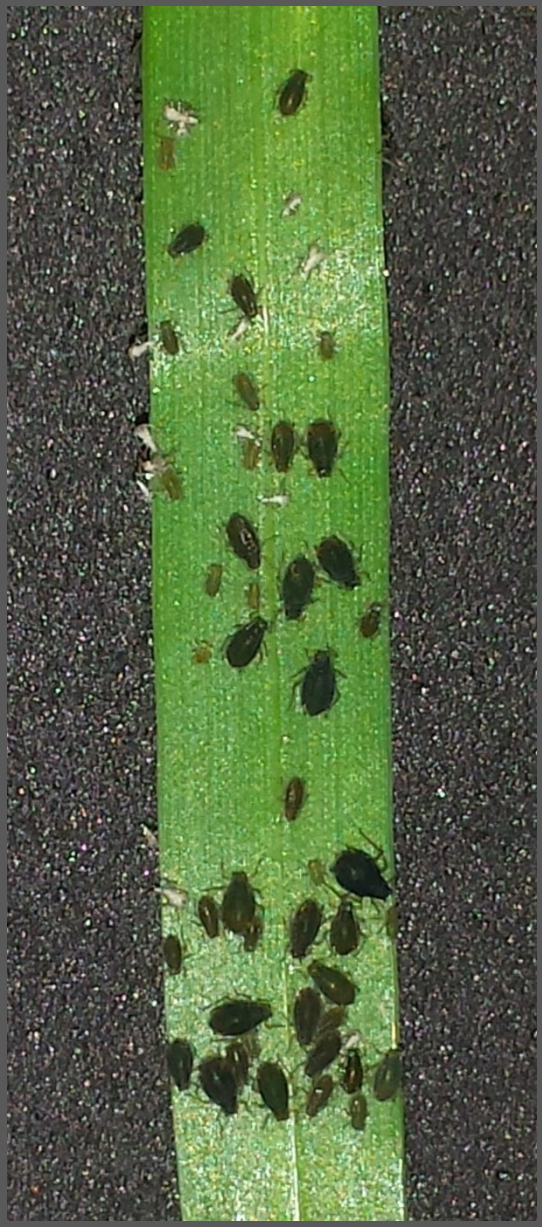
Research questions

1) Does concurrent occupation of the shared host plant by one aphid species alter the performance of the other?
2) Do differing water inputs for the shared host plant interact with one or both aphid species to alter the outcome of their interspecific interactions?

Rhopalosiphum padi L. (Hemiptera: Aphididae)

- Or, the bird cherry-oat aphid: 1 of 14 aphid spp. considered of most agricultural importance worldwide.
- Highly oligophagous—attacks all major cereals and pasture grasses.
- Has complex, holocyclic life history in United States.
- Vector of barley yellow dwarf virus
- Origin is debated, but *R. padi* is naturalized throughout United States.

(Blackman and Eastop 2007, Finlay and Luck 2011)



Metopolophium festucae cerealium Stroyan (Hemiptera: Aphididae)

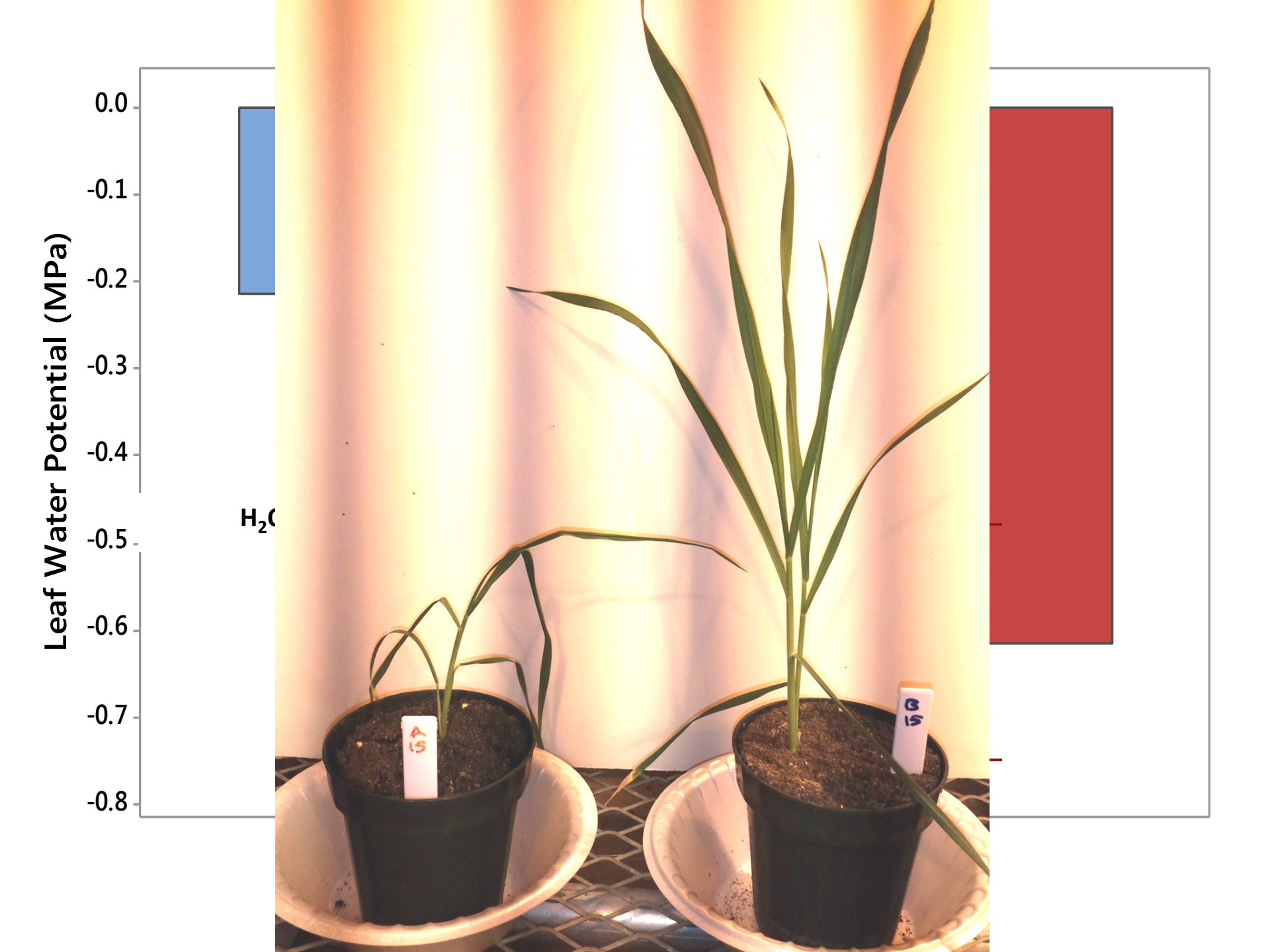
- A well-established pest in Europe (Dent 1983)
- First reported in Oregon, USA in 1994 (Halbert and Sandvol 1995).
  - Recently detected across WA, OR, and ID (Halbert et al. 2013).
  - Mean abundance in sweep net surveys increased by 331% in the region, 2011 to 2013 (Davis et al. 2014).
- Despite prevalence, little is known about *Mfc* biology in PNW agrosystems…

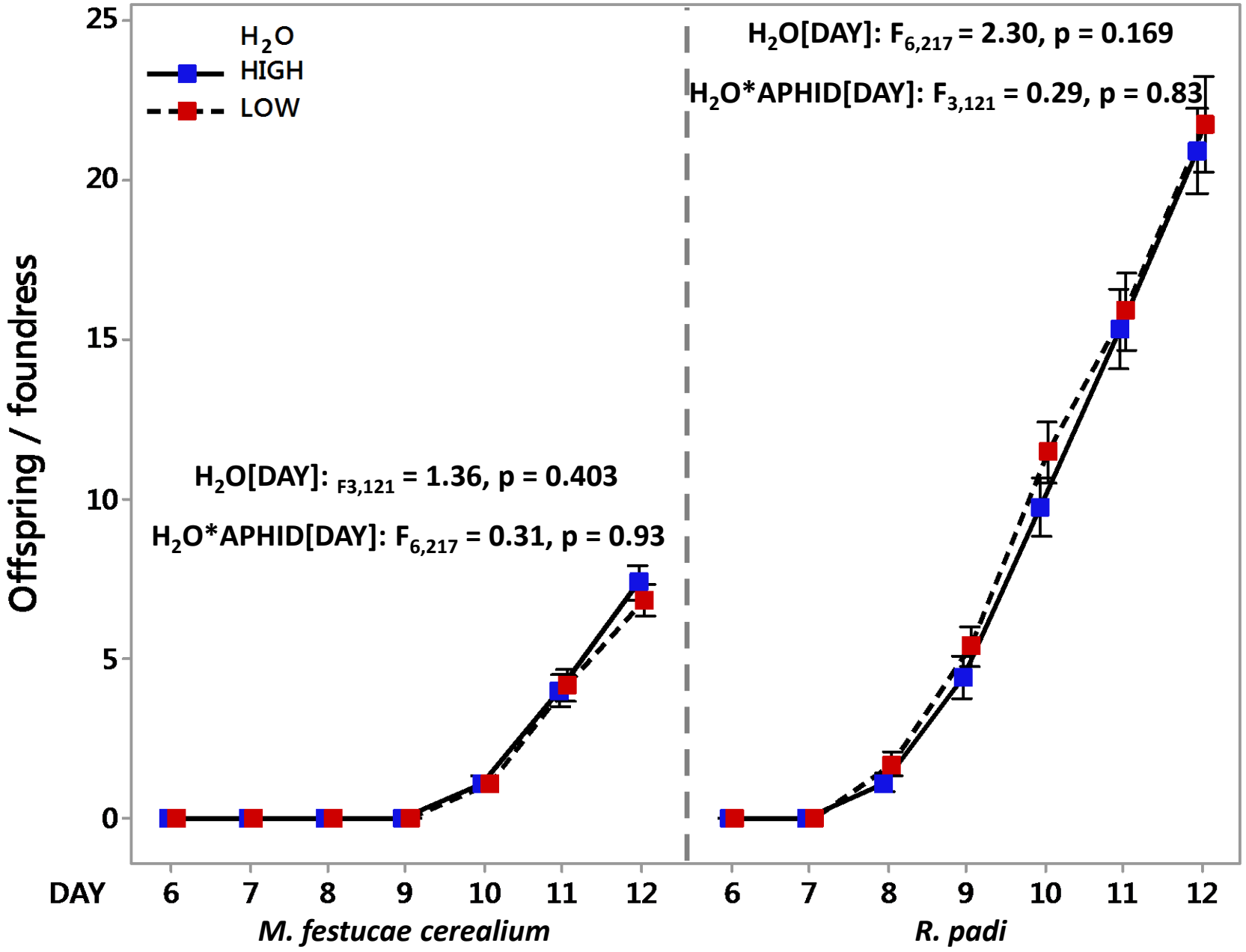
  but it prefers wheat and barley while able to reproduce on other cereals and pasture grasses; can significantly reduce wheat growth (Davis et al. 2014).
  - Anholocyclic? Overwintering behavior is unknown.
  - Not a vector of barley yellow-dwarf virus
  - Interacts with naturalized aphid species?

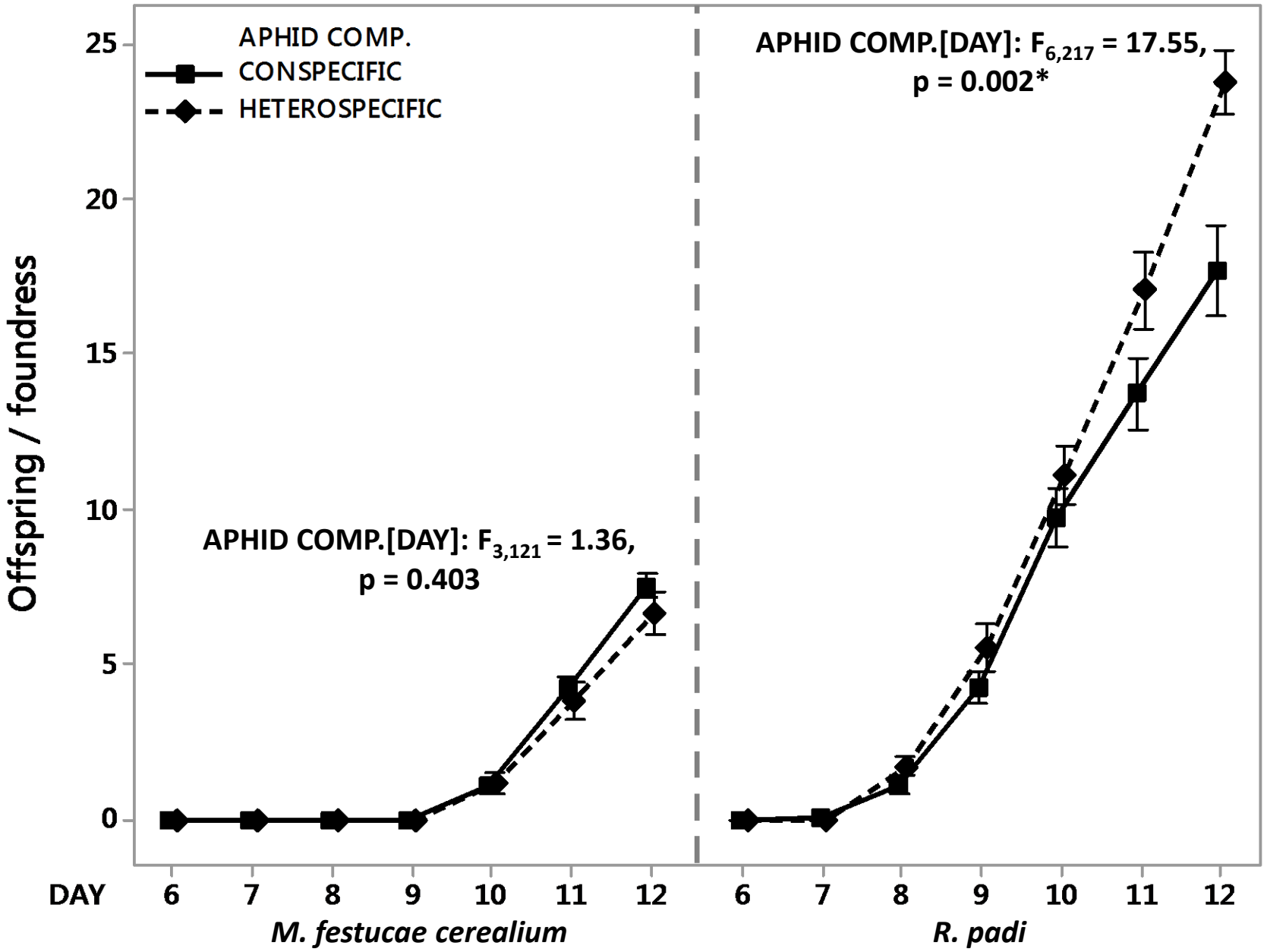
Experimental design

RHPA: MEFC	1: 0	0.5: 0.5	0: 1	0: 0 (control)
HIGH H_2O (80% / 72 h)	TRT 1 x 12	TRT 2 x 12	TRT 3 x 12	TRT 4 x 12
LOW H_2O (10% / 72 h)	TRT 5 x 12	TRT 6 x 12	TRT 7 x 12	TRT 8 x 12

- Balanced, randomized complete block design
- 12 replications across 8 treatment groups
  - 96 total experimental units


Leaf Water Potential (MPa)
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
H_2O


H2O
HIGH
LOW
H2O[DAY]: F6,217 = 2.30, p = 0.169
H2O*APHID[DAY]: F3,121 = 0.29, p = 0.83
H2O[DAY]: F3,121 = 1.36, p = 0.403
H2O*APHID[DAY]: F6,217 = 0.31, p = 0.93
Offspring / foundress
25
20
15
10
5
0
DAY
6
7
8
9
10
11
12
M. festucae cerealium
R. padi


APHID COMP.
CONSPECIFIC
HETEROSPECIFIC
APHID COMP.[DAY]: F6,217 = 17.55,
p = 0.002*
APHID COMP.[DAY]: F3,121 = 1.36,
p = 0.403
Offspring / foundress
25
20
15
10
5
0
DAY
6
7
8
9
10
11
12
M. festucae cerealium
R. padi

Results summary

1. Differing H_2O inputs significantly affected wheat leaf water potential but had no significant effects on *M. festucae cerealium* or *R. padi* reproduction.
2. Simultaneous colonization of host plants by *M. festucae cerealium* signficantly increased *R. padi* reproduction while *R. padi* presence had no effect on reproduction of *M. festucae cerealium*.
3. No significant H_2O input x aphid treatment interactions occurred affecting either *M. festucae cerealium* or *R. padi* reproduction.

Conclusions

1. Both *M. festucae cerealium* and *R. padi* can reproduce seemingly unaffected on wheat plants experiencing an average -0.4 MPa drought stress.
2. Presence of *M. festucae cerealium* facilitates *R. padi* reproduction under concurrent occupation of the same host plant tissue. This suggests a potentially commensalistic relationship between these two aphid species (i.e., *Mfc* remains unaffected while *R. padi* benefits).
3. On a whole-plant scale, these results may change—an experiment designed to demonstrate this possibility is currently underway.

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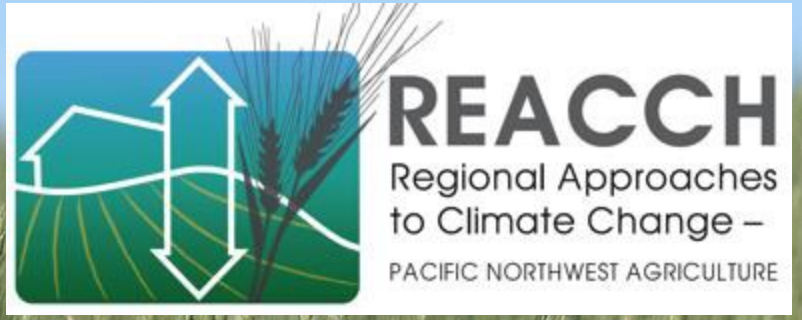

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photo by B. Stokes

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