PREreview of bioRxiv article "The vesicular trafficking system component MIN7 is required for minimizing *Fusarium graminearum* infection"

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[1]PREreview

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Summary

This is a review of Wood and Panwar, et al. bioRxiv (https://doi.org/10.1101/2020.03.16.994095) posted on March 18, 2020. Here, Wood and Panwar et al. assessed whether vesicular trafficking proteins, which have been previously identified to have a functional role in the innate immune response in Arabidopsis, also play a role in *Fusarium graminearum* recognition. In this pre-print manuscript, the authors identified two Arabidopsis mutants,*atmin7-1* and *atmin7-2* , that are hyper-susceptible to*F. graminearum* as indicated by an enhancement of FHB disease symptoms compared to the Arabidopsis Col-0 control. These data may suggest MIN7, which encodes an ARF-GEF protein previously shown to be targeted by the *Pseudomonas syringae* pv. t*omato* effector HopM1, has a role in mediating a defense response against *F. graminearum* . To test whether their observations from Arabidopsis and can be translated to a crop plant such as wheat, Wood and Panwar et al. identified three co-orthologous *Min7* genes in wheat and subsequently used Barley Stripe Mosaic Virus (BSMV)-mediated virus-induce gene silencing (VIGS) knockdown *TaMin7* expression. Significantly, *TaMin7* -silenced wheat displayed enhanced susceptibility to *F. graminearum* and significantly more FHB disease symptoms. Collectively, these data suggest disruption of MIN7 function in both Arabidopsis and wheat may compromise trafficking of innate immunity signals, thereby enhancing susceptibility to *F. graminearum* .

Comments

Results section — *Fusarium graminearum* infection of different Arabidopsis mutants

To investigate whether a vesicular trafficking protein has a functional role in the compatible interaction between *F. graminearum* (strain PH-1) and Arabidopsis, the authors screened a collection of Arabidopsis mutants with known mutations in nine immunity genes. Significantly, *atmin7-1* and *atmin7-2*were the only mutants that developed extensive FHB disease symptoms and necrotic lesions compared to wild-type Col-0. Have the authors thought about complementing *atmin7-1* and *atmin7-2* with a functional copy of AtMIN7 in a gain-of-function assay?

Results section — BSMV-mediated VIGS of *TaMin7*

- In Figure 4, the authors use the wheat variety 'Bobwhite' for their BSMV-mediated VIGS assays. However, showing hyper-susceptibility in an already susceptible wheat variety can be difficult to demonstrate, especially given the highly variable nature of FHB symptom development. We, therefore, suggest the authors include an additional control wherein they silence *TaMin7* in an FHB-resistant cultivar (such as Sumai3 or Ning7840). Including such an FHB-resistant genotype would provide additional evidence and strengthen their claim that silencing *TaMin7* confers susceptibility to *F. graminearum* .
- In Figure 4B and C, Wood and Panwar, et al. use the BSMV:*mcs4D*construct as a negative control to show that knockdown of*TaMin7* transcript expression results in hyper-susceptibility to*F. graminearum* . Have the authors thought about designing an additional VIGS fragment that targets a different portion of the*TaMin7* gene and test whether these *TaMin7* -silenced plants are still hyper-susceptible to *F. graminearum* ? Doing so would greatly strengthen the claim that the hyper-susceptibility phenotype is a result of specifically silencing *TaMin7* and not due to off-targeting.
- In addition to the data presented in Figure 4B, we propose the authors also quantify the amount of fungal DNA per spike to assess fungal burden (as performed in Dilks et al 2019; PLoS Pathog 15(4): e1007666). Adding such data would provide additional evidence to their claim of hyper-susceptibility in *TaMin7* -silenced wheat.
- In lines 146 – 149, the authors state there are no observable developmental or growth defects in the untreated Arabidopsis mutants. Are their observable phenotypic effects as a result of silencing*TaMin7* in wheat?

Materials and Methods section — The authors should clearly state how many individual plants were tested in each of the VIGS replicate experiments.

Discussion section — In lines 276 – 278, the authors state that *TaMin7* transcript expression may be repressed in *F. graminearum* -infected wheat (data not shown). We propose that the authors did themselves a disservice for omitting such data (unless, of course, these data were preliminary at the time of submission). We encourage Wood and Panwar, et al. to repeat this experiment and present these data as a separate figure. Such additional data would further support their hypothesis and strengthen their claim that *TaMin7*has a functional role in FHB resistance.

Editorial comments

Line 123: "if" – do the authors mean of?

Line 164: "trice" – do the authors mean thrice?