10.1071/FP22274

Functional Plant Biology

Supplementary Material

Mesoporous silica nanoparticle-induced drought tolerance in *Arabidopsis thaliana* grown under *in vitro* conditions

Thi Linh Chi Tran[A], *Albert Guirguis*[A], *Thanojan Jeyachandran*[B], *Yichao Wang*[A], *and David M. Cahill*[A,*]

[A]Deakin University, School of Life and Environmental Sciences, Waurn Ponds, Vic. 3216, Australia.

[B]Deakin University, Institute for Frontier Materials, Waurn Ponds, Vic. 3216, Australia.

[*]Correspondence to: David M. Cahill Deakin University, School of Life and Environmental Sciences, Waurn Ponds, Vic. 3216, Australia Email: david.cahill@deakin.edu.au

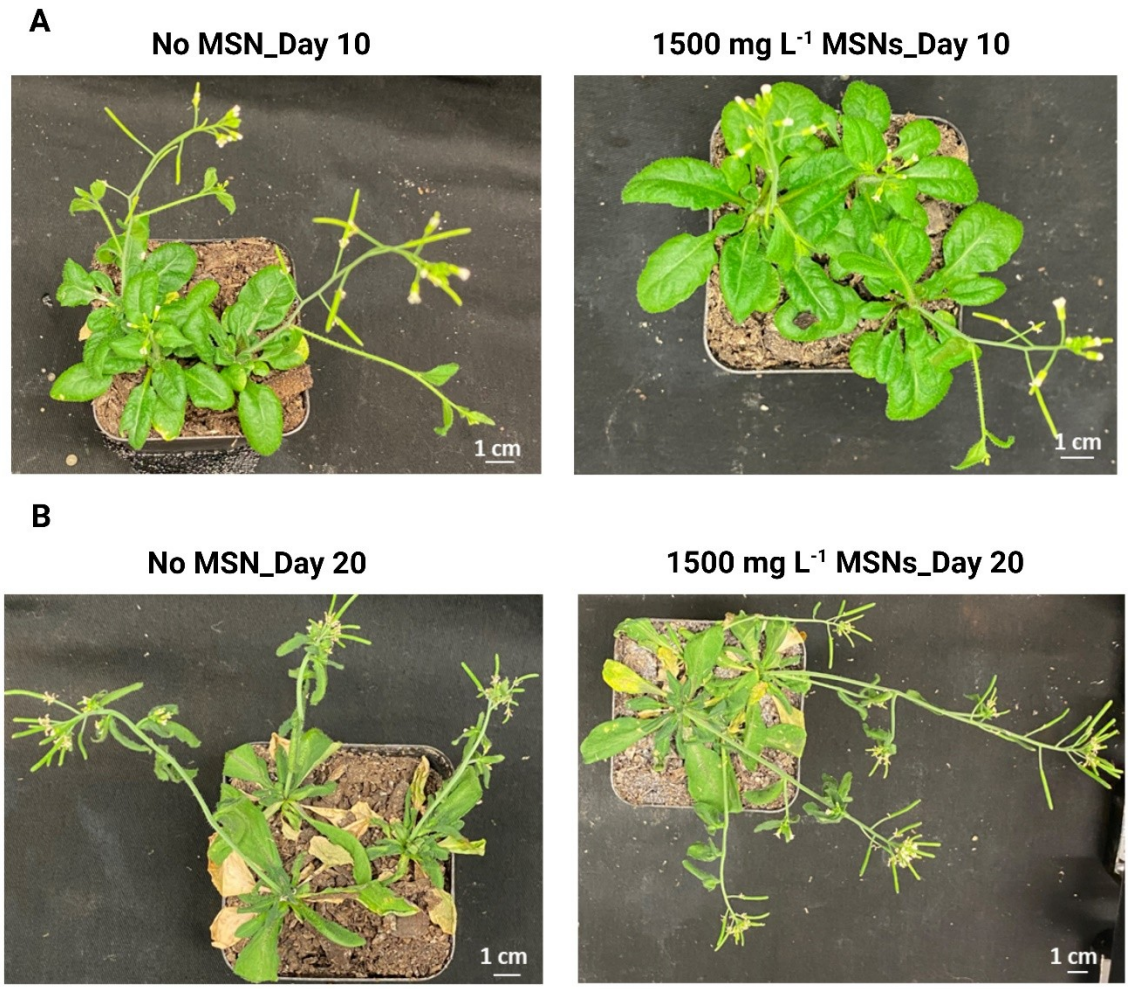

Fig S1. Effects of different concentrations of MSNs on drought responses of *Arabidopsis* growing in pots. Representative images of *Arabidopsis* treated with 0 and 1500 mg L^{-1} MSNs after 10 and 20 days exposed to simulated drought in pots (scale = 1 cm).

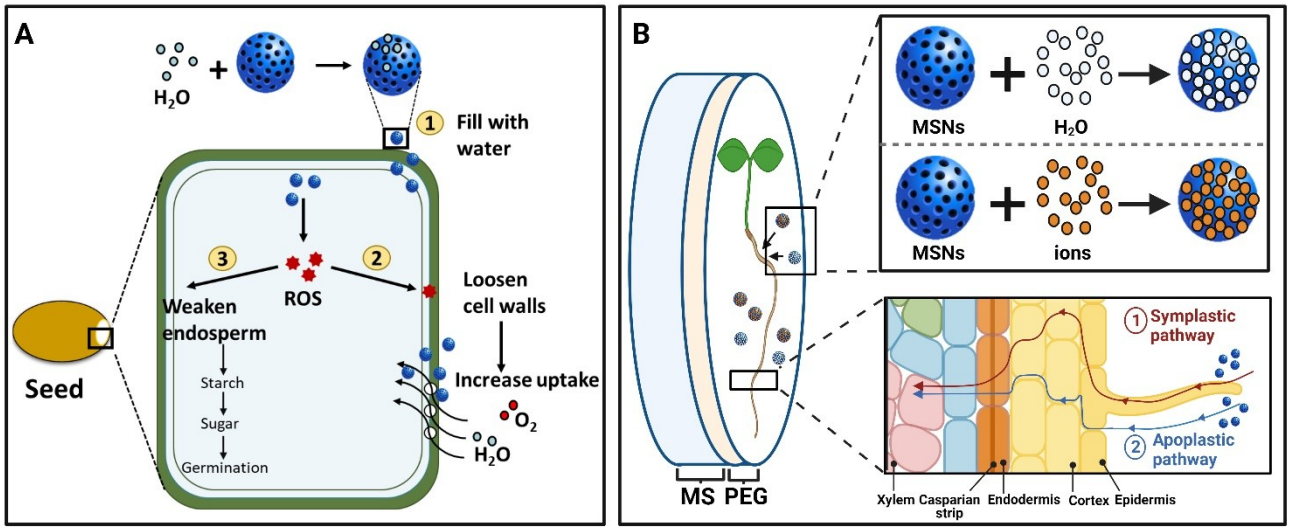

Figure S2. Proposed mechanisms for the interaction of MSNs with *A. thaliana*. In this study, we have shown that treatments with MSNs increased morphological and biophysiological characteristics of Arabidopsis seeds and seedlings. Based on findings from this research and other studies (Rahimi et al. (2021), Lu et al. (2020), and Sun et al. (2014)), here, we propose the mechanisms of action of MSNs, (A) in seed germination, and (B) in whole Arabidopsis plants. **(A) Mechanisms of action of MSNs in seed germination** (modified from Rahimi et al. (2021)). MSNs containing water in their mesopore are taken up by seeds through the seed coat. Internalised MSNs mediate ROS production leading to the loosening of seed coat cell walls and increasing the uptake of oxygen and water. ROS also induces α-amylase production which releases glucose from starch and promotes germination. **(B) Mechanism of action of MSNs in whole plants.** The system used was a vertical Petri plate containing MSN-MS medium overlain by a layer of PEG. Roots grew along the agar surface interacting directly with MSNs. The MSNs contained water and ions that were delivered via the apoplastic and symplastic pathways to the vascular tissues, as demonstrated by Sun et al. (2014). Note that the figures are not to scale. The illustration was created by BioRender (https://app.biorender.com/).