APPLICATIONS OF SELENIUIM NANOPARTICLES IN AGRICULTURE

UMassAmherst | College of Natural Sciences
Center for Agriculture, Food, and the Environment

Jimmy Tran, Heping Shang, Dr. Baoshan Xing
Paige Lab, Stockbridge School of Agriculture, UMass Amherst

GRANGE

USDA NIFA
United States Department of Agriculture
National Institute of Food and Agriculture

INTRODUCTION

Fusarium oxysporum wilt is a common fungal disease that affects several varieties of economically important crops including tomatoes, potatoes, and lettuce. On top of its ability to live in soil without an actual living host, *fusarium oxysporum* stunts infected plants resulting in leaf and xylem decay. Management of *fusarium oxysporum* includes seed cleaning, fungicide use, and crop rotation. The downside to these methods is that they are expensive, can result in leaching, and take a long amount of time.

Selenium nanoparticles (Se NPs) have been a rising trend in agricultural technology with improving plant and soil properties. Being a minor essential nutrient for plants, the idea of Se NPs being able to combat fungal diseases without the repercussions of overuse of fungicide does not seem far-fetched.

This research was mainly focused on the evaluation of the efficacy of Se NPs in suppressing lettuce *fusarium oxysporum* wilt by foliar and root application.

METHODS

Characterization of Se NPs

Hydrodynamic diameter and UV-vis spectra of Se NPs were determined using dynamic light scattering (DLS, Brookhaven, 90Plus) and a UV-vis spectrophotometer (Agilent 8453).

Greenhouse Study

Lettuce seeds (Black Seeded Simpson, Washington Atlee Burpee & Co., PA, USA) were germinated in Pro-mix BX (Griffin Greenhouse supplies Inc., MA, USA) potting soil in greenhouse.
After 2 weeks, lettuce seedlings were transplanted into pots (10 cm diameter and 9 cm height) filled with 300 g of Fusarium oxysporum infected soilless potting mix (1 g incubated millet/100 g Pro-mix BX).
Se NPs were homogeneously applied with the Pro-mix. Non-exposed lettuce seedlings infected with Fusarium oxysporum were also planted to serve as untreated infected control. There were six replicate pots in each treatment.
After one month, seedlings were harvested and fresh biomass of shoots and roots were recorded, and the tissues were then stored at −80 °C until analysis.

RESULTS

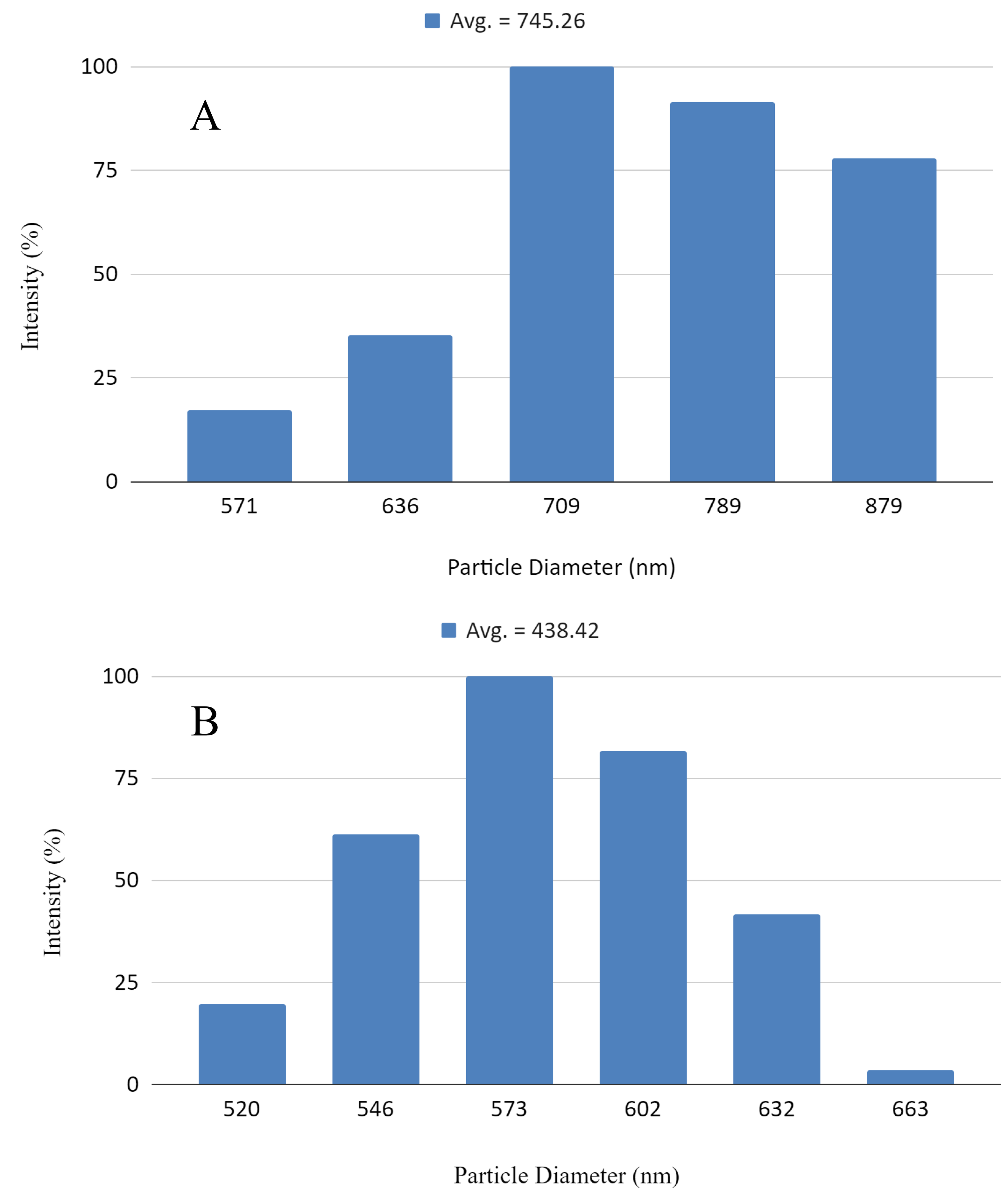

Figure 1. Size distribution (A) bare Se NPs and (B) *Aloe vera* leaf extract coated Se NP s at 50 mg/L

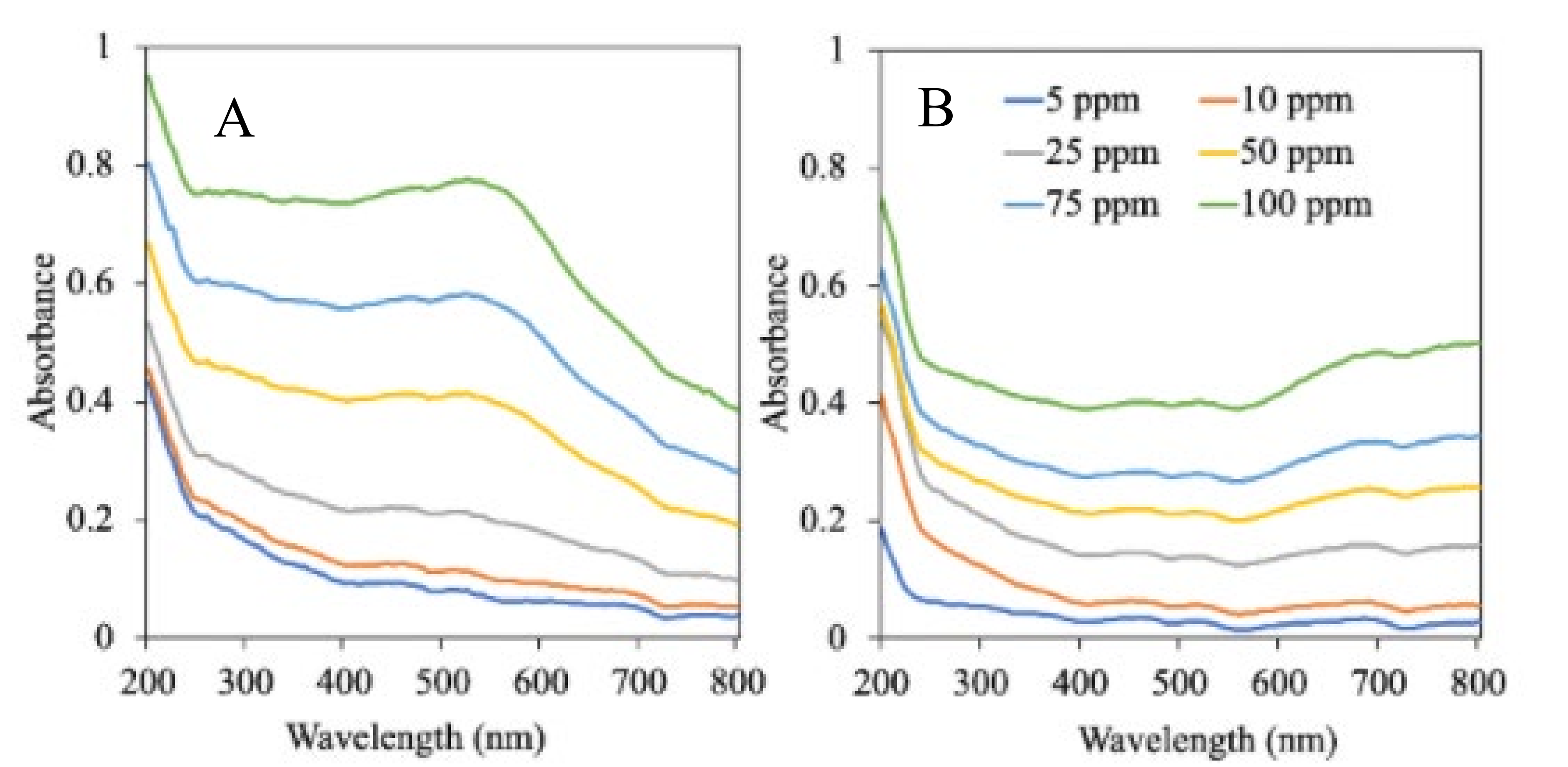

Figure 2. UV-Vis spectra of (A) *Aloe vera* leaf extract coated Se NPs and (B) bare Se NPs at 5-100 mg/L

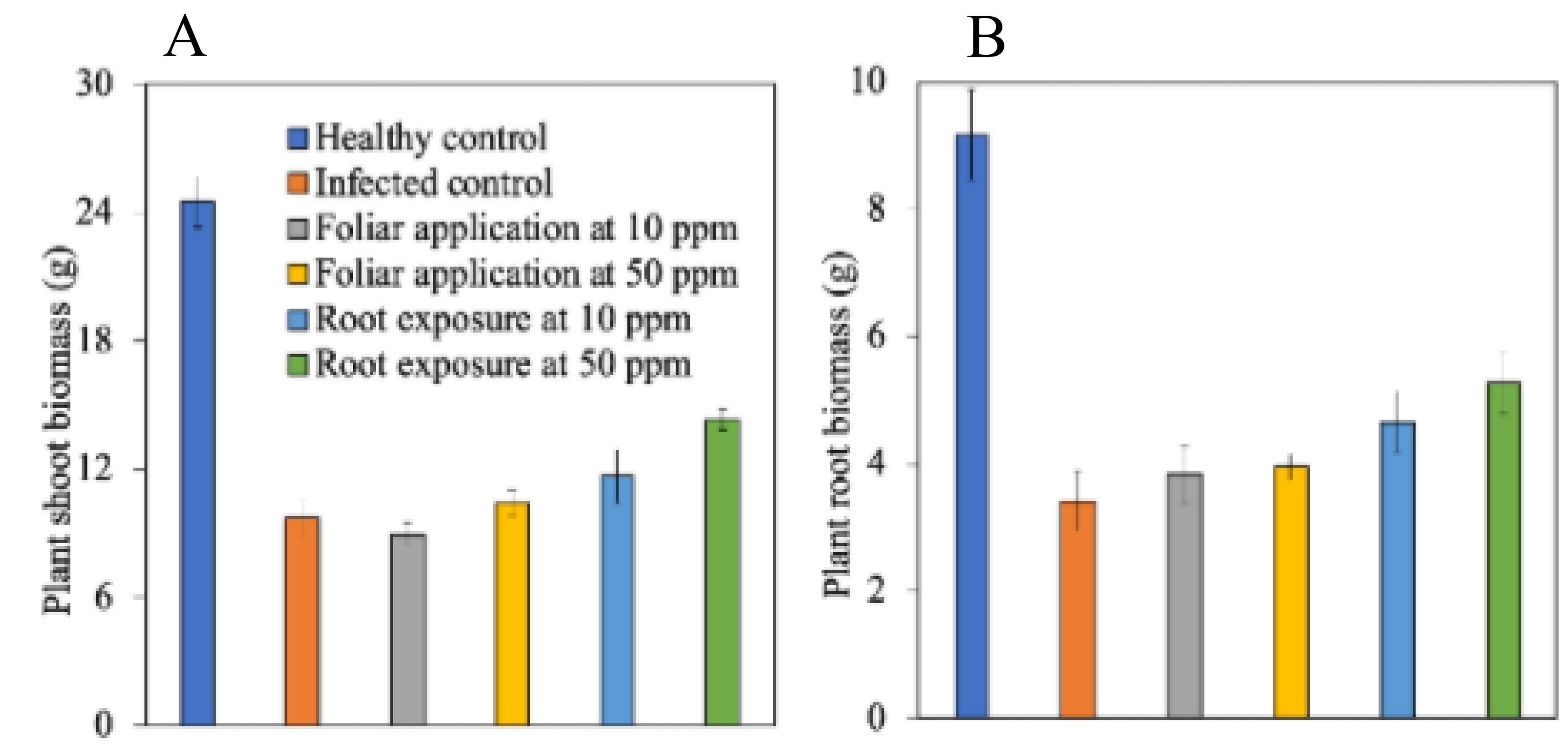

Figure 3. Physiological responses of *Fusarium oxysporum*-infected lettuce after exposure to *Aloe vera* leaf extract coated Se NPs at 50 mg/L. (A) Fresh shoot and (B) root biomass.

CONCLUSION

The average hydrodynamic diameter of bare Se NPs and aloe vera coated Se NPs at 50 gm/L is 745.26 nm and 438.42 nm respectively. The maximum absorbance of aloe vera coated Se NPs was 525 nm, which is characteristic of Se NPs. Higher concentrations of aloe-coated Se NPs were able to combat fusarium oxysporum and retain higher biomass.

FUTURE RESEARCH

With this information, further research can be conducted on how selenium nanoparticles might perform with different hosts such as tomatoes or potatoes. Studying this interaction between Se NPs and their host will help to shed light on whether or not this study presents results specific to how lettuce incorporates Se NPs in their defenses against *fusarium* wilt.

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