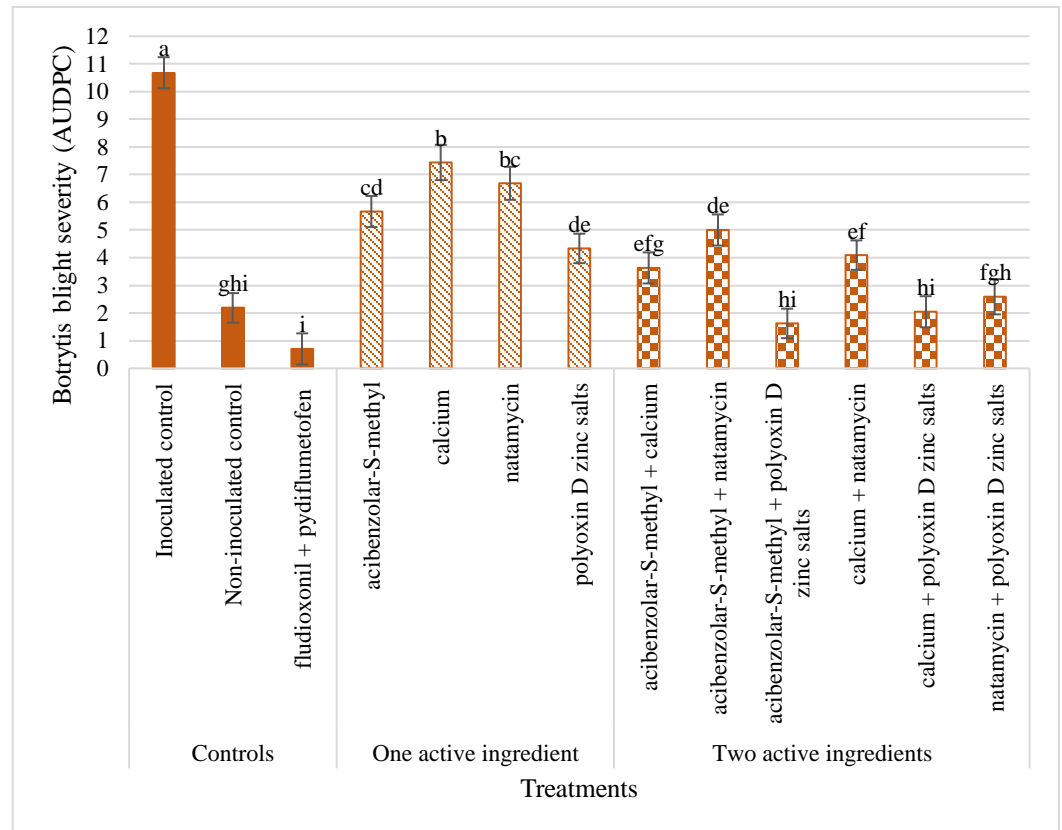


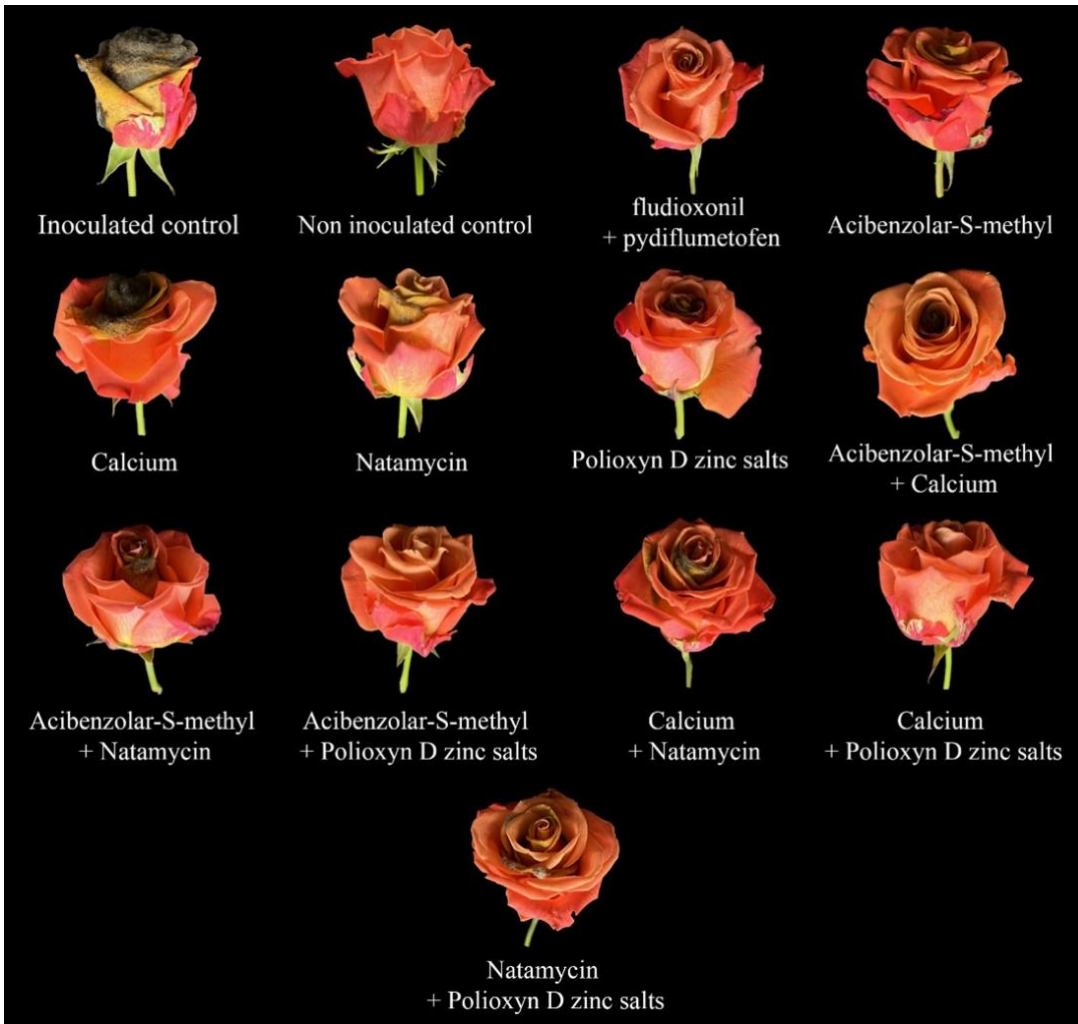
## Tank Mixes of Biorational Products can provide Botrytis Blight Control on Roses Comparable to the Best Chemical Fungicides

Over the past two years, we have been evaluating different biorational products for botrytis blight management, including biological control agents, plant nutrients, plant extracts, microorganism-derived compounds, and systemic acquired inducers. Actigard, Affirm, ON-Gard Calcium, and Zivion were the best-performing products for roses.

Actigard (acibenzolar-S-methyl) is an activator of host resistance against pathogens. Affirm (polyoxin D zinc salts) has antifungal properties. ON-Gard Calcium (calcium) is a formulation of calcium chloride and soy protein hydrolysate that increases calcium uptake. Zivion (natamycin) is a food preservative with antifungal properties and is labeled for postharvest disease management of fruits and control of diseases of mushrooms. We tested the efficacy of all these products against botrytis blight on cut roses, alone and in combination, to determine if any additive or synergistic effect occurred when used in a tank mix.



**Figure 1.** Botrytis blight severity of cut roses treated with acibenzolar-S-methyl (Actigard, 0.04 g/L), calcium (ON-Gard Calcium, 20 ml/L, 1000 ppm Ca), natamycin (Zivion, 4.84 ml/L), polyoxin D (Affirm, 0.5 g/L), and their combinations. Flowers were treated 24 h prior to inoculation with botrytis spores. Miravis Prime (fludioxonil + pydiflumetofen) was the chemical fungicide control. Inoculated and non-inoculated roses were also used as controls. Treatments identified with the same lettering above bars are not statistically different from one another.



**Figure 2.** Botrytis blight damage on cut roses 7 days after inoculation. Roses treated with dip application of biorational products used alone or in tank mixes.

An experiment was conducted using commercial cut roses (var. Orange Crush). Roses were obtained from a local wholesale distributor. Upon arrival, the roses were stored dry in the cooler for 24 hours. Then, flowers were dipped for 15 seconds in a solution containing either Actigard, Affirm, ON-Gard Calcium, Zivion, or a combination of each of these products. The flower buds were inoculated with a botrytis spore solution ( $1 \times 10^5$  spores/ml) 24 h after being treated with the different products and placed in humid chambers. Disease severity was evaluated 3, 5, and 7 days after inoculation.

Miravis Prime (fludioxonil +

pydiflumetofen) was our commercial fungicide control and is one of the most effective fungicides against botrytis. Inoculated and non-inoculated controls were also included. The results are presented as the area under the disease progress curve (AUDPC), which summarizes the disease severity over the 7-day experiment. Six roses were used per treatment. The experiment was repeated three times, and the means were averaged across experiments.

## Summary

- Acibenzolar -S- methyl, calcium, natamycin, and polyoxin D zinc salts used alone reduced botrytis blight compared to the inoculated control, but were not as effective as Miravis Prime.
- All tank mixes performed significantly better than the single active ingredient products except for acibenzolar-S-methyl + natamycin, which performed equally to acibenzolar-S-methyl alone.
- Acibenzolar-S-methyl + polyoxin D zinc salt and calcium + polyoxin D zinc salts performed as well as Miravis Prime (fludioxonil + pydiflumetofen).
- These results demonstrate that tank mixes of biorational products can provide comparable control to the best chemical fungicides for botrytis blight on cut roses.