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## ABSTRACT

Induction of systemic acquired resistance might enhance plant's own defense responses. Current study aimed to promote potato plants resistance toward the Early Blight disease caused by *Alternaria solani* through multiple application of low doses of 2,4-D, abscisic acid (AB), and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) along with the recommended fungicide. Two potato cultivars (Resistant and Susceptible) were treated once a week with micro-level doses of 2,4-D, AB, and H<sub>2</sub>O<sub>2</sub> for 6 wks and then inoculated with a field strain of *A. solani*. After 48 h of infection, half of the plants within each treatment were sprayed once with the fungicide that is recommended to control *A. solani*. Results showed that phenylalanine ammonia-lyase (PAL), polyphenoloxidase (PPO), and peroxidase (POD) enzyme activities were significantly increased after 1 d of infection and lasted for more than 15 d of infection. Application of the fungicide slightly increased the activity of the enzymes. The greatest enzymes activity was recorded after treating potato with 2,4-D and H<sub>2</sub>O<sub>2</sub>. The resistant potato cultivar (Nicola) showed greater level of enzyme activity compared to the susceptible one (Spunta).

## INTRODUCTION

- Potato (*Solanum tuberosum* L.) is one of the top five consumed crops worldwide.
- It was the 5<sup>th</sup> most produced crop in Egypt with 4.8 MMT in 2013.
- A plethora of diseases infects potato including the Early Blight caused by *Alternaria solani*.
- *A. solani* reduces tuber yield and quality by 20–30%.
- Control of *A. solani* depend mainly on the application of fungicides (protectants or curative/systemic).
- Application of abiotic or biotic inducers (i.e., virulent or avirulent pathogens, cell wall fragments of microbes, plant extracts, and/or synthetic chemicals) promotes plants' immune response against pathogens.
- The inducers result in programmed cell death, so the pathogen is surrounded by dead cells.
- Also, the plant is stimulated to synthesize antimicrobial compounds such as polyphenolics that hinder pathogen growth.
- The 2,4-D and abscisic acid have induced defense responses in plants & promoted resistance to pathogens.
- Elicitation of the hypersensitive reactions results in the increased buildup of defense-related enzymes (i.e., β-1,3-glucanase, chitinase, & peroxidase)

Study objectives were:

- To promote the resistance of potatoes to *A. solani* by multiple micro-level doses of 2,4-D, AB, & H<sub>2</sub>O<sub>2</sub>
- To test the success of these treatments with the use of the recommended fungicide

## METHODOLOGY

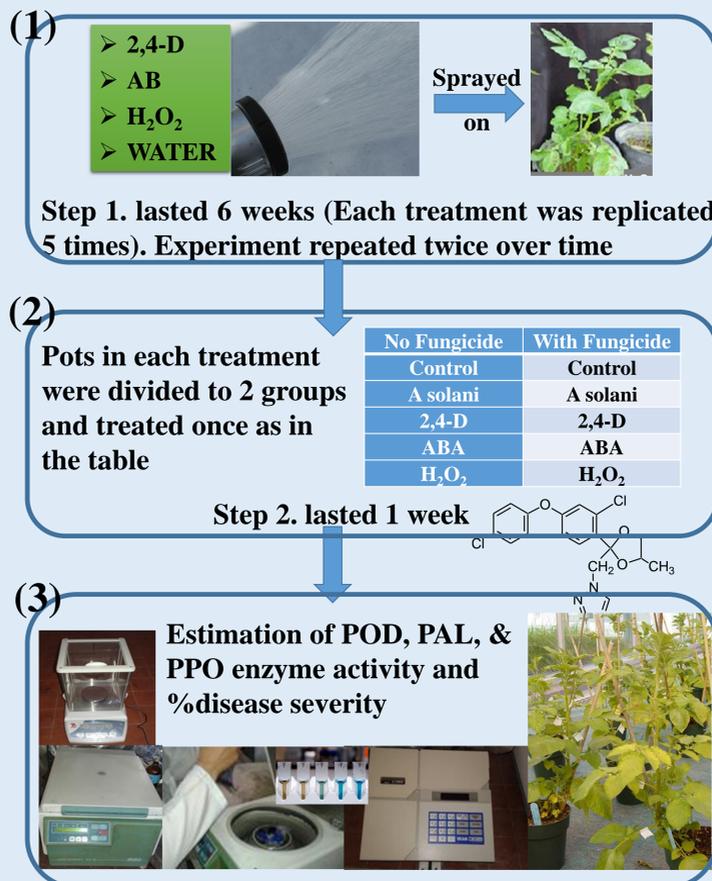


Figure 2. Potato plants after the application of AB, 2,4-D, & H<sub>2</sub>O<sub>2</sub> as separate treatment and/or in combination with the fungicide Score (F): AB+F, 2,4-D+F, & H<sub>2</sub>O<sub>2</sub>+F after inoculation with *A. solani*.

Table 1. Percent disease severity ± SD caused by Early Blight fungus to potato cultivars Nicola and Spunta after 15 d of inoculation

Treatment	Disease Severity (%)	
	Nicola	Spunta
<i>A. solani</i>	42.60±4.21	61.00±7.48
AB+ <i>A. solani</i>	19.00±2.56	32.30±4.08
AB+ <i>A. solani</i> + difenoconazole	9.20±1.26	16.12±3.15
H <sub>2</sub> O <sub>2</sub> + <i>A. solani</i>	14.00±2.64	20.00±3.54
H <sub>2</sub> O <sub>2</sub> + <i>A. solani</i> + difenoconazole	6.00±0.84	8.50±1.05
2,4-D+ <i>A. solani</i>	6.22±0.95	9.00±1.08
2,4-D+ <i>A. solani</i> + difenoconazole	2.30±0.49	5.00±0.85

## CONCLUSIONS

- Repeated treatments of low doses of AB, 2,4-D, and H<sub>2</sub>O<sub>2</sub> enhanced the acquired resistance of Nicola and Spunta cultivars to infection with *Alternaria solani*.
- The disease severity (%) varied from 2 to 19% for Nicola and 5 to 32% for Spunta compared with 43 and 61% for both cultivars challenged with *A. solani*, respectively.
- The 2,4-D was the most effective treatment followed by H<sub>2</sub>O<sub>2</sub>.
- The single spray of the fungicide with the elicitors slightly decreased the disease severity compared with the elicitors.

## RECOMMENDATION

Induction of systemic acquired resistance using low molecular weight & auxin-like chemicals might be incorporated in the management policies of the Early Blight fungus (*A. solani*).

## RESULTS & DISCUSSIONS

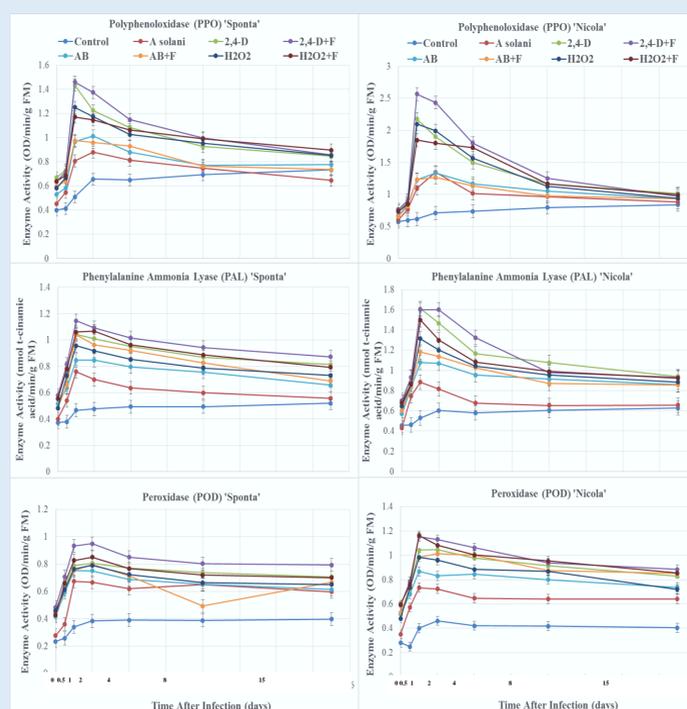


Figure 1. Specific activity of polyphenoloxidase (PPO; OD min<sup>-1</sup> g<sup>-1</sup> FM), phenyl ammonia-lyase (PAL; μmol *t*-cinamic acid min<sup>-1</sup>g<sup>-1</sup> FM), and peroxidase (POD; OD min<sup>-1</sup>g<sup>-1</sup> FM) of the potato cultivars Spunta and Nicola after the application of AB, 2,4-D, & H<sub>2</sub>O<sub>2</sub> as separate treatment and in combination with the fungicide Score® (F): AB+F, 2,4-D+F, and H<sub>2</sub>O<sub>2</sub>+F after the inoculation with *A. solani*.