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Ref. No.

The efficacy of Prosol Agrigrow against *Phytophthora* and *Pythium* in irrigation water

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Background

Phytophthora and *Pythium* are two important agricultural root fungi that lead to considerable crop losses in a number of agricultural commodities. Spores are spread from one point to another through water, whether in a river or through water in the soil, subsequently infecting crop plants. The aim of the current study was to determine if Prosol Agrigrow is effective, as an alternative fungicide, to eliminate fungal spores from river water.

Materials and Methods

This study was carried out with water from the Crocodile River in the Nelspruit area of Mpumalanga. The Crocodile River was used based on prior knowledge that both *Phytophthora* and *Pythium* were present in the water. This river is also an important irrigation source for agricultural activity in the area.

Water was pumped directly from the river into two large (70 litre) containers. From there, water was regulated at a flow rate of approximately 5 litres per hour into a series of three smaller containers (4.5 litres) placed on top of each other. The three containers were connected with rubber pipes to ensure water flowed from one container to the next (Figure 1). The flow of water through the containers was continuous for a period of 48 hours. The

top container contained the raw river water (untreated water). The raw river water would then flow from the top to the middle container where it was treated with Prosol Agrigrow at a concentration of 1:100 000 (Prosol Agrigrow to water). The treated water would then flow the bottom container (treated water). The bottom containers contained overflow pipes in which case overflow water would flow back into the river. In the top and bottom containers a bait for *Phytophthora* and *Pythium* were placed. Water flow for the period of 48 hours was to ensure that the bait effectively captured the *Phytophthora* and *Pythium* spores. The system consisted of four sets of containers that served as replicates (Figure 1).



Figure 1: The water treatment system used to assess the efficacy of Prosol Agrigrow against *Phytophthora* and *Pythium*

The *Phytophthora* and *Pythium* bait consisted of recently hardened off leaves from the avocado cultivar 'Fuerte'. After picking the leaves, they were rinsed with distilled water to clean of all dirt where after they were cut into a feather-like manner. Thereafter, one leaf was placed in each of the top containers (untreated water) and another leaf in each of the bottom containers (treated water) and allow to drift on the water for the 48 hour period to capture fungal spores.

After the 48 hour period elapsed, the leaves were taken to the Disease Management Laboratory of the Agricultural Research Council: Tropical and Subtropical Crops to assess the incidences of *Phytophthora* and *Pythium*. At the laboratory, 10 leaf disks were cut from each leaf and placed onto mediums in a petridish that were selective for *Phytophthora* and *Pythium*. The leaf discs were then incubated for 48 hours on the selective mediums. After the incubation period, the number of leaf discs from which fungal growth were observed were counted for each petridish. A report with the number of infected leaf discs were then compiled (see Annexure A). This report was used for data analysis. The treated and untreated samples were compared using analysis of variance and was considered significantly different when $P < 0.01$.

Results and Discussion

The efficacy of Prosol Agrigrow against *Phytophthora* in the river water is depicted in Figure 2. *Phytophthora* was present in the raw or untreated river water. The incidence of *Phytophthora* in the untreated water was $72.5 \pm 4.8\%$. After treatment with Prosol Agrigrow, no incidence of *Phytophthora* was recorded in the water. The Prosol Agrigrow therefore effectively eliminated all *Phytophthora* in the water. The Prosol Agrigrow most likely killed the zoospores of the *Phytophthora* fungus.

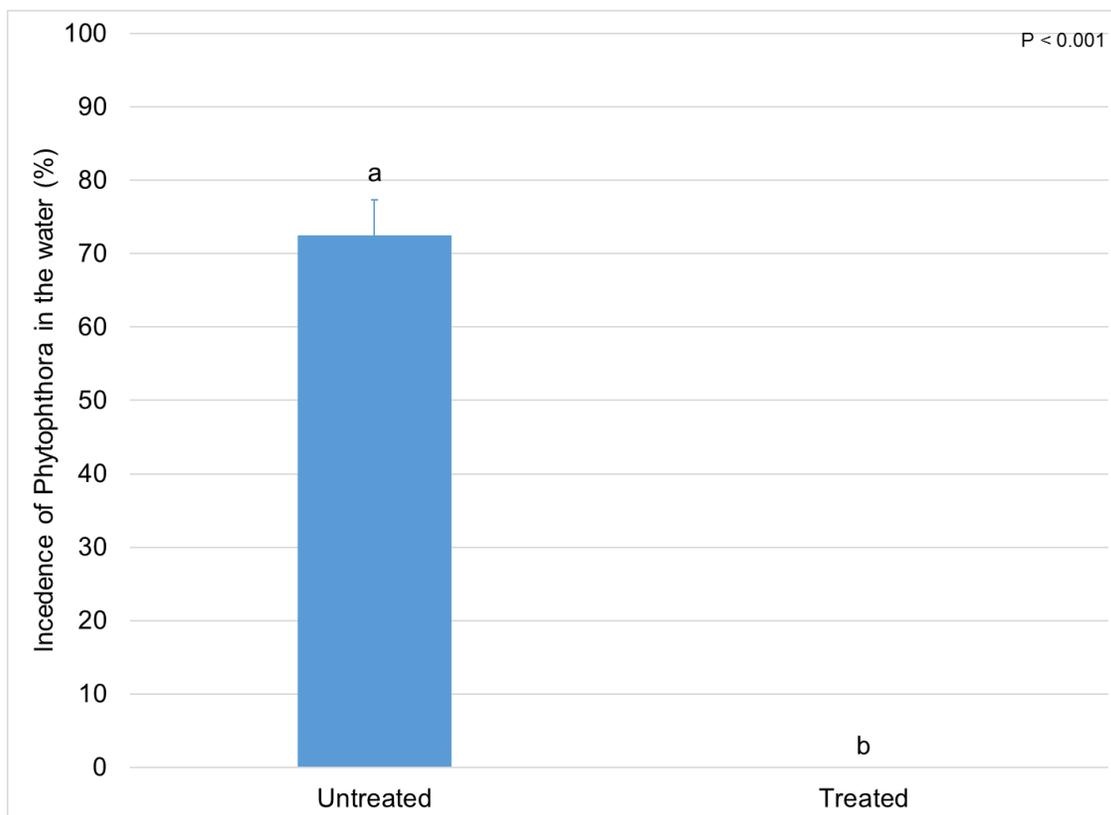


Figure 2: The efficacy of Prosol Agrigrow against *Phytophthora* in water from the Crocodile River

The incidence of *Pythium* in the river water is depicted in Figure 3. *Pythium* was also present in the raw or untreated river water. The incidence of *Pythium* in the untreated river water was $90.0 \pm 7.1\%$. No *Pythium* was present in the treated water, showing that the Prosol Agrigrow also eliminated the *Pythium* from the river water. The mode of action was most likely similar to the case of *Phytophthora*, where the spores of the *Pythium* fungus was killed.

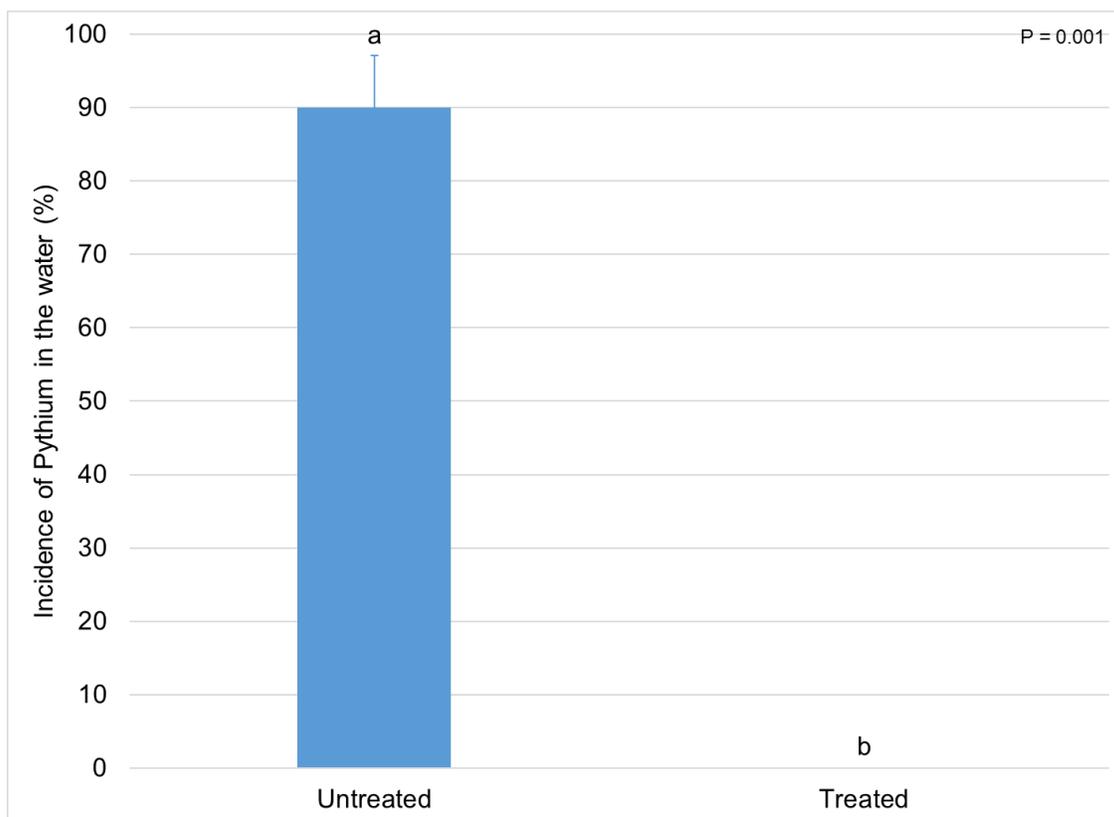


Figure 3: The efficacy of Prosol Agrigrow against *Pythium* in the water of the Crocodile River

Conclusions

The results of this study clearly showed that Prosol Agrigrow at a concentration of 1:100 000 is effective in eliminating both *Phytophthora* and *Pythium* in river water. Prosol Agrigrow can therefore be used as a water sanitizer to sanitize irrigation water before irrigating crops. For this study a relatively high dose of Prosol Agrigrow was used based on prior knowledge that the load of fungal spores in the river water is generally high. The dose to be used on-farm will be dependent on the fungal spore load of the irrigation water.