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Antifungal Properties of *Urtica dioca* against Six Phytopathogenic Fungi †

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Abstract: Several phytopathogenic fungi are responsible for massive production losses in important crops worldwide. To control diseases caused by plant fungi pathogens, a wide range of synthetic fungicides are applied in the fields. However, these agrochemicals are harmful for ecosystems (aerial, aquatic and terrestrial), non-target organisms and human health. In addition, since these antifungals have one specific cellular target, fungi can acquire resistance to them by the accumulation of mutations. Plant extracts provide natural alternatives to the use of synthetic fungicides in agriculture. Several plants are rich in secondary metabolites, including alkaloids, coumarins, flavonoids, terpenoids and saponins, that confer antifungal activity. This sustainable option is biodegradable, environmentally friendly and safer, and it is less likely to develop resistance since they often have several cellular targets. This study was conducted to investigate the antifungal activity of *Urtica dioica* extract against *Colletotrichum acutatum*, *Colletotrichum gloeosporioides*, *Colletotrichum godetiae*, *Colletotrichum nymphaeae*, *Diplodia corticola* and *Phytophthora cinnamomi*. *Urtica dioica* extract was prepared with 50% (v/v) ethanol, the solvent was evaporated at low pressure, and the residue was dissolved in water. The extract was incorporated into PDA medium at different concentrations (100, 500, 1000 and 2000 µg/mL) and mycelial discs were placed in the center of each Petri dish. Growth was measured as radial mycelial growth in the third, sixth and ninth days of incubation at 25 ºC in the dark. *Urtica dioica* extract was able to inhibit growth of all strains except *C. nymphaeae*. Growth inhibition was around 20% at 2000 µg/mL for the remaining *Colletotrichum* species. Inhibition of growth was also observed with *D. corticola* in a concentration-dependent manner from 100 µg/mL to 2000 µg/mL and revealed statistically significant differences (p<0.05) between these concentrations. Regarding the growth of *P. cinnamomi*, significant differences were observed between 100 µg/mL and 2000 µg/mL extract ($p < 0.0001$ and $p < 0.05$ on day 3 and 6, respectively). The most pronounced mycelial growth reduction (39.9%) was reached on day 3, an effect significantly different from (24.9%; $p < 0.05$) on the sixth day of incubation. Overall, the results of this work suggest that *U. dioca* can be a potential alternative, ecologically sustainable, natural fungicide to protect crops from damages caused by phytopathogenic fungi.

Keywords: antifungal activity; crops protection; plant extract; sustainable agriculture

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