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NEW PRE-EMERGENT BIOHERBICIDES AND ITS COMPATIBILITY WITH PLANT-GROWTH-PROMOTING-BACTERIA

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Weeds cause yield reduction in crop production, and their management is nowadays based in chemical control. The inadequate use of conventional herbicides results in the emergence of resistant populations and has a negative effect in the environment. A weed-control alternative is the use of plant-based compounds. In the present study, the phytochemicals citral and nonanoic acid, previously reported to have herbicidal effect, were used to formulate preemergent herbicides. Five emulsifiable concentrates (ECs) were formulated, and its compatibility with a plant-growth-promoting-bacterium (PGPB) was tested.

The emulsifiable concentrates containing the bioactive compounds citral and nonanoic acid with different commercial emulsifiers, were prepared and characterized. The stability and accelerated ageing of each EC was studied. Therefore, three ECs were selected and tested in in vitro assays, using seeds of *Lolium multiflorum* (one problematic weed in Argentina). Finally, the effect of ECs on *Pseudomonas monteilii*, a model PGPB, was evaluated. With this purpose, the ECs at 0.5%v/v were added in liquid media, and the bacterium development was quantified at regular times. In addition, *P. monteilii* biofilms, developed in cover glasses, were exposed to the chemicals for 16 h, and sessile microorganisms were quantified.

The results showed that the ECs containing emulsifiers with methyl esters presented the best emulsion performance. The accelerated ageing test revealed that they were stable for a long period, of at least two months at 50 °C, with no loss of herbicidal activity. The presence of the active compounds after accelerated ageing was confirmed in the FTIR spectra. The ECs inhibited the germination of *L. multiflorum* with IC 95 values from 0.133-0.238% v/v (0.017-54.70 µL/cm²). In addition, when sub-inhibitory concentrations were tested, leaves of the germinated plants were significantly shorter than in control treatment. The ECs did not affect the growth rate of *P. monteilii*, but they generated a reduction in the final *P. monteilii* planktonic biomass in comparison with the control (4.7 log(CFU/mL) in average). *P. monteilii* biofilms were incubated with the ECs for 16 h. Two of the three ECs did not affect the number of sessile cells in the bacterium biofilm.

The ECs formulated have a great potential as pre-emergence herbicides, having

a strong biological activity on *L. multiflorum*. These products showed also an inhibitory effect on the growth of the PGPB *P. monteilii*, being its effect over its biofilms less aggressive. Further efforts will be made to determine the effect on soil-microbiota and on other environment-components, as well as the product residuality in soil.

Palabras clave: pre-emergent herbicides - weeds - *Lolium multiflorum* - plant-growth-promoting-bacteria - *Pseudomonas monteilii*