

DETERMINATION OF BIODEGREDEATION POTENTIAL OF BENEFICIAL BACTERIA IN SOME PESTICIDE; IN VITRO

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ABSTRACT

In this study, the degradation of commonly used pesticide active ingredients in agricultural production Lambda-cyhalothrin, Malathion, Pyridaben, Acetamiprid, Abamectin, and Formetanate by beneficial bacteria under laboratory conditions was investigated. The bacterial isolates used in the study were *Enterobacter cloacae* (ZE-2), *Bacillus cereus* (ZE-7), *Acinetobacter calcoaceticus* (ZE-13), *Enterobacter aerogenes* (ZE-5), and *Bacillus megaterium* (SA-7). These isolates had been previously obtained from pepper cultivation fields and vermicompost, and were identified using various bacteriological tests and MALDI-TOF-MS analyses. In the first stage of the study, it was tested whether the selected active ingredients had any inhibitory effect on the bacterial species. Nutrient Agar (NA) medium was used in this part. The media were autoclaved at 121 °C for 20 minutes, cooled to 40 °C, and the active ingredients were added at the application doses recommended by the manufacturer. Approximately 15 ml of the prepared medium was poured into 90 mm diameter Petri dishes. As a control, media without any active ingredients were used, and bacterial inoculation was carried out on the solidified media. Bacterial suspensions prepared at a concentration of 1×10^8 cells/ml were pipetted (100 µl) onto the media and spread using sterile glass rods. After 24 hours of incubation, bacterial growth on the Petri dishes was observed. According to the results, Malathion and Acetamiprid, which did not have adverse effects on bacterial growth, were selected for the second phase of the study. In this phase, each Erlenmeyer flask containing 90 ml of Nutrient Broth was supplemented with the recommended application doses of the pesticides. Subsequently, 1 ml of bacterial suspension (1×10^8 cells/ml) was inoculated into each flask, and the cultures were incubated at room temperature in a shaker at 150 rpm for 7 days. Media containing pesticides but no bacteria served as positive controls, while media without any pesticides or bacterial inoculation served as negative controls. At the end of the incubation period, 5 ml of medium was taken from each Erlenmeyer flask and mixed with 5 ml of acetonitrile in 15 ml Falcon tubes. The tubes were centrifuged at 5000 rpm for 10 minutes, and 2 ml of the supernatant was transferred to glass vials. The extracted samples were then analyzed using an LC-MS/MS (Liquid Chromatography Tandem Mass Spectrometry) system to determine pesticide degradation. According to the analysis results, *E. cloacae* (ZE-2) showed promising results in the degradation of Acetamiprid. However, other bacteria were not observed to degrade the active ingredients. The study was conducted in vitro, and is thought to provide an infrastructure for future product-based studies.

Keywords: Biodegradation, Pesticide, LC-MS/MS, bacteria, in vitro