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PESTICIDE TOLERANCE OF SOIL BACTERIA IN INTENSIVELY CULTIVATED VEGETABLE LANDS IN NUWARA ELIYA

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Improper use of pesticides in cultivating exotic vegetables in Nuwara Eliya has detrimental effects on on-site soil quality and pollutes the off-site environment. The sensitive microorganisms get killed while the tolerant ones survive and multiply with repeated exposure to pesticides. Therefore, this study was undertaken to assess the degree of tolerance of bacteria to carbofuran, metribuzin, and mancozeb which are the most widely used insecticide, herbicide and fungicide respectively, in the vegetable cropping systems.

Samples of soil were collected from eight conventional farms which had been cultivated for 20 to 45 years and from an organic farm (OF) and a virgin land (VS). These soil samples were contaminated with pesticides at the rate recommended by the Department of Agriculture (DOA), incubated *in vitro* and CO_2 evolution was measured on the 3rd and 32nd day. Pesticide tolerant bacteria of the non-contaminated soil were enumerated using Tryptic soy broth agar amended with carbofuran, metribuzin and mancozeb at 300, 700 and 80 mg (a.i.) l^{-1}, respectively.

The bacterial population ranged from 7.83 to 2.27 cfu x 10^6 g^{-1} dry soil. The percentage of bacteria tolerant to carbofuran, metribuzin and mancozeb varied from 45.7 % to 4.3 %, 42.0 % to 7.5 % and 0.88 % to 0.00 %, respectively suggesting that mancozeb was the most toxic pesticide on bacterial community. The bacterial communities of all the soils showed a higher tolerance to carbofuran than to the other two pesticides with one exception. The highest percentage of bacteria tolerant to all three pesticides was observed in soil from an intensively cultivated farm in Blackpool with 30 years of cultivation history. The lowest tolerance to carbofuran and metribuzin was found in two cultivated soils whereas, the lowest tolerance to mancozeb was exhibited by OF (0 %) and VS (0.01%). This suggests that the repeated exposure to mancozeb has resulted in bacterial communities predominant with mancozeb tolerant bacterial populations. The basal respiration of experimental soils varied from 28 to 124 μg CO_2 g^{-1} dry soil day^{-1}. The rate of reduction in respiration rate was in the order of mancozeb > carbofuran > metribuzin on the third day of contamination. On the 32nd day, metribuzin showed the highest impact followed by mancozeb and carbofuran.

These results suggest that the toxic effects on soil bacteria were highest for mancozeb, followed by metribuzin and carbofuran, and the importance of previous exposure to develop pesticide tolerance in bacteria was significant only for mancozeb.