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Study on the distribution of organic carbon in soil fractions and its reaction potential of binding the pesticides

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Soil is the ultimate sink of all selectively applied pesticides. In addition to the basic physicochemical data of an active ingredient, the fate of the various compounds is largely determined by the type of application. Finally, pesticide and their metabolites, as well as structural elements, remain in the native carbon reserves of the soil or are sorbed & fixed to clay minerals and clay- humus complexes.
Soil organic matter (SOM) and the soil microbial community are the crucial components which regulate soil processes and contribute towards the stability of the soil ecosystem. It is an energy source for biological mineralization processes, functions as a buffer and participates in chemical reaction. Knowledge is essential to understand the extent to which the SOM influences the mobilization and immobilization processes of foreign substance in soil and the substance transport and pollutant decomposition in soil. The freshly incorporated organic matter undergoes mineralization and the non mineralized carbon fraction is of special relevance with respect to soil stability in general and decisive for the fate and particular the persistence of xenobiotics in soil.
The biological and physicochemical interactions establishing equilibrium between the organic matter bound, fixed or complexed to the soil matrix and that dissolve in the soil solution must be understood in detail to realize soil and groundwater conservation. The radio-tracer technology emerged as the latest technology in agriculture, which helps in studying the translocation of pesticide along with the organic matter and furthermore, the distribution of the pesticide in the soil phases.
For the elucidation of these relationships and distribution of organic carbon in soil fractions and its reaction potential of binding the pesticides, the present laboratory study was undertaken using 14C-enriched and non labeled maize straw as a source of fresh SOM in different soil fractions vis-à-vis its effect on distribution of 14C-labeled benazolin and non labeled benazolin (a selective, post emergence herbicide) as a xenobiotics throughout the soil system. To determine the turnover of SOM fractionation of top layer of the both the benazolin treated soil column was done followed by determination of 14C content in four different soil phases obtained from fraction, characterization of different phase and identification of the metabolites with TLC, HPLC and GC-MS. The result clearly indicated that where soil columns received non- labeled maize straw and 14C-benazolin as well as 14C-labeled maize straw and nonlabeled benazolin; the unit weight distribution study of radioactivity in benazolin followed the decreasing trend in different phases in following order of electrolyte>colloidal> micro aggregate > sediment phases respectively. The percentage distribution of maize straw (fresh organic matter) was also found highest in electrolyte phase followed the same order as in the case of benazolin. It was observed in phase-wise distribution study that radioactivity either of 14C-maize straw or 14C-benazolin was mostly concentrated in the sediment phase followed by micro aggregate, colloidal and electrolyte phase. From this it was clear that the soil columns, which received maize straw, have bound the pesticide benazolin and hindered the translocation to the lower layers leading to higher percentage of recovered radioactivity at top layer. Thus, these two results can be correlated in a way that dissolve organic matter affects the mobility of the pesticide along with its own mobility.