

Research Paper :

Acute Toxicity : Novel Mode of Pesticides on Earthworm

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SUMMARY

Lab-experiments were carried out to assess the relative acute toxicity of eight novel modes of pesticides viz., abamectin, diafenthiuron, fipronil, imidacloprid, spinosad, indoxacarb, novaluron and profenofos on earthworm (*Eisenia foetida*) comparing contact filter paper test and soil test wherein, the area of contact-exposure was kept uniform and the exposure-period was kept 48 h and 28 days, respectively. All the pesticides found to be toxic in former test were depicted comparatively less toxic in latter test, indicating that the estimation of toxicity differs significantly with the test method, type of chemical molecule and also physicochemical properties of the soil.

Key words :

Acute- toxicity,
Novel pesticides,
Earthworm,
Eisenia foetida

Earthworms are the representative of soil fauna being largest invertebrate biomass of soil ecosystem and they are common in many soils and thus are vulnerable to various impacts on soil. The soil not only acts as a substrate for organisms but also as a recipient medium for chemicals. Agrochemicals irrespective of their place or mode of application exert certain unwanted influence on this non-target organism, which in turn becomes undesirable victim. It is used as an efficient biomonitor for eco-toxicological studies, both as an indicator and test species. It is an excellent tool to detect soil pollutants (Bouche, 1988). The earthworm, *Eisenia foetida* (Savigny) is reported to be a suitable test species (Heimbach, 1988).

The laboratory tests used for ecotoxicological assessment of pollutants to earthworms mainly constitute the acute and chronic exposure studies; majority are designed to measure acute toxicity i.e. mortality of earthworm, as the main end point (Reinecke and Reinecke, 1998). In general, nine distinct tests have been described. The European Economic Community (EEC) and the Organization for Economic Co-operation and Development (OECD) have standardized and advocated three tests for estimation of field hazards viz., contact filter paper test, artificial soil test and silica paste glass-ball test. Besides, United States Environmental Protection Agency (EPA) has also recommended ecological effects test guidelines. Amongst the nine tests, contact filter paper test is simpler, cheaper and

quick method, which is designed in such a way that the earthworms are exposed to the toxicant both by contact and in the aquatic phase. This test is reported (Edwards and Bohlen, 1996) to be an excellent screening technique to assess the relative toxicity. Perusal of literature in respect of ecotoxicity studies reveals that most of the novel pesticides are relatively safe to birds, fishes, daphnia, bees, etc. however, there is a paucity of literature especially on the earthworms.

MATERIALS AND METHODS

Contact filter paper test and soil test in accordance with some modifications and on the similar lines advocated by EPA were adopted to assess relative acute toxicity of eight novel modes of pesticides on adult earthworm, *Eisenia foetida*. Laboratory experiments were carried out in CRD with three replicates for each of the pesticides to compare the acute toxicity. In both the tests, area of contact-exposure was kept uniform (56 cm²/worm) while exposure-period was kept 48 h and 28 DAE for the former and latter tests, respectively. The toxicity was assessed on the basis of worm's mortality at recommended field concentration by following the former test on similar lines advocated by Goats and Edwards (1988) and Edwards and Bohlen (1996) and for the latter test by keeping views of EPA guidelines and also the studies carried out by Van-Gestel and Ma (1990). In soil test, clayey loam soil was provided as substrate medium. A block of thermocol (size 23.6 x 23.6 x 2 cm³)

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