

Assessment of ecotoxicological effects of pesticides on the soil fauna and soil processes under tropical conditions

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The work reported here is planned for the SHIFT project "Management of plant residues and its effect on decomposition and soil fauna in central Amazonian agro-ecosystems". The results of SHIFT I show that the macrofauna, especially ants, earthworms, diplopods, isopods and termites, is mainly responsible for the decomposition of litter. Assuming that a – more or less – natural decomposition rate is necessary for the sustainable use of agroforestry polyculture plantations, negative effects on these organisms must be avoided. When transferring the results of SHIFT I to normal agroforestry sites in the Manaus region, fungicides and insecticides have taken into consideration (cf. proceedings of the first SHIFT workshop). No data are available to assess the risk of these compounds to macrofauna species active in litter decomposition. Even worse, no standardised methods are available to measure side effects of pesticides on macrofauna species under tropical conditions. This statement is true for single species tests in the laboratory as well as for monitoring (bioindicator) studies in the field.

In Brazil, EMBRAPA is responsible for the improvement of agroforestry measures. Therefore, the agency must be able to recommend (or ban) the use of certain pesticides in order to avoid harmful effects of these substances on macrofauna species since otherwise important ecosystem functions like litter decomposition and therefore, in the long-run, the economically sound and sustainable use of such cultures could be seriously affected.

The work is planned to be divided in the following steps:

1. Identification of suitable test species, test conditions and test endpoints;

Species to be identified as potential test organisms must be kept under standardized conditions in the laboratory in such a way, that they reproduce (fortunately as a mass culture); help from other institutions would greatly enhance the chance of success and at the same time clearly minimize the time needed. The ecological requirements of each species should be known in order to decide which one is useful for testing purposes.

2. Performance of successful (i.e. reproducible) laboratory tests using two pesticides relevant for EMBRAPA; Currently, the two test chemicals are selected: probably one "old", very well known insecticide (data available on fate and effects including tropical sites) like Parathion, Endosulfan or Deltamethrin and one "field-relevant" fungicide applied in Amazonia regularly will be used.

3. In close interaction with other parts of the planned project: Extrapolation of these experiences to the microcosm and field level (agroforestry plantations);

4. Inclusion of functional endpoints on the latter two levels; this might include the bait-lamina test (measuring the feeding rate of the macrofauna) and the litter-bag test (measuring the decomposition rate of organic material) The first has the advantage of being very quick and easy, but it is of less ecological relevance in comparison to the litter-bag method. In the laboratory, only bait-lamina could be used just by adding them to the test substrate in the effect tests running anyway. In the microcosms and in the field, potentially both methods could be used with either natural (*Vismia* ?) or artificial (cellulose ?) organic material.

5. Formulation of test guidelines (according to OECD standards).

For this work package, experiences on the development of terrestrial ecotoxicological guidelines from temperate regions will be used in the standardization process. The outcome of the project could be used for the region of Manaus but will also help to assess the ecotoxicological effects of pesticides in tropical regions in general.