

## **Information on How the Toxicity of Pesticides is Described**

The international convention for measuring pesticide toxicity is the LD50 which means the dose of the pesticide that will kill 50% of a test population (usually rats or rabbits). In other words it is a Lethal Dose for 50% of the population - hence LD50.

It is presumed that this gives a good indication of the toxicity to humans - we are also mammals. The LD50 is measured in milligrammes of pesticide per kilogramme of body weight of the test animals. For example, fenitrothion has an oral LD50 of 503 mg/kg which means that if a number of rats weighing 1 kg are each fed 503 mg, half of the test population will die. As the LD50 increases, the toxicity decreases. A pesticide such as bendiocarb has a lower oral LD50 of 55 mg/kg which means that a smaller quantity will kill half of the test population - bendiocarb is more toxic.

Pesticides have an oral LD50 - (the toxicity if it is swallowed) and a dermal toxicity (the toxicity if it touches the skin). The oral LD50 is usually lower since pesticides can enter the bloodstream more easily through the stomach than through the skin.

The actual toxicity of the pesticide bought by a farmer also depends on the concentration of the formulation -for example, the active ingredients of some pyrethroids have a relatively low LD50 and are therefore quite toxic, but are supplied in such dilute concentrations that the formulation is not very toxic at all.

There are various national and regional colour or pictogram conventions which indicate the toxicity of the formulation (not simply the toxicity of the active ingredient). And the triangle colour coding is based on oral LD50 -the worst case scenario.

If the formulation is a solid, the toxicity is usually much lower since it is more difficult for a solid to pass through the skin or the lining of the stomach.

The hazard to operators using pesticides depends on several factors:

- the inherent toxicity of the active ingredient
- the state it is in (solid or liquid)
- the formulation concentration
- the degree of exposure to the pesticide.

The World Health Organization publishes a hazard classification covering all of the most common pesticides. It divides them up into several groups:

- Class 1a "Extremely Hazardous" (oral liquid LD50 values up to 20 mg/kg)
- Class 1b "Highly Hazardous" (oral liquid LD50 values 20 - 200 mg/kg)
- Class II "Moderately Hazardous" (oral liquid LD 50 values 200 - 2000 mg/kg)
- Class III "Slightly Hazardous" (oral liquid LD50 values more than 2000 mg/kg)
- There is an additional table for "products unlikely to present acute hazard"

However, the LD50 figures given in the WHO classification are for the **active ingredient (a.i.)**. These LD50 values must be modified to take account of the concentration of the pesticide formulation actually used. For example, as we have seen above, the LD50 of fenitrothion active ingredient is 503 mg/kg (moderately hazardous), but the LD50 of a 10% EC formulation of fenitrothion is likely to be much higher (less toxic). The general formula for working out the toxicity of specific formulations is

$$\text{LD50 of formulations} = \frac{\text{LD50 of active ingredient} \times 100}{\text{percentage concentration of formulation}}$$

So in the case of a 10% fenitrothion formulation, the formulation LD50 =

$$\frac{503 \times 100}{10} = 5030 \text{ mg/kg (slightly hazardous)}$$

The WHO classification takes into account the type of formulation as well. Therefore dry formulations are considered less toxic than liquid formulations. However, it is wise to consider that all insecticides are TOXIC and therefore safety precautions should be observed. The minimum protective clothing should be overalls, boots and a hat. An apron of plastic may be needed to keep the overalls dry and avoid splashes when opening containers, mixing pesticide and filling sprayers.