

Effect of cypermethrin on total carbohydrates, glycogen, pyruvate and lactic acid contents in liver and kidney tissues of albino rats

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SUMMARY

Cypermethrin is a synthetic pyrethroid insecticide that has insecticidal activity, low avian and mammalian toxicity that affects the nervous system of vertebrates and invertebrates by affecting voltage depending sodium channels and inhibiting ATPase enzymes. This study has revealed significant variance in total carbohydrates, glycogen, pyruvate and lactate content in liver and kidney tissues of albino rats after administration of cypermethrin. With the oral sublethal dose (41mg/kg) of cypermethrin as single dose, double dose, multiple doses with 48 intervals, the total carbohydrate, glycogen, pyruvate contents decreased where as lactic acid content increased in liver and kidney tissues of albino rats. In the present study, significant decrement was observed in total carbohydrates, glycogen and pyruvate contents due to higher energy demands under cypermethrin toxicity.

Key words :

Cypermethrin,
Total
carbohydrates,
Glycogen,
Pyruvate, Lactic
acid, Albino rat

Pesticides occupy rather a unique position among many chemicals by increasing food and fibre production and by reducing the occurrence of vector borne diseases. An increase in global food demands has resulted in a significant increase in the use of pesticides in agriculture. If the credits of pesticides include enhanced economic potential in terms of increased production of food and fibre, and amelioration of vector-borne diseases but their debits have resulted in serious health implications to man and his environment. There is now overwhelming evidence that some of these chemicals do pose potential risk to humans and other life forms and unwanted side effects to the environment (Forget, 1993). No segment of the population is completely protected and the burden is shouldered by the people of developing countries and by high risk groups in each country (WHO, 1990). The world-wide deaths and chronic illness due to pesticide poisoning number about 1 million per year (Environews Forum, 1999). In humans, exposure to pesticides has been associated with cancer (Dich *et al.*, 1997).

Pyrethroids and pyrethrins are used in a wide array of indoor and outdoor applications, including medicinal, veterinary and agricultural usages (ATSDR, 2003). Pyrethroids usage has been estimated at 23% of the worldwide insecticide market.

Cypermethrin was initially synthesized in 1974 (Elliott *et al.*, 1974) and first marketed in 1977 as a highly active synthetic pyrethroid

insecticide, effective against a wide range of pests in agriculture, public health and animal husbandry. These compounds have gained popularity over organochlorine and organophosphate pesticides due to their high efficacy against target species (Elliott *et al.*, 1978) and their relatively low mammalian toxicity (Parker *et al.*, 1984) and rapid biodegradability (Leahey, 1985).

Cypermethrin acts as a stomach and contact insecticide. It has wide uses in cotton, cereals, vegetables and fruit, for food storage, in public health and in animal husbandry and its structure is based on pyrethrum, a natural insecticide which is extracted from chrysanthemum flowers, but it has a higher biological activity and is more stable than its natural model.

Cypermethrin is classified by the World Health Organization (WHO) as 'moderately hazardous' (Class II) (WHO 1994 - 95). It interacts with the sodium channels in nerve cells through which sodium enters the cell in order to transmit a nerve signal. These channels can remain open for up to seconds, compared to the normal period of a few milliseconds, after a signal has been transmitted. Cypermethrin also interferes with other receptors in the nervous system. The effect is that of long-lasting trains of repetitive impulses in sense organs.

The pyrethroids are highly toxic to aquatic organisms and fish as well as to bees – with the same mode of action in each organism. The

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