

Review article

PYRETHROID INDUCED TERATO-GENICITY AND GENOTOXICITY

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ABSTRACT : Pesticide has become an integral part of modern agriculture. Pyrethroids are biodegradable that is why uses of this pesticide being in large amounts, and due to their not being used properly, they affect harmful insects as well as many beneficial insects and many different types of organisms and humans. Produced effects such as neurotoxic, genotoxic and teratogenic effects. Cypermethrin (CYP), a class-II type of pyrethroid pesticide has been studied in many organisms for its various adverse effects, but its teratogenic and genotoxic effect has not been much studied in birds. So, in this review conclude the genotoxic and teratogenic potential of different type of pyrethroid in various animals.

Key word : Pyrethroid, teratogenicity, genotoxicity.

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INTRODUCTION

Pesticides are chemical, which is used against pests in agriculture, animal husbandry and public health. Against the targeted species these chemicals are highly effective, thus became the inseparable part of modern agriculture. Pesticides are divided into organophosphate, organochlorines, carbamate and pyrethroid based on their chemical structure. Due to the rapid biodegradable of pyrethroid, it is being used in place of carbamide, organophosphate and organochloride (Kaushik *et al*, 2018).

Pyrethroid is a group of synthetic pesticide, which is similar to the natural pesticide pyrethrum and produced by the flower of pyrethrum plant of chrysanthemum genus of Compositae family native to Asia and northeastern Europe. As an insecticide, these pyrethroids are used in agriculture, disinfection and ectoparasitic disease (Heudorf and Angerer, 2001). Pyrethroid bind to voltage-sensitive Na⁺ channel and convert their gating kinetics. thereby nerve function are disrupted and generate acute neurotoxic effects in insect as well as non-target organism (Choi and Soderlund, 2006). Studied suggest that in non-targeted species teratogenicity, reproductive toxicity and genotoxicity could be induced by pyrethroid.

Type of pyrethroid

On the basis of chemical structure pyrethroids are classify in two type -

Type I and type II (Kaushik *et al*, 2018).

Type I –Pyrethroid that have without cyano group.

Type II - Pyrethroid that have contained cyano group

Type I	Type II
Permethrin	Cypermethrin
Bioallethrin	Deltamethrin
Tefluthrin	Fenvalerate
Allethrin	λ -cyhalothrin
Tetrametrin	α -cypermethrin
Ressmethrin	β -cypermethrin
Bioresmethrin	Esfenvalerate
Prallethrin	Cyfluthrin

Teratogenicity and genotoxicity

The development of any type of structural and functional defects during fetal development is called teratogenicity. Genotoxicity refers to processes that alter the structure, information content, or segregation of DNA and that are not necessarily associated with mutagenicity (Pellevoisin *et al*, 2018).

micronuclei induction by λ -cyhalothrin was tested on *Rana catesbeiana* tadpoles. Tadpoles are exposed to 4 different concentrations (0.02, 0.1, 0.2 and 0.4 $\mu\text{g/L}$) of the pesticide, resulting in increased concentration dependence in the micronuclei frequency in peripheral blood (Campana *et al*, 2003).

Mammals : In a study, λ -cyhalothrin induced genotoxicity was examined in the peripheral blood of Wistar male rats. The 6.23mg/kg dose of λ -cyhalothrin was given for a period of 7, 14 and 21 days. The result showed that 21 days of treatment significantly increase the frequency of micronuclei (Fetoui *et al*, 2015).

Deltamethrin

Invertebrate : In a study deltamethrin induced genotoxicity was investigated in *Galleria melonella* (Lepidoptera: Pyralidae). Different concentration of deltamethrin (5, 20, 50, 100 and 150 μg) was given for 24, 48, 72 and 96 hours. Significantly increase micronuclei formation has found to respond to higher doses (100 and 150 μg) (Kurt and KAYI^a, 2015).

Mammals : Deltamethrin induced genotoxic effects were studied in a rat comparative to biopesticide: *Bacillus thuringiensis*. 5 mg/kg b. w./day dose of deltamethrin was given orally. The result showed significantly increase DNA damage, chromosomal aberration in the bone marrow. (Ismail and Mohamed, 2012).

Fenvalerate

Mammals : In a study, the mutagenic effect of fenvalerate was observed in rat bone marrow cells. The response to treatment with fenvalerate increased significantly at the end of treatment. This result suggests the action of fenvalerate on DNA, including the chromosomal aberration in cells (Verma and Singh, 2013).

Bioallethrin

Fish : In a study, bioallethrin induced genotoxicity was examined in *Channa punctatus*. Fishes exposed to sublethal concentration (0.0025, 0.005 and 0.010 ppm) of bioallethrin. The result showed significantly increase micronuclei in erythrocyte (Choudhari and Saxena, 2016).

CONCLUSION

This study represents the effect of pyrethroid pesticide. The pyrethroid insecticide is used in fields, poultry farms, houses and gardens. As a result, it produced many adverse effects in these organisms such as genotoxic, teratogenic, neurotoxic and other functional effects. Due to this entire ecosystem along with the organism is being affected. Therefore, they should be limited in terms of the good of the ecosystem and other safety resources should be used instead.

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