

# ENVIRONMENT

## Pesticides pollution in marine environment

**I**N recent years, the use of pesticides has increased by many folds in many parts of the world. The major cause of pesticidal hazard is faulty application and negligence on the part of the applicator in adopting certain simple precautionary measures. Added to this is the lack of knowledge about proper dosage. Pesticides are economic poisons employed to regulate the impact of various animals and plants upon our life and economy. The effect of vast majority are relatively non-selective and their usage therefore may result in undesirable, even unanticipated, side effects. The use of pesticides has undoubtedly contributed to increased crop yield and to human health, but has also produced a number of adverse effects, including widespread pollution of the natural environment accompanied by damage to marine and inland fisheries, beneficial insects and occasional overt poisoning of humans.

The production of pesticides in India for agricultural development during 1976-80 was about 250,000 tones. It can be assumed that 25% of pesticides will finally reach the sea. Such enormous quantities, when added to the seas around India, will undoubtedly have some effect on water quality of marine environment. There are two main groups of synthetic pesticides: (i) organochlorine pesticides and (ii) organophosphate pesticides. Organochlorine compounds such as DDT and BHC are most toxic to fishes. Many of these chemicals are stable and are not metabolized nor excreted to any appreciable degree; they remain stored in tissues. Organophosphorus

compounds, the commonest of which are malathion and parathion, are generally less toxic to fishes. They are relatively unstable and rarely stored to any extent within animals, but are highly toxic to fish food organisms.

A number of pesticides are used in India and demand for them is on increase. It is estimated that there is a 15% increase in the consumption of pesticides every year throughout the world. During the last ten years, the use of DDT alone in India has increased nearly four folds. It is estimated that DDT and BHC requirements during 1985-86 would be about twenty thousand tonnes and ten thousand tonnes respectively, twice the present requirement.

Pesticides may enter aquatic ecosystem indirectly by drift by spraying on agricultural land from fallout from air-dust particle accumulations in the atmosphere, in run off from agricultural lands by direct application to aquatic environment to eradicate mosquitoes, etc., by discharge of industrial waste emanating from a pesticide factory or improper discharge of excess pesticides and containers. Aquatic plants and animals can accumulate certain pesticides in many tissues in greater concentrations than can water. This indicates the biological magnification of these chemicals. Such a biological magnification of pesticides may result in high pesticide concentrations in fishes and birds. Organochlorine insecticides have the greatest magnification because they are persistent and have a high affinity for lipids. The degree of magnification of insecticides is usually proportional to

their persistence and inversely related to their suitability in water. In aqueous system, pesticides encounter volatilization, decomposition by ultraviolet light irradiation, microbial degradation, biological magnification and absorption and desorption from suspended matter. All these phenomena are not sufficient to result in self-purification of water and so additional treatment and disposal methods are required to eradicate pesticides from aquatic environment. DDT, BHC, chlordane, heptachlor, toxaphene, aldrin, dieldrin and endrin are some of the chemicals most toxic to fishes and other biological communities. About 77,420 tonnes of pesticides and insecticides are used in agricultural development purposes in India every year. In view of the imperative need to increase food production, pesticides application within the country will further increase. Field research on the nature and extent of pesticide pollution in marine environment is progressing slowly.

Recent studies have proved that even very low concentrations of pesticides which enter the environment can affect productivity of these waters, kill eggs and larvae of clams and oysters; influence the behaviour of fishes such as schooling and feeding; induce changes in the blood chemistry and enzymatic functions of these organisms; reduce backbonic collagen contents and indirectly interfere with food chains. These pesticides are accumulated more in plants and fatty tissues of fishes. Animals which have become weak and moribund as a result of exposure to pesticides may easily be destroyed by predators. Since very low concentrations of organochlorine pesticides affect reproduction in fishes, there is every possibility that these pollutants may adversely affect the local fishery.

Pesticide-induced mortality patterns of marine molluscs, crustaceans and teleosts are also measurably related to various physio-chemical environmental parameters. They

include temperature, salinity pH of the medium, type and concentration of chemical and duration of exposure. Some of the organophosphorus pesticides for example are most toxic under conditions of comparatively higher temperature, salinity and low pH. On the other hand, some organochlorine pesticides are most toxic at intermediate temperatures when pH is more than 9 or less than 7 over a wide range of salinities. Inter and Intra-species variations in susceptibility to different pesticides are considerable. Age, size, sex, general condition and especially chemical makeup are important in predicting degree of resistance of a species to a specific biocide. There has been an accumulation of vast amount of data on pesticides but we are still unable to define the problem fully or evaluate the permanent effect of these chemicals on aquatic animals and their environment.

Although, direct poisoning is the most obvious influence of pesticides,

indirect harm can result in higher animals by concentration of chemicals in their passage through food chains or by reduction in numbers of important food organisms. It is reported that marine invertebrates can take up pesticides from medium by concentration factors of 70,000 and greater.

The importance of pesticide pollution from the human health point of view is being investigated. Today, there is an urgent need of data on the specific areas of pesticides pollution in seas and estuaries, whether the environmental burden is decreasing or increasing and what the sources of contamination are. The establishment of a continuing monitor system is necessary despite technical difficulties; bioassay of animals offers a reasonable approach to this problem. Various kinds of crustacea that make up the most valuable marine harvests are of course representatives of some groups of animals that pesticides are designed to kill. Particular concern is felt for sedentary animals that are

unable to move away from pollution. The oyster might be particularly susceptible because of its tendency to concentrate and store trace chemicals from the surrounding environment.

Coastal zone receives a vast number of adventitious chemicals including insecticides, herbicides to control marsh plants, synthetic, detergents, factory and domestic wastes and radioactive materials. It is possible, even probable, that some of these chemicals display synergism or antagonism. Therefore, early remedial solution in terms of effective and integrated ecological management of the coastal and estuarine ecosystem is necessary to restore normal conditions.

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