

**M.S.105. JOSE P. JACOB—Combined Toxic Effects of Oil and Pesticides on Selected Marine Invertebrates—1989—
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Among the various pollutants identified as hazardous to aquatic life, oil and Pesticides rank greater importance. Although, Pesticides are not directly introduced into the sea or estuaries, it is proved that they are toxic to non-target aquatic organisms. On the other hand, Petroleum hydrocarbons are known to affect the health of the aquatic ecosystem in general and intertidal animals in particular. Therefore, documentation of the effects of Pesticides and Petroleum hydrocarbons on the life and activity of aquatic animals is of cardinal importance. Basic studies are necessary for the refinement of methodologies. Further, documentation on the stress profiles of marine animals subjected to sublethal exposure to Oil and Pesticides will become highly essential to understand the impacts of these on the coastal ecosystem.

In the present investigation two species of Molluscs, namely *Villorita cyprinoides* var. *cochinesis* a common representative of the oligo and mesohaline stretches of the Cochin backwaters and *Perna indica* the brown mussel, extensively distributed along the intertidal and subtidal rocky beaches of the South West coast of India, were selected to analyse the toxic effects of Oil and Pesticides. The toxicants employed were two organochlorines, DDT and Aldrex and two organophosphates Ekalux and Dimecron and water accommodated fractions of Light Diesel Oil-LDO (WAF)-and Persian Gulf Crude-P.G. Crude (WAF). These were employed either singly or in combinations.

In general, information on the toxic effects of Oil and Pesticides on marine and estuarine bivalves are detailed out in the Review of Literature. In this chapter, available papers on acute and subacute toxicity of organochlorines and organophosphates, crude and refined oil are critically reviewed. Most papers which explain the various causative factors that govern the sublethal toxicity of Pesticides and Oil are also documented. Information available on combined toxicity of Pesticides and Oil although limited is also provided.

The chapter on Material and Methods details out the animals used for the present study, the areas and methods of collection. Instrumentation employed, chemical methods followed and experimental design to study the lethal toxicity, oxygen consumption, filtration, byssogenesis, accumulation and depuration of Petroleum hydrocarbons are given. The statistical techniques used for analyses and computation of data also outlined in this chapter.

The chapter on results presents information on lethal toxicity of the various pollutants on *Perna indica* and *Villorita cyprinoides* either exposed in a fashion, where the toxicants were supplied individually or in combination. The sublethal toxicity of the same animals has also been delineated. Analyses of the tissue load of Petroleum hydrocarbons in the case of *Perna indica* has also been worked out.

Among the four Pesticides used, Ekalux was highly toxic to *Perna indica*, while the water accommodated fraction of Persian Gulf Crude did not produce any lethal effect at the concentrations employed. Whereas, in the case of *Villorita cyprinoides* var. *cochinenses*, Ekalux only, produced toxic effects at low concentrations.

The combination of Pesticides with varying or unvarying concentrations of LDO (WAF) brought down the 96 h LC 50 values of the various Pesticides.

The rate of filtration was found to be highly influenced by the presence of Pesticides and Oil fractions. The combinations of these Pesticides and Oil were found to reduce the effective concentrations of both organochlorines and organophosphates and LDO (WAF).

The reaction of the animals, assessed based on oxygen consumption has also been worked out. The approach of this study was exposure of the animals to sublethal concentrations of the organochlorines and organophosphates and water accommodated fractions of Petroleum hydrocarbons. The effective concentration of individual toxicants when employed singly or in combination has also been elucidated. The presence of Pesticides distinctly influenced the effective concentrations rates of WAF's to bring about variations in oxygen consumption.

Continued exposure to very low concentrations of various Pesticides at times did not bring about any drastic reduction in oxygen consumption. As a matter of fact, at a few instances it resulted in enhanced oxygen consumption in the case of *Perna indica*.

Byssogenesis has been proved to be an extremely dependable index to analyse sublethal toxicity of Pesticides and Oil.

Perna indica was found to accumulate large quantities of Petroleum hydrocarbons when they were exposed to low concentrations of Oil fractions for longer duration. The rate of depuration was found to be slow after seven days exposure in raw sea water.