

Pesticide Residues in Marine Fishes

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Pesticide residues in four marine fishes, black pomfret (*Parastromateus niger*), mackerel (*Rastrelliger kanagurta*), marine vala (*Chirocentrus* sp.) and tuna (*Euthynnus affinis*) are reported. Highest concentration is found in black pomfret followed by tuna, vala and mackerel. The contents of various pesticides present in fish under study are well below the action level prepared by FDA to cause any health hazard.

Earlier work by Radhakrishnan *et al.* (1986) has shown that mussels can be used as sentinel organisms for monitoring marine pollution. Polychlorinated biphenyls in the marine environment, particularly in the Mediterranean, has been reported by Geyer *et al.* (1984). Steinwandter (1983) has reported polychlorinated styrenes in rhine fish. Toxicity of methyl parathion to the fish *Mystus cavasius* has been reported by Murthy *et al.* (1984). Σ DDT, PCB's and HCB in the sediment of lake genera has been reported by Thomas *et al.* (1984). However not much work has been done on pesticide residues in Indian food fishes. The present study is the beginning of an attempt to screen different fishes of Indian coast for their content of pesticide residues. Concern about pesticide residues stems from the widespread use of insecticides to control insects in agricultural fields. With extensive use of pesticides in paddy and other agricultural products, pollution by pesticide residues pose a serious problem. As the sea is the final dumping ground for all these pollutants the marine flora and fauna tend to accumulate them thereby causing serious health hazards to consumers.

Materials and Methods

Fresh black pomfret (*Parastromateus niger*), mackerel (*Rastrelliger kanagurta*), marine vala (*Chirocentrus* sp.) and tuna (*Euthynnus affinis*) were collected from local market and brought to the laboratory in ice. The fishes were dressed, the muscle separated and used for the study. The pesticides were extracted, after drying with anhydrous

sodium sulphate, with petroleum ether (60–80°C) and the clean up procedure for gas chromatographic analysis was done as per Pesticide Analytical Manual (FDA, 1977). The component pesticides were identified by comparing with standards. The analyses were carried out in Varian GC fitted with Vista 402 computing integrator. The column used was 4% OV 101 + 6% OV 210 on chromosorb W – HP 80–100, 6 $\frac{1}{4}$ ' x $\frac{1}{4}$ " glass column and the temperature was programmed as 160° – 1° -4°/min 210, 20'. The column effluents were monitored with the aid of an Electron capture detector (ECD) with Ni⁶⁰ as electron source maintained at 250°C. The injection port was maintained at 250°C. Pure standard chemicals were used in the analysis. The standard pesticides were from M/s Applied Science, U.S.A. All the analyses were carried out in triplicate and the average values are reported.

Results and Discussion

Table 1 presents the quantity of pesticides present in the four fishes studied. As seen from the Table α BHC, aldrin and pp' DDT are the major pesticides in black pomfret, while in mackerel dieldrin is practically absent and pp' DDT, op' DDT and endrin are present in high concentrations. In marine vala pp' DDT is practically absent, hepta epoxide and aldrin are present in higher concentrations. Lindane, heptachlor, dieldrin and op' DDT are present in very low concentrations. In tuna dieldrin and op' DDT are absent while endrin is present in fairly large quantity. α BHC and aldrin and heptachlor are also present to a considerable extent compared to other pesticides.

Table 1. Pesticide residues in different fishes (ppm)

Pesticides	Mackerel	Marine vala	Black pomfret	Tuna
α -BHC	0.0020	0.0020	0.2000	0.0070
Lindane	0.0003	0.0008	0.0030	0.0020
Heptachlor	0.0004	0.0001	0.0003	0.0040
Aldrin	0.0020	0.0120	0.0900	0.0050
Hepta epoxide	0.0020	0.0250	0.0010	0.0040
pp'DDE	0.0020	0.0010	0.0030	—
pp'DDD	0.0020	0.0090	0.0020	—
Dieldrin	Nil	0.0007	0.0010	Nil
op'DDT	0.0050	0.0020	0.0070	Nil
Endrin	0.0030	0.0040	0.0040	0.0800
pp'DDT	0.0090	Nil	0.0420	—
Total	0.0277	0.0566	0.3533	0.1026

Table 2. Action levels for pesticides under FDA regulations

Pesticide	Commodity	Action level ppm
Aldrin and dieldrin	Fish & shell fish: raw, smoked, frozen, canned	0.3
DDT, TDE, DDE	Fish: raw, smoked, canned, frozen	5.0
Endrin	Fish & shell fish: raw, smoked, canned, frozen	0.3
Heptachlor and Heptachlor epoxide	Fish & shell fish: raw, smoked, frozen and canned	0.4 and 0.3

Source: Infofish Marketing Digest No.2 March, 1982

However on comparison with Table 2, where action levels to be taken for some of the pesticides are given, none of the four fishes studied contained any of the pesticides to a level enough to cause any health hazard, pp' DDT, aldrin, dieldrin, DDT and DDE endrin, heptachlor and hepta epoxide all are in lower concentrations than the action level proposed by FDA. However, incidence of pesticide residues in fish should be viewed seriously because there is possibility of accumulation of these pesticides residues in fishes which can lead to serious health hazards in the consumers.

The authors are grateful to Shri M.R.Nair, Director, Central Institute of Fisheries Technology, Cochin for the permission to publish this paper.

References

- Geyer, H. D., Freitez, D. & Korte, F. (1984) *Ecotoxicol. Environ.* **8**, 129 as quoted in *Pollution Abstracts*. p. 84-06262
- Murthy, A. S., Remani, A. V., Christopher, K. & Ragabhushanam, B. R. (1984) *Environ. Pollut. Ser. A* **34**, 37 as quoted in *Pollution Abstracts*. p. 84-06293
- FDA (1977) *Pesticide Analytical Manual* Vol. I, National Technical Information Service, U. S. Department of Commerce Section 211, p. 13.
- Radhakrishnan, A. G., Antony, P. D., Mukundan, M. K. & Jose Stephen (1986) *On Use of Mussels as a Pollution Indicator*. Paper presented in the National Seminar on Mussel Watch. 13-14, February 1986, Cochin
- Steinwandter, H. (1983) *Anal. Chem.* **310**, No. 7, 705 as quoted in *Pollution Abstracts*. p. 84-04856
- Thomas, R. L., Vernet, J. P. & Frank, R. (1984) *Environ. Geol.* **5**, (3), 101, as quoted in *Pollution Abstracts*. p. 84-06427