

Adsorption of Polychlorinated Biphenyl (Aroclor 1254) on Shrimp

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Polychlorinated Biphenyls (PCBs), when discharged into a river or lake, accumulate on the sediment because of their low solubility, finally assuming relatively high concentrations. Thus there are numerous ways by which PCBs can find their way into marine food products. When shrimp were exposed to 100 ppb of Aroclor 1254 for 48 hours, they accumulated 1300 ppb of PCBs in a very short time (GUSTAFSON 1970). A couple of generalizations with respect to PCB levels in fish are noteworthy: (a) fish with the highest levels of PCBs are found in waters near an industrial or metropolitan area and (b) the PCB level is directly proportional to the eating habits and the fat content of the fish (ENOS 1972). Since there is a need for further study, the present investigation is a part of research designed to evaluate the adsorptive pattern of PCBs on shrimp.

EXPERIMENTAL

Two pounds of unpeeled shrimp and two pounds of peeled, deheaded and deveined shrimp were dipcoated separately in 100 ppm solution of Aroclor 1254 for exactly one minute. All samples were placed under refrigeration for 12 hours, after which 25 g from each treatment were blended and extracted using acetonitrile. The extracted samples were further subjected to cleanup by florisil column chromatography. The cleaned-up extract was concentrated and used for gas chromatographic quantitation. Four random sample replicates were used under each treatment.

Gas chromatographic analysis were carried out using Varian Aerograph (Model 1200) equipped with an electron capture detector, fitted with 5 ft by 1/8 in coiled pyrex glass column packed with 10% DC-200 on Chromosorb W and operated at inlet, column and detector temperatures of 225, 185 (isothermal), and 210°C respectively. Nitrogen flow rate was adjusted at 55 ml per minute with the chart speed of 1/4 in per minute. The chromatograms obtained were comparatively studied based on their total peak areas.

RESULTS AND DISCUSSION

The maximum and minimum values for PCB adsorbed on peeled and unpeeled shrimp are presented in Table 1. All values are based on total solids in order to avoid fluctuations due to moisture content. The average values were 33.2 and 26.3 $\mu\text{g}/100 \text{ g}$ solids for unpeeled

TABLE 1

POLYCHLORINATED BIPHENYL ADSORPTION ON PEELED & UNPEELED SHRIMP

SAMPLE		PCB CONTENT ($\mu\text{g}/100 \text{ g solids}$)
Unpeeled Shrimp	Maximum	37.31 ***
	Minimum	31.52
	Mean Value \pm	
	Std. deviation	33.23 ± 2.37
Peeled Shrimp	Maximum	28.90
	Minimum	24.40
	Mean Value \pm	
	Std. deviation	26.30 ± 1.73
Mean Percent Difference		20.85

*** The differences were found to be statistically significant ($P < 0.01$).

and peeled shrimp respectively. The difference among treatments was found to be statistically significant ($P < 0.01$). Thus unpeeled shrimp had more PCB adsorption potential than the peeled shrimp, a possibility that PCBs are liable to be adsorbed on the outer shell or the chitinous material. This phenomenon may prove to be of high ecological significance and following points need consideration: (1) it indicates the possible site of PCB accumulation, especially in shrimp and may be in other marine animals, particularly those with outer shells, (2) it predicts a careful utilization of shrimp waste as feeds for fish or other animals, (3) it reveals another unpredicted source of PCB entry into the food chain, and (4) a possibility exists that similar results may be obtained for chemically related pesticides.

REFERENCES

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