

# INVESTIGATION OF RELATIONSHIP BETWEEN $^{210}\text{Po}$ AND ACCUMULATION OF MALONDIALDEHYDE (MDA), PROLIN AND $\text{H}_2\text{O}_2$ IN MUSSELS AND COMMON SOLE

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## Abstract

In this study, mussels (*Mytilus galloprovincialis*) and fish (*Solea solea*) were collected seasonally in Inciralti, Izmir, Turkey.  $^{210}\text{Po}$ , malondialdehyde (MDA),  $\text{H}_2\text{O}_2$  and prolin levels were investigated in different tissues (gills, hepatopancreas and muscle) of mussels and fish. The highest activity concentrations of  $^{210}\text{Po}$  were found as  $75 \pm 3$  and  $252 \pm 14$  Bq  $\text{kg}^{-1}$  in hepatopancreas of mussels and fish, respectively. The highest levels of MDA,  $\text{H}_2\text{O}_2$  and prolin in mussels and common sole were also measured in hepatopancreas. These levels were determined between 50-150 nmol  $\text{g}^{-1}$  fw, 16-40  $\mu\text{mol g}^{-1}$  fw and 300-370  $\mu\text{mol g}^{-1}$  fw for MDA,  $\text{H}_2\text{O}_2$  and prolin in mussels and fish in hepatopancreas, respectively.

**Keywords:** Aegean Sea, Fishes, Radionuclides, Mollusca

The objectives of the study are to obtain concentration data on  $^{210}\text{Po}$  in liver and gills of mussels (*M. galloprovincialis*), and fish (*Solea solea*) and to determine the seasonally correlation between the concentrations of  $^{210}\text{Po}$  and lipid peroxidation (LPO), hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) and prolin levels as oxidative stress bio-markers.

Aegean region is highly industrialized and there exist many large cities. Furthermore, there are intense agricultural activities with dense use of fertilizer and many rivers (Bakırçay, Gediz and Menderes) and stream carrying industrial and agricultural residues into the sea. The main industries in the region are food processing, oil, soap and paint production, chemical industries, paper and pulp factories, textile industries, and metal processing (Kontas et al., 2004; Kucuksezgin et al., 2006).

The mussel and fish samples were collected seasonally from 2008 to 2009 at Inciralti station, Izmir (Figure 1).

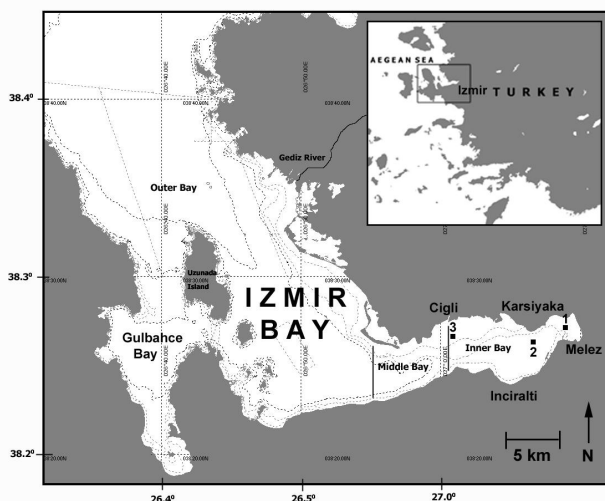


Fig. 1. The sampling station

The radiochemical procedure for mussel samples is given elsewhere (Ugur, 2011). Measurements of  $^{210}\text{Po}$  were realized by its 5.30 MeV alpha particle emission, using  $^{209}\text{Po}$  as the internal tracer. Polonium was spontaneously plated onto silver discs in 0.5 M HCl in the presence of ascorbic acid to reduce of  $\text{Fe}^{3+}$  to  $\text{Fe}^{2+}$ . Polonium alpha activities were measured by Ortec Octete Plus spectrometer. Proline content was determined according to the modified method of Bates et al. (1973). The hydrogen peroxide content was determined according

to Jana and Choudhuri (1981). MDA content was determined spectrophotometrically as described by Heat and Packer (1968).

For mussels, the highest  $^{210}\text{Po}$  and  $\text{H}_2\text{O}_2$  activities were found in winter, while the highest LPO and prolin levels were found in spring.

In this study, in winter period it was observed that stress indicating parameters was lower than expected. This result can be attributed that the detoxification mechanisms are more active in this period.

For fish, the highest  $^{210}\text{Po}$  activities were found in winter, while the highest LPO and prolin levels were found in spring. In liver the  $\text{H}_2\text{O}_2$  levels are higher in spring than in winter. In gills the  $\text{H}_2\text{O}_2$  levels are higher in winter than in spring. In conclusion, this is the first study on the relationship between the  $^{210}\text{Po}$  levels and stress parameters in mussels and fish collected from Inciralti, Izmir, Turkey. In addition to the stress parameters we measured, it could be useful to evaluate the antioxidant enzymes activities, PCBs, PAH, phenols and heavy metal levels in the mussel and fish samples from Inciralti. Madeira et al. (2013) found that the relationship between the lipid peroxidation and temperature changes due to the fish species, therefore for future studies it would be beneficial to investigate this parameter.

## References

- 1 - Bates, L.S., Waldren, R.P. and Teare, I.D., 1973. Rapid determination of free proline for waterstress studies. *Plant Soil*, 39:205-207.
- 2 - Heat, R.L. and Packer, L., 1968. Photoperoxidation in isolated chloroplasts. I. Kinetics and toichiometry of fatty acid peroxidation. *Arch. Biochem. Biophys.* 125:189-198.
- 3 - Jana, S. and Choudhuri, M.A., 1981. Glycolate metabolism of three submerged aquatic angiosperms during aging. *Aquat Bot.* 12:345-354.
- 4 - Kontas, A., Kucuksezgin, F., Altay, O., Uluturhan, E., 2004. Monitoring of eutrophication and nutrient limitation in the Izmir Bay (Turkey) before and after Wastewater Treatment Plant. *Environmental International*, 29: 1057-1062.
- 5 - Kucuksezgin, F., Kontas, A., Altay, O., Uluturhan, E., Darilmaz, E., 2006. Assessment of marine pollution in Izmir Bay: Nutrient, heavy metal and total hydrocarbon concentrations. *Environment International*, 32: 41-51.
- 6 - Madeira, D., Narciso, L., Cabral, H.N., Vinagre, C., Diniz, M.S., 2013. Influence of temperature in thermal and oxidative stress responses in estuarine fish. *Comparative Biochemistry and Physiology, Part A*. 166:237-243.
- 7 - Ugur, A., Özden, B., Filizok, I., 2011. Spatial and temporal variability of  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  in mussels (*Mytilus galloprovincialis*) at the Turkish coast of the Aegean Sea. *Chemosphere*, 83: 1102-1107.