

**Electrochemical biosensor immobilization of formaldehyde dehydrogenase
with Nafion for determination of formaldehyde from Indian mackerel
(*Rastrelliger kanagurta*) fish**

Abstract

An electrochemical biosensor was developed based on formaldehyde dehydrogenase immobilized with Nafion membrane for determination of formaldehyde in fish. The enzyme was immobilized through the entrapment technique and measured based on the reduction of β -nicotinamide adenine dinucleotide. The response time of the formaldehyde biosensor was <1 min, with an optimum pH of 8. The optimum enzyme loading and NAD⁺ concentrations were found at 30 mg/mL and 0.5 mM, respectively. Using the formaldehyde biosensor, a linear response of formaldehyde showed a range of 0.1 to 10 ppm and a detection limit of 0.016 ppm. In application of Nash method, the samples were stored at 4°C \pm 1 for 10 days. With the two combined methods, a linear correlation coefficient with $R^2 = 0.9982$ ($y = 0.956x - 0.014$) was found. The developed formaldehyde biosensor showed a good reproducibility, long storage stability (more than 6 months stored at 4°C), and also effective monitoring of formaldehyde level in Indian mackerel (*Rastrelliger kanagurta*) fish.