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The development of a biosensor for the detection of PS II herbicides using green microalgae

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A biosensor was developed using green microalgae (Chlorophyta) for detecting and monitoring the presence of Photosystem II herbicides in water samples. The biosensor was based on the ability of the herbicide residues to inhibit the quinone-binding site at the PS II complex and its effect on the kinetic of chlorophyll a fluorescence. The inhibition of the quinone-binding site inhibited the electrons flow, causing the absorbed energy to be released. This resulted in an increase in the fluorescence emitted by the sample. This increase in fluorescence was used to detect the presence of the PS II herbicide in the water sample. The reaction mixture consisted of the microalgae mixed with the PS II herbicide. On addition of the herbicide, the microalgae fluorescence increased with time to reach a saturation point. The initial rate of the fluorescence increase after the addition of PS II herbicide was proportional to herbicide concentrations. In this investigation, 6 freshwater microalgae isolated from lake near Likas, Kota Kinabalu were examined; *Scendesmus dimorphus, Chlorella sp., Selesnestrum sp., Kirchneriella sp., Pediastrum sp*. and *Coelastrum sp*. It was found that the best microalga was *Scenedesmus dimorphus* based on the following criteria: (1) highest growth rate, (2) easy to culture and maintain and (3) sensitivity to low concentration of diuron. Intact microalgae were used as the biosensor of herbicide. The fluorescence was determined using fluorometer (TD 700, Turner Design). Herbicides used were PS II herbicides; diuron (3-(3,4-dichlorophenyl)-1,1-dimethylurea), propanil (3′,4′-dichloropropionanilide) and bromacil (5-bromo-3-sec-butyl-6-methyluracil). The sensitivity of the biosensor was 10 μM herbicide concentrations for all species of algae used.