Protect Our Health by Water Bear (Macrobiotus sp.)

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The ESG (Environmental, Social & Governance) indicators emphasize reducing product-induced pollution. Nitrogen fertilizers harm the environment and human health. This study used tardigrade Macrobiotus sp. to detect nitrate in vegetables for environmental and health protection. The study found that the median cryptobiosis concentration of Macrobiotus sp. in nitrate standard solution after 24 hours is 266 mg/L NO3-. Further testing was conducted using the active tardigrade to detect nitrates in various vegetable extracts. The survival rate was highest when testing Chinese cabbage, but the process took 24 hours. Anhydrobiosis tardigrades had significantly shorter detection times, within 2 hours, and could be reused up to 6 times. The autofluorescence intensity emitted at 510 nm when excited with a 490 nm light source was significantly higher than active tardigrade, relative fluorescence intensity could used to defined activity state of Macrobiotus sp. The study also investigated protection mechanisms of tardigrades during cryptobiosis. Both enzymatic and non-enzymatic antioxidant systems were active during cryptobiosis, the expression of antioxidant enzymes SOD and catalase increased significantly. Lipid accumulation formed physical barriers, reducing osmotic stress. Some polypeptides increased during cryptobiosis and recovery, indicating stress-related proteins. In conclusion, the use of tardigrade Macrobiotus sp. as a biological assay to detect nitrate in vegetables is a more time-saving and eco friendly than common nitrates detection method. It also reduces the sacrifice of experimental animals. This model has the potential to detect other chemical stress in the environment, preventing harm to humans and the environment caused by chemical stress.

Awards Won:
Fourth Award of $500