

Evaluating Low-Cost Nitrate Test Strips for Drinking Water Using Algorithm-Based Color Interpretations.

Henry Li

Nitrate (NO_3) is a common contaminant in drinking water as waste from farming and factory industries. Over ingestion of nitrate can cause major health issues such as heart problems and fatigue. Currently, the low-cost method to test nitrate in drinking water is water testing strips. Often the method to use water testing strips to determine the concentration of nitrate in a sample involves a user to directly compare the color panel of nitrate with the reference chart given by the manufacturer. However, this method is very subjective to the user and can produce bias and cause overestimation or underestimation of nitrate in a given sample. In this study, serial dilutions of nitrate in different concentrations is performed, diluted samples are added salt and placed in a colorimeter for marine nitrate samples as reference value. Another portion of nitrate sample is used for nitrate strips. The photos of nitrate strips are taken using a mobile phone with a calibration card to standardize across lighting conditions and cell phone models. The RGB values of nitrate strip and concentrations from the testing meter is plotted. This study concluded that as concentration of nitrate increases, the RGB values decreases. The Green in RGB values is the best predictor of RGB trend with respect to Nitrate concentrations. Furthermore, the study has also concluded that further research is needed as RGB no longer being an accurate predictor for concentrations past a certain concentration. The future perspective of this study includes forming an effective calibration curve that will produce a guessed value of nitrate concentration with the input of a single image of nitrate strip photo. Further, a smart phone app maybe developed as an user-friendly method to analyze nitrate strip and produce such guessed range. This study aims to increase the accuracy of low-cost nitrate testing strip and increase the usability of such product to make nitrate testing more accessible, especially for low-income communities in Eastern North Carolina most affected by nitrate presence in their drinking water.