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RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: Relationship between Secchi disk visibility and chlorophyll *a* in aquaculture ponds

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Abstract: The potential of using Bannister's linear equation ($k_t = k_w + k_c c$) (where k_t is the overall light extinction coefficient, k_w represents the non-phytoplankton light extinction, k_c is the specific light extinction coefficient due to chlorophyll *a* (chla), c is the chla concentration, and $k_c c$ represents the light extinction due to chla) to partition sources of turbidity in Secchi disk visibility (SDV) measurements in aquaculture ponds was evaluated. Eight data sets from five sites around the world were used in the study. Chlorophyll *a* data were regressed against the overall light extinction coefficient determined from SDV measurements. The relationship between chla and overall light extinction coefficient was linear for seven of the eight data sets. The contribution of non-phytoplankton turbidity to SDV measurements was estimated by the intercept of the linear regression line (equivalent to k_w). The values obtained (range = 3.61–8.91 m^{-1}) were variable and unpredictable between replicate ponds at all sites, but did not vary significantly over time ($P < 0.05$). Because chla concentration serves as an indicator of phytoplankton concentration, the contribution of phytoplankton turbidity to SDV measurements was estimated by the slope of the linear regression line (equivalent to k_c) multiplied by the chla concentration. The slope of the regression line (0.014 ± 0.006 m^{-1} (mg m^{-3})$^{-1}$) was similar to values reported for natural freshwater systems. The partitioned light extinction coefficients and chla concentrations were also used to determine the threshold chla concentration above which SDV measurements are determined primarily by chla. The threshold chla concentrations (177–980 mg m^{-3}) above which phytoplankton biomass becomes the primary determinant of SDV were higher than observed chla concentrations. The results indicate that Bannister's linear equation can generally be used to partition and quantify the sources of turbidity in aquaculture ponds. The results also suggest that the contribution of non-phytoplankton turbidity to SDV measurements in fertilized and fed aquaculture ponds can be more important than phytoplankton turbidity.

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