NOTICE OF PUBLICATION

RESEARCH REPORTS
TITLE XII POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

Title: Determination of phosphorus saturation level in relation to clay content in formulated pond muds

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Date: 14 August 1997 **Publication Number:** CRSP Research Report 97-113

Price: The CRSP will not be distributing this publication. Copies may be obtained by writing to the authors.

Abstract: An experiment was conducted to determine the amount of P needed to saturate simulated fish ponds sediments, formulated to contain six levels of clay (0, 30, 41, 64, 73 and 81% by weight). A series of cylindrical cement tanks were filled to 20 cm depth with the six sediment types and triple superphosphate (TSP) solution was added to reach P saturation in sediment. Results showed that all sediment types reached a constant inorganic-P concentration in the upper 5 cm after 12 weeks of TSP application, and P adsorption capacity of sediment increased with increasing clay content. Sediment P adsorption was slower and not significant ($P>0.05$) below 5 cm depth except in the sediment type containing 0% clay. Regression analysis showed that the rate and adsorption capacity of P in sediment are primarily governed by clay content and its dominant minerals. While organic-P and loosely bound-P are commonly deposited in sediment, most inorganic-P is adsorbed by cations to form cation-P complexes. The linear relationship between cation-P saturation level and the percentage of clay in sediment is highly significant (r^2 - 0.84, $P<0.001$) and, therefore, the maximum adsorption capacity of cation-P in pond sediment can be approximated by $Y = 0.019X$ (where Y represents the 100% saturation level in mg P g^{-1} soil, and X is the percentage of clay in the sediment). In practice, the level of P saturation in sediment can be approximated by the intial cation-P and clay contents in the top 5 cm of pond mud using the equation: P saturation (%) = initial cation-P (mg g^{-1} soil) x 100/P adsorption capacity (mg g^{-1} soil).

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This abstract was excerpted from the original paper, which was published in Aquaculture Engineering, 15(6):441-459.

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Pond Dynamics/Aquaculture Collaborative Research Support Program, Oregon State University, Snell Hall 400, Corvallis, Oregon 97331-1641 USA. The Pond Dynamics/Aquaculture CRSP is supported by the U.S. Agency for International Development under CRSP Grant No.: LAG-00-96-900015-00.