133B

***Analysis and speciation of natural mineral fertilizer to be used in prawn farming***

B S Lankage*[1] and J A Liyanage[2]

[1] *Department of Chemistry, The Open University of Sri Lanka, Nawala, Nugegoda.*

[2] *Department of Chemistry, University of Kelaniya, Kelaniya*

Prawn culture in Sri Lanka is relatively a new industry, but it expanded rapidly during the recent years. Nutrition and feeding plays a central and essential role in the development of sustainable prawn culture. Metals (essential and non-essential) that nourish the feed, affect the function of prawn life. Many of these effects depend strongly on the particular form in which the metals are present in the system i.e. the pond medium. Computer aided chemical speciation analysis was used to study the suitability of this natural mineral sample as a prawn feed. Experimentally analyzed quantities of components were used to speciate the changes that occur in leaching of metals from the mineral and the subsequent distribution in the aquatic environment.

Experimental analysis of this mineral sample show (mg) sodium (3.821±0.0231), potassium (4.405±0.0201), calcium (0.9851±0.0347), magnesium (0.0498±0.0), manganese (0.076±0.003), copper (0.0548±0.0021), iron (14.428±0.0542), zinc (0.1058±0.0155), silver (0.0024±0.0021), nickel (0.0131±0.0046), lead (0.1015±0.0152), nitrite (230.0±152.2), sulphate (41.5±7.6), nitrate (677.5±90.21), phosphate (1.3±1.2) and silicate (198.2±10.2).

Computer simulations of concentration of each ion species as a function of pH at 30 °C indicate that, iron is completely precipitated in the pH range of 2-14 as $Fe_2O_3$, sodium, potassium and silver show 100% dissolution in their +1 oxidation state, magnesium is completely dissolved in 1-9 pH range. Calcium dissolves 100% up to pH 8 and precipitation starts at pH 9 and reaches an optimum value 91.5% at pH 12. Copper indicates 100% dissolution in the pH range 8-9. Manganese is present as $Mn^{2+}$ in the pH range of 7.6-8.5 and precipitation occurs between $7<pH<13$. Zinc dissolves into four forms, but their solubility is very low except $Zn^{2+}$ in the pH range of 7.6-8.4. Zinc is precipitated as $ZnSiO_3$. Nickel and lead are not essential metals for prawn culture and their solubility is very low. Silicate dissolves 100% as silicic acid ($H_4SiO_4$) in the pH range of 7.6-8.4 for prawn farming. Absorbing metals such as $K^+$ and $Na^+$ are in complete dissolved state and the minerals that are consumed in bulk are stable in the sample and some are precipitated as minerals.

The stability of the feed (solubility) is the major characteristic quality in prawn feed. The stability of the sample was calculated as the ratio of dry matter retention after leaching and dry matter of the original sample. Dry matter retention was 80.1% at pH 8.15 which is the suitable pH value for the prawn framing. The Nitrogen: Phosphorous ratio is 172:1. Therefore, this mineral sample also can serve as a nitrogen fertilizer for algal culture.

*bslankage@hotmail.com Tel: 011 4204960