

The quantitative evaluation of bio-available particulate phosphorus discharged from Yasu River.

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It is well known that primary production in Lake Biwa is limited by phosphorus, and that means phosphorus load into Lake Biwa influence on its environment. In general, it is considered that algae in aquatic ecosystem use soluble reactive phosphorus (SRP) as a phosphorus source, however, it has been revealed that a part of particulate phosphorus (PP) also might be used as phosphorus source in recent study. It has been reported that PP discharge from watershed increases during ploughing and irrigating the fields or rainfall event, and most of the annual phosphorus load discharged through river is PP. Those mean that discharge of bio-available PP from watersheds has critical potential to control primary production in aquatic ecosystems. However, there are a few studies that clarify the sources and amount of bioavailable fraction of PP discharged from watersheds in Japan. The purpose of this study is to estimate sources and amount of bioavailable fractions of PP discharged from Yasu river watersheds.

River water samples were collected in 5 sites in Yasu river from one to four weeks interval from April 2014 to May 2015. Drainage from paddy fields were collected from Koka city, where locates in middle part of Yasu river watershed 3 times from May 2015 to July 2015. River water during rainfall events was also collected at 2 times in down stream site and 1 time in up stream forested site in Yasu river watersheds. We separated several fractions of PP from suspended sediment (SS) by sequential extraction methods (1M ammonium chloride, 0.11M bicarbonate dithionite (BD), 1M NaOH, 0.5M HCl extraction) in water sample. SRP extracted from the particle fraction was determined by the molybdenum-blue method. We assumed that SRP extracted by ammonium chloride (NH₄Cl-SRP) and bicarbonate dithionite (BD-SRP) were bio-available PP because NH₄Cl-SRP release SRP in low SRP concentration environment and BD-SRP release SRP in reductive condition.

PP concentrations in Yasu river were higher during ploughing period and rainfall events. BD-SRP was dominant in base-flow in Yasu river, however NH₄Cl-SRP was also important in small rainfall event (15.5 mm) at ploughing period, and non reactive phosphorus (NRP) extracted by NaOH (NaOH-NRP) was also important at large rainfall (97 mm) in August. We will discuss the source of these fraction of PP and estimate the amount of discharge rate of those.

Keywords: particulate phosphorus, bioavailability, watersheds