

NUTRIENT BALANCE IN PHYTOTREATMENT POND OF LAND-BASED FISH-FARM WASTEWATER

S. Porrello, M. Lenzi*, E. Persia, M. De Pirro*, P. Tomassetti

Central Institute for Marine Research. (ICRAM), v. di Casalotti, 300 – 00166 Rome, Italy;
s.porrello@icram.org

*Lagoon Ecology and Aquaculture Laboratory (LEALab), OPL s.r.l. v. G. Leopardi 9, Orbetello, Italy;
lealab2@hotmail.com

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Abstract

In the Orbetello lagoon (South Tuscany, Italian West Coast) there are four intensive land-based fish farming facilities which have a wastewater inflow of $51.7 \cdot 10^6 \text{ m}^3 \text{ y}^{-1}$, with the result of a strong environmental impact leading to an extensive cyclic growth of opportunistic macroalgae. One of these fish farms, that produced about 100 tonnes y^{-1} of European sea bass and gilt head sea bream, in 20 soft PVC tanks of 450 m^2 everyone (total volume of 9000 m^3), adopted a phytotreatment system, constituted of four ponds, arranged in series (10451 m^2 , 7134 m^3 , about 80% of the total rearing volume). In treatment system, *Ulva rigida* C. Ag developed spontaneously. The aim of the present investigation, carried out between June 1999 and May 2000, was the valuation of the diurnal efficacy of the adopted improvement system, in real scale. For this purpose, the yearly N and P balances (as dissolved and particulate water components and macroalgal and sediment contents) were calculated. Monthly water samples were taken at 8:00 a.m. in input and at 4:00 p.m. in output from the treatment, considering the calculated Mean Residence Time of 8 hours, to determine total dissolved (TDN, TDP) and total particulate (TPN, TPP) nutrients. Yearly macroalgal production by consecutive monthly biomass determination and three-monthly N and P content determination in algal thalli and sediment were estimated. The balance result showed reduction of 13.7% and 20.9%, respectively for total nitrogen (TN=TDN+TPN) and total phosphorus (TP=TDP+TPP). The sediment stored 9% and 20.7% of TN and TP inputs, respectively, while only 3.0% and 0.2% were stored into the macroalga. 4.0% of TN was maybe removed towards the atmosphere. The expectations stimulating the construction of the phytotreatment system were not completely disappointed, at least as far as the validity of the criterion adopted was concerned, nevertheless, an high nutrient quantity was still released in the lagoon environment.