

ORGANIC MATTER AND MUCILAGE FORMATION IN THE NORTH ADRIATIC SEA

V. Vojvodić * and B. Čosović

Center for Marine and Environmental Research, Rudjer Boskovic Institute, Bijenička c. 54, 10002 Zagreb, Croatia - vojvodic@irb.hr

Abstract

In the recent period, the massive formation of aggregates reported as "mucilage phenomenon" occurred in the north Adriatic Sea. Here we compared the data of dissolved organic carbon (DOC) content and the concentration of its reactive part with surface active properties obtained in the north Adriatic Sea during intensive mucilage event of 2002, and of 1994 in the absence of such event.

Keywords : *Adriatic Sea, Mucus Aggregates, Organic Matter.*

The shallow semi-closed basin of the north Adriatic Sea is characterised by significant seasonal and long-term oscillations of oceanographic and biological conditions such as a complex and different pattern of circulation, River Po discharges, and intrusion of high saline waters. Since 1988, the hypertrophic production of huge mucilaginous aggregates forming layers along seawater column has occurred in the north Adriatic Sea with increased frequency and intensity (summers of 1988, 1989, 1991, 1997, 2002-2004) [1].

Understanding of the phenomenon of formation of aggregates requires better knowledge of the nature and physico-chemical properties of organic matter, particularly of surface active substances mostly produced by phytoplankton activities.

This work was therefore aimed to determine the distribution and reactivity of organic matter in the north Adriatic Sea in two characteristic years as 2002 with and 1994 without mucilage formation.

Surface active substances were analysed in the samples collected from the depth of 0.5 m at the sampling positions in the north Adriatic Sea situated along the transect between Rovinj and mouth of the River Po. For quantitative determination of SAS measured in nonfiltered (SAS NF) and filtered (SAS F) samples by electrochemical method (a.c. polarography) the calibration curve of model nonionic SAS, Triton-X-100 was used [2].

During both periods of investigations, 1994 and 2002, the lowest values of SAS concentrations were observed in winter (0.025-0.093 mg/L), while higher concentrations (0.024-0.285 mg/L) were detected in the period from spring to autumn. DOC values showed similar trends of seasonal variations with lower values in winter (0.93-1.69 mg/L) and higher values (1.02-2.91 mg/L) in the period from spring to autumn.

Markedly higher concentrations of DOC (29 % to 40 %) were obtained during 2002 in which massive formation of huge aggregates occurred, in contrast to the concentrations obtained for 1994 without the mucilage phenomena. However, in 1994, concentrations of surface active substances were higher, 6,5 % to 27 %.

(NSA), which have been calculated by dividing the obtained surfactant activities by the belonging organic carbon content [2]. Comparison was made with model substances as representative for naturally occurring organic materials, fulvic acid, polysaccharides Dextrane T-500 and Xanthan. As shown in Fig.1 the most data obtained in March of 2002, in which both SAS and DOC values significantly increased, are grouped close to the lines of Xanthan, i.e. organic matter with high organic carbon content showed similar reactivity to those of high molecular weight polysaccharide Xanthan (Mw 2×10^6). In contrast, the data obtained in 1994 with lower and almost constant DOC concentrations are shifted towards the lines of more reactive lower molecular weight organics such as polysaccharide T-500, and fulvic acid (Mw up to 10^5).

The obtained results suggest that in the north Adriatic Sea in early spring of 2002 dominated reactive organic material with high content of organic carbon, which probably had an important role in the massive accumulation of organic carbon and in triggering the mucilage occurrence.

References

- 1 - Giani M., D.Degobbi D. and Rinaldi A. (eds), 2005. Mucilages in the Adriatic and Tyrrhenian Seas. *In: Science of the Total Environment*, Elsevier, The ISSN: 0048-9697, Volume 353, Issue: 1-3, 15-Dec-2005.
- 2 - Čosović B. and Vojvodić V., 1998. Voltametric Analysis of Surface Active Substances in Natural Seawater. *Electroanalysis*, 10, (6), 429-434.

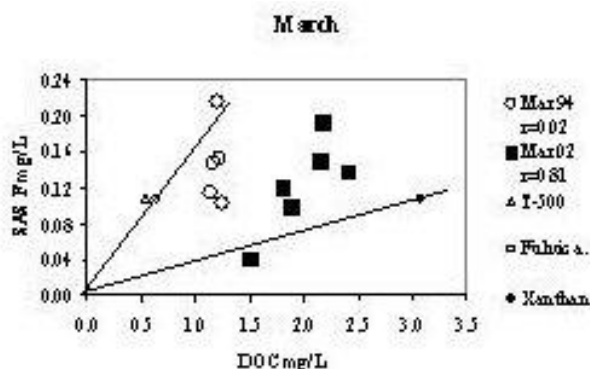


Fig. 1. Correlation of SAS concentrations eq. to Triton-X-100 and DOC values obtained in the north Adriatic Sea samples collected at depth of 0.5m during 1994 and 2002. Dashed lines correspond to model SAS: 1) fulvic acid, 2) polysaccharide dextran T-500 and 3) xanthan.

Surface active properties of organic substances obtained in the selected month (March) were characterized by normalized surfactant activities