# The challenge of monitoring textile dyes' byproducts in the aquatic environment

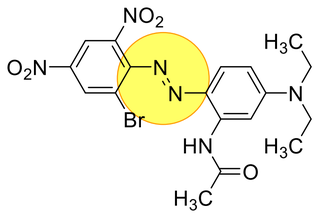
*Emerging pollutants in aquatic ecosystems*

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3rd IN THE IWRA ONLINE CONFERENCE SERIES

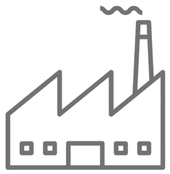
## 1 INTRODUCTION

Disperse dyes are often used in textile dyeing process. Colorless byproducts are generated during the dyeing processes that include dye reduction wash out and chlorination disinfection steps.

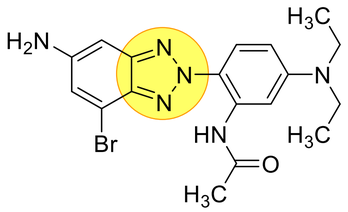
Dyes and their byproducts are released into rivers through wastewater treatment plants.



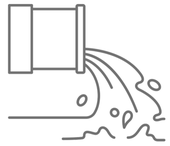
C.I. Disperse Violet 93



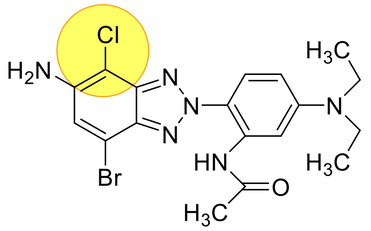
Chemical agents



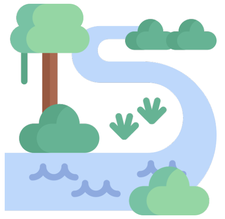
Non-CI PBTA-9



Chorinatination



PBTA-9



Occurrence

## 2 MATERIAL AND METHODS

Synthesis of byproducts

AMES test

Acute toxicity - 48 h
*D. silimis*

Monitoring - HPLC

## 3 RESULTS

Byproducts, non-CI PBTA-9 and PBTA-9, were more mutagenic than C.I. Disperse Violet 93 (Fig. 1). No toxicity for *D. similis* was observed to C.I. Disperse Violet 93 below its water solubility, but non-CI PBTA-9 and PBTA-9 were toxic with an EC50 258 and 444 µg $L^{-1}$ (Fig. 2). The non-CI PBTA-9 and the dye DV93 were found in surface waters. The chlorinated compound, PBTA-9, was not detected in surface waters (Table 1).

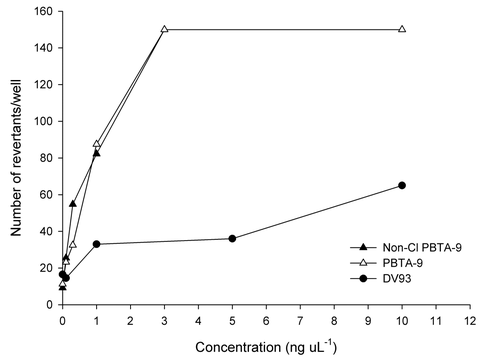



Fig. 1 Mutagenicity of non-CI PBTA-9, PBTA-9 and DV93 (YG1041 ± S9)

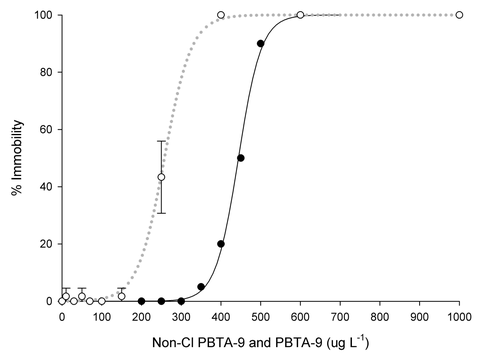



Fig. 2 Toxicity of non-CI PBTA-9 and PBTA-9

Table 1. Occurrence of compounds in surface water

| Non-CI PBTA-9 | PBTA-9 | DV93 |
|---|---|---|
| 1.3 – 7.9 ng $L^{-1}$ | < LOD | 1 ng $L^{-1}$ |

## 4 CONCLUSIONS

The monitoring of dye byproducts are still a challenge for regulatory agencies. First, the route of synthesis of these contaminants is not always known which makes difficult to obtain analytical standards to assess their hazard and their concentrations in the aquatic environment. Second, byproducts are usually related to local problems, and industrial processes are always evolving generating continuous research.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unesco Intergovernmental Hydrological Programme

IWRA International Water Resources Association