



COMPARATIVE TOXICITY OF THE FUNGICIDE PROCHLORAZ BETWEEN ESTUARINE AND FRESHWATER ORGANISMS



O. Andreu-Sánchez, E. Sancho and E. Andreu-Moliner

Lab. of Ecotoxicology and Environmental Quality. Dept. of Functional Biology. Faculty of Biological Sciences. University of Valencia. C/ Dr. Moliner, 50. E-46100-Burjassot (Valencia), Spain.

Author's contact: encarna.sancho@uv.es. Fax: +34 96 354 37 77



Fig. 1: Albufera of Valencia

INTRO.

The Albufera Lake (Eastern Spain) presents two differentiated aquatic environments: estuarine and freshwater (Fig. 1). Estuarine area is due to influence of seawater intrusion and freshwater area is fed by from irrigation channels and ditches. Prochloraz is a fungicide widely used as alternative to Carbendazim treatments in paddy fields from Eastern Spain. It is used among the Spanish Mediterranean wetlands during July and early August to avoid and treat rice blast disease caused by *Pyricularia oryzae* fungi (Fig. 2). During this period spraying operations with commercial Octagon E® (45% a.i.) are conducted by farmers (Fig.3).



Fig. 2: Effects of *P. oryzae* on rice plants



Fig. 3: Spraying operation with prochloraz fungicide during July and early August

MATERIAL AND METHODS.

To assess the effect of pesticides on marine and freshwater environments, it is necessary to compare representative organisms for both environments. For this reason, we have selected the *Artemia franciscana* (Artoxkit M™) as marine-estuarine organism (Fig.4) and *Thamnocephalus platyurus* (Thamnotoxkit F™) as freshwater organism (Fig.5). TOXKITS™ microbiotests are based in dormant or immobilized eggs (cryptoforms), which are hatched to obtain live organisms to perform the tests. All bioassays were performed according to the Standard Operational Procedure (SOP) provided in each Toxkit™.

Assays were performed in 24 wells polystyrene plates. The organisms were exposed to different concentrations of a.i. Prochloraz (Purity >99.5% a.i., from Riedel-de-Haën) for a period of 24 hours to evaluate acute toxicity. Acetone was used as carrier, due to: 100, 50, 25, 12.5 and 6.25 mg/L to *Thamnocephalus platyurus* and 50, 25, 12.5, 6.25 and 3.12 mg/L to *Artemia franciscana*, respectively. LC_{50-24h} values were obtained by means of a Probit regression included in SPSS+ v.15 Statistical Software.



Fig. 5: Thamnotoxkit F™

Fig. 4: Artoxkit M™

Table 1. LC _{50-24h} values, expressed in mg/L (95% CL), for Prochloraz tested on <i>A. franciscana</i> and <i>T. platyurus</i> larvae 24h old.		
Organism	LC _{50-24h} mg/L	C.L. (95%)
<i>Artemia franciscana</i>	40,7*	36,4 - 45,1
<i>Thamnocephalus platyurus</i>	12,9*	11,5 - 14,3

*Significant differences ($p < 0.05$, $n=10$)

RESULTS AND DISCUSSION.

Results of the study are showed in the Table 1. *Thamnocephalus platyurus* (LC_{50-24h} = 12.9 mg/L. - I.C.95% = 11.5 - 14.3 mg/L) was more sensitive than *Artemia franciscana* (LC_{50-24h} = 40.7 mg/L. - I.C.95% = 36.4 - 45.1 mg/L). The ANOVA test showed significant differences ($p < 0.05$) between both classes of organismos used in the study. These sensitive differences can be influenced by important factors such as pH and salinity.

Sensitivity to pesticides may also be influenced by specific physiological characteristics of aquatic species. For example, *A. franciscana*, as euryhaline organism, have a higher capacity of osmoregulation which in turn contributes to a higher resistance to contaminants. According to 93/67/EEC European Directive, this compound is classified like Harmful (H) (Harmful: EC₅₀=10-100mg/L).

CONCLUSIONS.

Two commercial microbiotests, Artoxkit M™ and Thamnotoxkit F™ based in 2 species from different aquatic environment (marine/estuarine and freshwater respectively) has been used to evaluate the toxicity of Prochloraz, a widely fungicide used in rice cropping areas like Albufera Natural Park (Valencia, Spain). The use of two different organisms from different environments like *A. franciscana* and *T. platyurus* is a simple tool to evaluate the potential toxicity of pesticides used in irrigated areas. The use of several aquatic invertebrates in acute toxicity tests, is essential determine the possible environmental risk associated to the presence of these contaminants, in freshwater and seawater ecosystems. These important differences, in the response of non-target organisms to pesticides, confirm that there is no possibility of comparison between the results obtained and the sensitivity of organisms presented in different ecosystems. Thus the need for a battery of bioassays is justified.

ACKNOWLEDGEMENT.

This study was supported by the Spanish National Plan for Research (Project AGL2002-04532-C03-01). OAS acknowledges a doctoral fellowship from the Spanish Ministry of Science and Education. Toxkits™ used in this study were kindly donated by ECOTest, s.l.