

The “Aflatox” database: a tool for QSAR studies and for the development of new antifungal and anti-aflatoxigenic compounds

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The aim of the Aflatox project (www.aflatox.it) is the development of an innovative biotechnological multi-step approach to design and test new compounds with a biological activity on fungi. The full-experimental database that we have been creating constitutes a powerful source of data to identify important requirements to be taken into account for the development of new generation pesticides, responding to “greener” and environmentally sustainable agricultural strategies. In particular, the compounds must be active against phytopathogenic genera contaminating cereals and food/feed derivatives, with a particular focus on aflatoxigenic species. The requirements to become a good candidate, are not only the high effectiveness in preventing fungal proliferation and mycotoxin biosynthesis, but also the non-toxicity for the environment and the human health.

The project has been divided into three different sections: the first is the design and synthesis of some parent compounds from natural molecules, the second is the study of their biological effect and cytotoxicity, and the third is the chemical modification of the most active compounds in order to study the mechanism of action and to improve the biological activity. In particular, in this last stage of the project, the compounds which had shown good results were modified not only in their chemical scaffold, but also used as chelating agents for bio-metal ions like zinc, copper or iron. In fact, molecules bound to transition metal ions present the capacity of promoting the cellular uptake and, in most cases, to introduce a source of oxidative stress in the target.

At present, we have managed to create a database containing a panel of 162 compounds which have been synthesized, characterised and tested for antifungal and antimycotoxigenic properties. Toxicological and genotoxicological evaluation were conducted on human cell lines and *A. cepa* root apex. All these data have been collected in a database that will allow us to produce Q-SAR (Quantitative structure-activity relationship) evaluation profiles.



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