

BIODEGRADATION OF CYPERMETHRIN AND AMITRAZ BY *Aspergillus niger* IN CATTLE TICK DIPPING BATHS

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INTRODUCTION

In the last decades, the liberation of polluting agents to the atmosphere, produced mainly as a result of the industrial development, has surpassed the natural mechanisms of recycling and auto-depuration of the receiving ecosystems. For that reason, and in order to reduce the liberation of polluting agents, it exists nowadays the need to investigate processes that accelerate the degradation of the polluting presents in the atmosphere.

Bioremediation is a technology that use the metabolic potential of the microorganisms to transform organic polluting agents into simpler compounds. It constitutes a very useful tool to reduce the environmental impact since a great number of microorganisms from the ground and the water have been isolated and characterized, able to degrade a large range of organic compounds.

The amitraz and the cypermethrin are two compounds that are used in baths for the elimination of tick in cattle, since there are zones where the tick is an animal sanitary problem.

For the amitraz effectivity, the pH must be around 12 and in these conditions it remains indefinitely active. It does not happen the same with the cypermethrin that works at pH between 6 and 7 and is degraded in months.

The volume used in these baths is approximately 10,000 liters, which indicates the potential contamination that these compounds can cause if they spills on environment.

OBJECTIVE

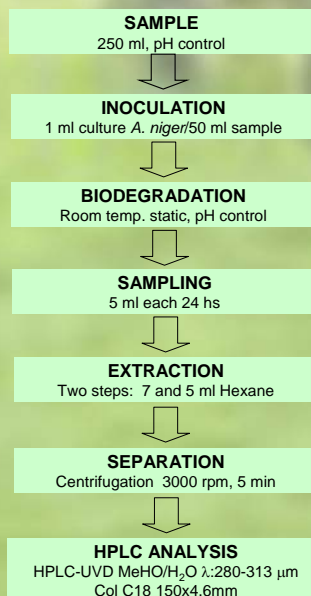
The objective of this work was to study, on a laboratory scale, the biodegradation of cypermethrin and amitraz - used for the elimination of tick of the cattle - by treatment with *Aspergillus niger*.

MATERIALS AND METHODS

Fungal strain: the strain of *Aspergillus niger* used in this study was provided by the Laboratory of Microbiology of the Faculty of Chemical Engineering. It was reactivated in Malt Extract Agar (MEA) for 8 days at 28 °C to prepare the suspension of fungal spores to inoculate the reactors.

Biodegradation assays: the suspension of fungal spores was made by scraping the Petri dishes cultivated for 8 days at 28 °C and suspending the conidia in 5 ml of polysorbitan 80 (Tween 80) to 0.1%.

One milliliter of culture was inoculated into 50 ml of sample 1 (277 ppm cypermethrin) (Reactor 1) and 50 ml of sample 2 (250 ppm amitraz) (Reactor 2). Both reactors had a capacity of 250 ml.



Study of *Aspergillus niger* viability

Microbial counts were made to obtain the initial concentration inoculated. After a contact period of 30 min in both reactors, microbial counts were made at time zero and every 24 hours during 7 days to evaluate the viability of *A. niger*. Decimal dilutions of fungi were made in 0.1% peptone water and cultivated on MEA for 5 days at 28 °C. Results were expressed as viable counts per ml (CFU/ml).

RESULTS AND DISCUSSION

A strong degradation of Amitraz and Cypermethrin by action of *Aspergillus niger* up to 50 % of initial concentration was found.

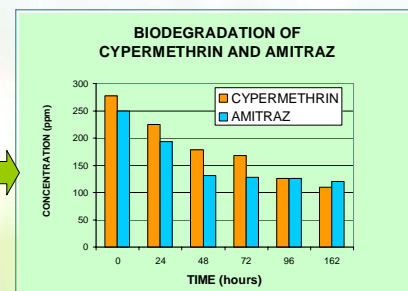


Fig. 1: Evolution of Cypermethrin and Amitraz concentration in the presence of *A. niger*

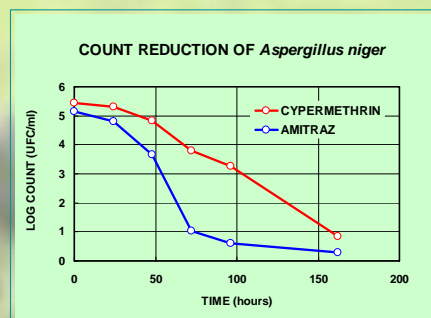


Fig. 2: Evolution of *Aspergillus niger* in Cypermethrin and Amitraz

A diminution in fungal counts from 4 to 5 log orders was observed.

CONCLUSION

The use of *Aspergillus niger* for the degradation of cypermethrin and amitraz is a promising tool due to the reduction of the time of degradation and to the destruction of the microorganism inoculated.

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