

# CHARACTERIZATION OF THE MESOTRIONE BIODEGRADATION PATHWAY BY *BACILLUS* STRAINS – COMPARISON OF SOIL SLURRIES AND BATCH EXPERIMENTS



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Recently marketed selective herbicide from the triketone family to control broad-leaved weeds in maize (under the name Callisto®)

## Introduction

Derived from a natural phytotoxin produced by *Callistemon citrinus*

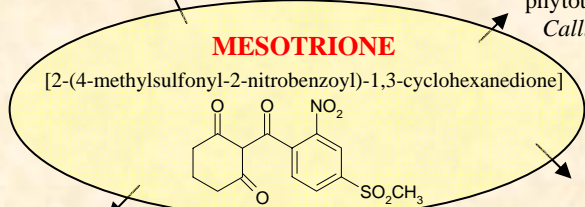
## Screening of microbial strains

120 bacterial and fungal strains tested

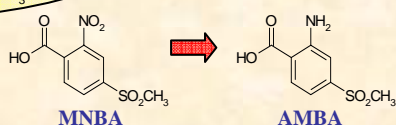
(previously isolated from the different environmental compartments)

Only 7 bacteria able to biotransform mesotrione

One very efficient: *Bacillus* sp. 3B6



Acts by competitive inhibition of the enzyme 4-HPPD involved in the carotenoid biosynthesis



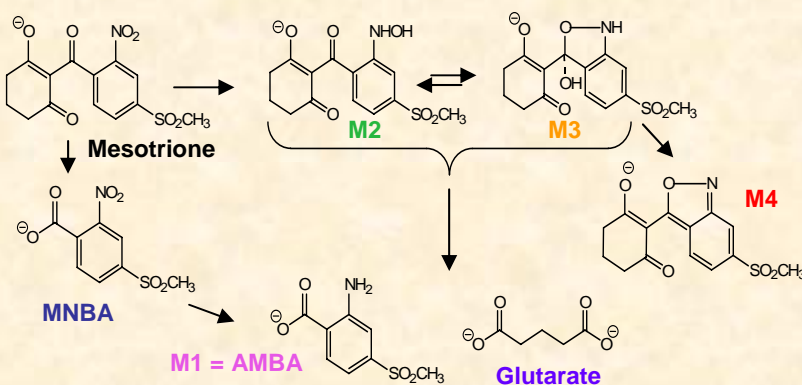
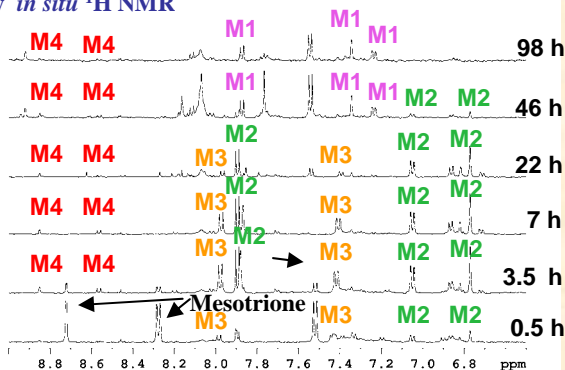
Isolated from cloud water with an impactor



*Bacillus* sp. 3B6

## Biodegradation pathway of mesotrione by *Bacillus* sp. 3B6 in water

Kinetics of mesotrione (1mM) biodegradation monitored by *in situ* <sup>1</sup>H NMR

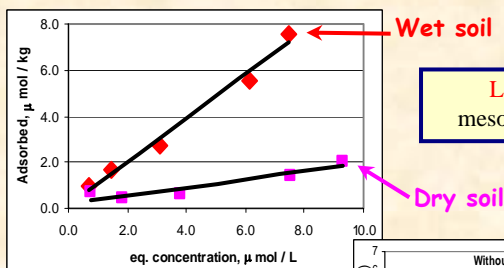


## Modulation of mesotrione biodegradation in soil

Agricultural soil (characterized as clay-loam soil) isolated from « Plaine de Limagne » (France) never treated previously with mesotrione (Horizon: 0-5cm; Clay fraction: 37%, OM: 2.2%)

### Soil slurry experiments

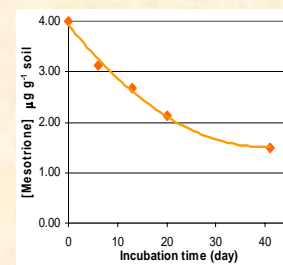
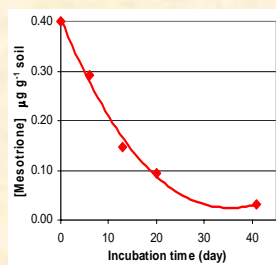
Adsorption isotherms (Solid/liquid ratio 1/3)



Low sorption of mesotrione on this soil

### Batch experiments (Mesocosm)

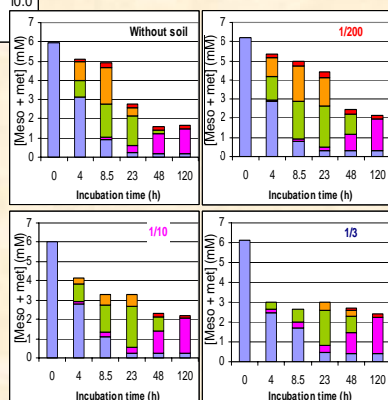
- Spreading of pure Mesotrione (solution buffered at pH 7.0)  
- 1 × [Field Rate (FR): 0.40 μg active-ingredient g<sup>-1</sup> dry soil] and 10×FR



Dissipation of mesotrione

Two metabolites detected (MNBA and AMBA)

Biodegradation in the presence of soil



No kinetic modification of mesotrione biodegradation

Same metabolites observed but ...

Modulation of their kinetics and concentrations

## Conclusions

- \*Detailed description of the mesotrione metabolic pathway
- \*No effect of the soil presence on the mesotrione biodegradation but on its metabolites (**batch experiments**)
- \*Dissipation of mesotrione to a great extent in soil **microcosms**