UNIVERSITEIT GENT

FACULTEIT BIO-INGENIEURSWETENSCHAPPEN

TRANSPORT AND DEGRADATION OF PESTICIDES IN A BIOPURIFICATION SYSTEM UNDER VARIABLE FLUX

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INTRODUCTION

Biopurification systems (BPS) are developed to treat water contaminated by direct losses, which are generated during the filling and rinsing of the spraying machine. A BPS consist of a biological active matrix which retains and degrades pesticides. The retention and degradation characteristics in an organic mixture subjected to three different flows are determined via inverse modelling of the breakthrough curves of isoproturon, linuron, metalaxyl, metamitron and bentazon.

What controls the hydraulic and chemical load on the system?.


Type of crop


Type of sprayer

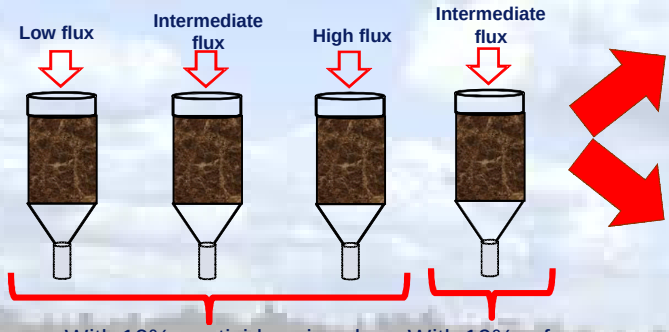

Behaviour of the operator


Spraying scheme


Season

MATERIALS AND METHODS

Pesticides (metamitron, bentazone, metalaxyl, isoproturon, linuron) continuously added at 10mg/l




Microcosms (10 x 15 cm)

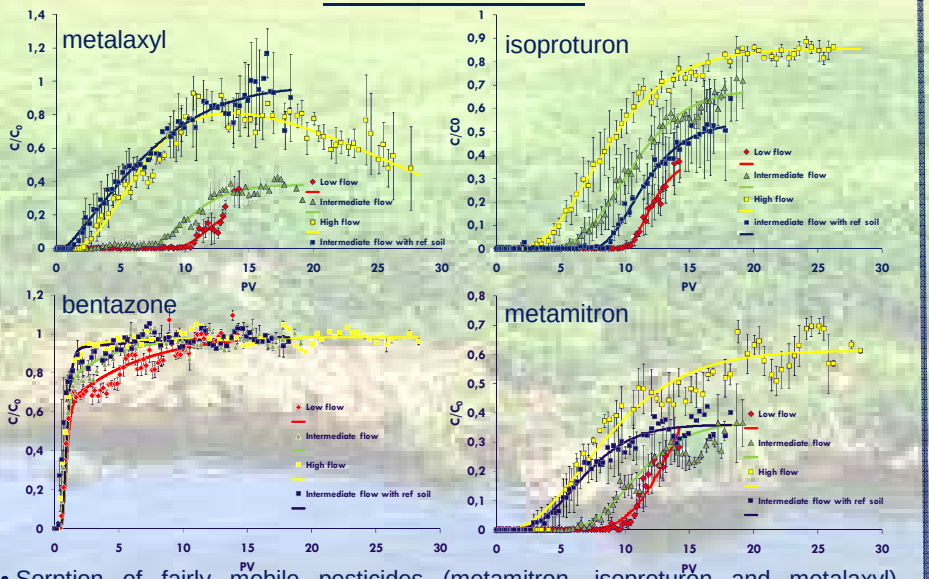

Macrocosms (45 x 45 cm)

Matrix consists of 5% dried cow manure, 25% coco chips, 35% peat mix, 25% straw and 10% pesticide primed soil. Pesticide-primed material = material originating from agricultural field or other sources which have been long-term treated with and exposed to the target pesticide and which have developed a pesticide-degrading micro population able to mineralize the compound.

	Low flux	Intermediate flux	High flux
Microcosm	56.3 l/d/m³	95.6 l/d/m³	160.1 l/d/m³
Macrocosm	12.5 l/d/m³	34.6 l/d/m³	56.4 l/d/m³

RESULTS AND DISCUSSION

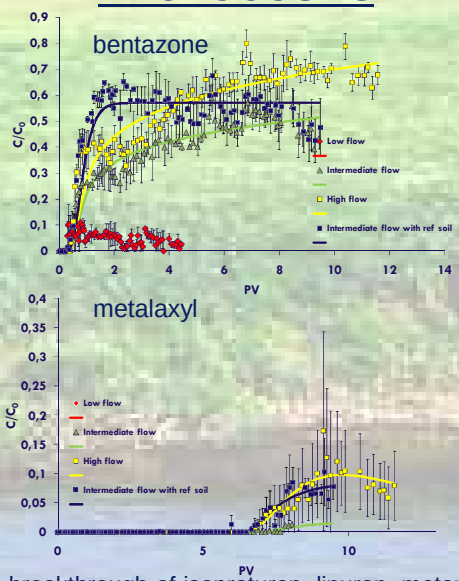
MICROCOSMS



• Sorption of fairly mobile pesticides (metamitron, isoproturon and metalaxyl) decreased considerably with increasing flux, due to nonequilibrium sorption at the highest flux. The applied fluxes did not have a significant influence on very mobile (bentazone) and immobile pesticides (no breakthrough of linuron).

• Dissipation (degradation or the formation of bound residues) of metamitron, isoproturon and metalaxyl was significantly influenced by the flux + higher dissipation of metalaxyl in the columns containing pesticide-primed material.

MACROCOSMS



• No breakthrough of isoproturon, linuron, metamitron, strong reduction (± 90%) in the bentazone effluent concentration at the lowest flow

• Strong reduction in the metalaxyl effluent concentration at all flows + larger reduction in the barrels containing pesticide-primed soil

➔ A DECREASE IN THE CHEMICAL AND HYDRAULIC LOAD ON THE SYSTEM

➔ STRONG REDUCTION IN THE PESTICIDE EFFLUENT CONCENTRATION!

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