



CIDGRO

4th European Biobed Workshop



BIOPURIFICATION SYSTEM FOR PESTICIDES DEGRADATION. AN INTEGRAL STUDY

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STEPS – STUDIES



Degradation



Lixiviation



Inoculation



Rhizosphere

STUDIES - BIOMIXTURE COMPONENTS



Soils →

Organic	(12% OM)
Clay	(3% OM)
Sandy	(2% OM)



Lignocellulosic materials →

Wheat straw
Sawdust
Barley huks



Peat

Biochar

Partial substitution



DEGRADATION (%) OF PESTICIDES (100 mg kg⁻¹)

Biomix	Atrazine	Ioproturon	Iprodione	Chlorpyrifos
A1	89.8 ± 2.4 a	79.1 ± 0.7 a	24.8 ± 1.7 a	76.1 ± 0.9 ab
A2	66.2 ± 4.2 c	63.6 ± 0.2 b	25.6 ± 1.2 a	86.8 ± 0.2 a
A3	77.0 ± 0.2 b	53.2 ± 0.2 c	34.3 ± 0.2 a	57.8 ± 0.2 b
B1	76.5 ± 0.2 b	77.4 ± 2.2 a	52.9 ± 5.2 b	72.9 ± 0.7 ab
B2	75.0 ± 4.2 b	63.3 ± 1.4 ab	38.1 ± 0.3 c	77.2 ± 1.1 a
B3	92.7 ± 0.2 a	52.4 ± 1.7 b	68.4 ± 1.2 a	55.9 ± 1.7 c
C1	73.4 ± 0.4 b	74.4 ± 0.4 a	32.3 ± 1.2 a	76.1 ± 1.2 a
C2	71.6 ± 0.3 c	44.3 ± 1.2 b	25.9 ± 1.5 a	55.7 ± 1.1 c
C3	92.7 ± 0.5 a	65.0 ± 0.2 a	23.6 ± 1.1 a	63.7 ± 0.4 b

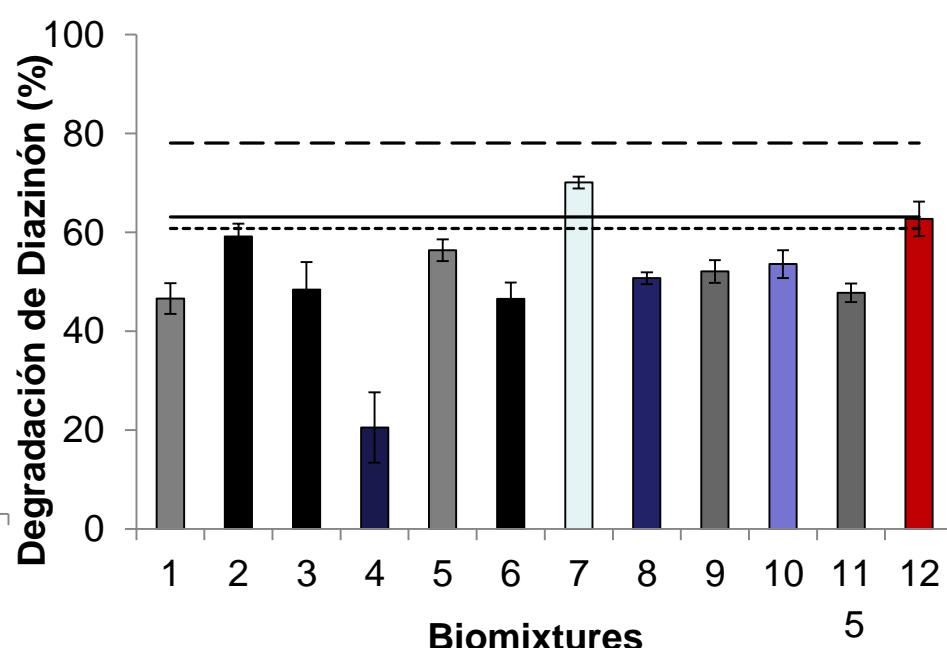
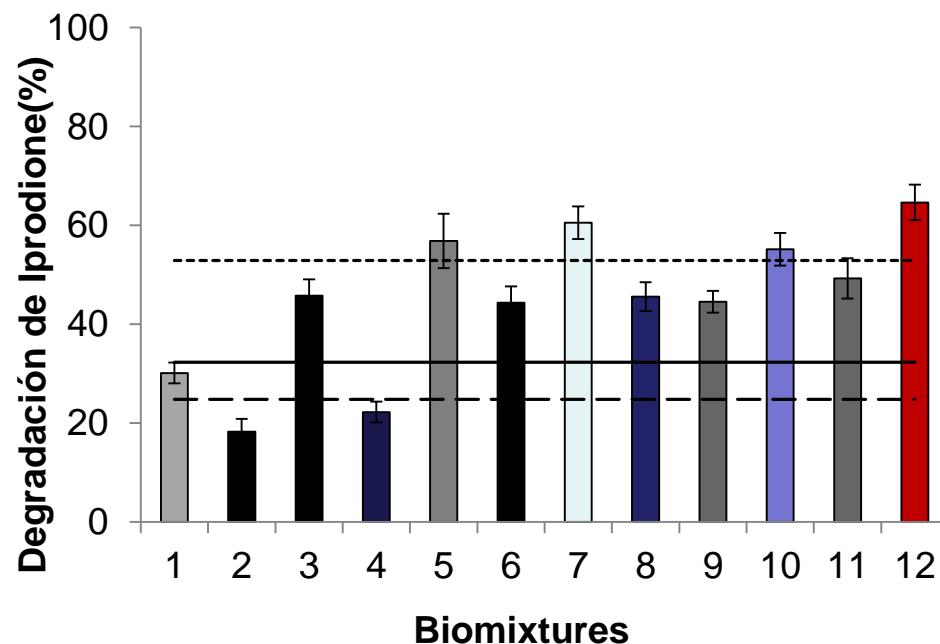
The degradation of the pesticides was high in the biomixes prepared with the different lignocellulosic residues, except for iprodione .

A= clay soil; B: sandy soil; C: organic soil

1=50% straw; 2=25% straw and 25% sawdust; 3=25%straw and 25% barley husk⁴

IPRODIONE AND DIAZINONE DEGRADATION

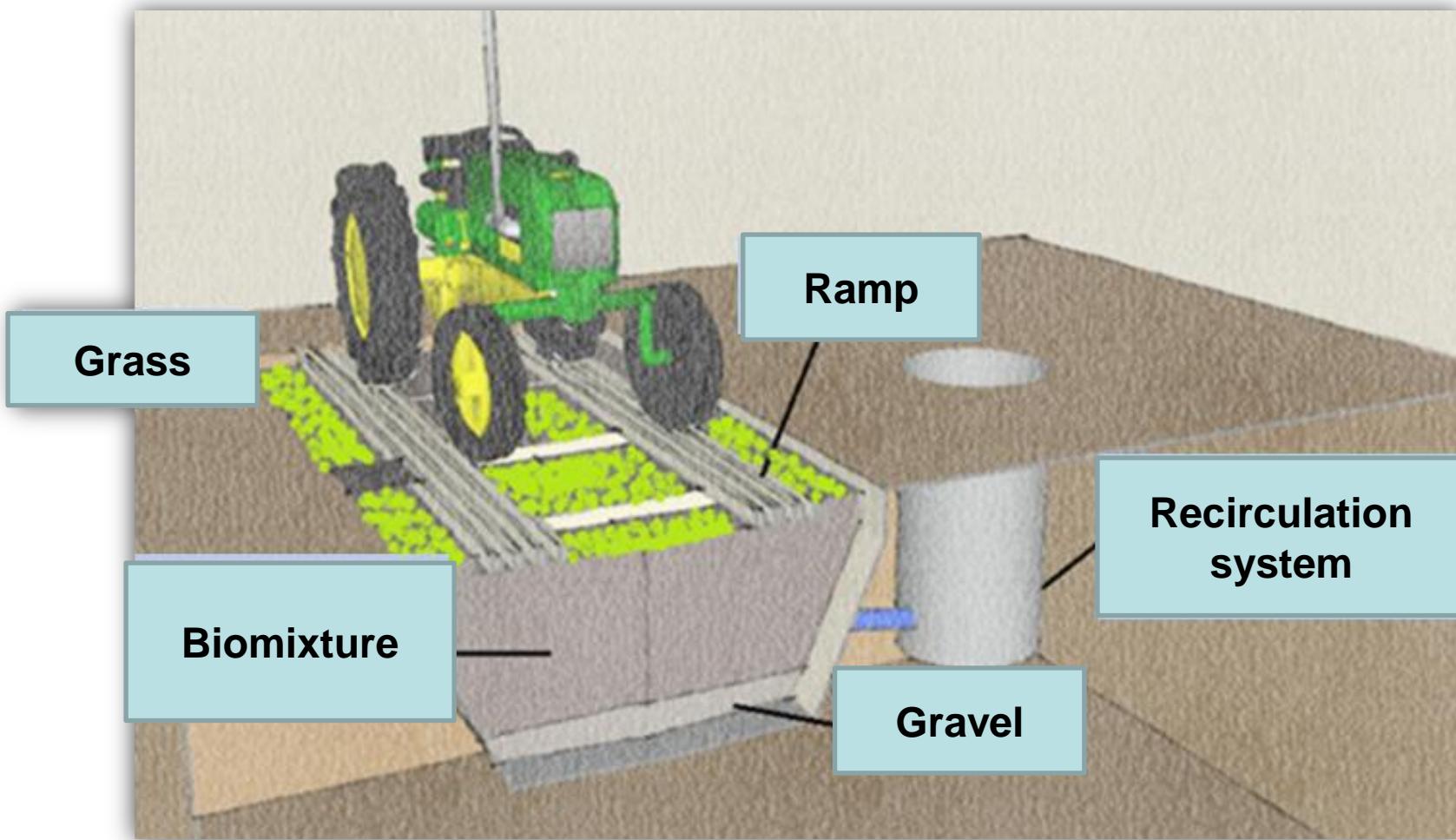
Biomixtures												
	Clay Soil (25%) Straw (50%)				Organic Soil (25%) Straw (50%)				Sandy Soil (25%) Straw (50%)			
	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Peat (%)	20	15	10	5	20	15	10	5	20	15	10	5
Biochar (%)	5	10	15	20	5	10	15	20	5	10	15	20



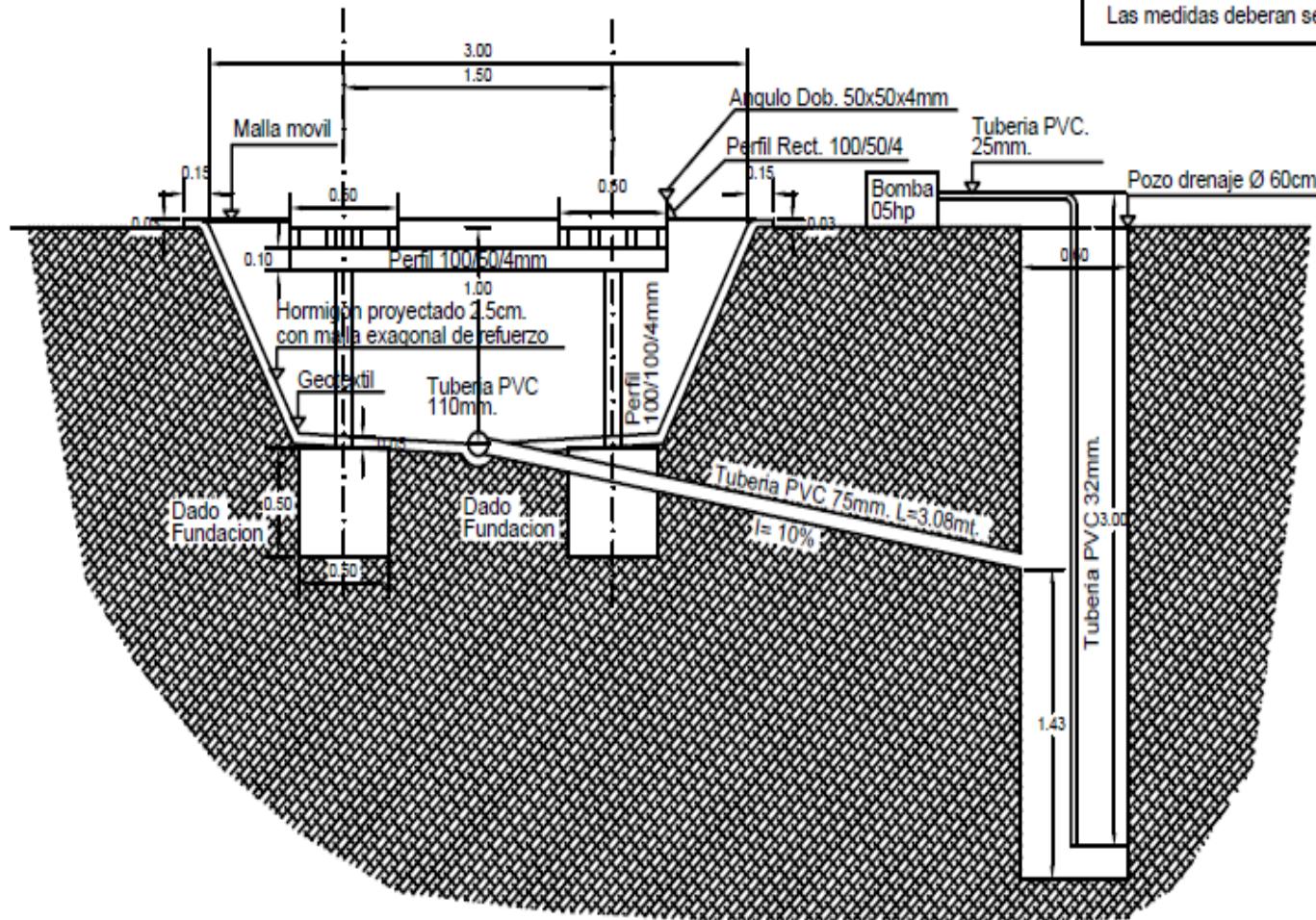
STEPS – EDUCATION-DIFUSION



BIOBED CONSTRUCTION - DIAGRAM



BIOBED CONSTRUCTION



NOTA:

Los materiales a utilizar para la estructura metalica deben ser resistentes segun calculo para 5.000 Kg. (Tractor)

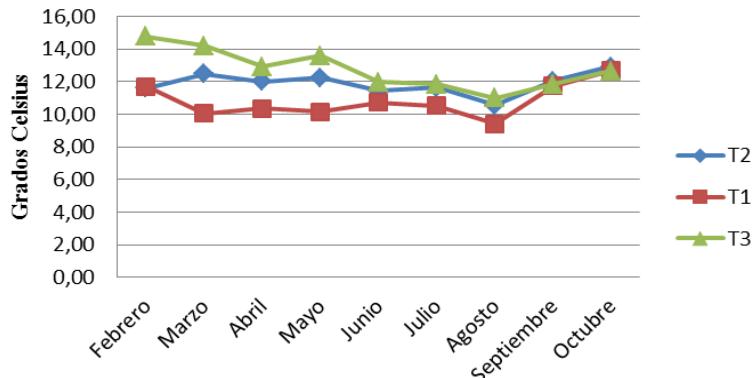
Las medidas deberan ser verificadas en obras

STEPS – CONSTRUCTION-OPERATION-CONTROL

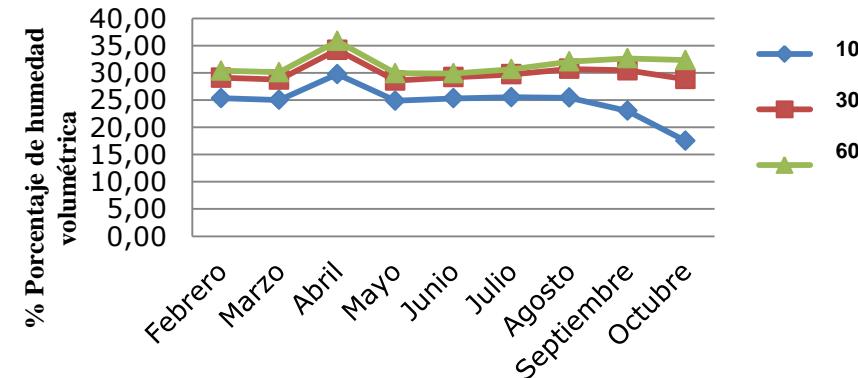


STEPS – CONSTRUCTION-OPERATION-CONTROL

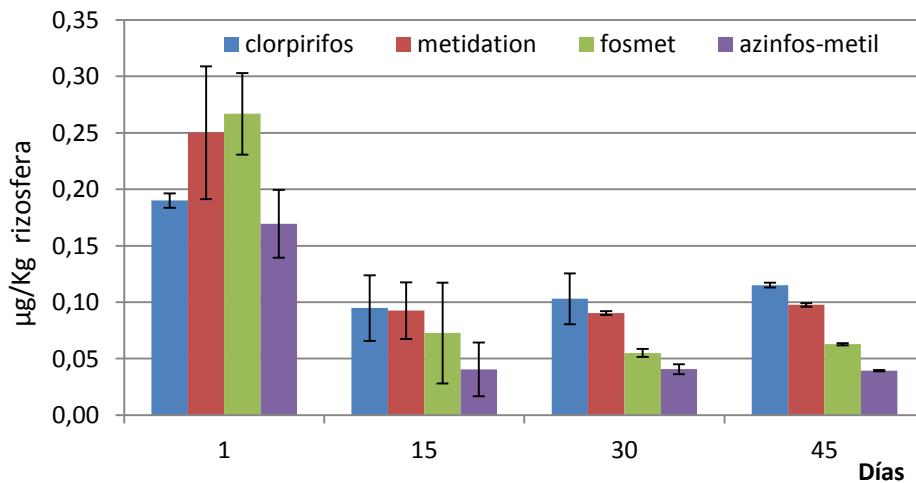
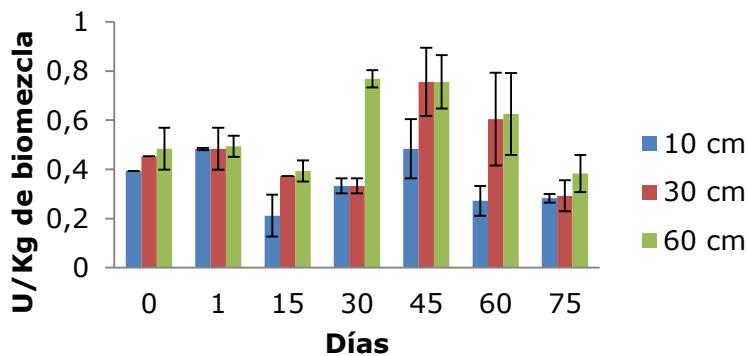
Evolución de la temperatura



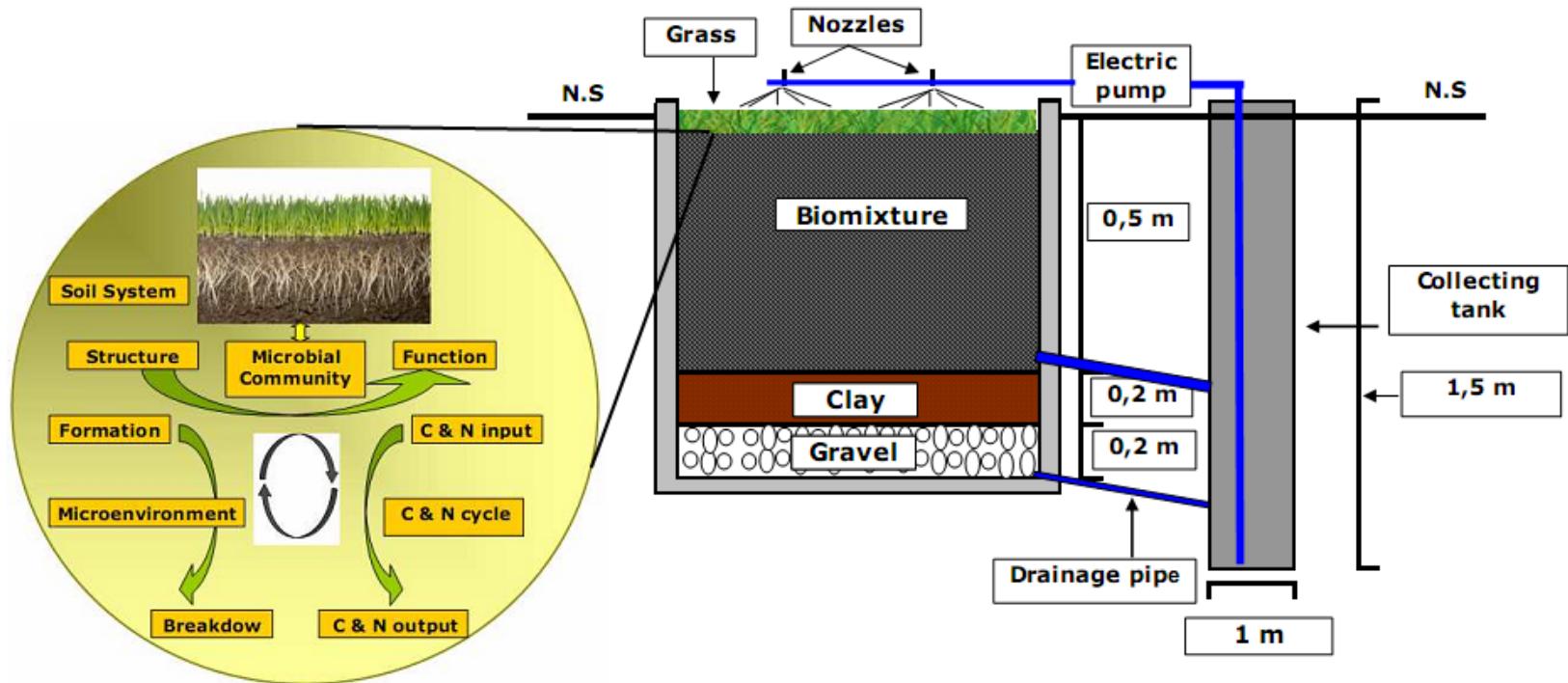
Humidity



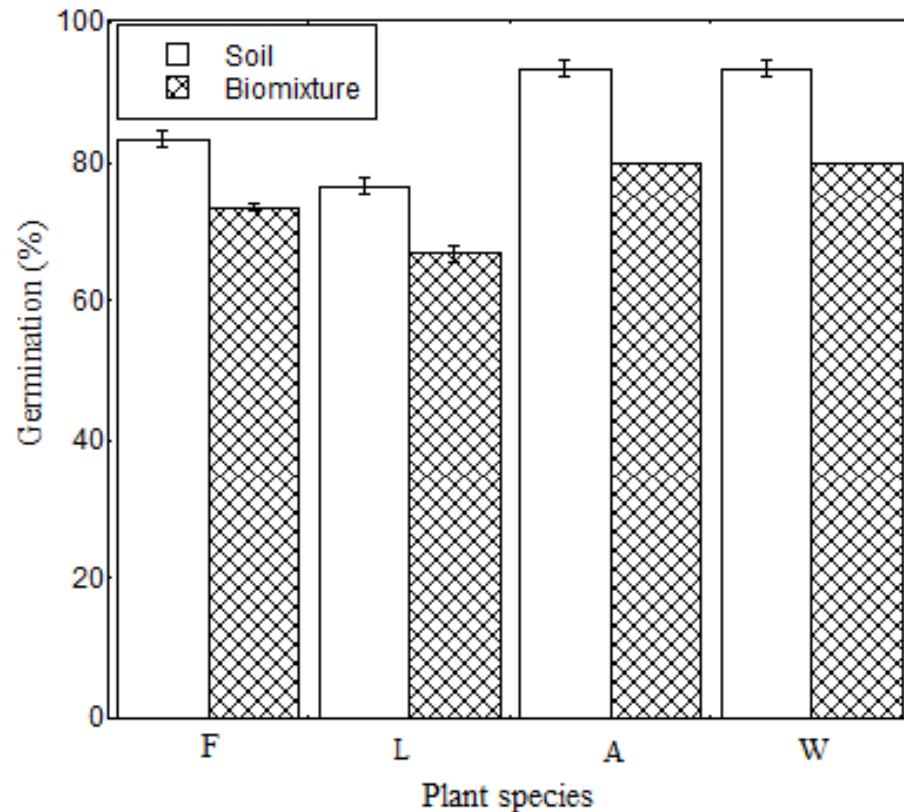
Peroxidases



CURRENT STUDY - RHIZOSPHERE



SEEDS GERMINATION



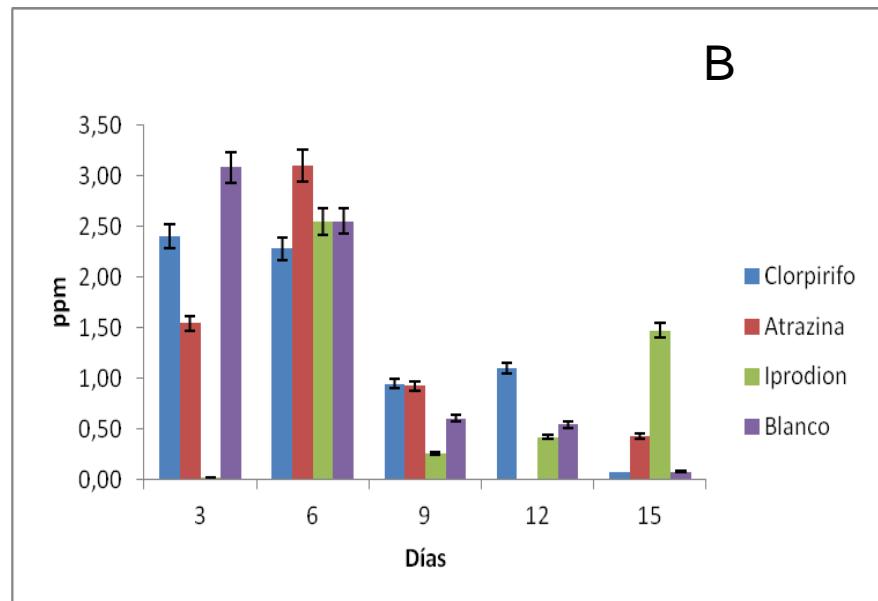
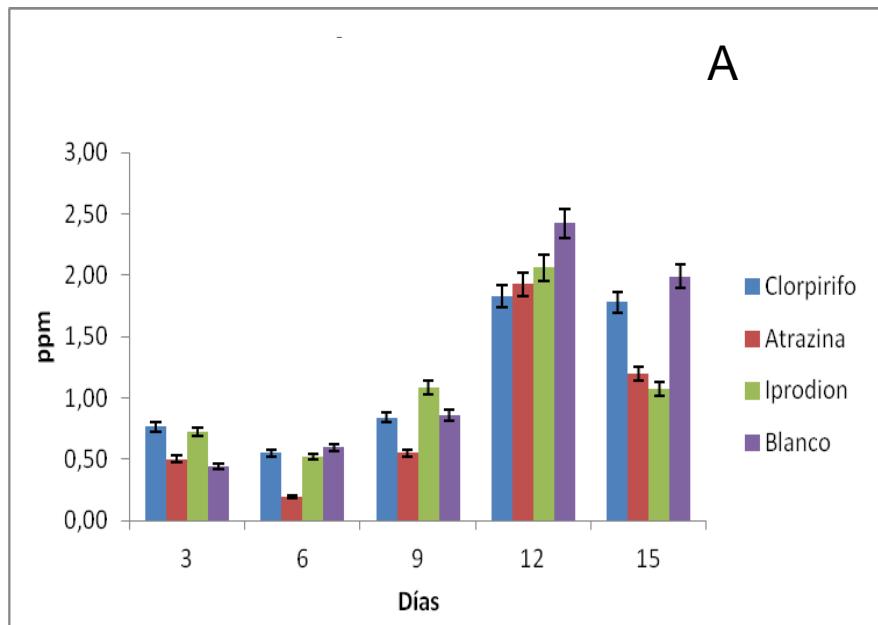
Germination of *Festuca arundinacea* (F), *Lolium perenne* (L), *Agrostis tenuis* (A) and *Trifolium repens* (W) species after 7 days in biomixture or biomixture with a soil layer above.

Germination (%) at day 7 of *F. arundinacea* (F), *L. perenne* (L), *A. tenuis* (A) and *T. repens* (W), contaminated with ATZ, CHL and ISP (0-100 mg kg⁻¹)

Filter paper					Soil			
Pesticides mg kg ⁻¹	F	L	A	W	F	L	A	W
0	83 ^a	93 ^a	100 ^a	93 ^a	83 ^a	77 ^a	93 ^a	93 ^a
ATZ (H)	10	73 ^a	43 ^c	97 ^a	85 ^a	83 ^a	60 ^b	83 ^a
	50	70 ^a	33 ^c	83 ^a	57 ^c	70 ^a	50 ^b	80 ^a
	100	63 ^a	33 ^c	90 ^a	33 ^c	63 ^b	43 ^c	90 ^a
CHL (I)	10	77 ^a	77 ^b	97 ^a	87 ^b	83 ^a	73 ^a	93 ^a
	50	87 ^a	73 ^b	97 ^a	67 ^b	87 ^a	77 ^a	93 ^a
	100	83 ^a	47 ^c	97 ^a	57 ^c	60 ^b	60 ^a	90 ^a
ISP (H)	10	77 ^a	77 ^b	93 ^a	57 ^c	35 ^c	73 ^a	90 ^a
	50	73 ^a	67 ^b	90 ^a	50 ^c	53 ^c	50 ^b	80 ^a
	100	67 ^a	43 ^c	90 ^a	47 ^c	53 ^c	53 ^b	87 ^a

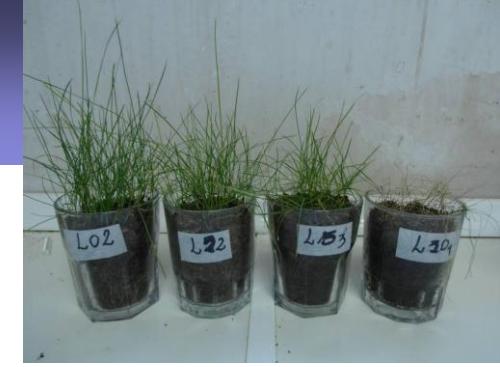
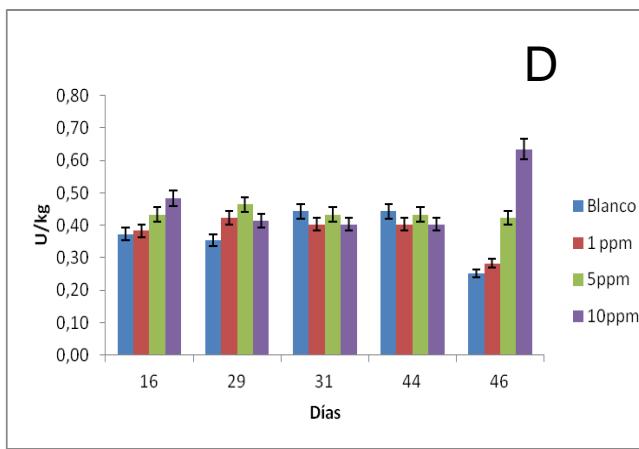
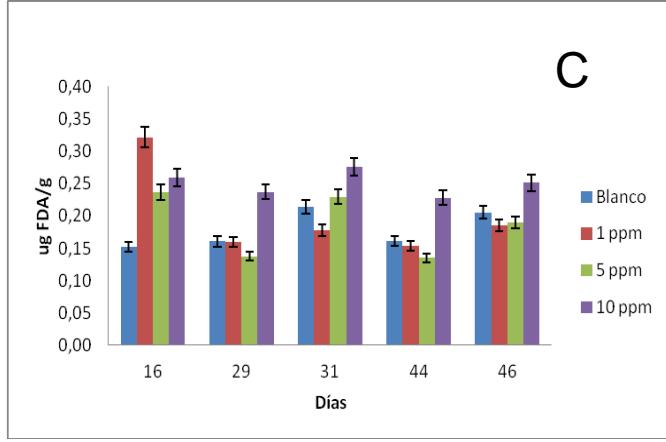
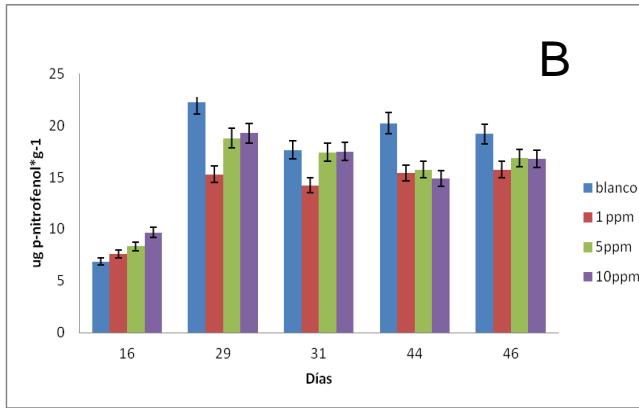
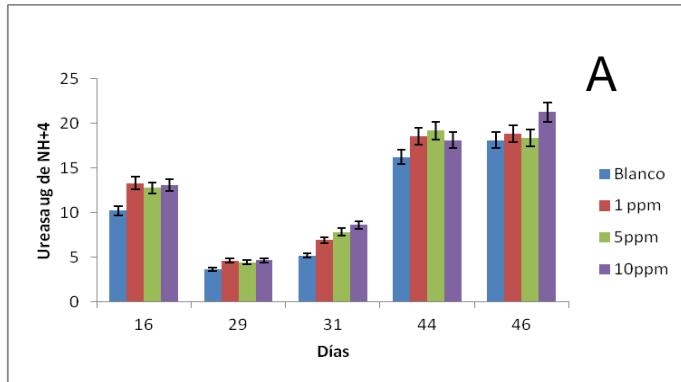
- The seeds germination was higher in soil than in filter paper with exception of *F. arundinacea* in ISP.
- L. perenne* germination was lowest both in filter paper and soil with ATZ
- T. Repens* germination was lower in filter paper with ATZ, CHL e ISP than the control, instead of no differences were observed in soil

ORGANIC ACIDS EXUDATES



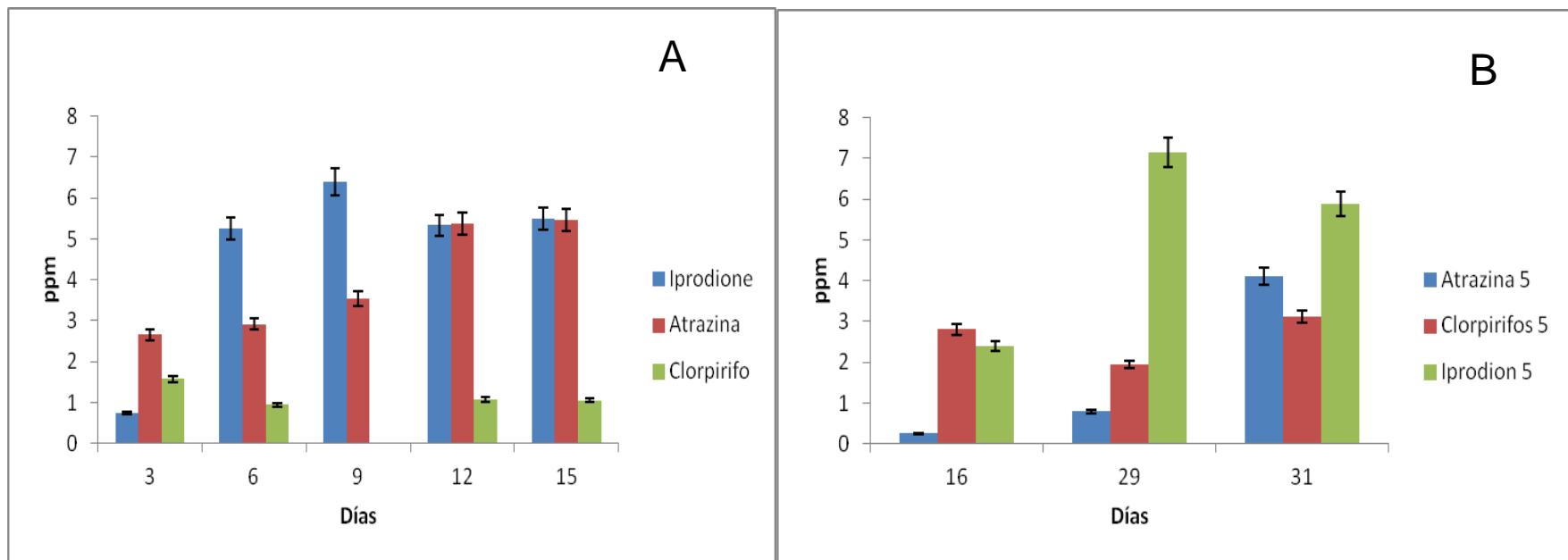
Oxalic acid (a) and malic acid (B) exuded from *L. perenne* in nutritive solution contaminated with pesticides (5 ppm)

BIOLOGICAL ACTIVITY



Activity of urease (A), acid phosphatase (B), FDA (C) and peroxidases (D) in the rhizosphere of *L. perenne* in a biomixture contaminated with pesticides (1 to 10 ppm)

PESTICIDES QUANTIFIED IN EXUDATES



Pesticides quantified in radical exudates of *L. perenne* in nutritive solution (A) and biomixture (B) contaminated with pesticides (5 ppm)

SOME CONCLUSIONS



The addition of barley husk and sawdust improved the characteristics of the biomix prepared with the 3 soils studied increasing OM and N contents.

The partial substitution of peat for biochar increased the degradation of iprodiones respect to the biomixture with 25% of peat.

The seeds germination was higher in soil than in filter paper with exception of *F. arundinacea* in ISP and *L. perenne* germination was lowest both in filter paper and soil with ATZ

Oxalic acid increased with time in presence of pesticides instead of malic acid decreased in the rhizosphere of *L. perenne*.

Iprodione was less degraded in the biomixture with *L perenne* as grass cover

THANKS

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