An improved prototype of biomassbed. Preliminary evaluation in lab conditions.

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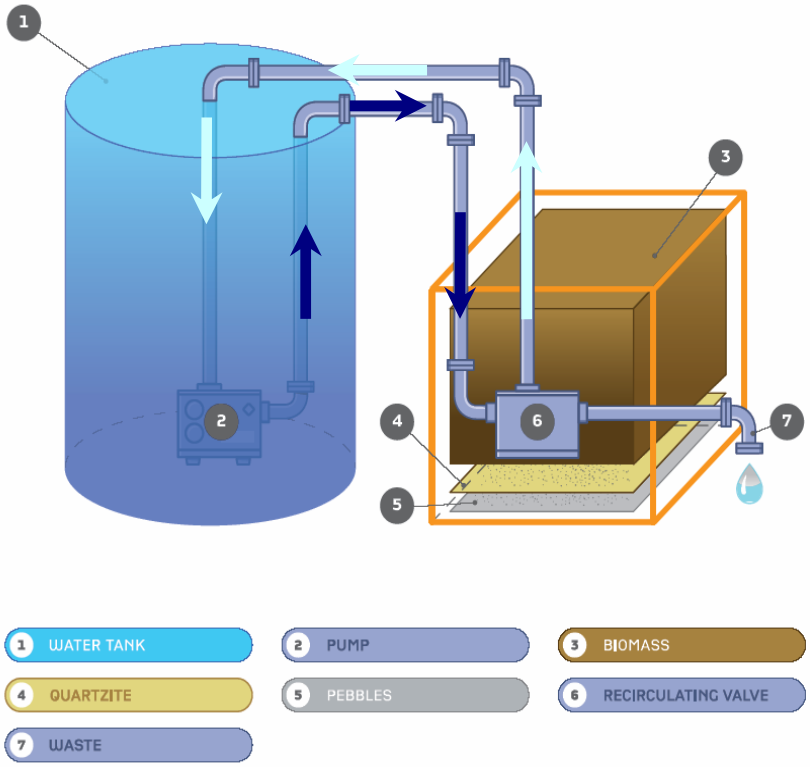
Bioreactor characteristics



Prototype

- Water tank (volume 970 L)
- Biofilter (diameter 920 mm; height 990 mm)
- Working pressure 0,5 bar
- Measured water flow 26 L/min

Advantages

- Continuous or discontinuous (short frequent cycles) water circulation through the biofilter
- Possibility of different water volumes (ex. 1 m^3, but more water, bigger tanks, more biofilters)
- Possibility to cover with ground the tank in farm (system more compact)
- Tests of different types of biomass (ex. white fungi)
- Simple tests of different a.i.

First Test

-Addition herbicide BOLERO TZ (450 g/L Acetochlor and 214 g/L Terbuthylazine) and insecticide DURSBAN 4 (480 g/L Chlorpyrifos)

-Continuous water circulation through the biofilter for 35 days (28 May-2 July 2007)

-Water volume at the beginning of the test: 1100 L

-Biomass composition: soil 35%, compost and organic matter 65%

Second Test

-Addition herbicide BOLERO TZ (450 g/L Acetochlor and 214 g/L Terbuthylazine), insecticide DURSBAN 4 (480 g/L Chlorpyrifos) and fungicide RIDOMIL GOLD 480 EC (480 g/L Metalaxyl)

-Continuous water circulation through the biofilter for 41 days (10 July-20 August 2007)

-Water volume at the beginning of the test: 1100 L

-Biomass composition: soil, compost, peat, straw, horse manure, starter of *white fungi*

Third Test

-Addition herbicide BOLERO TZ (450 g/L Acetochlor and 214 g/L Terbuthylazine), insecticide DURSBAN 4 (480 g/L Chlorpyrifos) and fungicide RIDOMIL GOLD 480 EC (480 g/L Metalaxyl)

-Discontinuous water circulation through the biofilter, 15 min every 4 hours, for 15 days (18 September-3 October 2007)

-Water volume at the beginning of the test: 1100 L

-Biomass composition: soil, compost, peat straw, horse manure, starter of *white fungi*

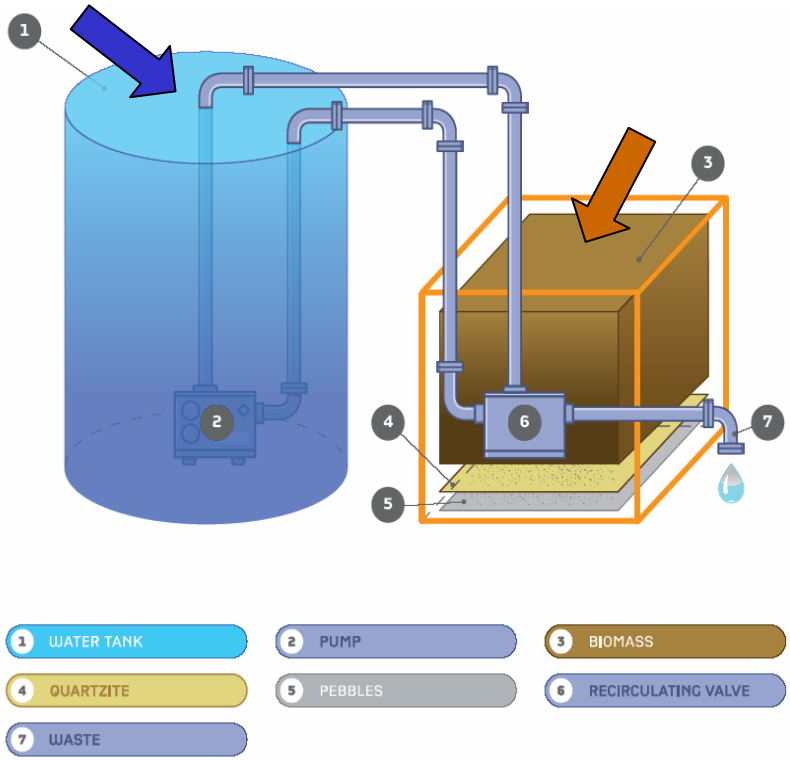
Sampling and analyses

During the tests, water after the filtration and biomass inside the biofilter are sampled, at different time.

Analyses:

-water (pesticide residues)

-biomass (pesticide residues; COD; organic carbon; total nitrogen; moisture)



HPLC parameters

- HPLC Agilent HP1100 Series

-Column Phenomenex® Luna C18 (2) (250 x 4.60 mm i.d., 5 μm, 25°C) with Diode Array detector

-Flow 1 ml/min

-Wavelenghts and retention times: Acetochlor (λ 210; 17,4 min), Terbuthylazine (λ 223; 14,9 min), DET (λ 215; 8,5 min), Chlorpyrifos (λ 290; 21,9 min); Metalaxyl (λ 210; 11 min)

-Volume injected 50 μl

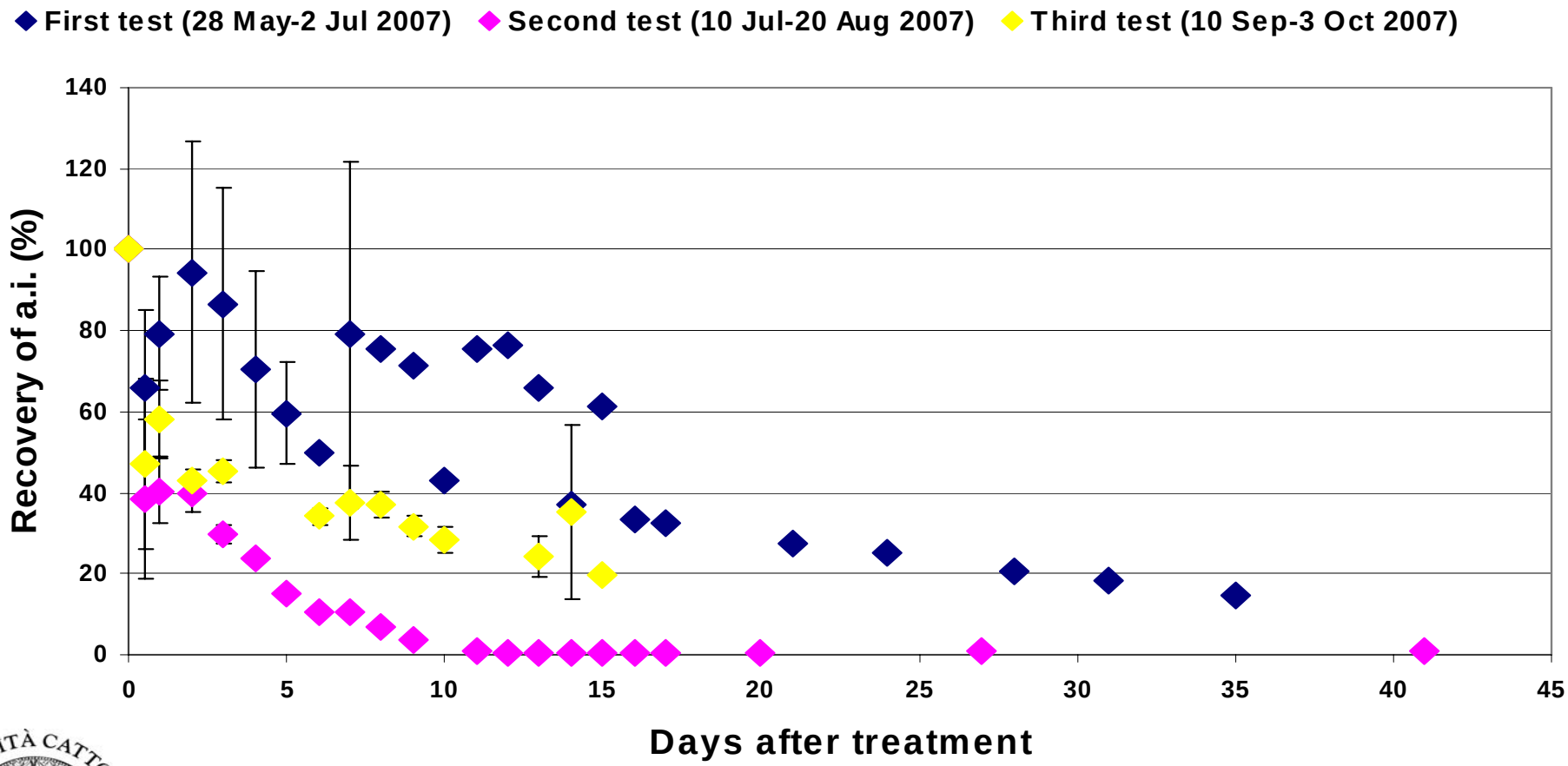
-Run time 27 min (post-run 4 min)

Biomass characterisation

	Biomass	
Determination	*30 Aug 2007*	*4 Oct 2007*
COD (mg/L)	140800	118400
N tot (%)	0,490	0,462
Organic Carbon (g/kg)	79,3±7,88	81,9
Moisture (% d.m.)	272,6±9,58	221,2±2,59
C/N ratio	16	18

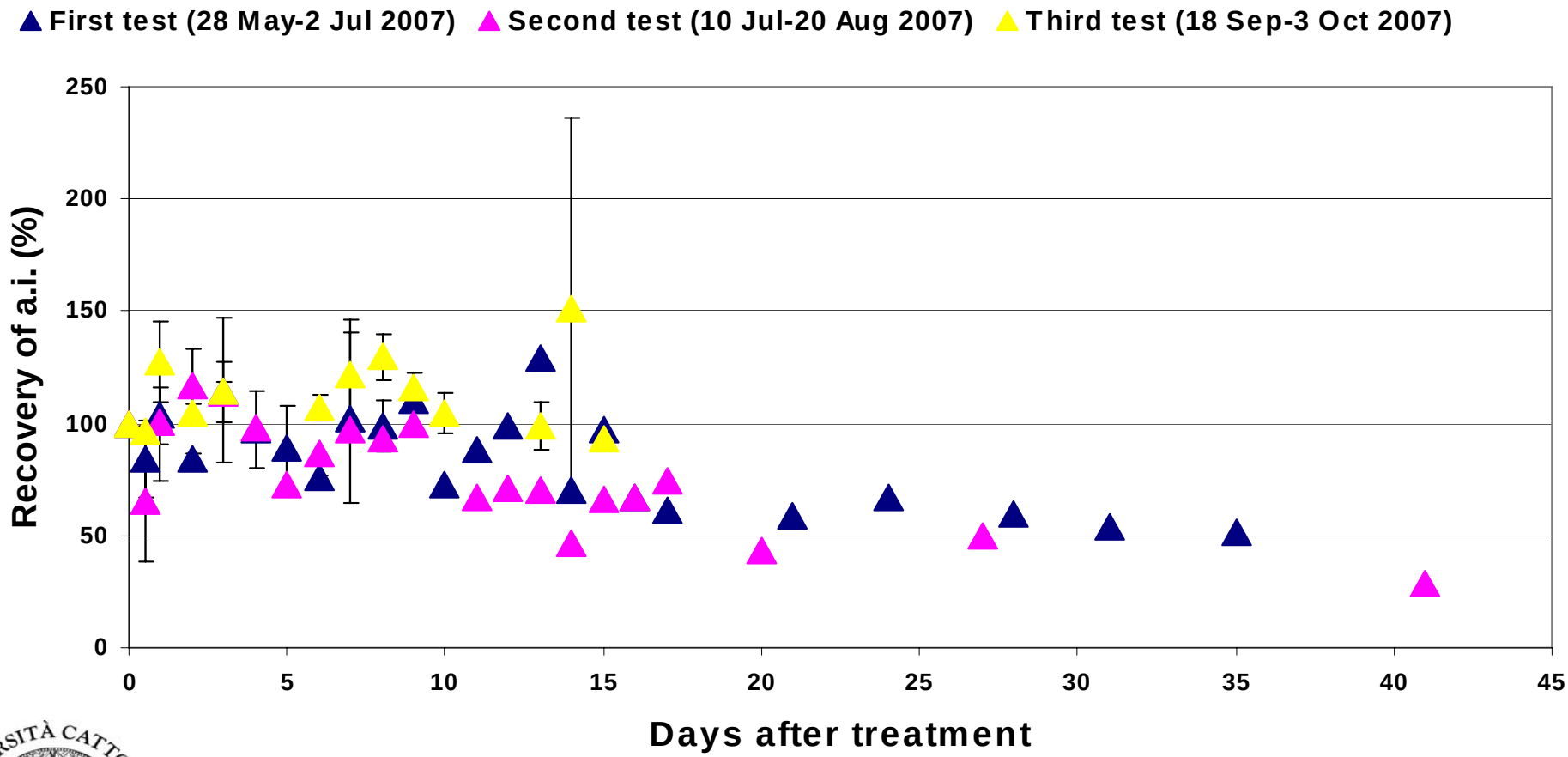
Results: water (1)

ACETOCHLOR



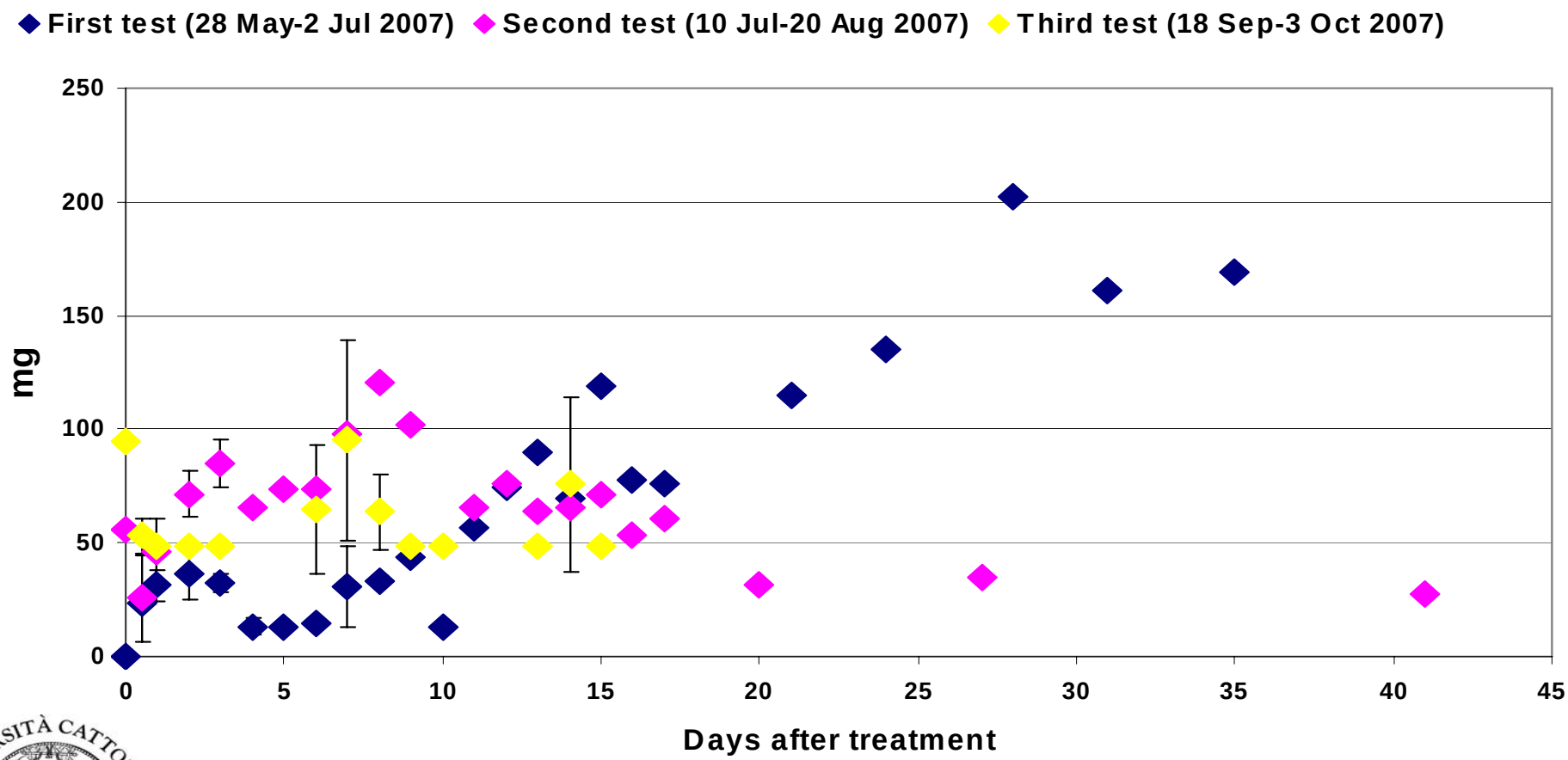
Results: water (2)

TERBUTHYLAZINE



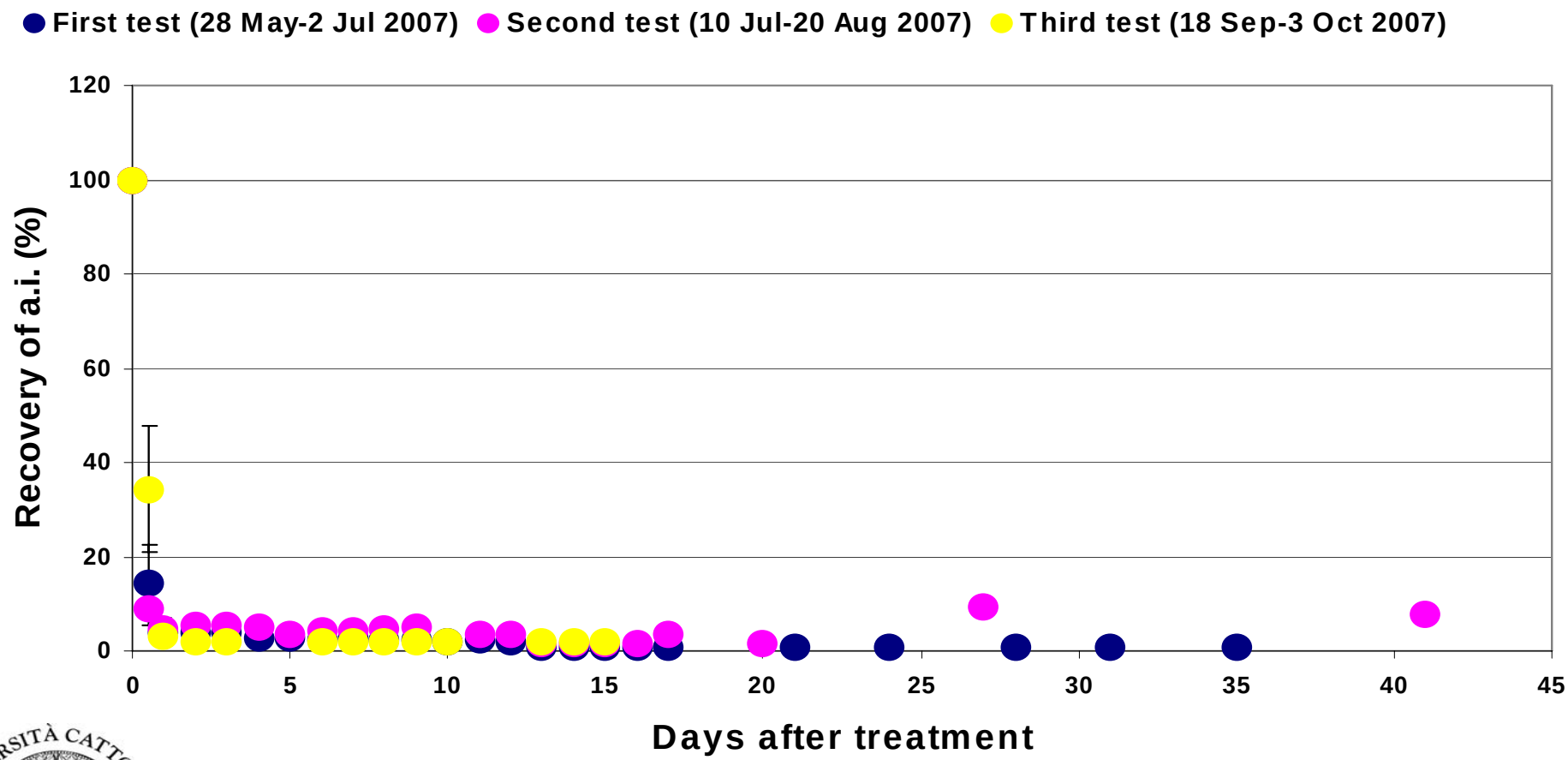
Results: water (3)

DESETHYLTERBUTHYLAZINE



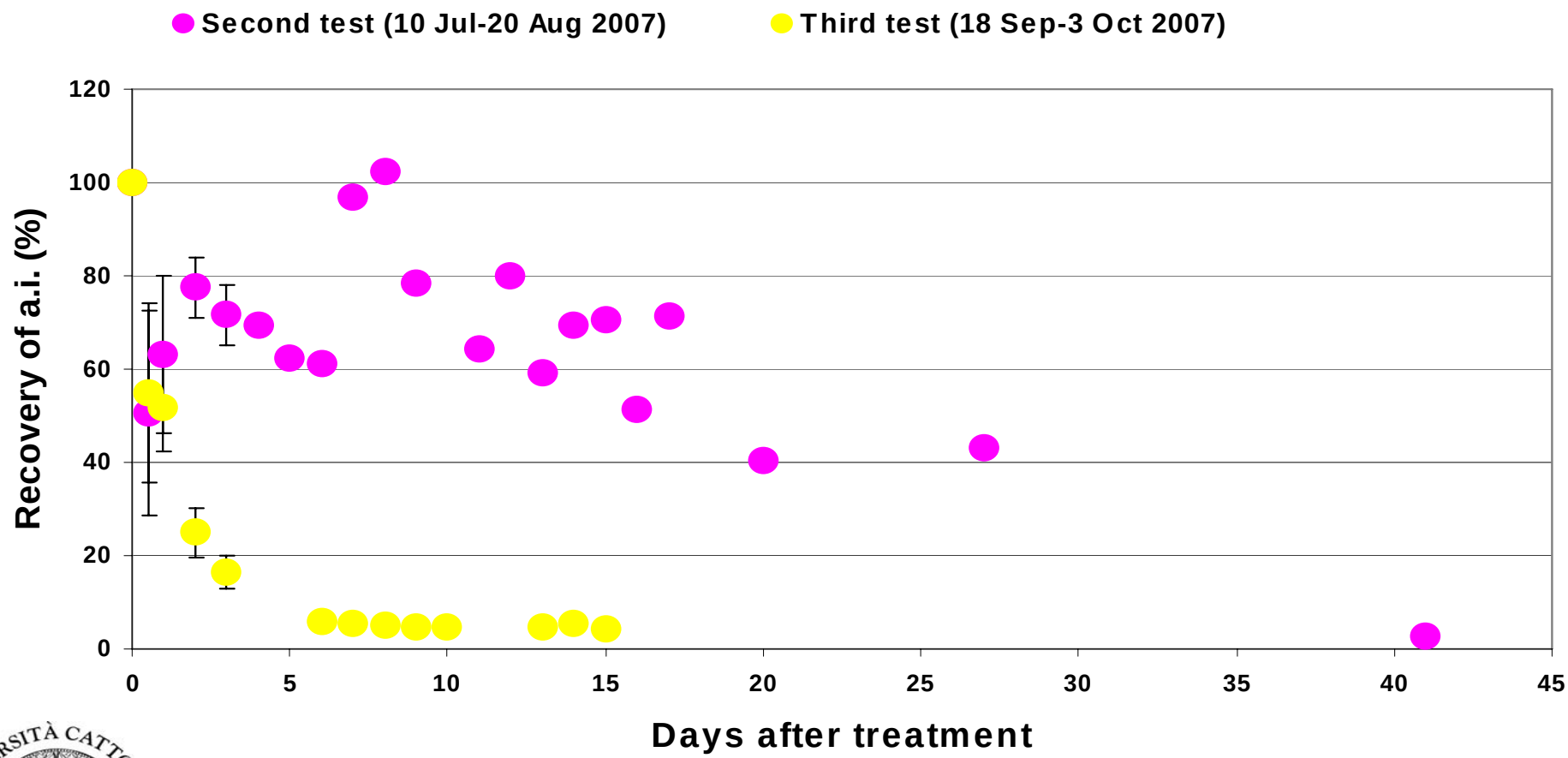
Results: water (4)

CHLORPYRIFOS

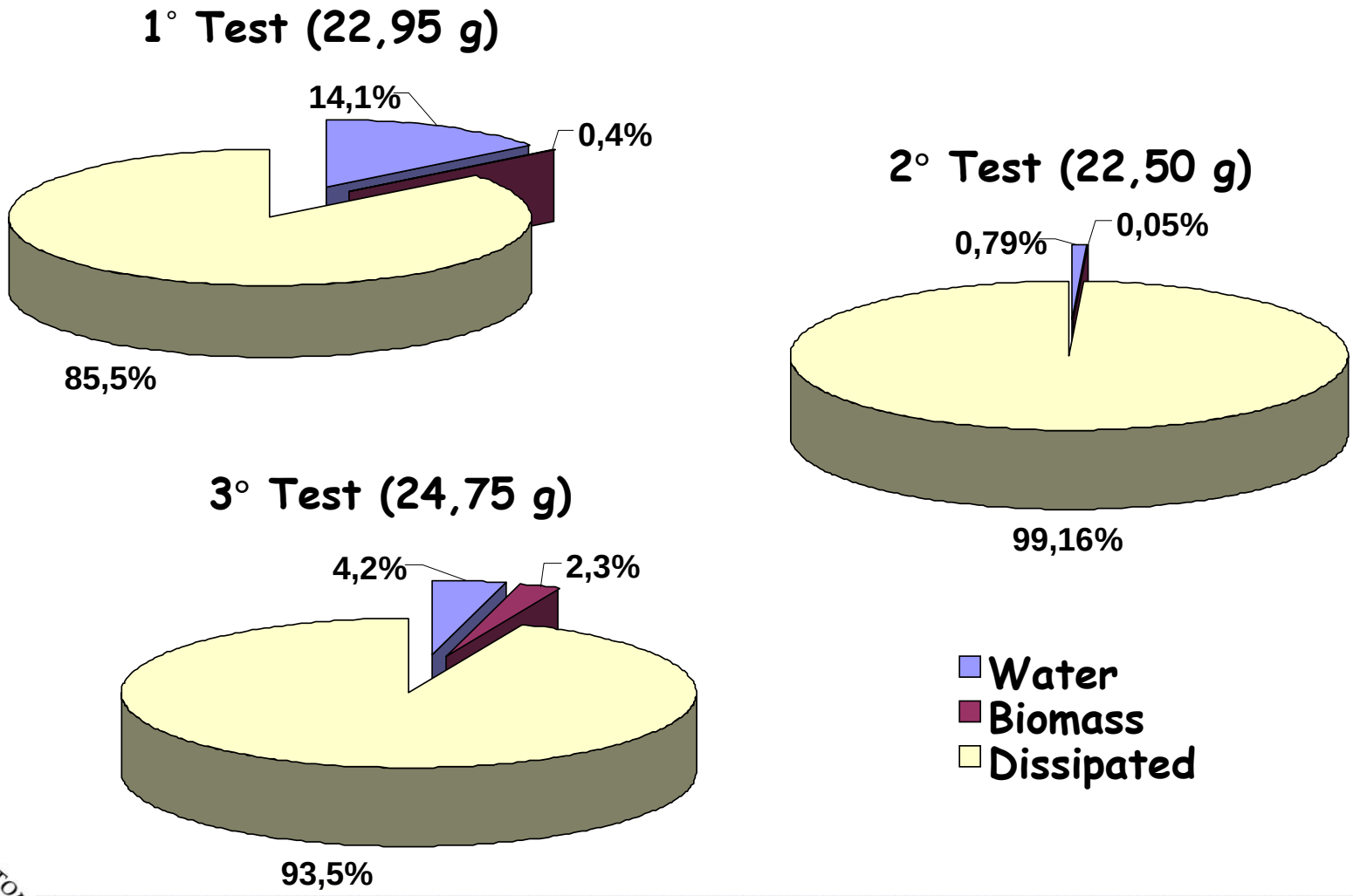


Results: water (5)

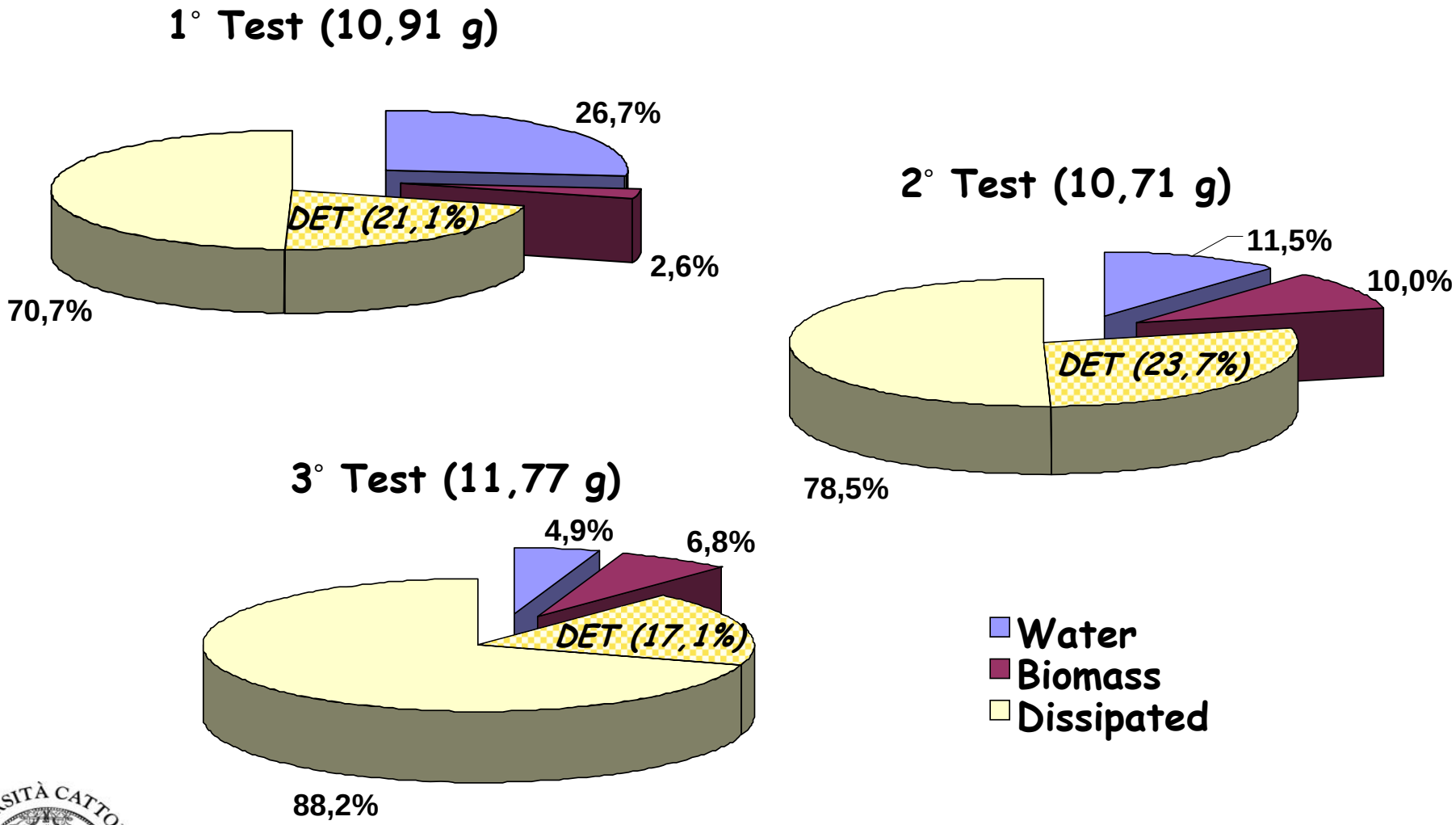
METALAXYL



MASS BALANCE: Acetochlor

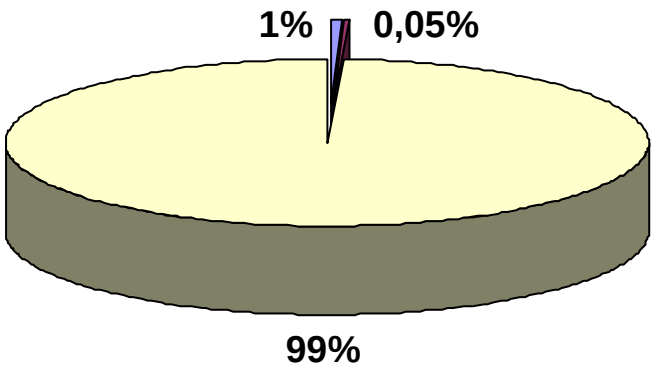


MASS BALANCE: Terbuthylazine

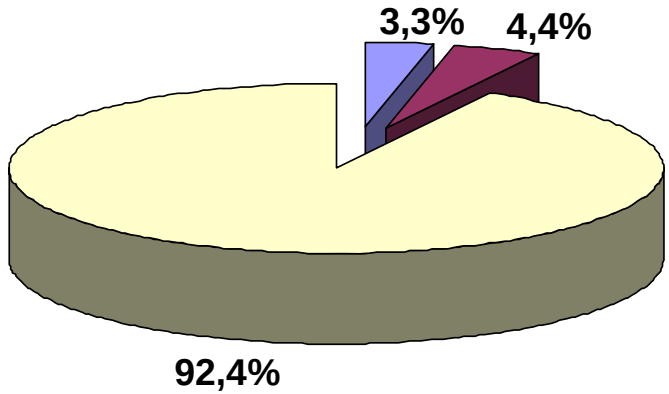


MASS BALANCE: Chlorpyrifos

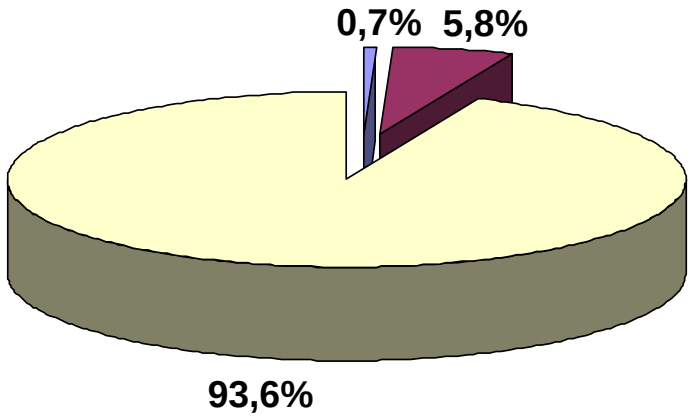
1° Test (12,48 g)



2° Test (13,44 g)

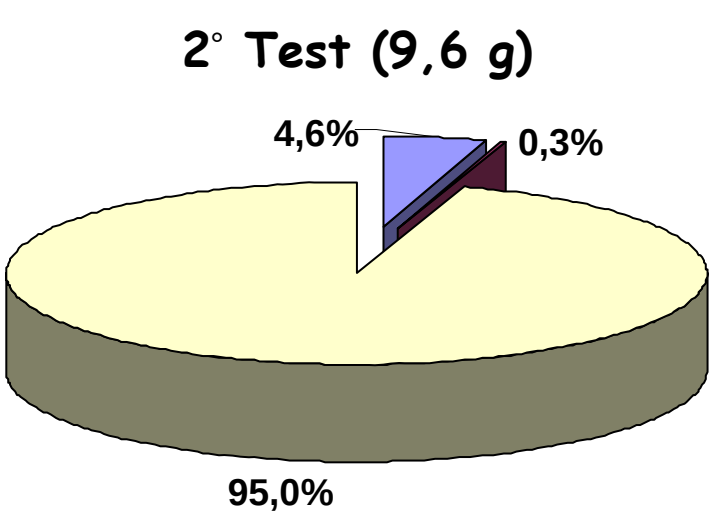


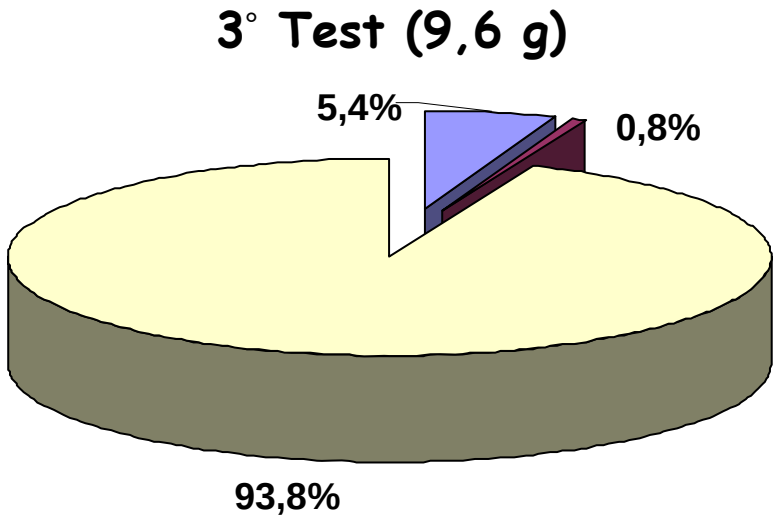
3° Test (12,96 g)



Water
Biomass
Dissipated

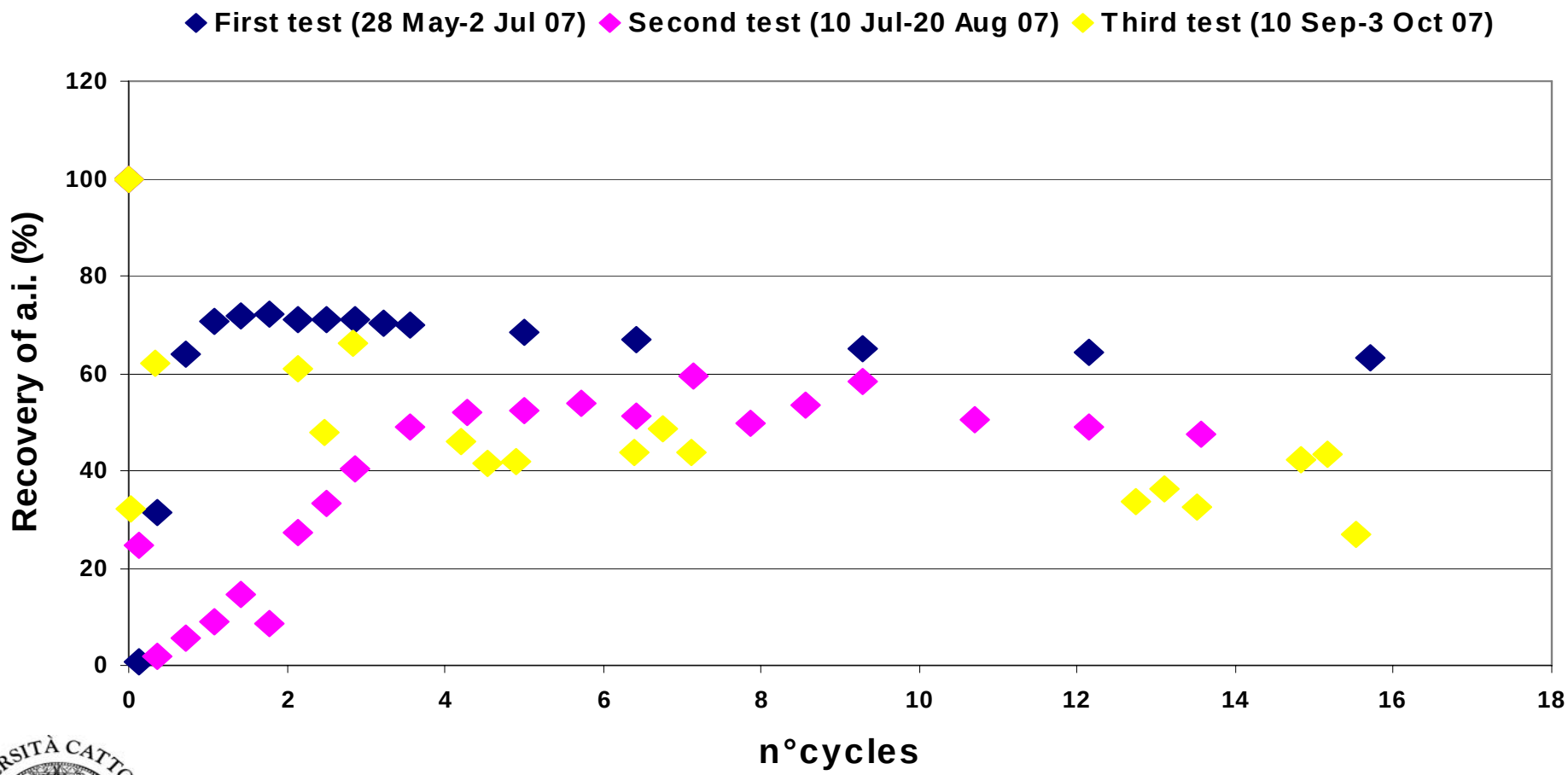
MASS BALANCE: Metalaxyl





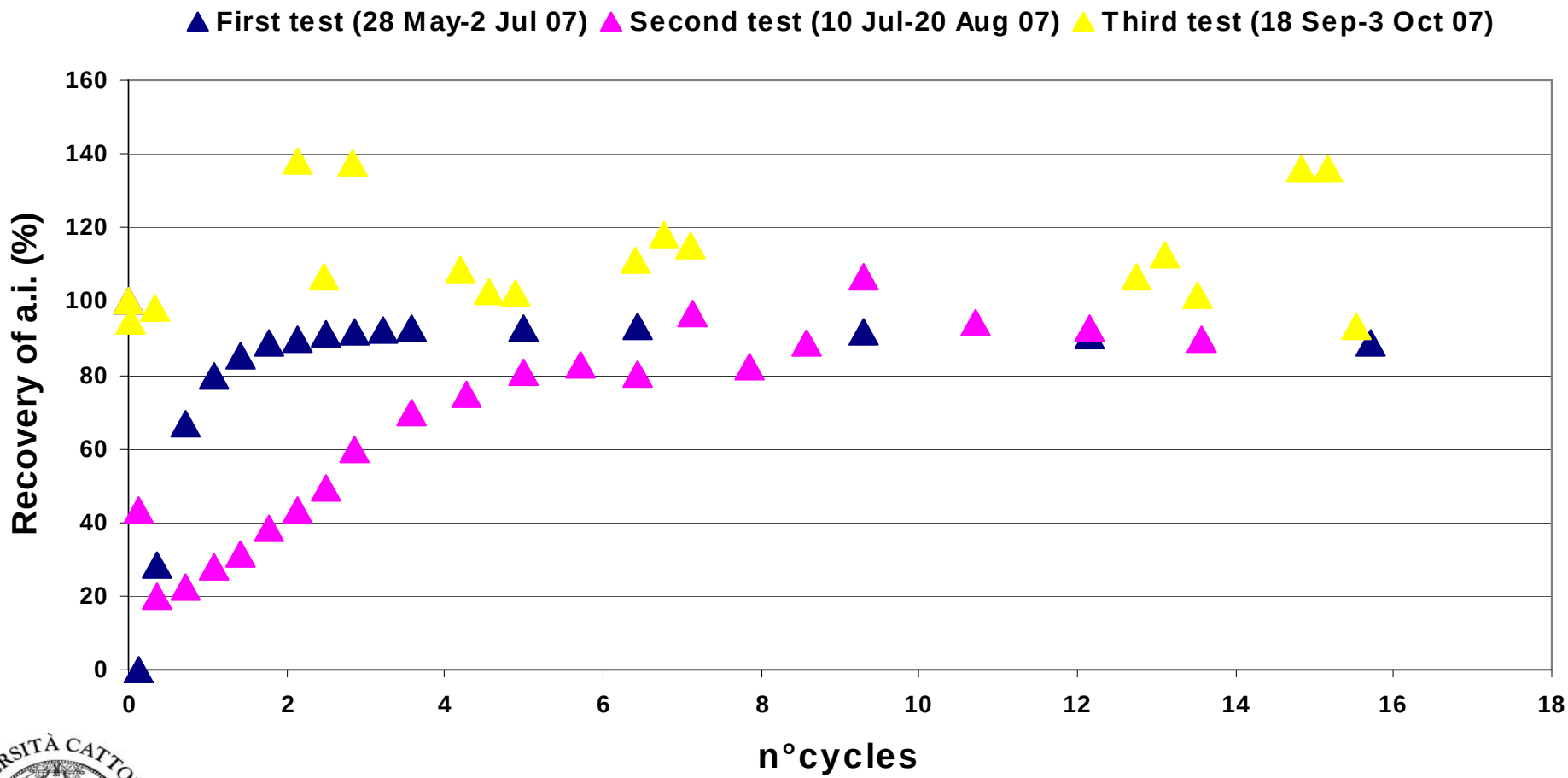
How many water cycles?

ACETOCHLOR

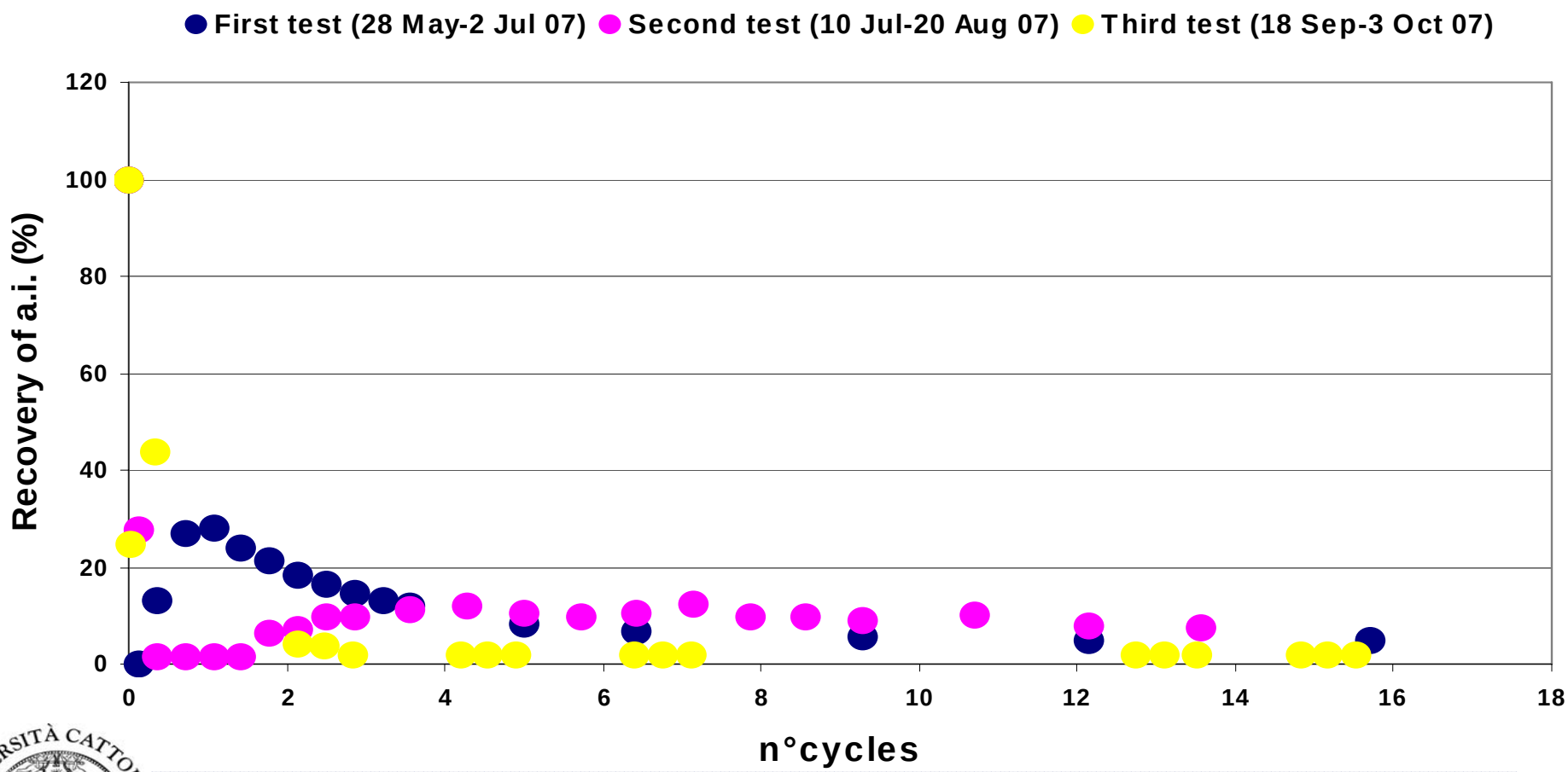


How many water cycles?

TERBUTHYLAZINE

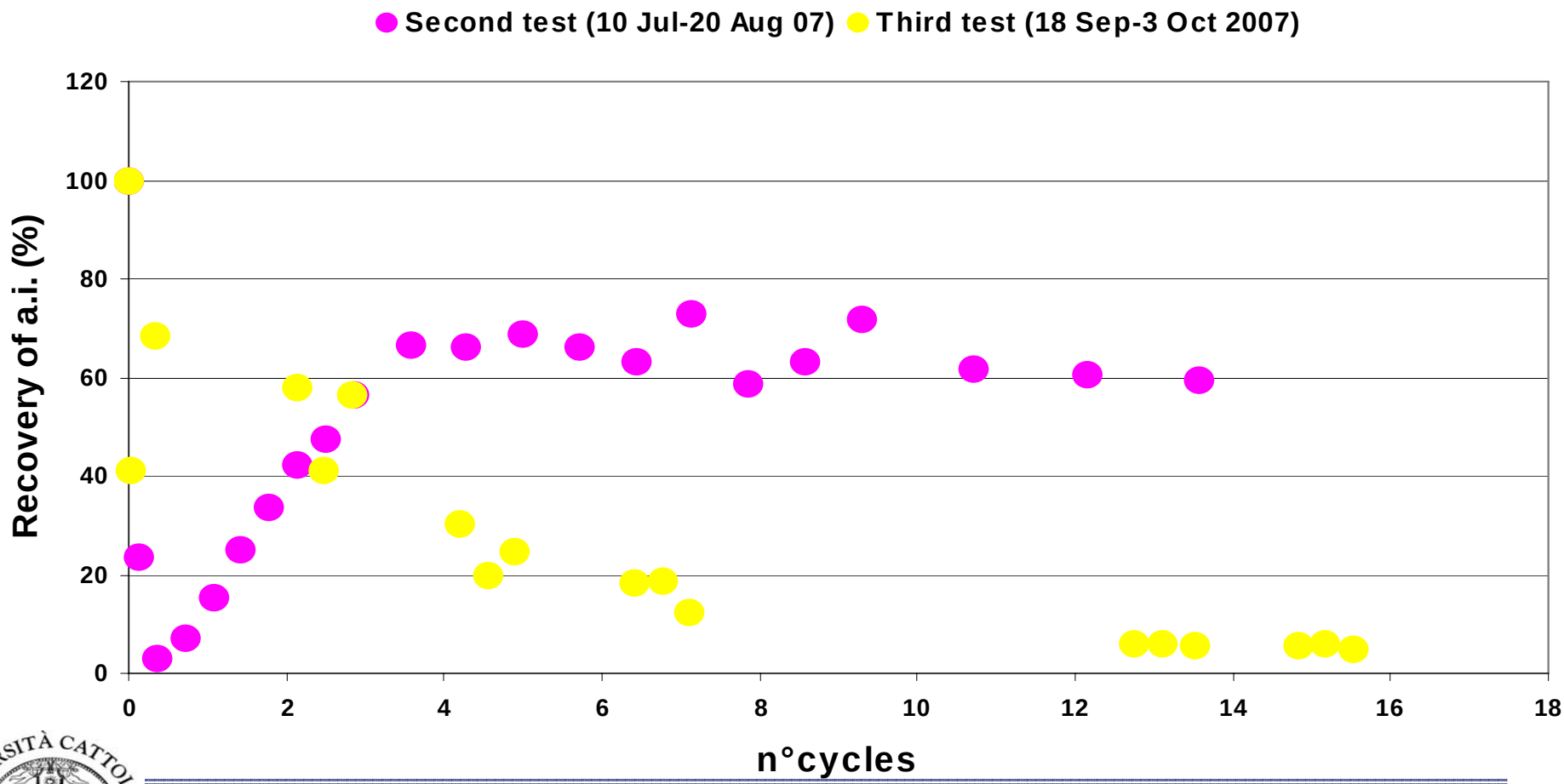


How many water cycles?



How many water cycles?

METALAXYL



Consideration and perspectives (?)

- The results are interesting, but it's necessary to try other biomass composition and active ingredients.

- It seems necessary to change the biomass because lots of a.i. are sorbed on it.

Acknowledgment

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