

BEHAVIOR OF NURSERY-BOX-APPLIED FIPRONIL AND FIPRONIL SULFONE IN RICE PADDY FIELD

THUYET D. Q., WATANABE H., MOTOBAYASHI T., OK J.

Department of Agricultural and Environmental Engineering

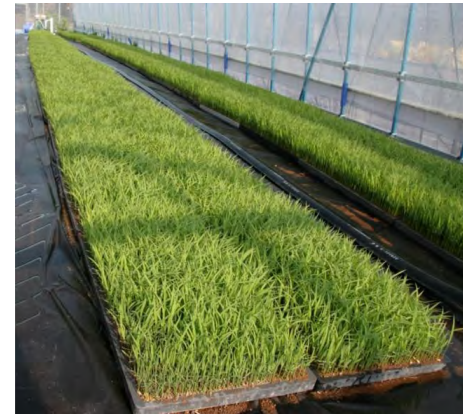
United Graduate school of Agriculture Sciences

Tokyo University of Agriculture and Technology

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Rice nursery box

- ❑ **Nursery boxes** with applied insecticide have been used in **Japan** for rice cultivation since the **1970s** (Asaka et al., 1978)
- ❑ **55%** of the total cultivation area was treated with nursery box application in **1999** and it **will increase** to 60 - 70% of total cultivation area of rice (Kurogochi, 2003)
- ❑ **Advantage** of the application of pesticide in the nursery box
 - Labor saving
 - Low application rate
 - Environmental friendly



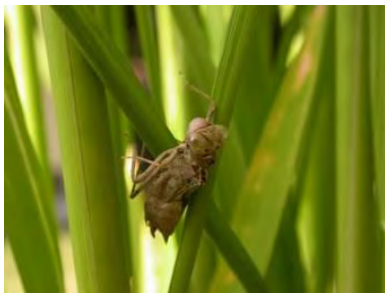
Rice nursery box



Rice transplanting 2

Nursery-box-applied fipronil issues

- Residues of fipronil and its metabolites were found in **surface water in Japan** (Iwafune, 2010).
- **Increase** use of nursery-box-applied fipronil and **reduction** of dragonfly (Jinguji, 2009)



A dragon fly larva in the rice paddy field

(Jinguji et al, 2010)



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Pesticide run-off from paddy field

- Environmental effects?
- Risk assessment?
- Pesticide management?

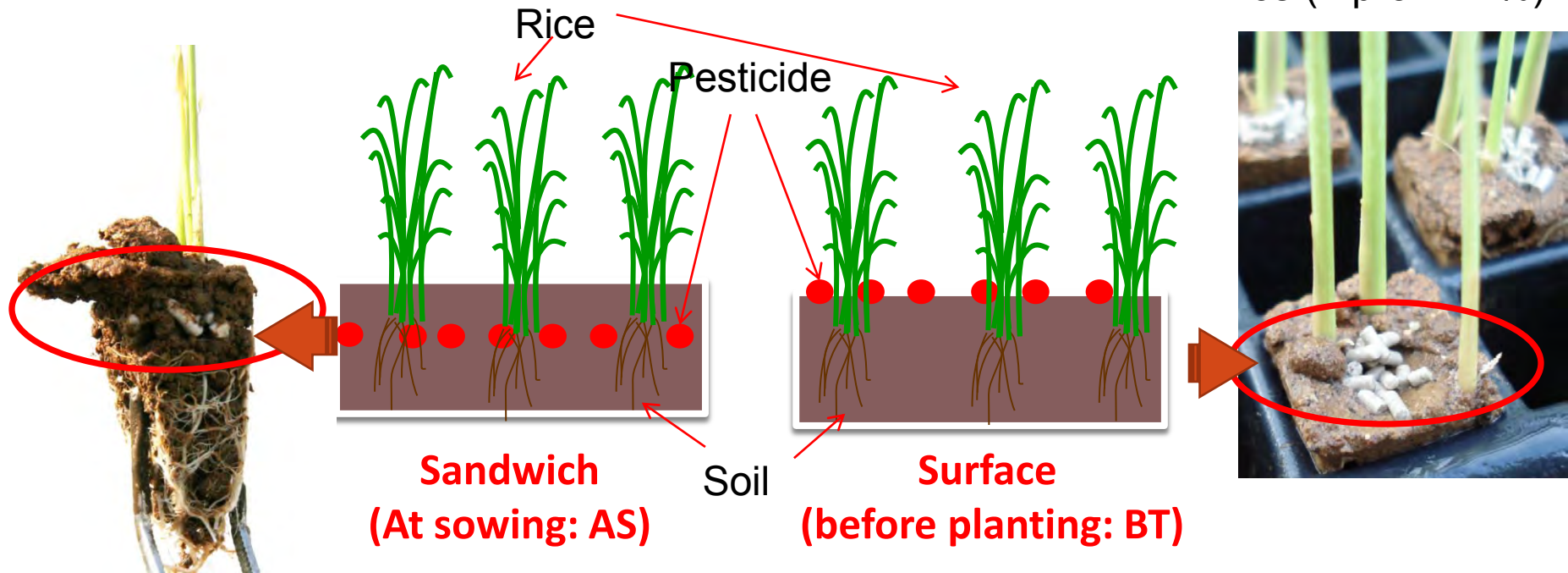
Nursery-box-applied fipronil

Application

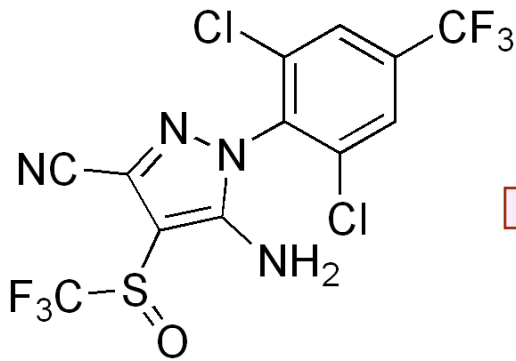
- before transplanting (BT)
- at sowing (AS) : 14- 21 days before transplanting day



Prince (Fipronil 1 %)



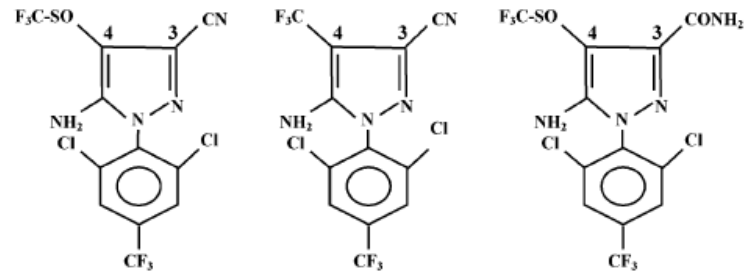
Fipronil and its metabolites



Fipronil



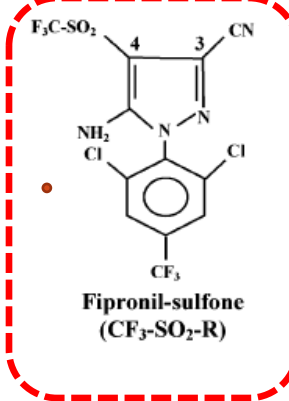
High
Toxicity



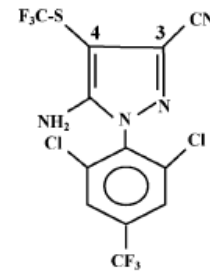
Fipronil

Desthiofipronil
(CF₃R)

Fipronil-amide
(NH₂-CO-R')



Fipronil-sulfone
(CF₃-SO₂-R)



Fipronil-sulfure
(CF₃-S-R)

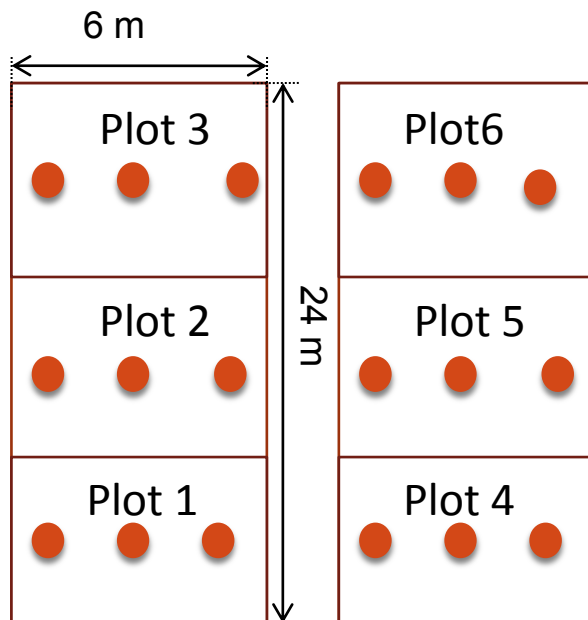
Fipronil sulfone

Aajoud et al. 2003

Objectives

- to investigate the **environmental behavior** of **nursery-box-applied fipronil granule** and its sulfone **metabolite** in Japanese rice paddy plots under **BT and AS** treatment methods.

Layout of experimental plots

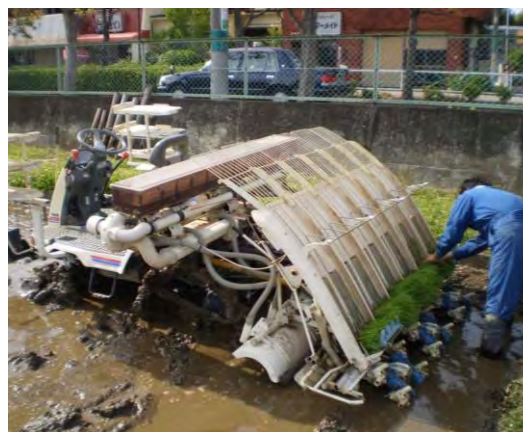


BT

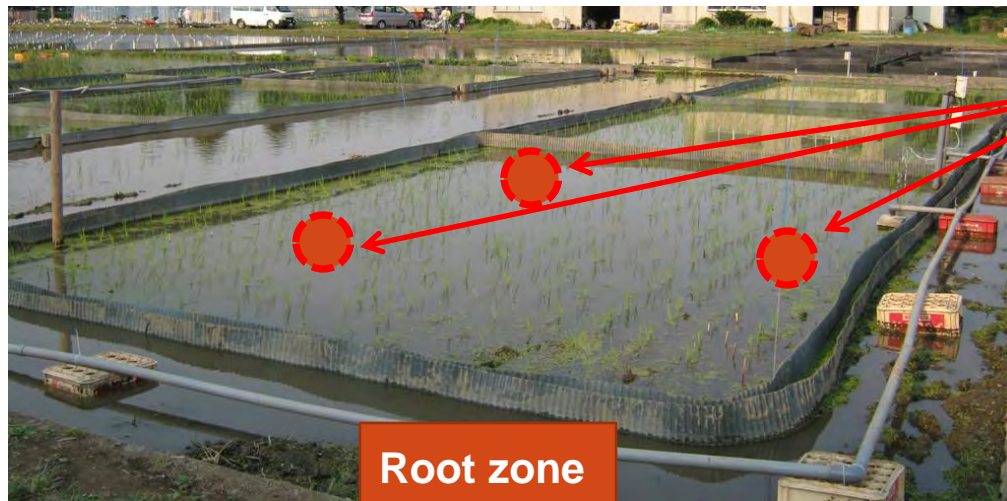
AS

● Sampling points

- Sampling interval: 12h, 1, 3, 7, 14, 21, 28 and 35 DAT
- Water samples
- 1-cm soil surface samples
- 5-cm soil surface in inter-rows
- 5cm soil surface in root zone



Sampling for water and soil

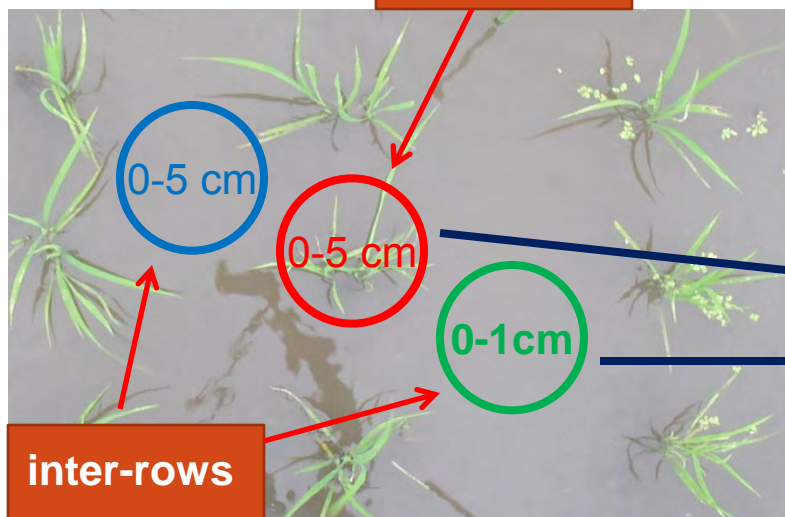


Sampling points

Root zone



Sampling core



inter-rows

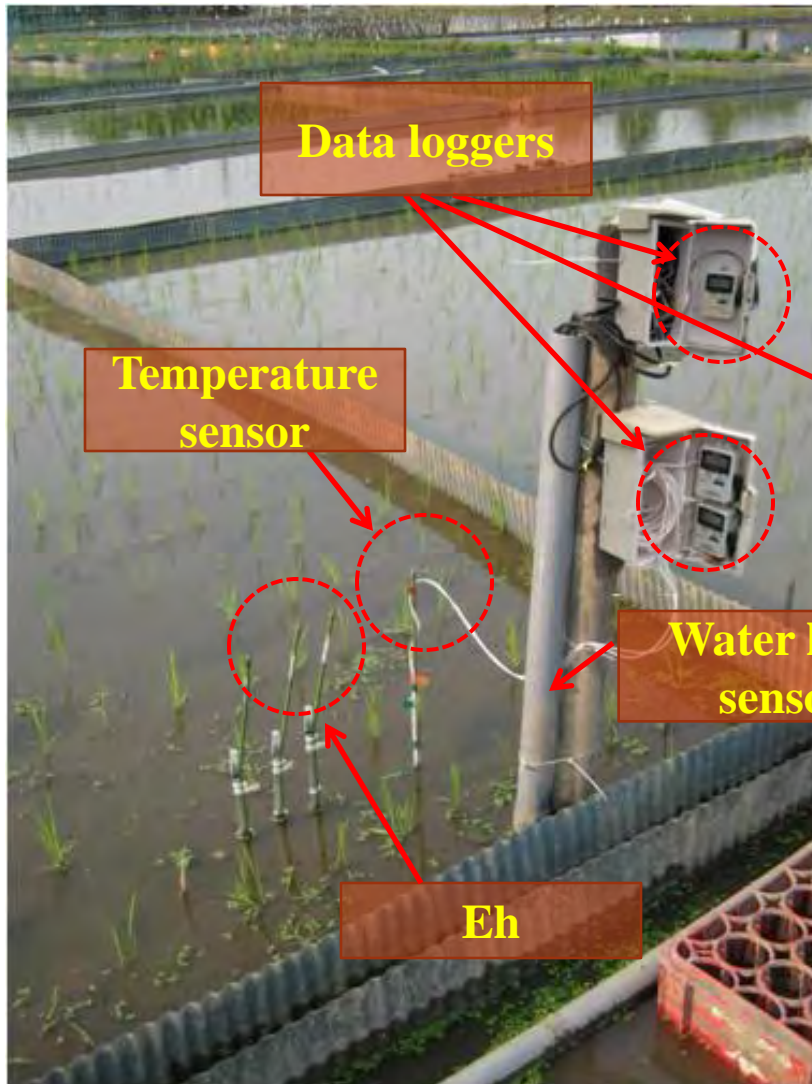


Sampling core in root zone

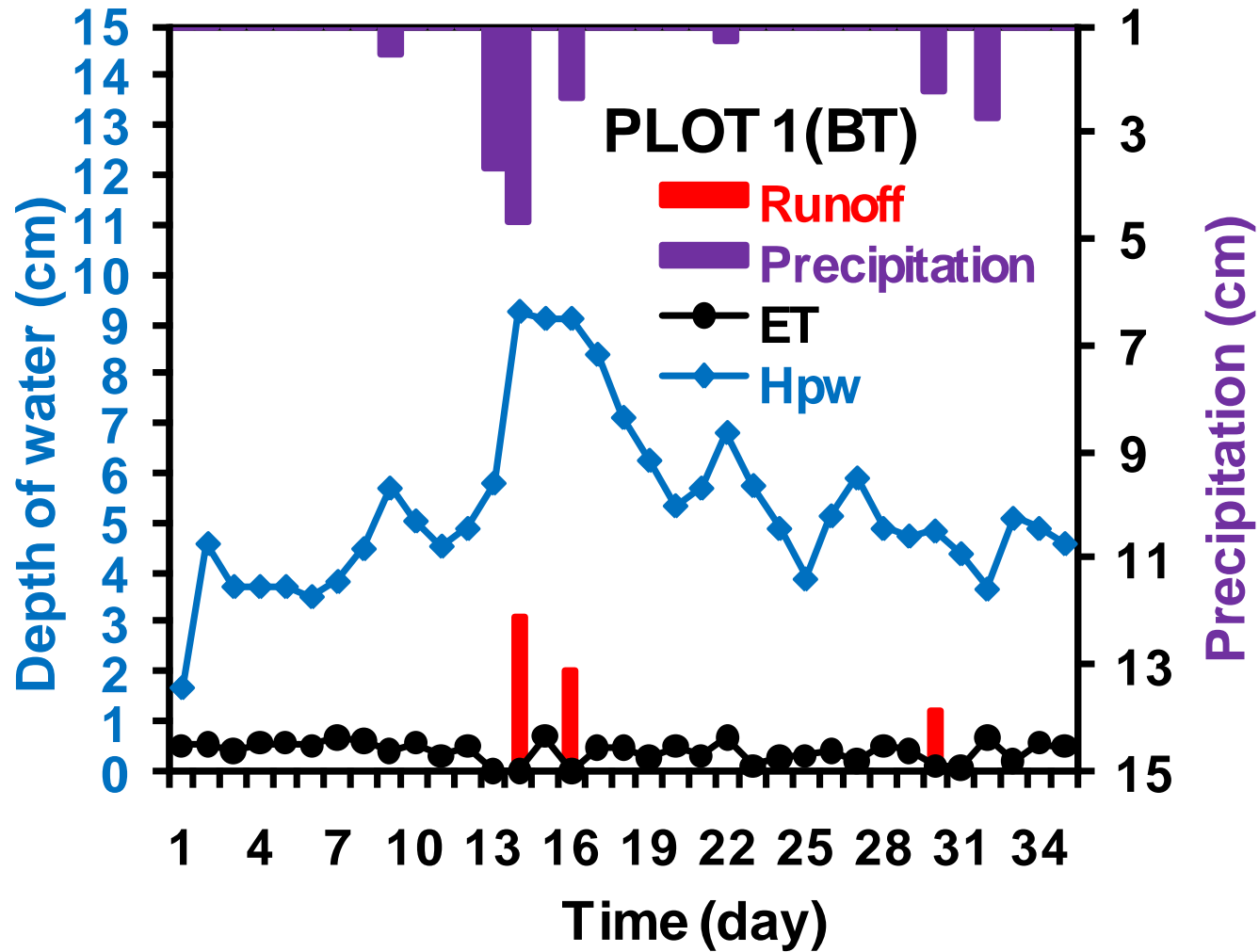


0-1cm Soil sampling

Monitoring WL, ET, Temp., pH, Eh, EC

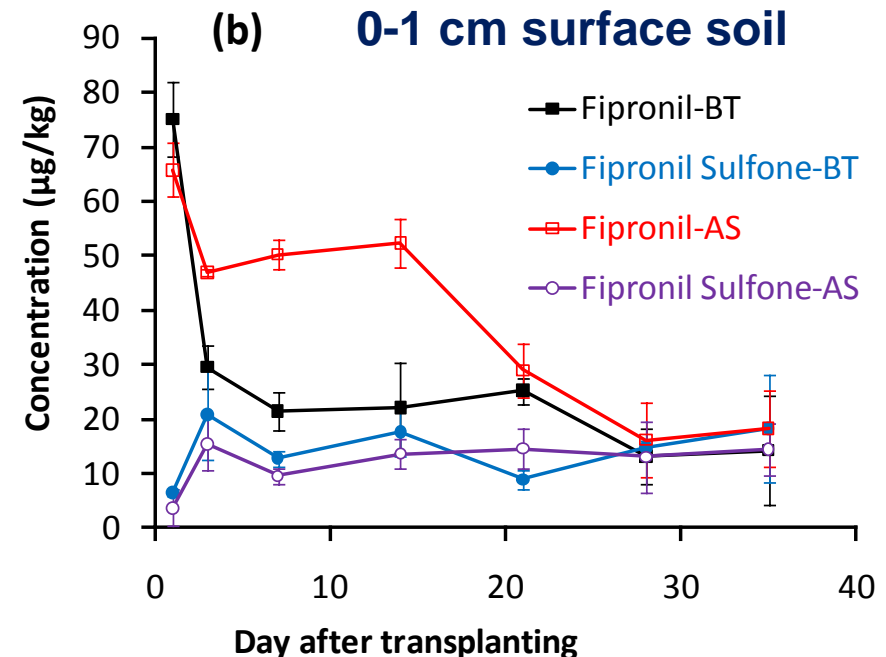
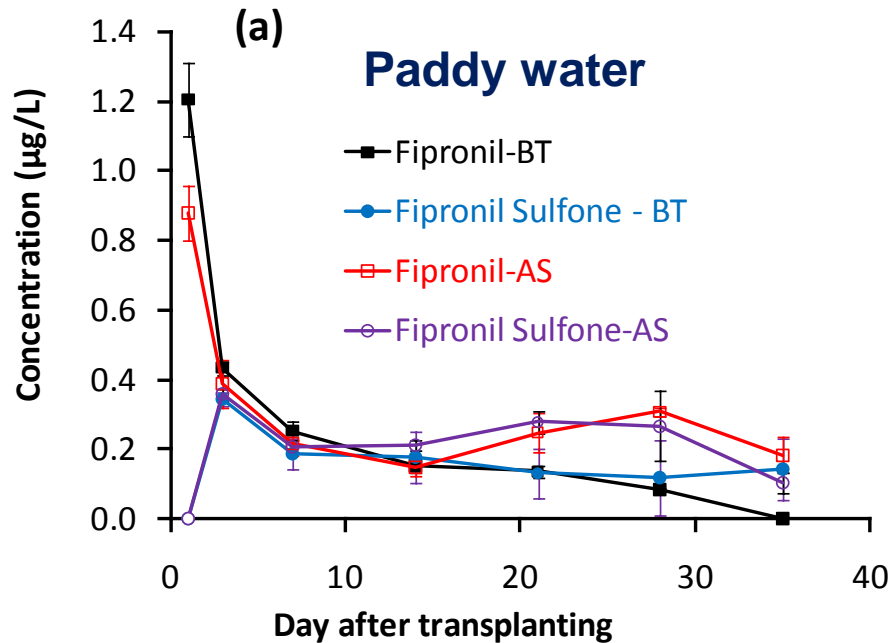


The daily water balance



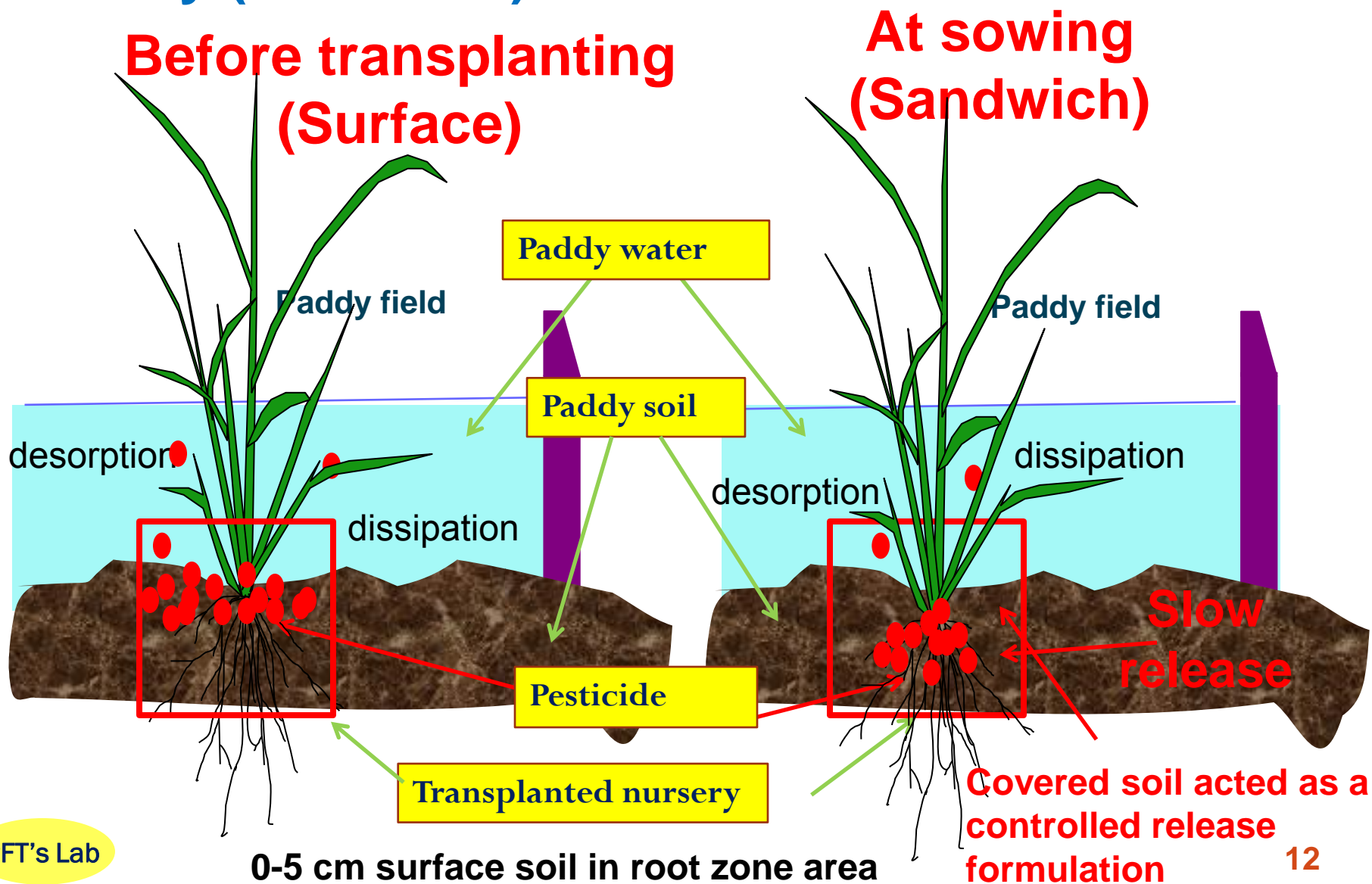
Concentrations in paddy water and 0-1 cm paddy soil

Treatment	AS	BT
a.i	1.0%	1.0%
formulation	Convention	

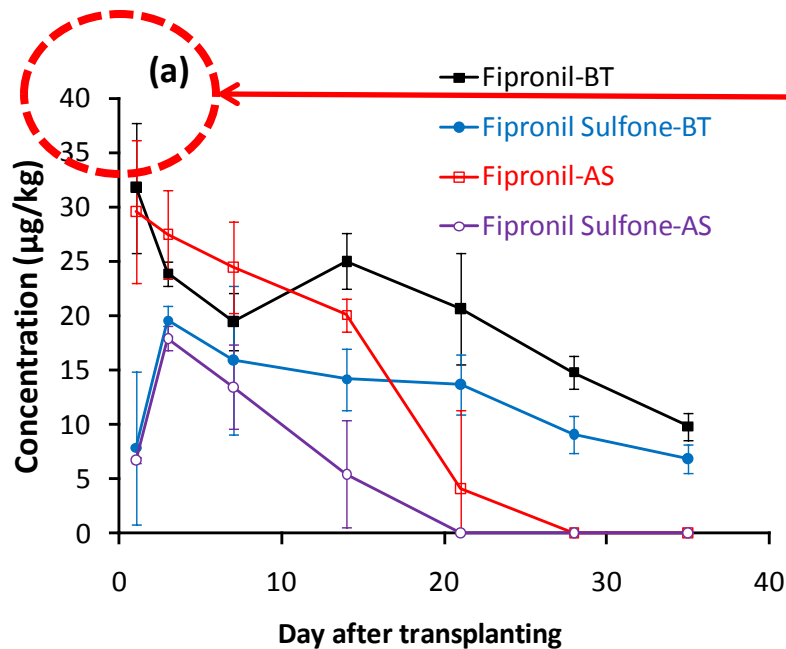


- ❑ Small different of BT & AS : in water : BT > AS because of treatment methods (BT vs. AS)
- ❑ Metabolite was found at low concentration.

Desorption and dissipation in transplanted nursery (root zone)



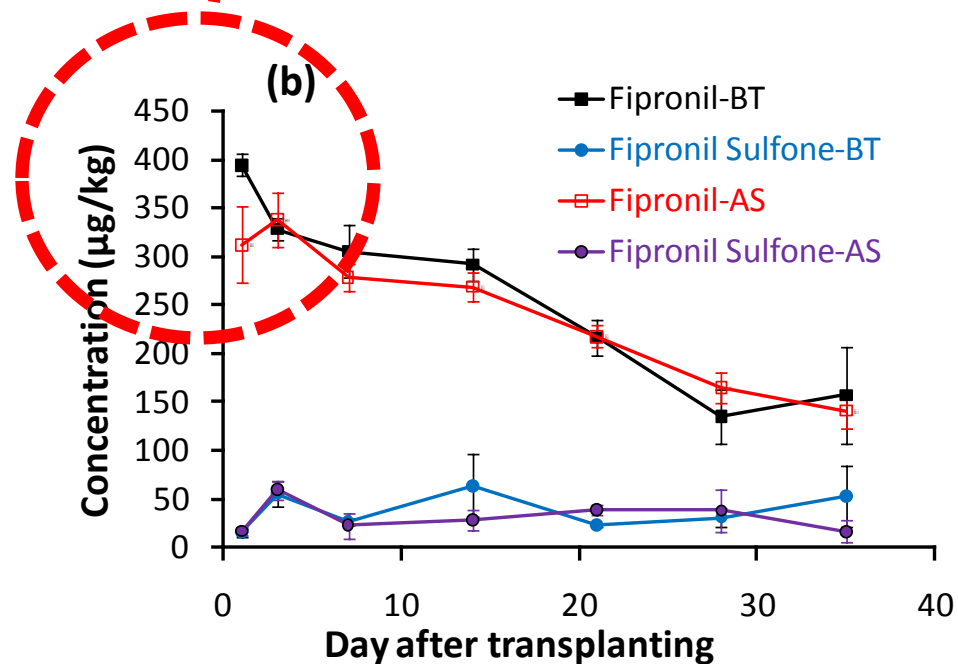
Concentrations in 0-5 cm paddy soil : inter-rows and root zone



10 times greater

0-5 cm root zone soil

0-5 cm inter-rows soil



Dissipation kinetics of fipronil in paddy water and paddy soils

	Water	Soil		
	BT	BT 0-1cm Inter-rows	BT 0-5cm Inter-rows	BT 0-5cm Root zone
r^2	0.9	0.6	0.8	0.9
DT_{50} (day)	2.9	19.7	9.0	23.7
	AS	AS 0-1cm Inter-rows	AS 0-5cm Inter-rows	AS 0-5cm Root zone
r^2	0.9	0.9	0.8	1.0
DT_{50} (day)	3.1	17.6	7.8	27.7

Conclusions

- ❑ The behavior of **nursery-box-applied fipronil** and fipronil sulfone in two paddy plots under two treatment methods, **BT and AS treatments**, were investigated.
- ❑ The **dissipation** of fipronil from paddy water and surface paddy soil can be described **by first-order kinetics**.
- ❑ In both treatments, most of fipronil mass was stayed in **root zone** of rice plant.
- ❑ Fipronil sulfone was found in all soil and water samples.

Thank you for your attention
