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ONDERZOEK & ADVIES IN LAND- & TUINBOUW

EARLY PREDICTION OF MEALWORM HARVEST

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ondernemen in west-vlaanderen

Efficient rearing starts with knowing how many animals you have.

Not that easy

How can we control the #MW or yield in each container?

1

Modelling

offspring depends on

- # adults
- Size of the container
- Days of oviposition

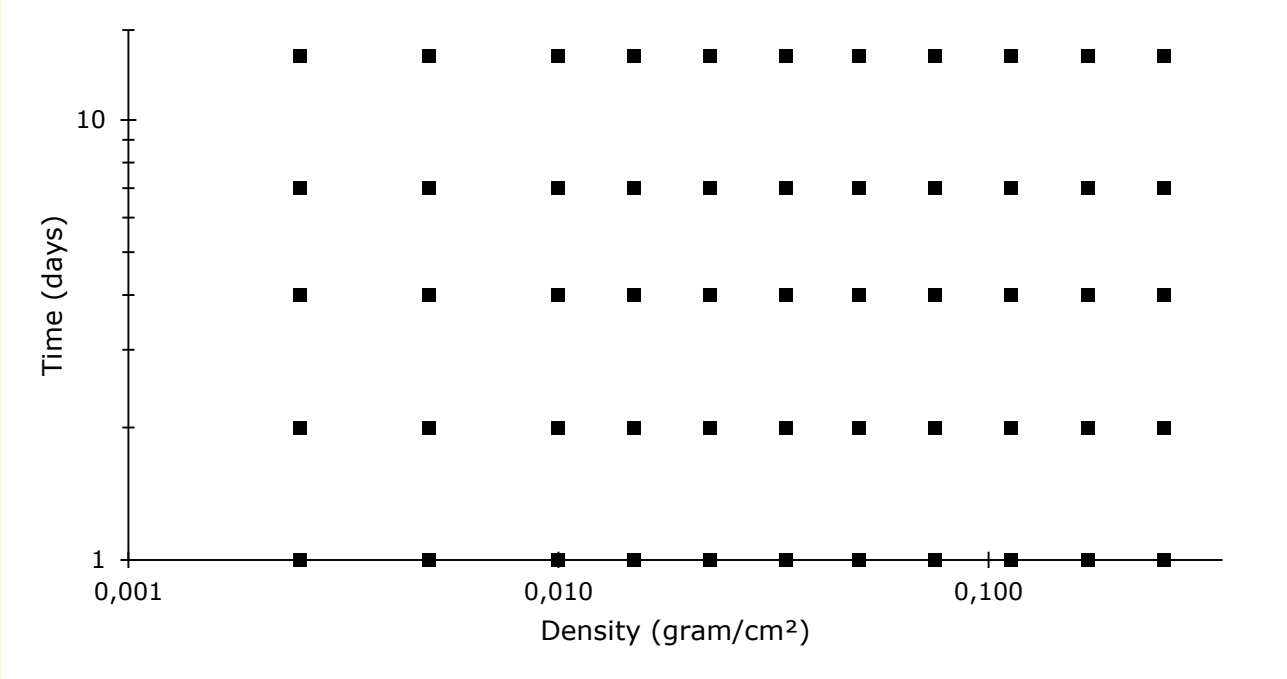
- Sex ratio
- Temperature
- Humidity
- …

Experimental setup

Standard way of breeding on semi-industrial scale

- Wheat bran + daily moisture source (carrots)
- Oviposition in wheat bran or on the floor of the container
- # mealworms was determined after 9 weeks

Experimental setup



Model ranges

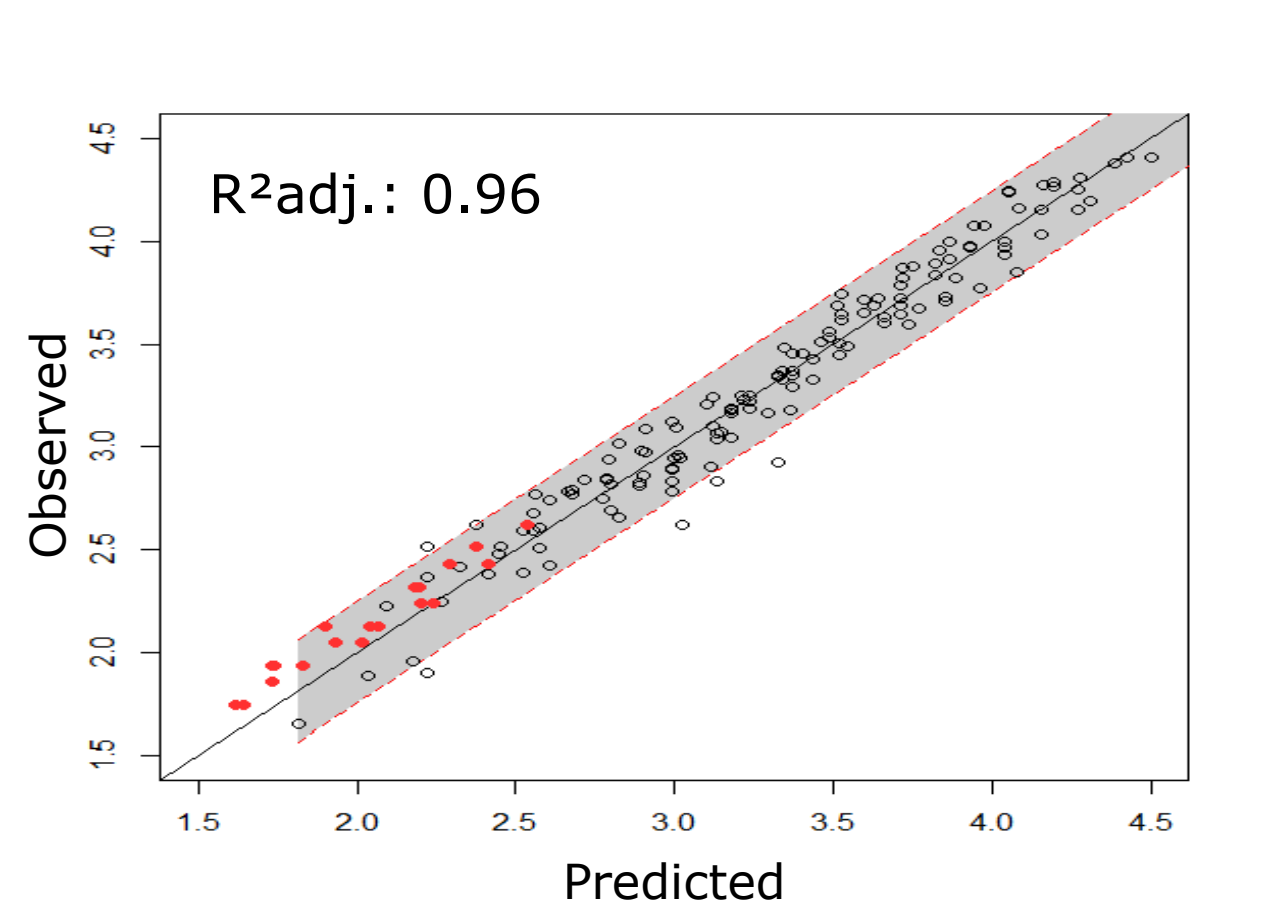
Oviposition: 1-14 days

Beetles: 0.5 – 500 gram

Area: ± 200 - 2150 cm²

Beetledays
=
Log_{10} (Beetles*Days)

Beetledays: result



Log_{10}(#MW) = 1.77 + 0.64*BD + $1.80*10^{-4}$*area

Beetledays = Log_{10} (Beetles*Days) * Log_{10}(surface)

Berggreen et al. 2018

Beetledays: result

- Continuous increase in # mealworms with increasing BD
- But: decrease in *per capita* offspring
- Decrease in density increases yield

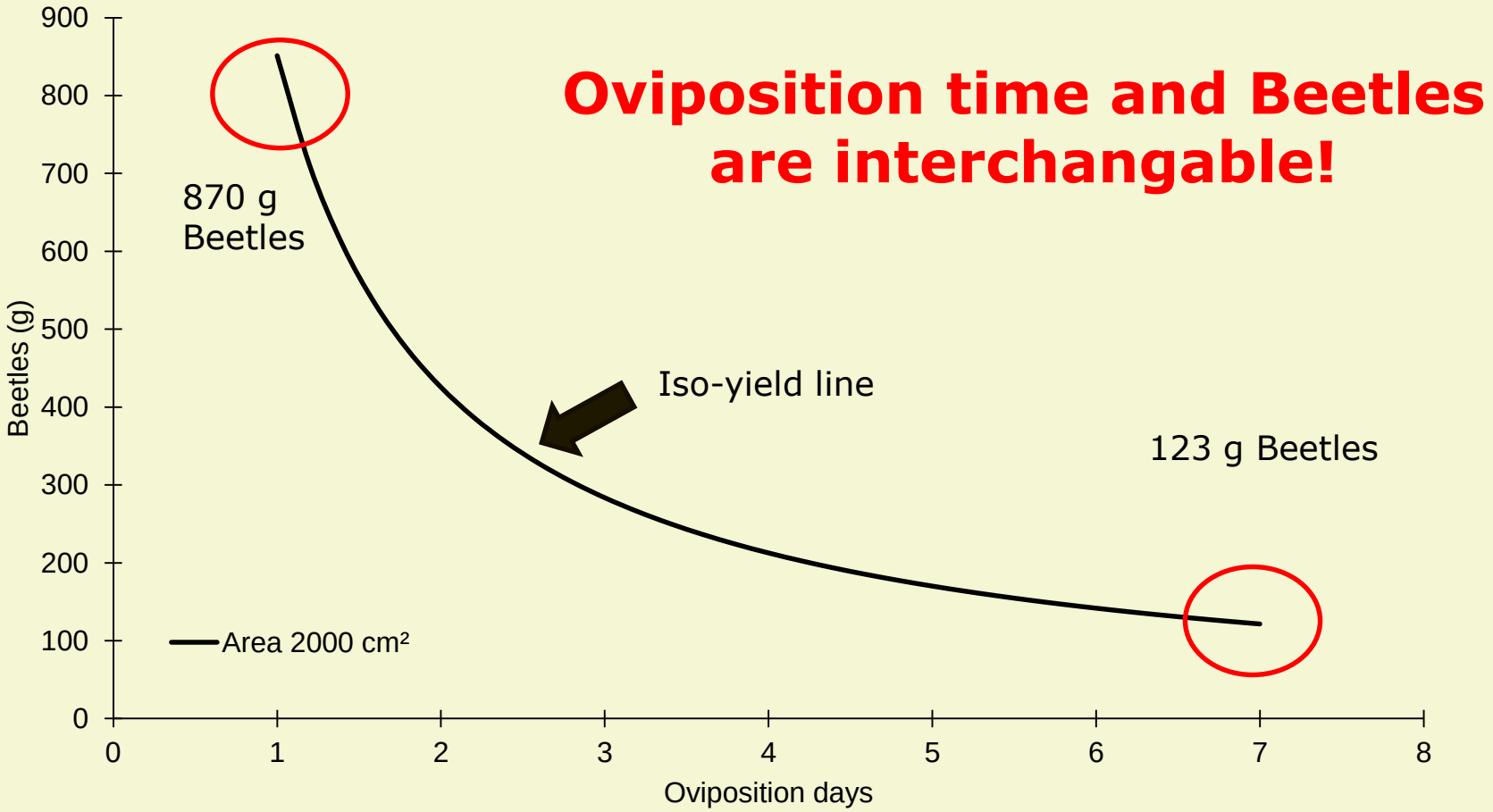
Log_{10}(#MW) = 1.77 + 0.64*BD + $1.80*10^{-4}$*area

Beetledays = Log_{10} (Beetles*Days)

Beetledays: Example 1 kg harvest

1) Harvesting 1 kg at mw at 0.1 g at 2000cm²

2) $(Log_{10}(10000)-1.77- 0.00018*2000)/0.64$ = Beetledays = 2.93



2

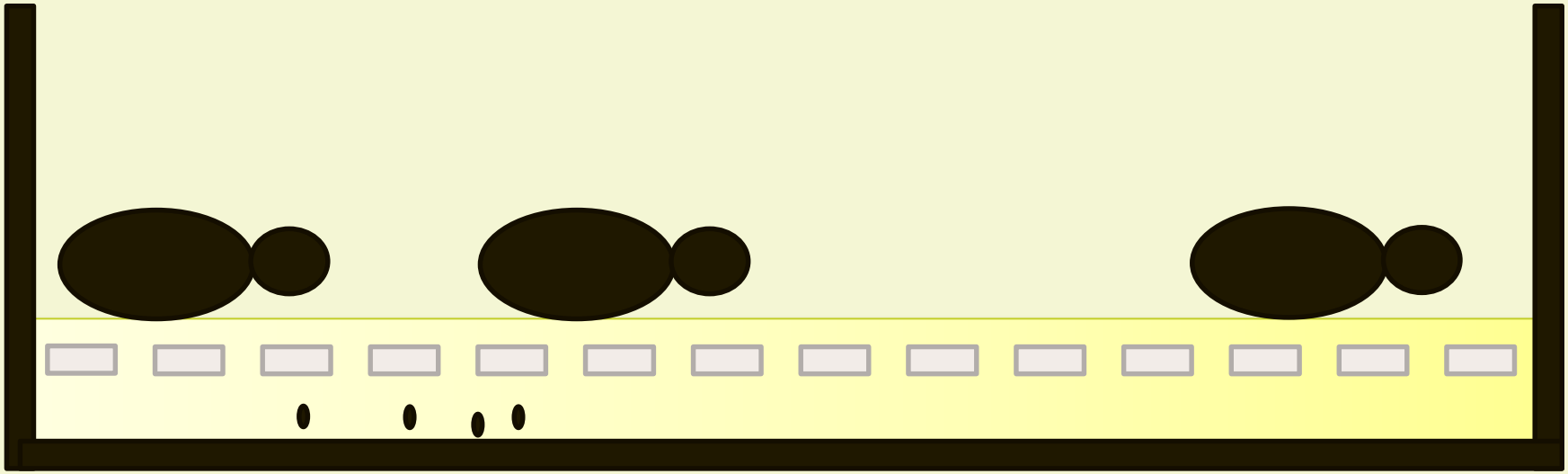
Active control

Collect eggs

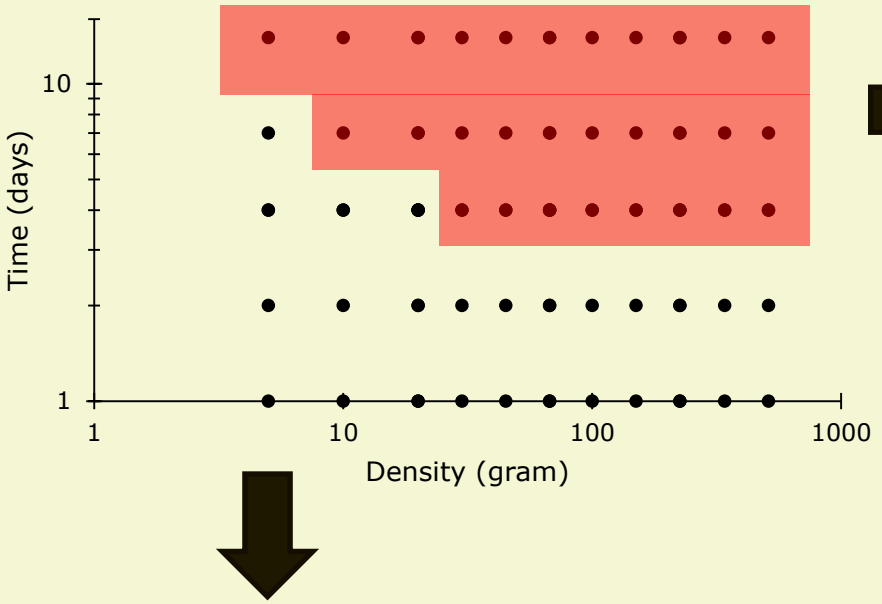
- Is it possible
- Egg weight ≈ # offspring
- Reduced cannibalism

Egg separation: method

- Beetles on screen 6mm from container floor
- Beetles were forced to lay eggs in flour
- Eggs were removed by sieving at 0.5 mm



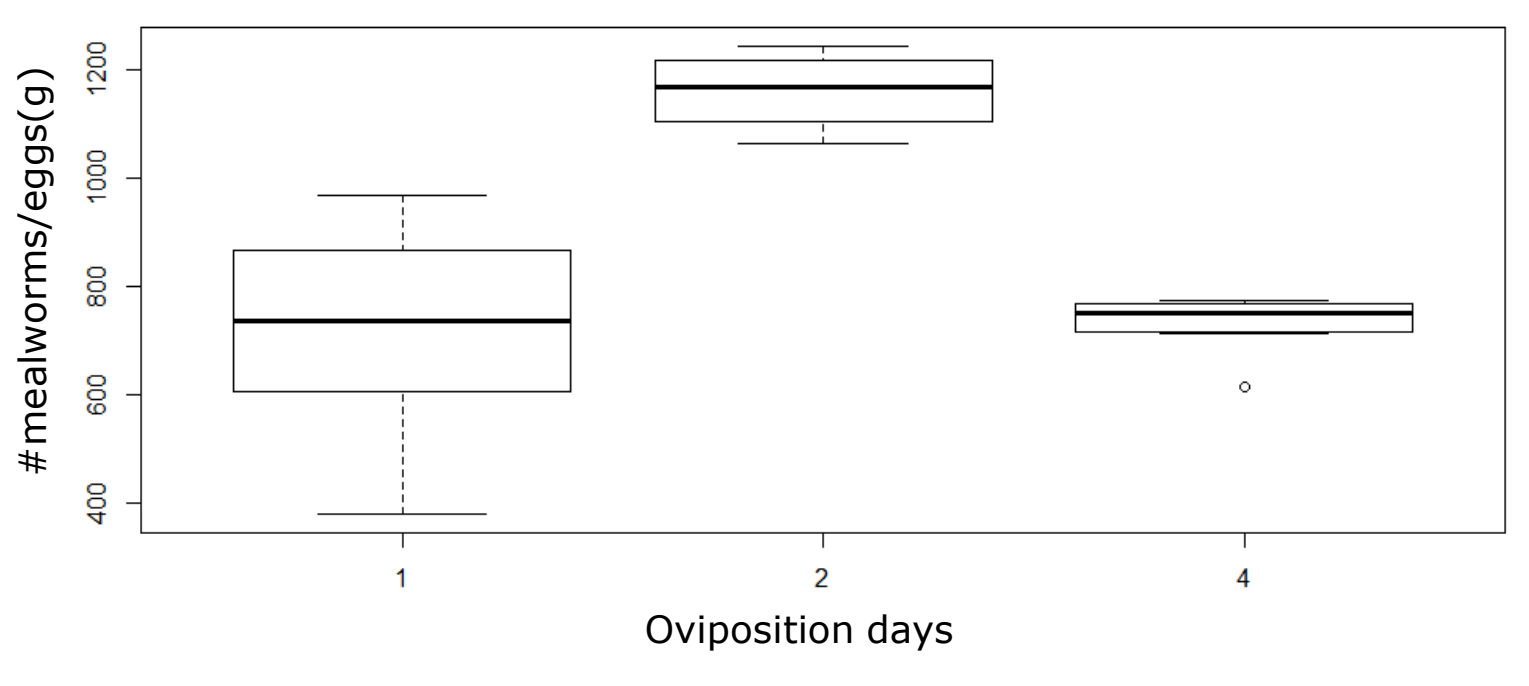
Egg separation



Possible but currently only for lower densities and/or oviposition times

Egg weight vs # mealworms

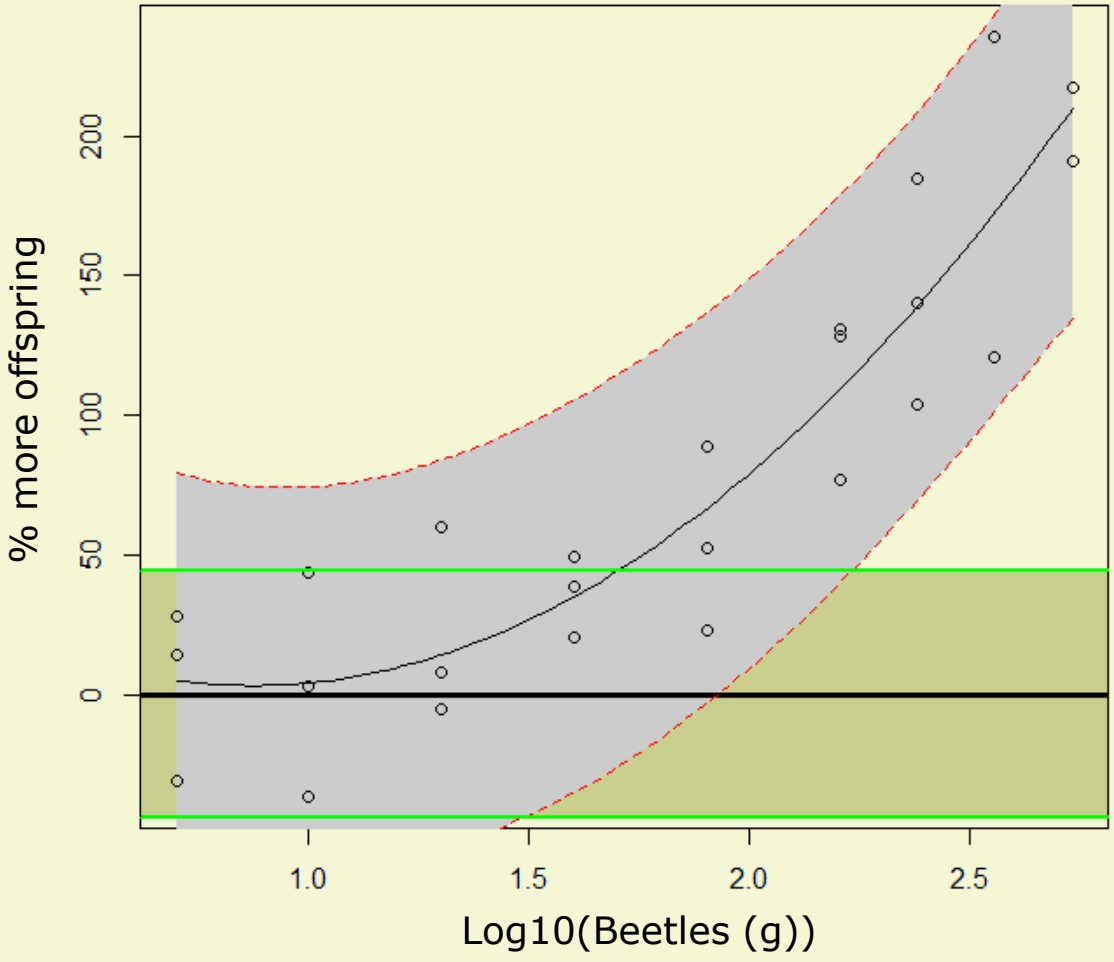
It is possible… But…



727	1160	729
± 198	± 66	± 56

Highly variable, better harvesting method is needed.

Egg separation vs cannibalism



New method

Up to 200% more offspring at high densities

Classic rearing method
(previous model)

Conclusion

- Beetleday model:
  - Easy to use
  - A priori decision of # MW/container
  - suboptimal production at high densities
- Separating the eggs:
  - Is possible and can be good,
  - A posteriori decision of # MW/container
  - Higher yield at high densities,
  - Workload increases significantly

Partners/sponsers

BioBoost
Accelerating biobased horticulture

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Epping Forest District Council

ILVO
Institute for Agricultural and Fisheries Research

Kenniscentrum Plantenstoffen

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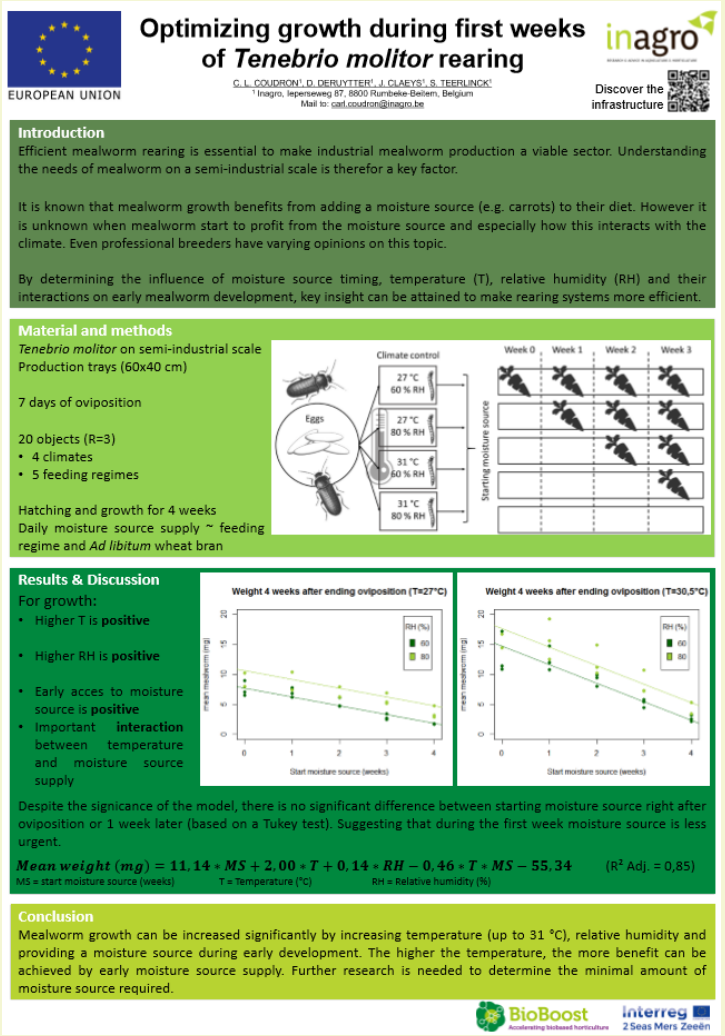
Poster



47.13 by C.L. Coudron