

How (not) to trigger pupation in *Tenebrio molitor*

26 August 2019
EAAP 2019, Ghent
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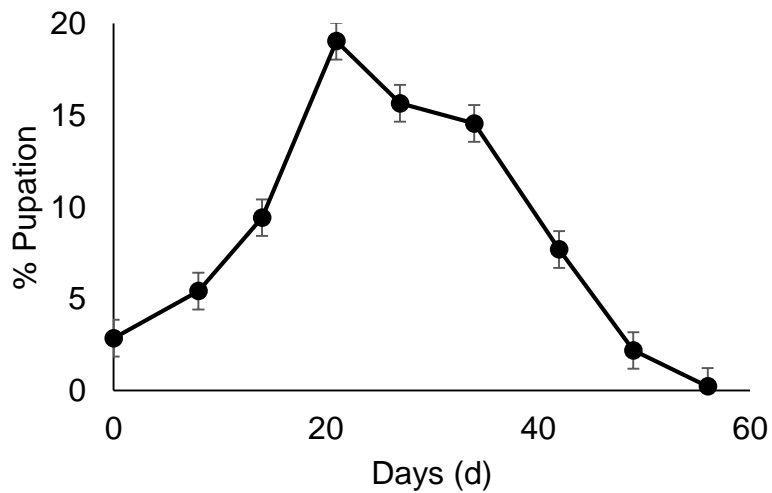
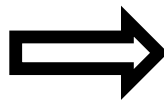
● WHY?





SINGLE, IRREVERSIBLE, QUICK EVENT

NOW ADD BIOLOGY AND NUMBERS



- CANNIBALISM
- HARVESTING DIFFICULTIES
- COMBINATION OF ALL LIFE STAGES

AVOIDED ONLY BY SEPARATION



investment

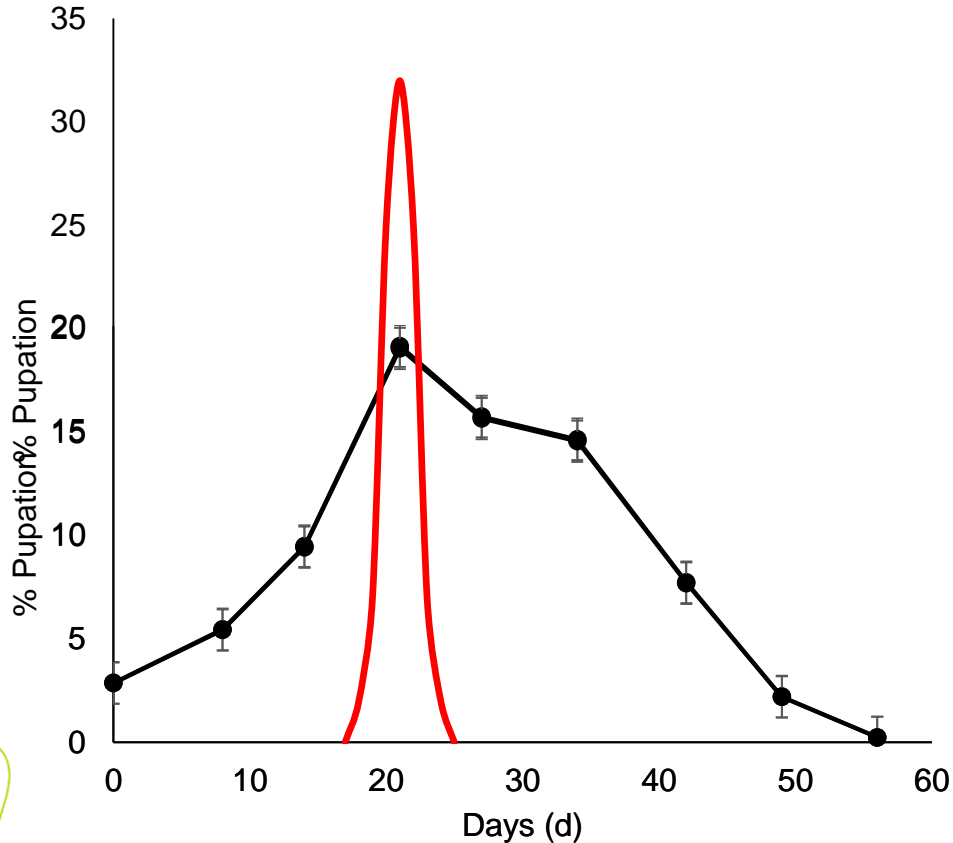


work



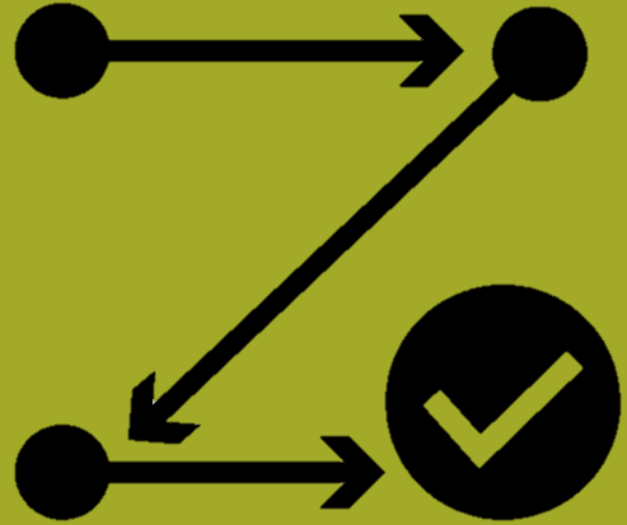
stress

Optimal solution



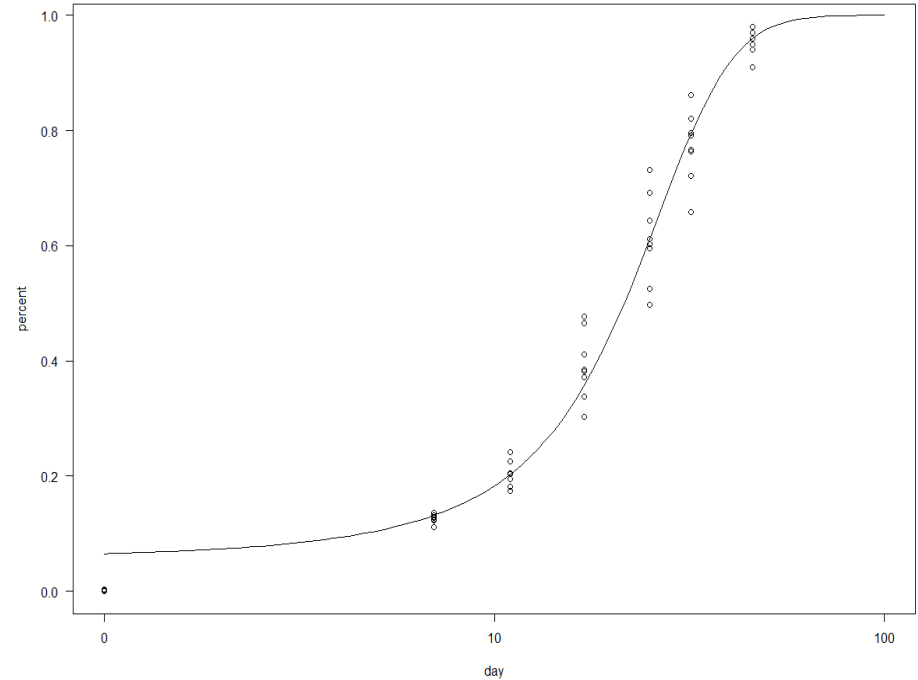
FORCE THE MEALWORMS TO PUPATE IN A CERTAIN TIMEFRAME BY DELAYING OR ACCELERATING THE PUPATION.

● HOW?



Overall experimental approach

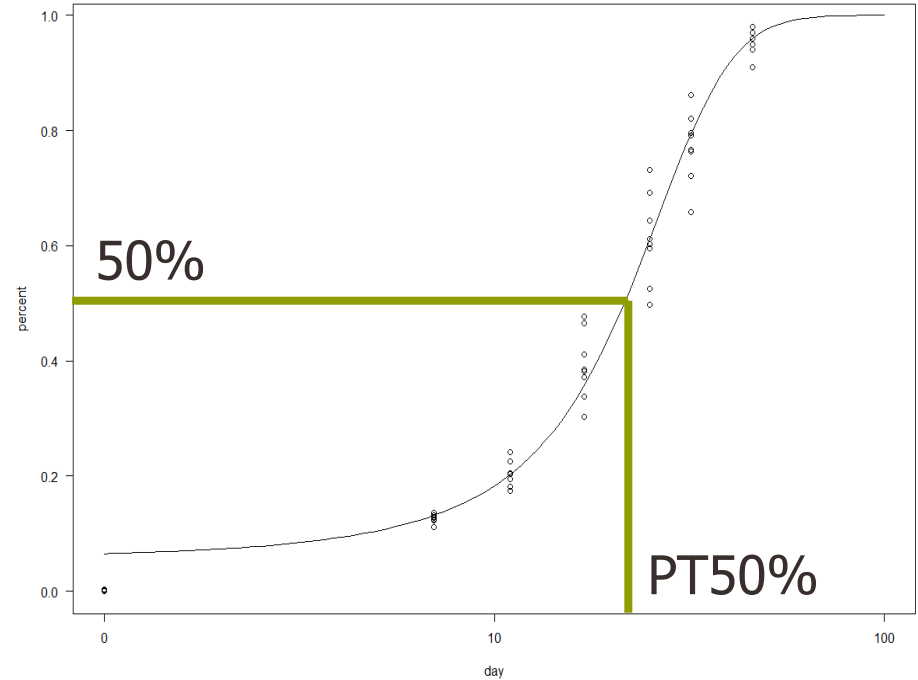
- 60*40 CRATE WITH 5000 MEALWORMS
- START EXPERIMENT AT FIRST PUPAE
- COUNTING PUPAE TWICE A WEEK AND CONSTRUCT A CUMULATIVE CURVE



Statistical analysis

PT50 (PUPATION TIME):

TIME BETWEEN FIRST AND 50 %

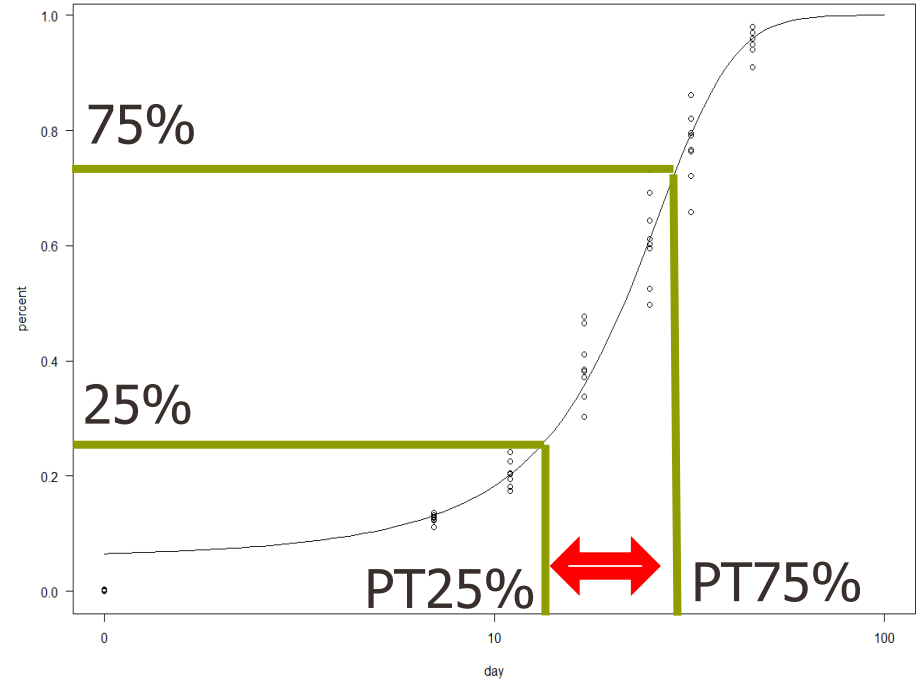


Statistical analysis

PT25-75 (PUPATION SPEED):

TIME BETWEEN 25 AND 75 %

PROXY FOR SPEED OF PUPATION
WHEN THE 'BULK' IS PUPATING



Experiments



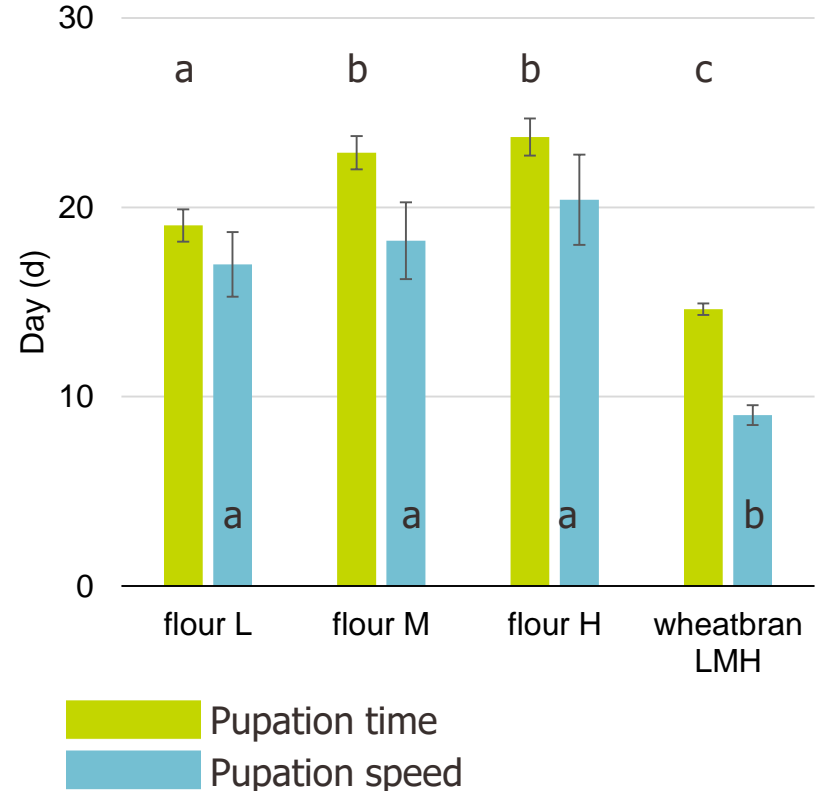
Influence of the substrate

NUTRITIONAL QUALITY AND
OVERALL STRUCTURE OF THE
SUBSTRATE MAY INFLUENCE THE
ABILITY TO PUPATE



Choosing the right substrate

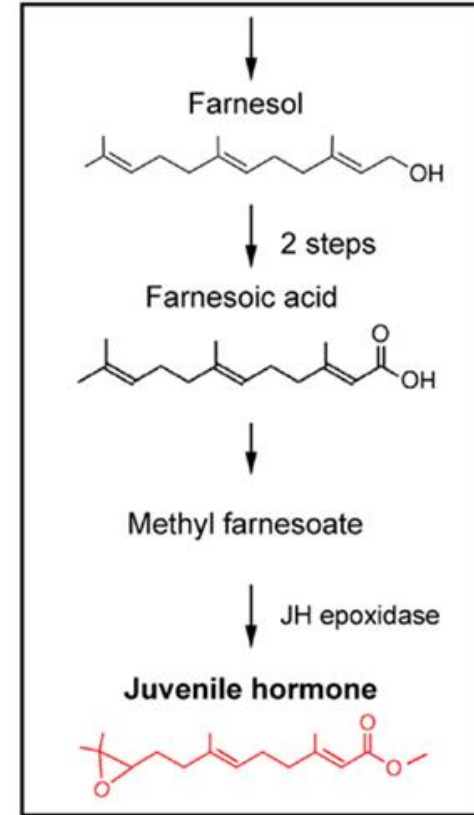
- CLEAR DIFFERENCE BETWEEN WHEAT BRAN AND FLOUR
- AMOUNT OF WHEAT BRAN DID NOT INFLUENCE THE PUPATION
- INCREASING THE FLOUR INCREASED PUPATION TIME BUT NOT PUPATION SPEED



Influence of frass

JUVENILE HORMONES ARE USED TO
DELAY PUPATION AND CREATE LARGER
LARVAE IN DIFFERENT INSECTS

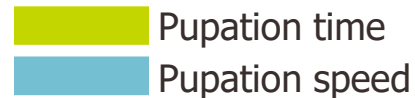
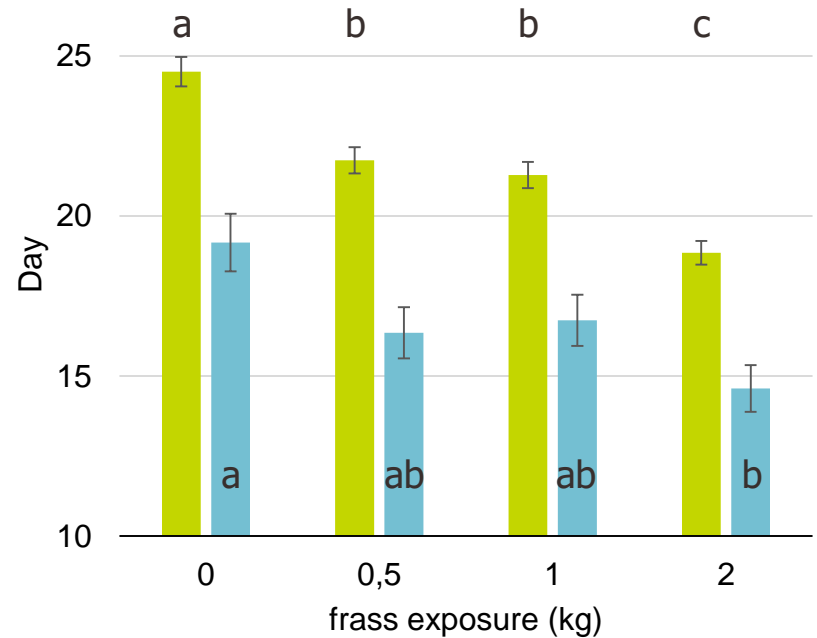
FARNESOL FOUND IN FRASS AND
COULD INFLUENCE PUPATION AS
JUVENILE HORMONE MIMIC



JUVENILE
HORMONE
BRANCH

Influence of frass

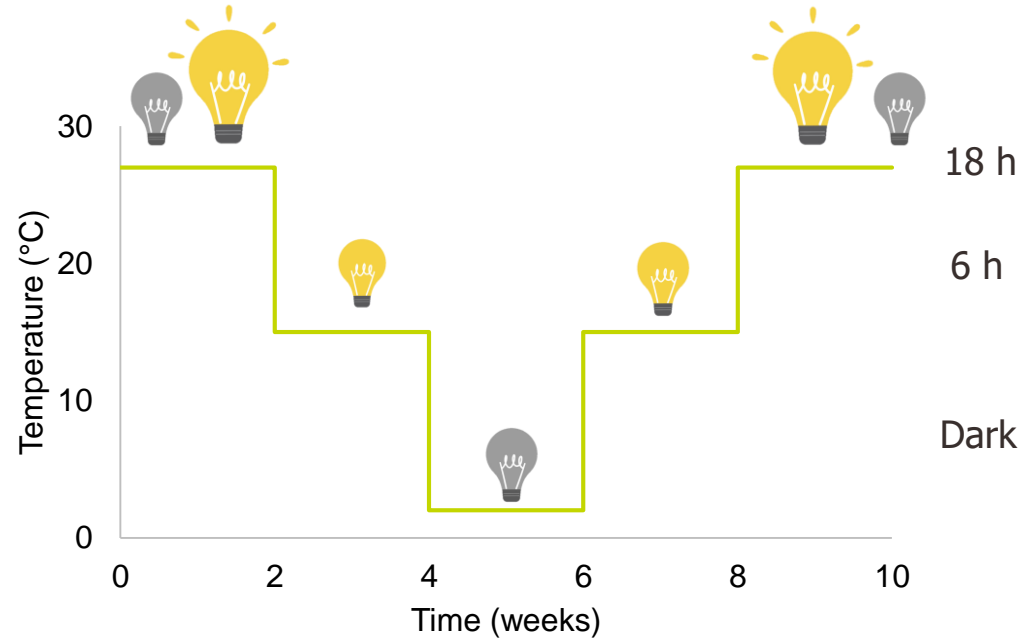
AN INCREASE IN FRASS
DECREASES THE PUPATION TIME
AND SPEED



Mimicking spring/summer

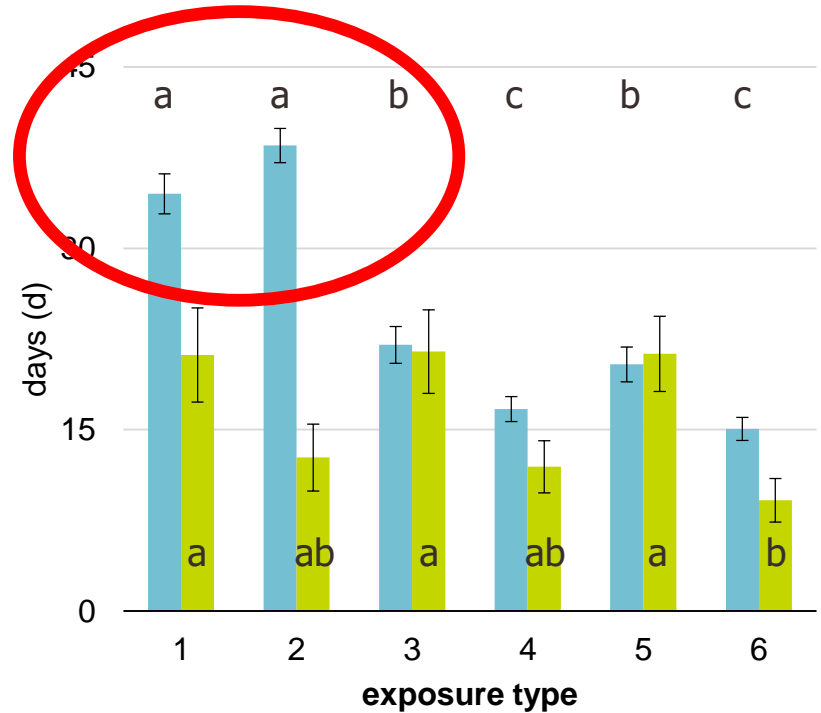
STANDARD REARING
CONDITIONS CONTINUOUS
27°C AND DARK



IN NATURE: NO PUPAE ARE
FOUND IN WINTER, CAN WE
DELAY PUPATION AND THEN
TRIGGER THEM IN 'SPRING'?



Mimicking spring

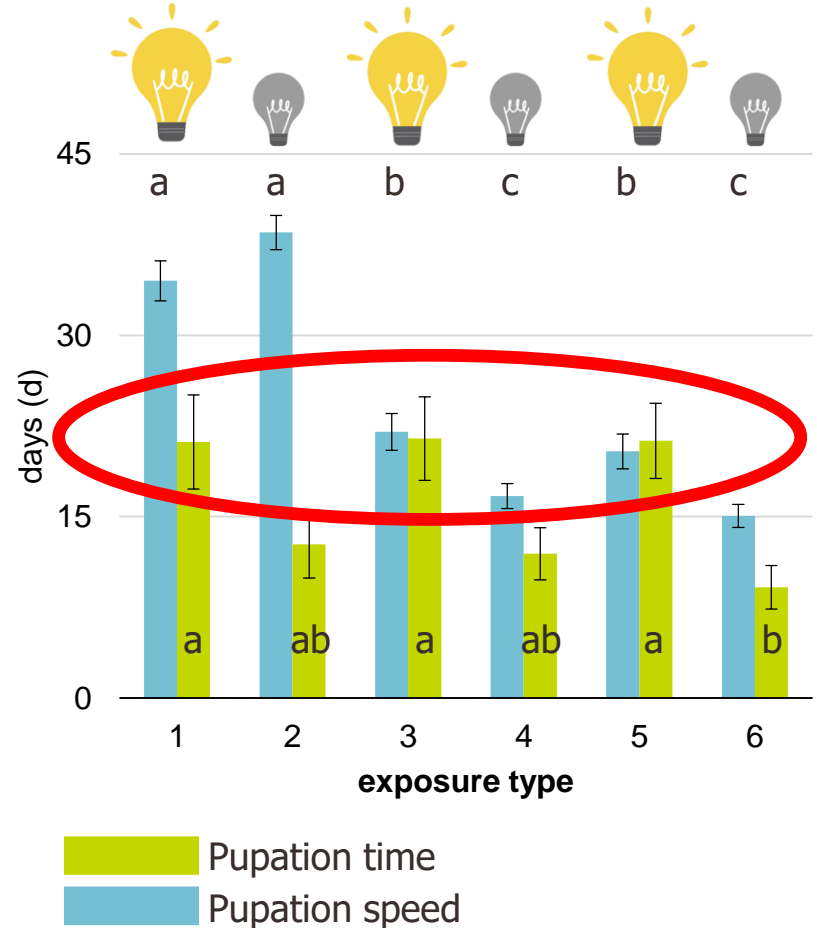
A COLD PERIOD AT 2°C DELAYS THE PUPATION SIGNIFICANTLY, HOWEVER WHEN THE PUPATION STARTS AGAIN IT IS AS FAST AS OTHER SCENARIOS



 Pupation time
 Pupation speed

Mimicking spring

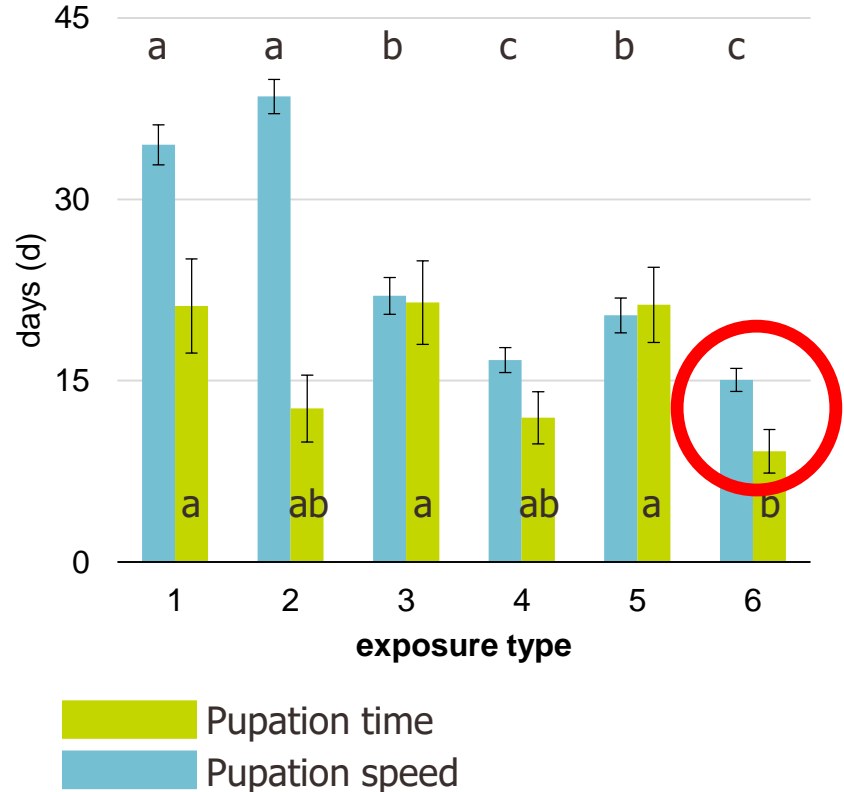
SIGNIFICANT LOWER PUPATION SPEED WHEN EXPOSED TO PROLONGED PERIODS OF LIGHT!
(20 DAYS VS 11 DAYS)



Mimicking spring

TYPE 6 HAS THE BEST PUPATION TIME AND SPEED

BUSINESS AS USUAL ...



Final trials

HEAT SHOCK -> NO POSITIVE EFFECT

COLD SHOCK -> NO POSITIVE EFFECT

WANDERERS -> NO REPRODUCIBLE EFFECTS

Conclusion

27°C, dark, wheat bran without frass removal results in the fastest pupation time and speed.

This is what we did at the start... and still do



Questions



BioBoost
Accelerating biobased horticulture

Interreg 
2 Seas Mers Zeeën



Gefinancierd binnen het Interreg V-programma 2 Zeeën, het grensoverschrijdend samenwerkingsprogramma met financiële steun van het Europees Fonds voor Regionale Ontwikkeling

