



Ynsect



More than an organic fertilizer: mealworm frass as a substitute to conventional fertilizer to ensure a sustainable future

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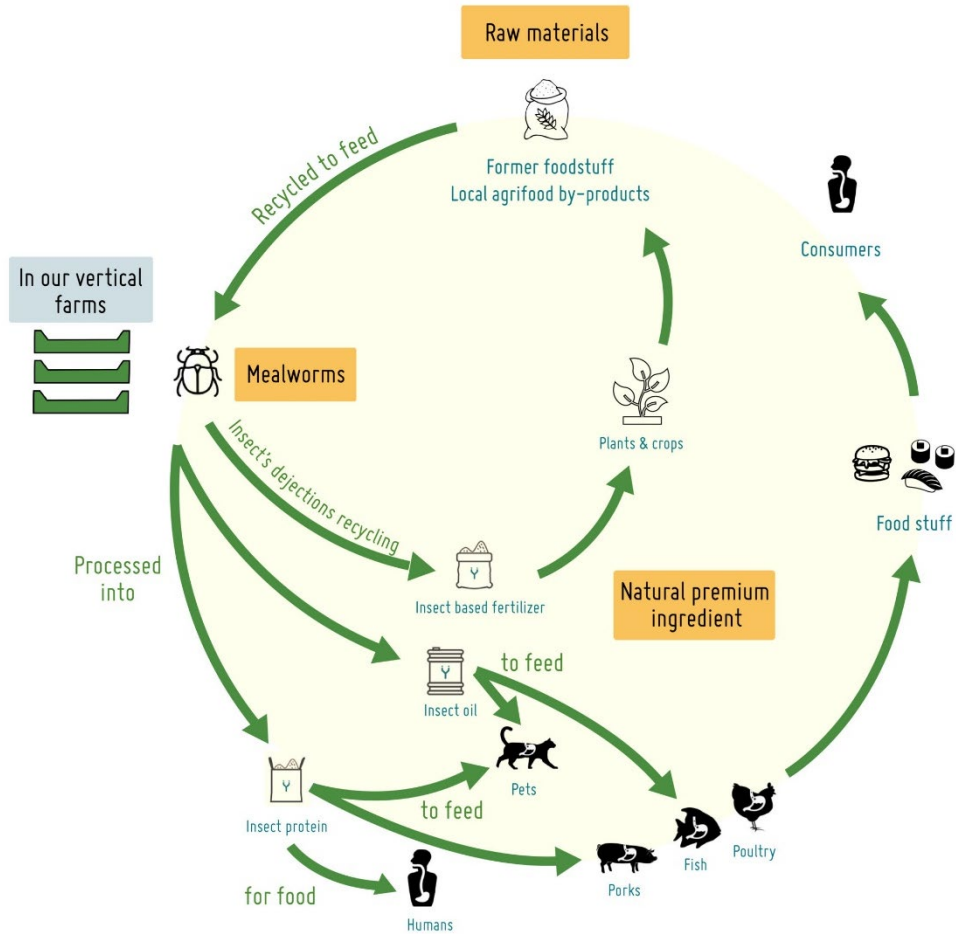
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# Ynsect presentation



YnFrass



Tested on **14 crops over 4 years**



Market approval in **March 2020**



**Allowed for organic farming** under European regulation EC 834/2007



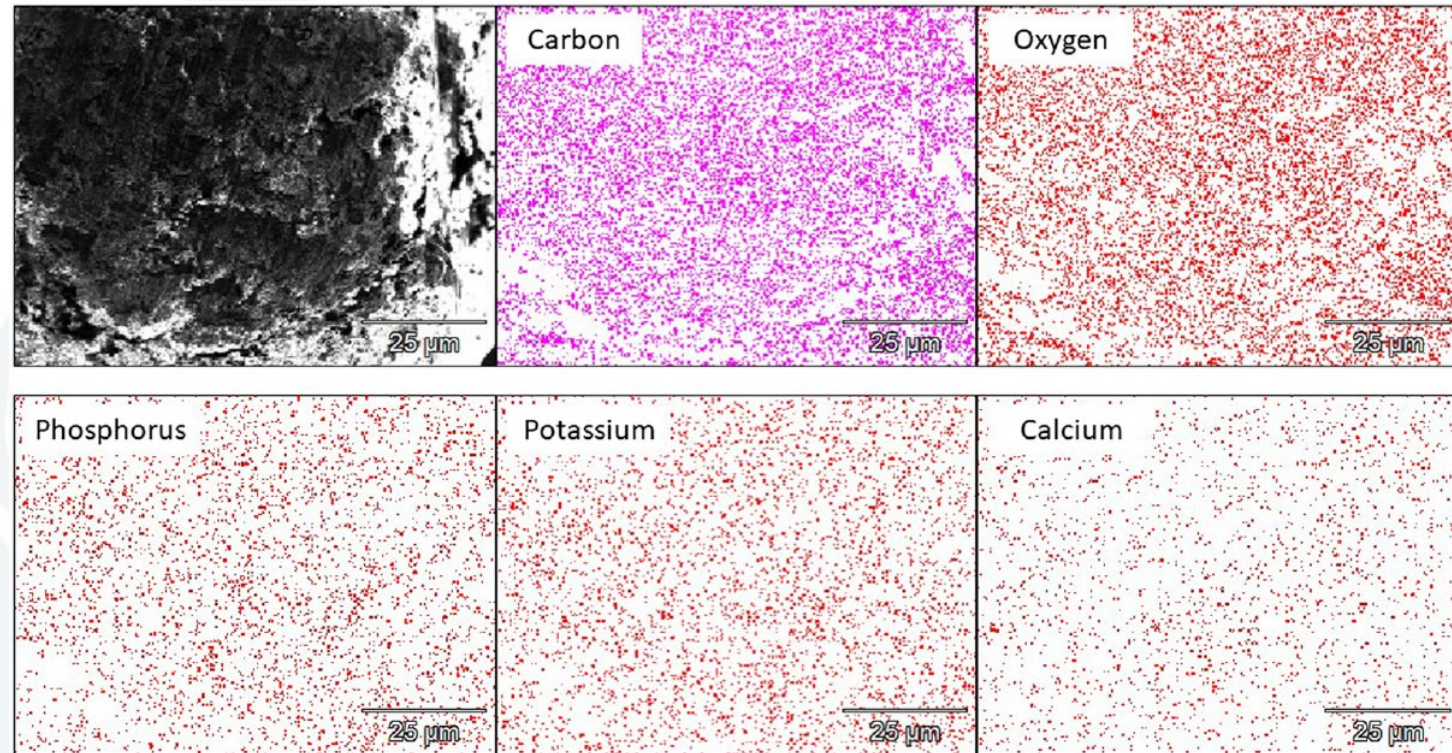
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# Mealworm frass characteristics

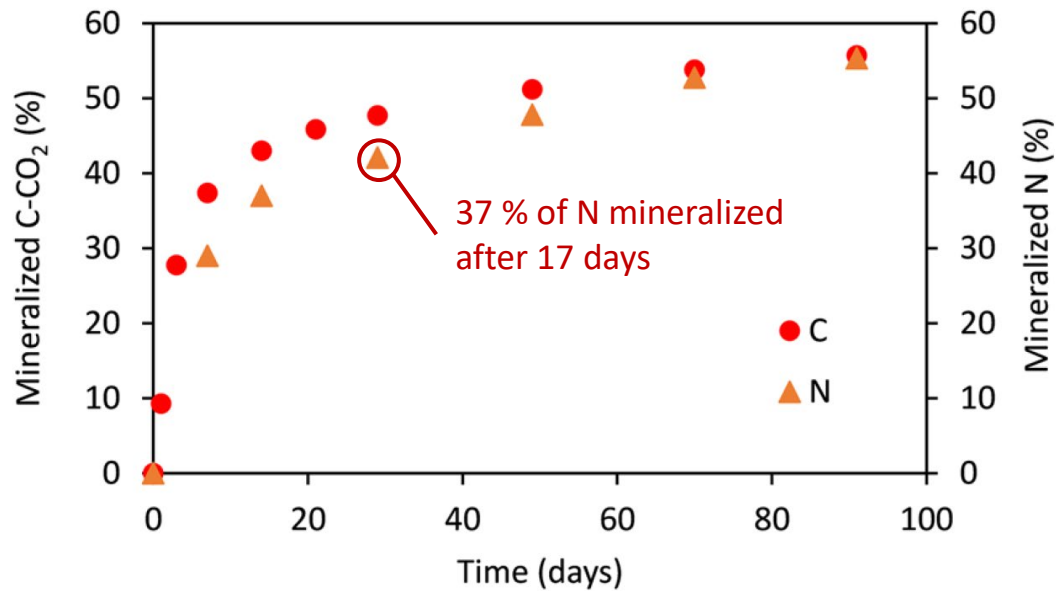
**Table 1.** Chemical characteristics of frass

Content in crude matter (90 % dry matter)	
Organic matter	80 to 84 %
C/N ratio	10
pH	6,0
Nitrogen	4 to 5 %
Phosphorus (P <sub>2</sub> O <sub>5</sub> )	2,8 to 3,9 %
Potassium (K <sub>2</sub> O)	1,7 to 2,4 %
Magnesium (MgO)	0,7 %
Calcium (CaO)	0,4 to 0,9 %

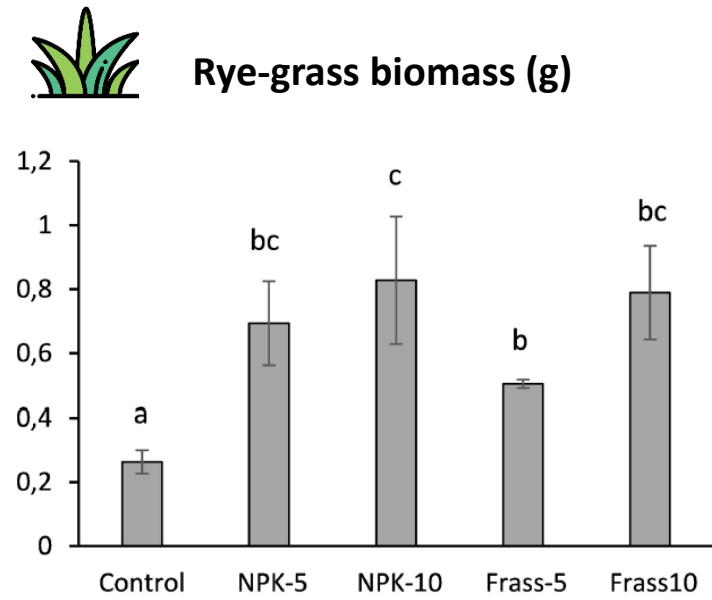
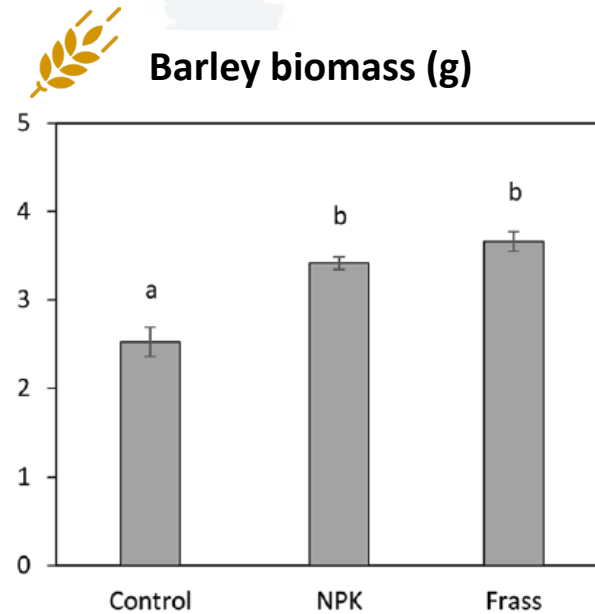


**Figure 1.** Scanning electron microscope - energy-dispersive X-ray spectrometer characterisation of frass

# Mealworm frass potential as a substitute to conventional fertilizer



**Figure 2.** Carbon and nitrogen mineralization dynamics of frass

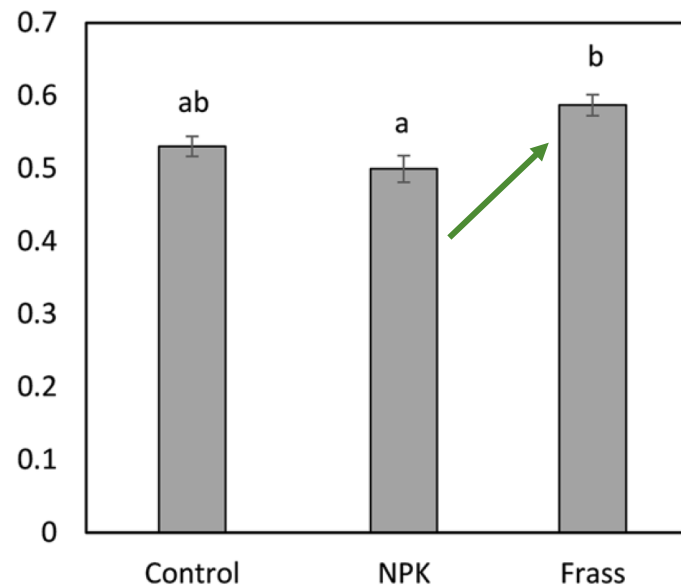


**Figure 3.** Biomass of harvested barley and rye-grass.

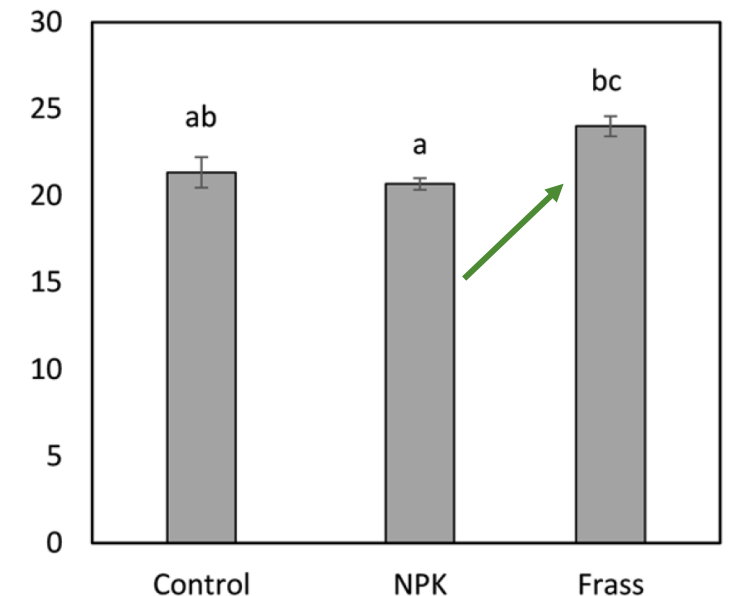
# Mealworm frass effect on soil microbial activity and functional diversity



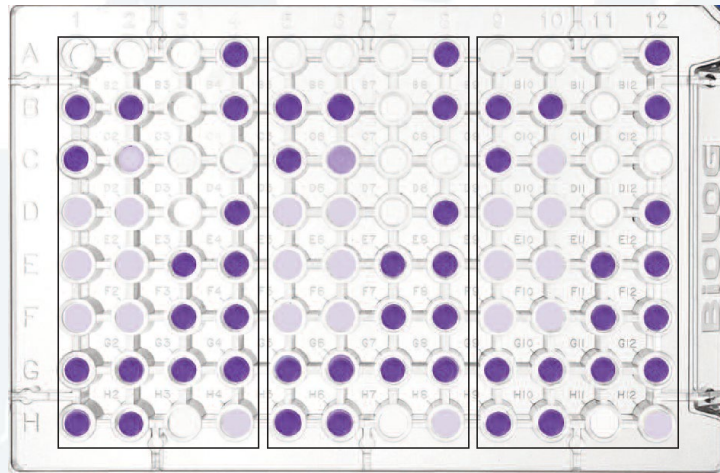
Average well-color development



Richness



**Figure 4.** Average well-color development and Richness of metabolized substrates in BIOLOG EcoPlate after frass application.



# Mealworm frass and earthworms synergetic effect

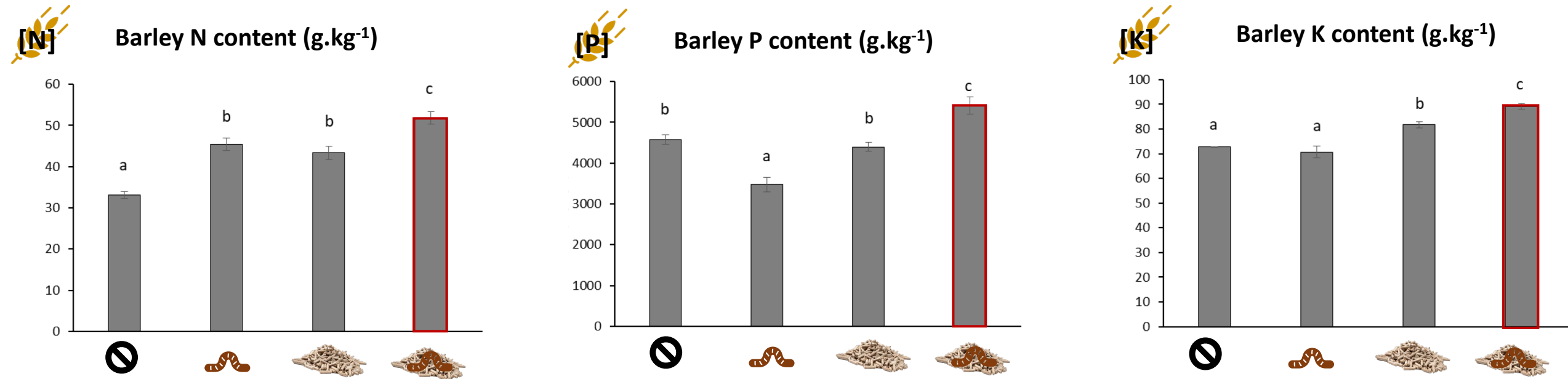
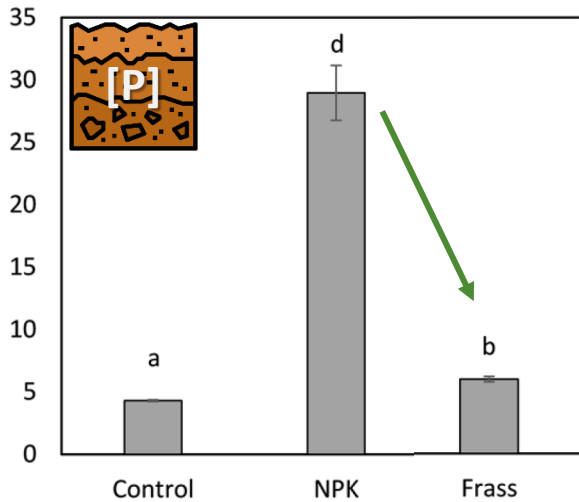


Figure 5. Concentrations of N, P and K of barley.

# Mealworm frass carbon and environmental footprint



Soil water soluble P (mg.kg<sup>-1</sup>)



Barley P concentration (mg)

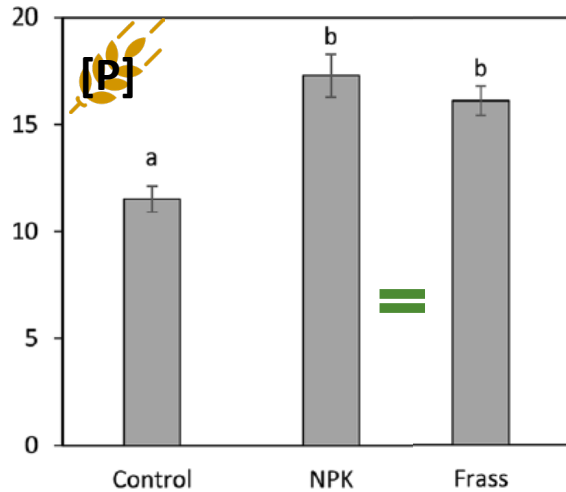


Figure 6. Concentrations of water-soluble P in soil and P barley content



1 year



= -19% carbon footprint



100 years

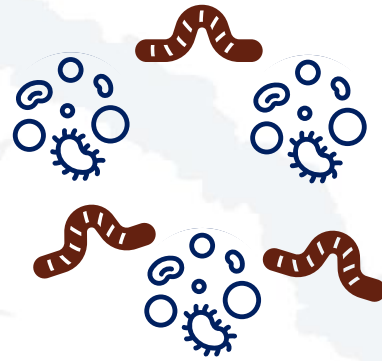


= 8 times smaller carbon footprint

Figure 7. Frass carbon footprint scenario as a substitute to conventional fertilizer



# Conclusion



Stimulation of **micro and macro-organisms activity / diversity**



**Good substitute to conventional fertilizer**



**Reduce carbon and environmental footprint**

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# References



 agronomy



Communication

## Earthworms (*Lumbricus terrestris* L.) Mediate the Fertilizing Effect of Frass

Anne-Maïmiti Dulaurent <sup>1,\*</sup>, Guillaume Daoulas <sup>2</sup>, Michel-Pierre Faucon <sup>1</sup> and David Houben <sup>1,\*</sup>

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## Assessment of the Short-Term Fertilizer Potential of Mealworm Frass Using a Pot Experiment

David Houben<sup>1\*</sup>, Guillaume Daoulas<sup>2</sup> and Anne-Maïmiti Dulaurent<sup>1</sup>

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## OPEN Potential use of mealworm frass as a fertilizer: Impact on crop growth and soil properties

David Houben<sup>1\*</sup>, Guillaume Daoulas<sup>2</sup>, Michel-Pierre Faucon<sup>1</sup> & Anne-Maïmiti Dulaurent<sup>1</sup>

Dulaurent, A. M., Daoulas, G., Faucon, M. P., & Houben, D. (2020). Earthworms (*Lumbricus terrestris* L.) mediate the fertilizing effect of frass. *Agronomy*, 10(6), 783. Link : [https://www.mdpi.com/2073-4395/10/6/783?type=check\\_update&version=1](https://www.mdpi.com/2073-4395/10/6/783?type=check_update&version=1)

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Thank you !

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