Efficiency of rearing yellow mealworms (*Tenebrio molitor* L.) on fibre-rich composted and mycoremediated residual streams

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EAAP - 1 September 2024

Clippings in the Netherlands

≈ 500K ton
annually

Reed
175K tons wet

Grass
100K tons wet

Waterweed
20K tons wet

Pennywort
10K tons wet

Pond herb
10K tons wet

Duckweed
7.5K tons wet

Japanese Knotweed
1K tons wet

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CoMySect project

- MECHNICAL
- Thermal

Physical

- Alkaline

Chemical

- Bacterial
- FUNGAL

Biological

CoMySect project

Develop safe and nutritious substrates for insect rearing from low-value organic residual streams using composting, fermentation and mycoremediation

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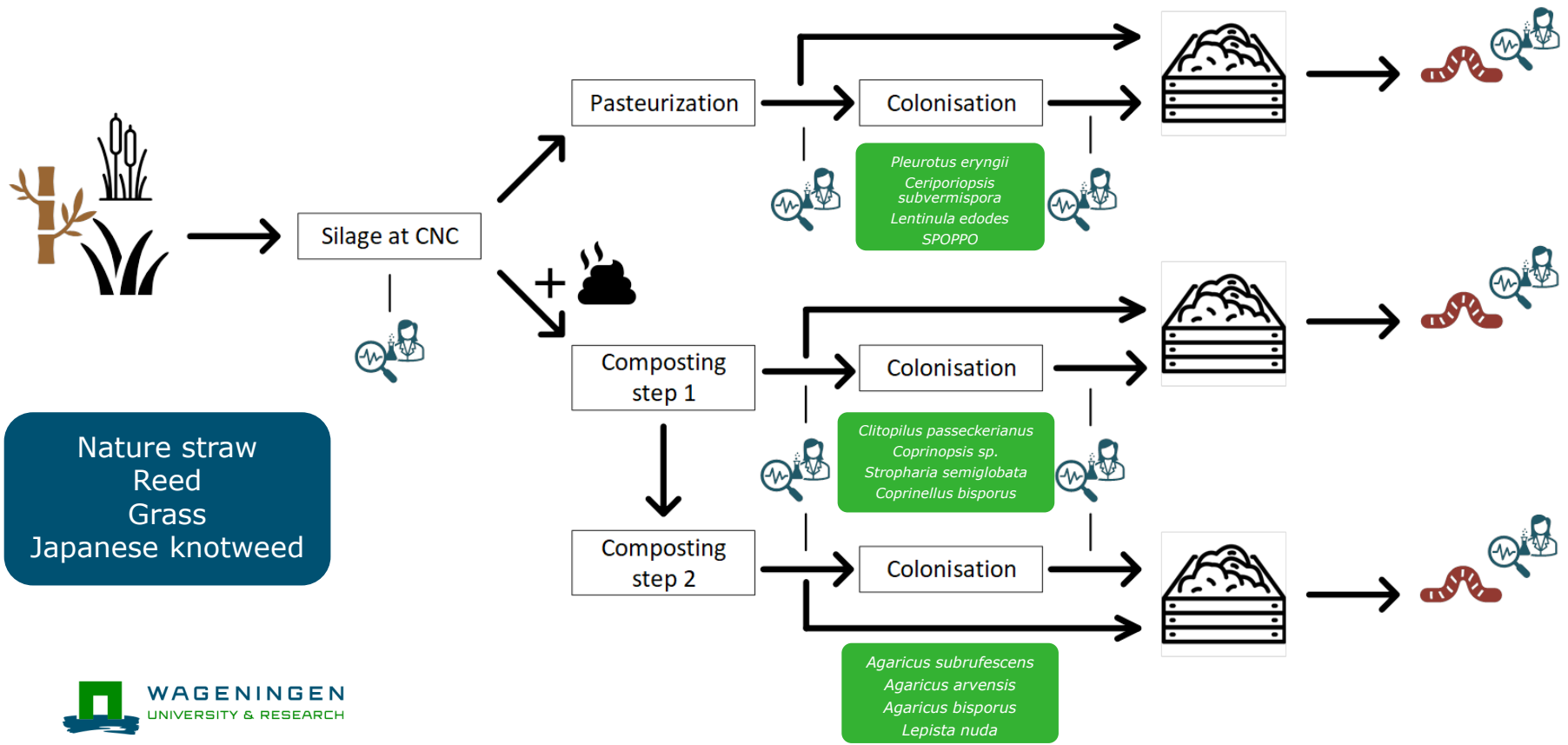
Peguero *et al.* Waste Management 160 (2023)
Peguero *et al.* Frontiers Sustainable Food Systems (2022)
Gold *et al.* Waste Management 102 (2020)

Overview



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Methodology- trial 1

Naturestraw

Japanese Knotweed

Reed

Grass

Starting point:
- Treated clippings
- 50 larvae (2 weeks old)
- 15g substrate (0.3g/larvae)
- Larval weight

4 weeks

Harvesting point:
- Counting alive larvae → survival rate
- Larval weight (yield)
- Frass weight

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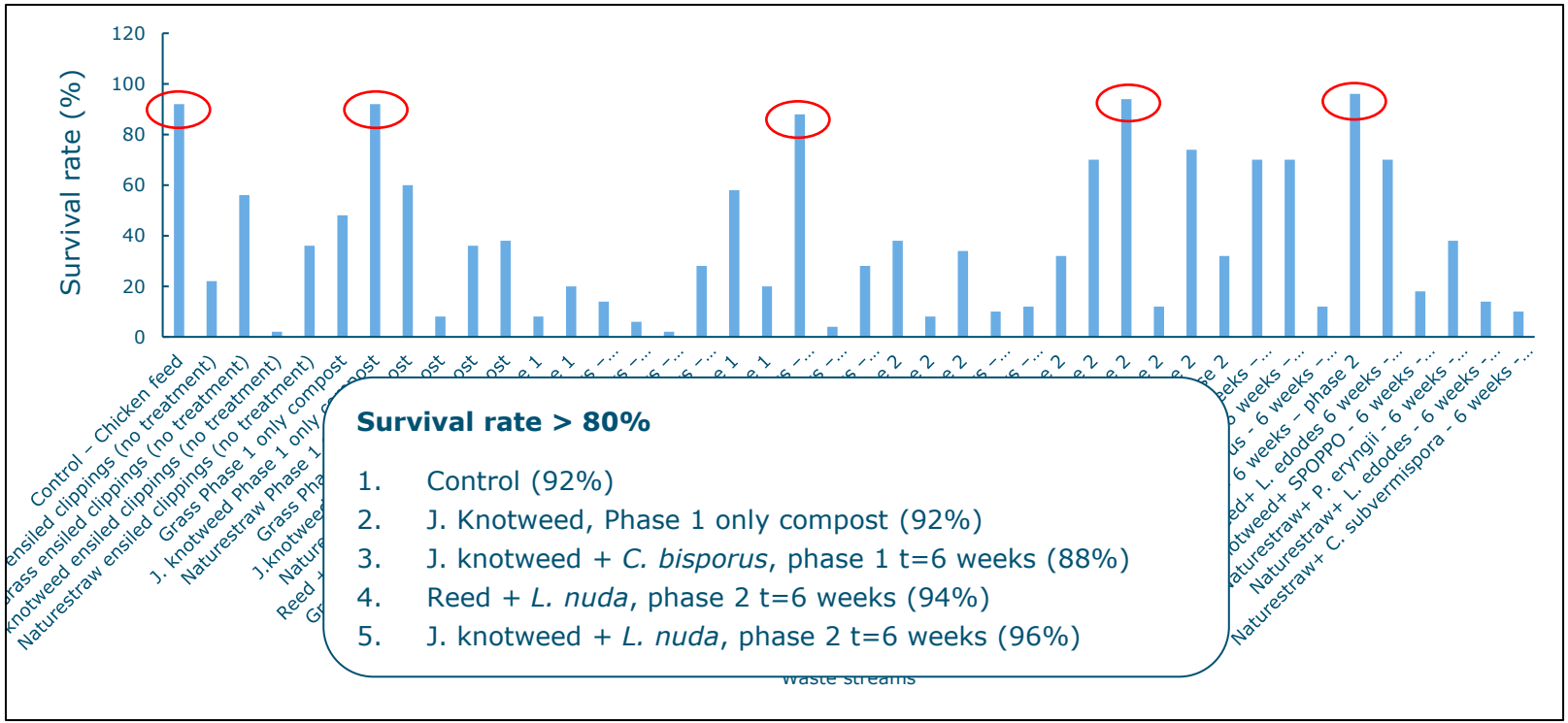
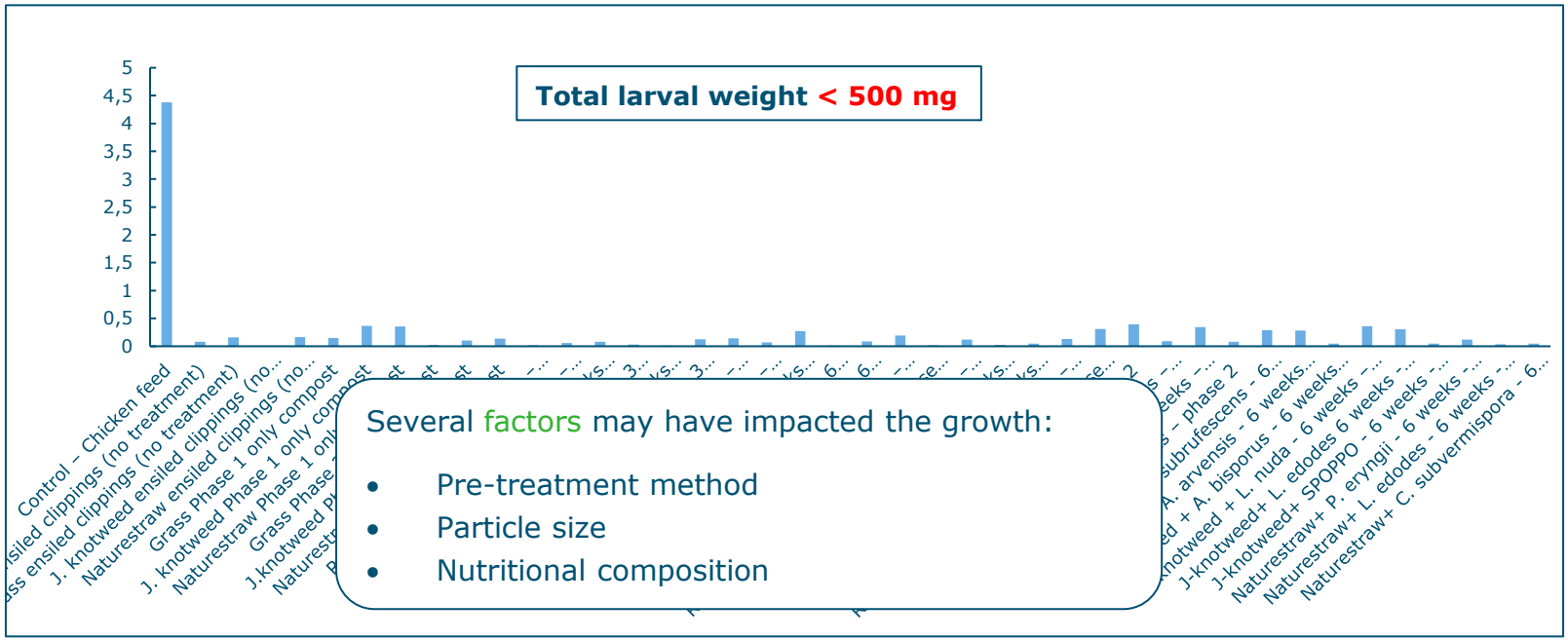
Results – survival rate (%)



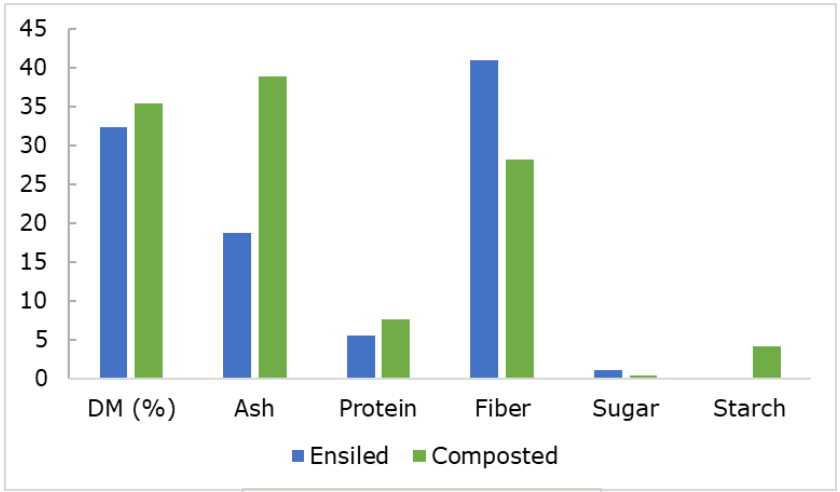
Results – Total larval weight (g)



Materials & Methods – trial 2

Treatment * Particle size	Composted knotweed (KW) not shredded Composted knotweed shredded Ensiled knotweed shredded Ensiled knotweed not shredded
Knotweed inclusion	Control 1: Commercial wheat bran 10 KW composted shredded - 90 Control 1 30 KW composted shredded - 70 Control 1
10% protein	Control 2: 90 Corn starch (CS) - 10 Pea Protein (PP) 10 KW composted shredded – 80 CS – 10 PP 30 KW composted shredded – 60 CS – 10 PP
20% Protein	Control 3: 80 CS - 20 PP 10 KW composted shredded – 70 CS – 20 PP 30 KW composted shredded – 50 CS – 20 PP

Materials & Methods – trial 2



Japanese Knotweed

Starting point:
- 50 larvae (2 weeks old)
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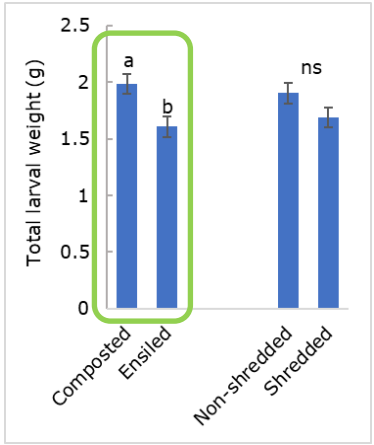
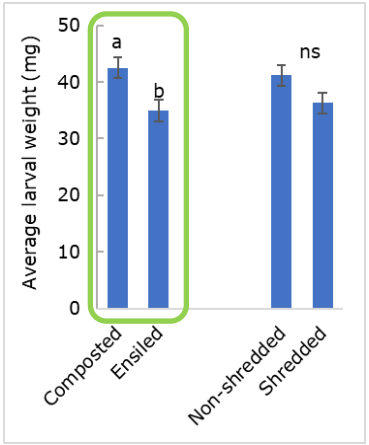
- Larval weight

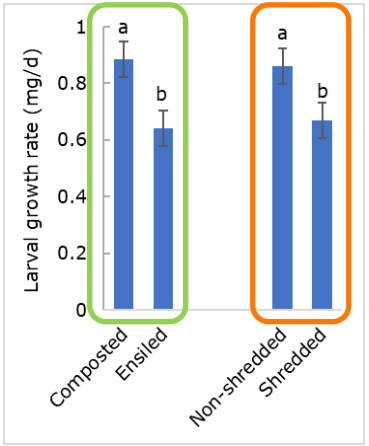
4 weeks

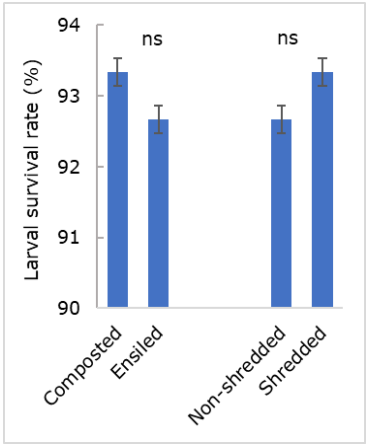
Harvesting point:
- Counting alive larvae → survival rate
- Larval weight (yield)
- Frass weight

Results - Treatment * Particle size





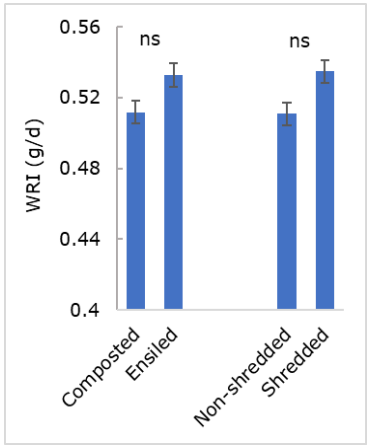


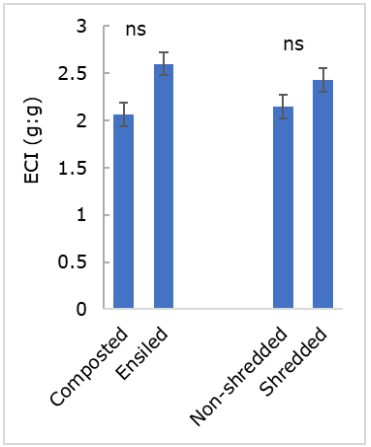


Treatment * Particle size

Composted knotweed (KW) not shredded
Composted knotweed shredded
Ensiled knotweed shredded
Ensiled knotweed not shredded

Treatment * Particle size → P> 0.05 ns





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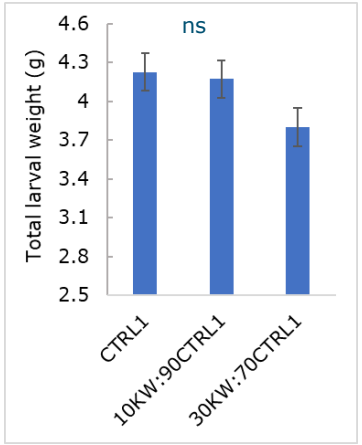
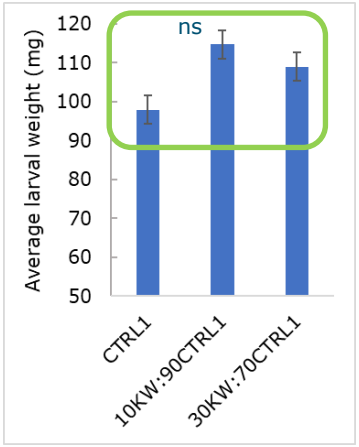
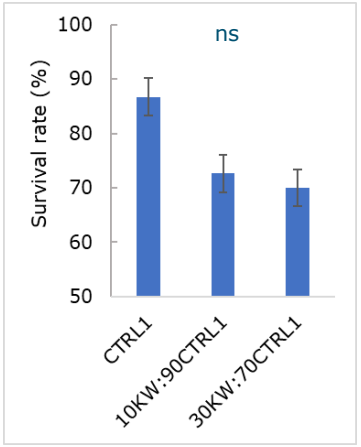
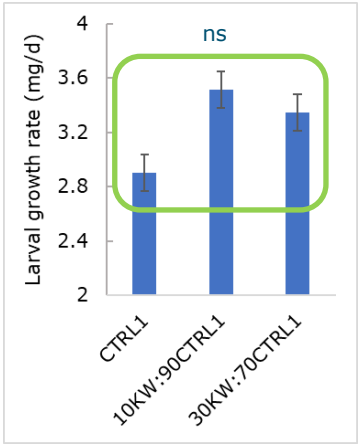
Results – Control 1 + Knotweed





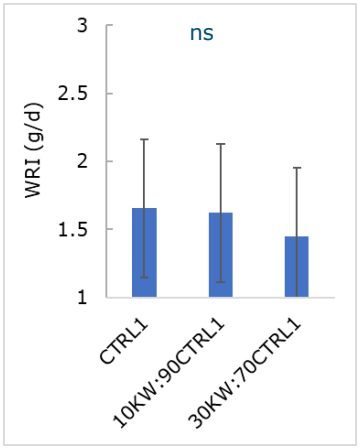


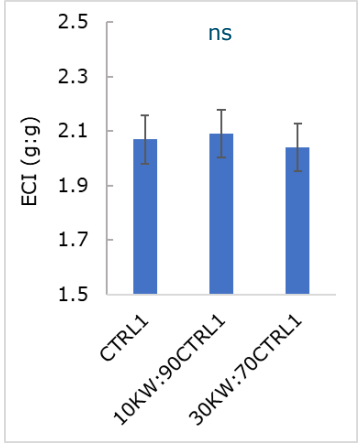


Knotweed inclusion

Control 1: Commercial wheat bran
10 KW composted shredded - 90 Control 1
30 KW composted shredded - 70 Control 1

NO significant differences





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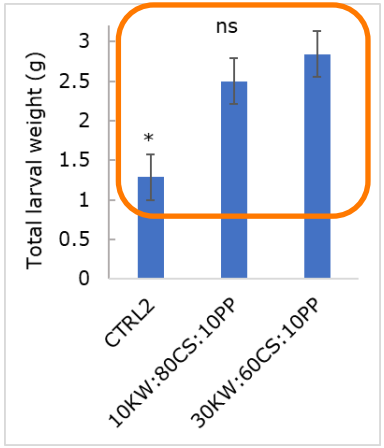
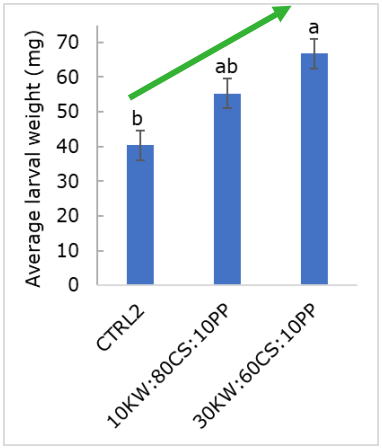
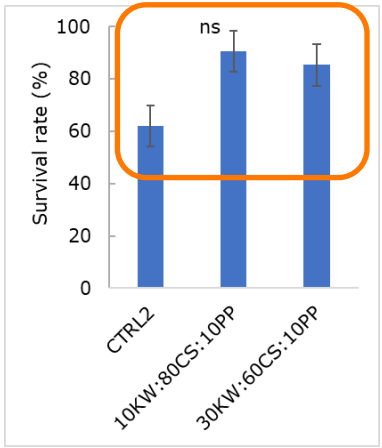
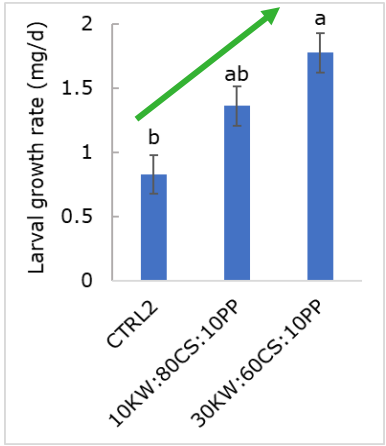
Results – Control 2 + Knotweed + 10% Protein



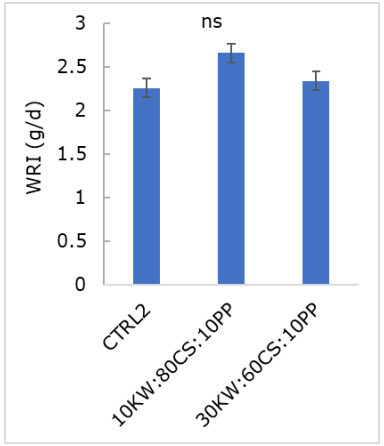






10% protein

Control 2: 90 Corn starch (CS) - 10 Pea Protein (PP)
10 KW composted shredded – 80 CS – 10 PP
30 KW composted shredded – 60 CS – 10 PP



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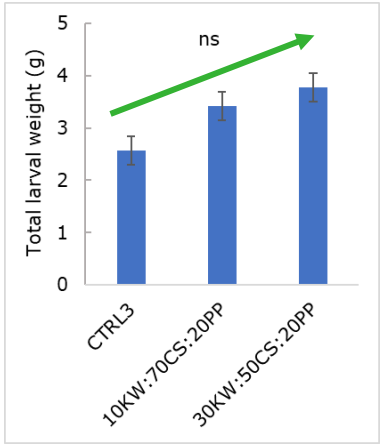
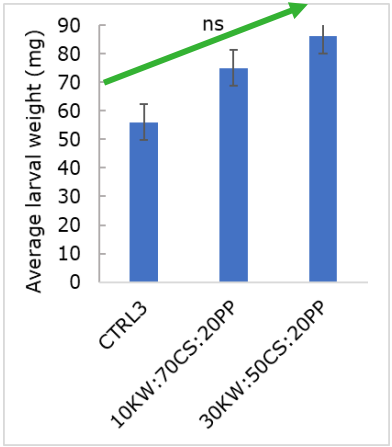
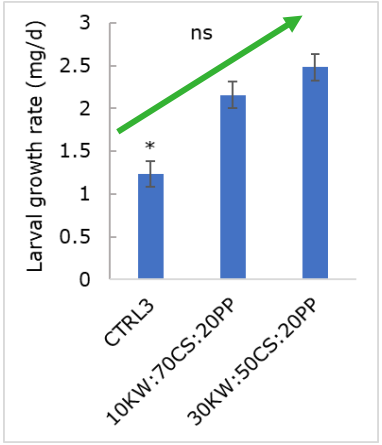
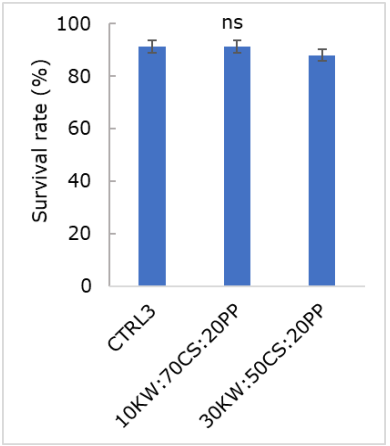
Results – Control 3 + Knotweed + 20% Protein





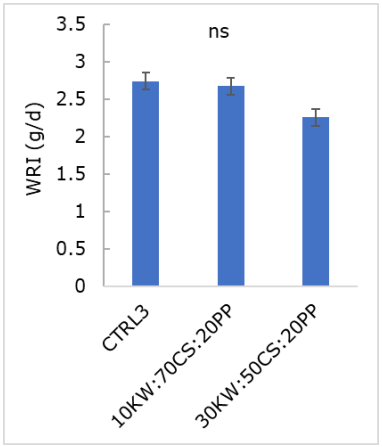


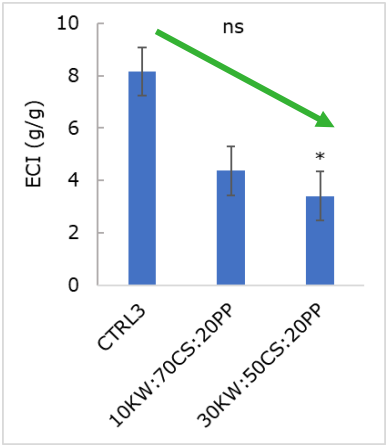


20% Protein

Control 3: 80 CS - 20 PP
10 KW composted shredded – 70 CS – 20 PP
30 KW composted shredded – 50 CS – 20 PP

NO significant differences





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Conclusion

- Fungal treatment → not very successful
- Knotweed is a potential clipping → nutritionally not enough but improves the structure of the diet
- Composting better than ensiling: pH, nutrients availability..
- The particle size of the Knotweed is not very important

Acknowledgements

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