



# Potential of insect frass as a bio-organic fertilizer from super worm (*Zophobas morio*) and mealworm (*Tenebrio molitor*)



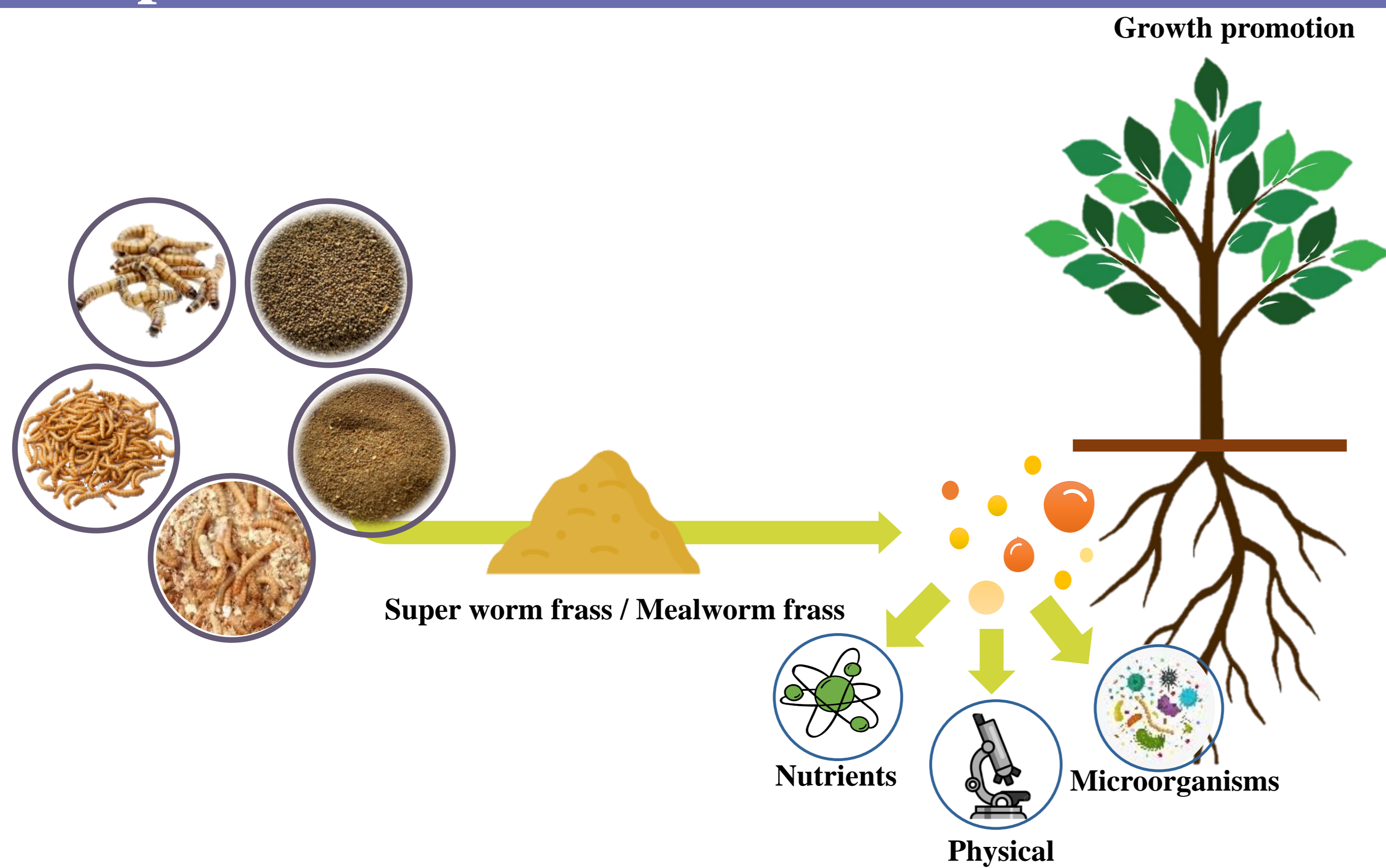
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## Graphical abstract

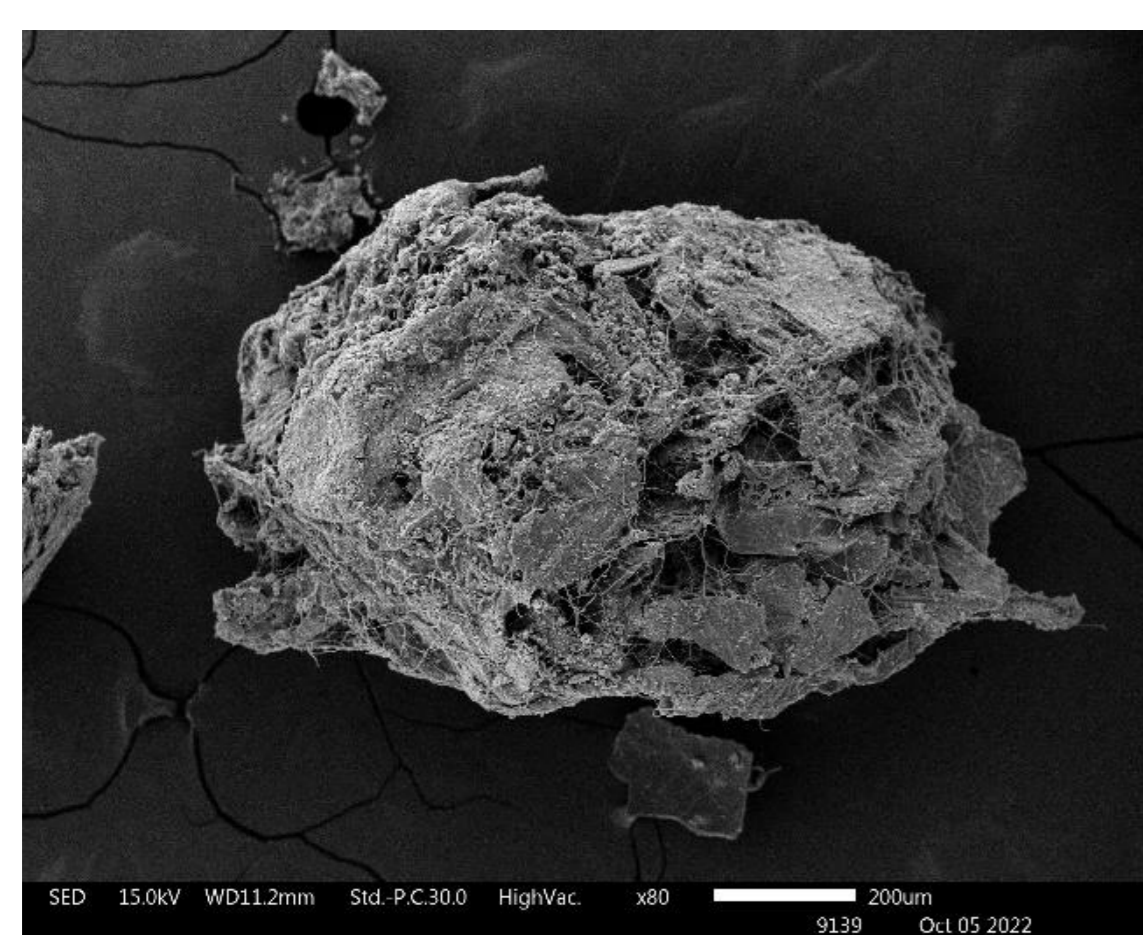


## Material and Method

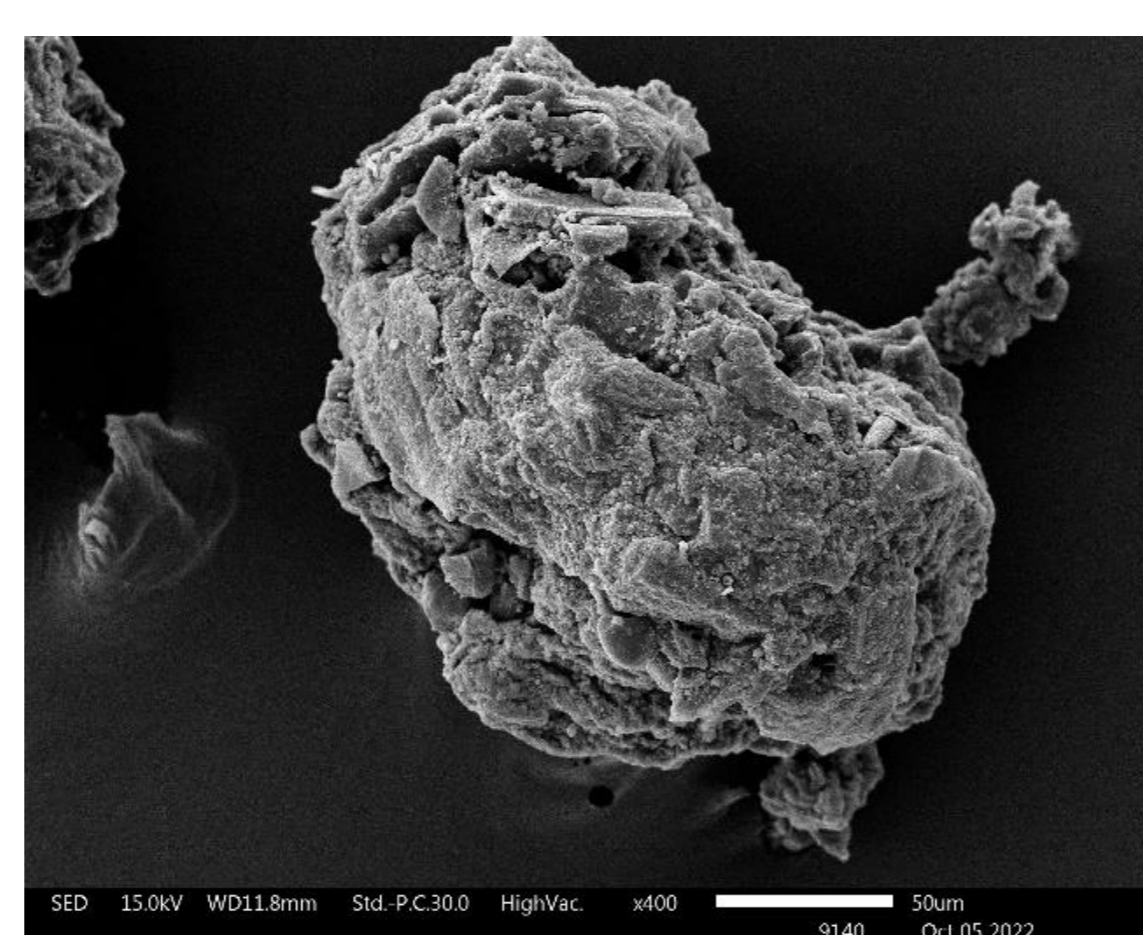
- **SEM-EDS characterization of frass:** The inner morphology of frass by using a Scanning Electron Microscope (SEM) with energy dispersive X-ray spectroscopy (EDS), the shape and size of frasses, as well as their chemical compositions by weight, were analyzed.
- **Chemical analysis:** Frass was analyzed for pH, total carbon (C), total nitrogen (N), total phosphorus (P), and total potassium (K).
- **Isolation of microorganisms:** The screening and isolation of microorganisms were analyzed by serial dilution and plate count. The isolated microorganisms were evaluated for their plant growth-promoting potentials.

## Result

### Physical properties



Super worm frass



Mealworm frass

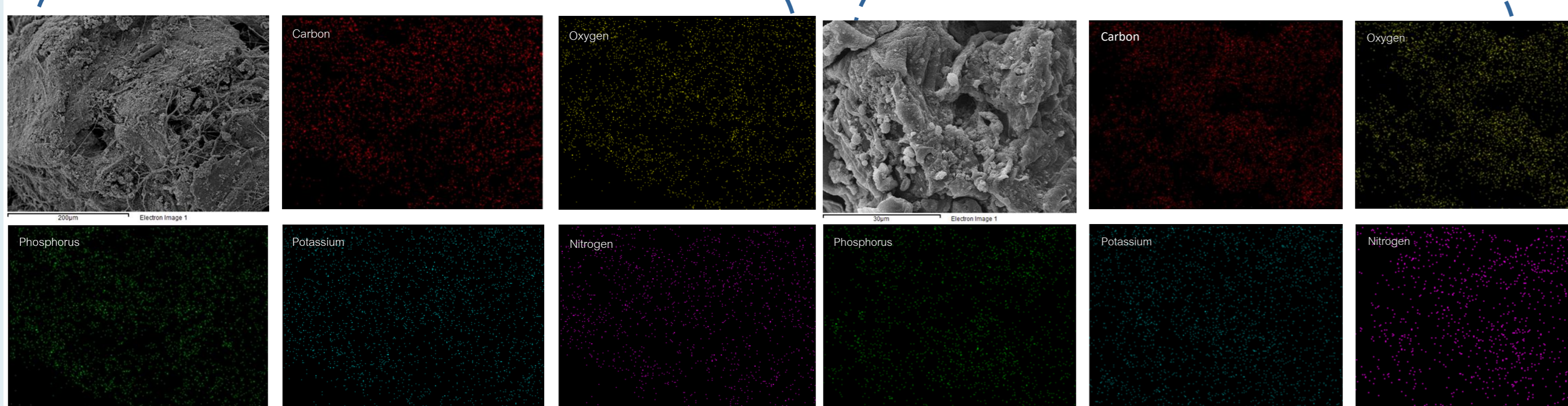


Figure 1: a uniform distribution of nutrients (N, P and K) within the frass organic matter (represented by the C and O maps), suggesting the absence of isolated mineral phases which might potentially drive nutrient release by frass.

## Acknowledge

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## Introduction

➤ Insect frasses have literally been studied as a bio-organic fertilizer as it contains high plant nutritional values such as nitrogen (N), phosphorus (P) and potassium (K) as well as the potential presence of beneficial microorganisms.

➤ Objective

➤ To compare physical, chemical and microbiological properties of super worm (*Zophobas morio*) frass and mealworm (*Tenebrio molitor*) frass as potential bio-organic fertilizers.

## Result (cont.)

### Chemical analysis

Table 1. Chemical analysis of frass

Sample	pH	Total C (%)	Total N (%)	Total P (%)	Total K (%)
Super worm frass	7.21	29.02	4.00	1.33	1.47
Mealworm frass	6.86	28.96	5.09	1.38	2.29

### Screening and selection of frass

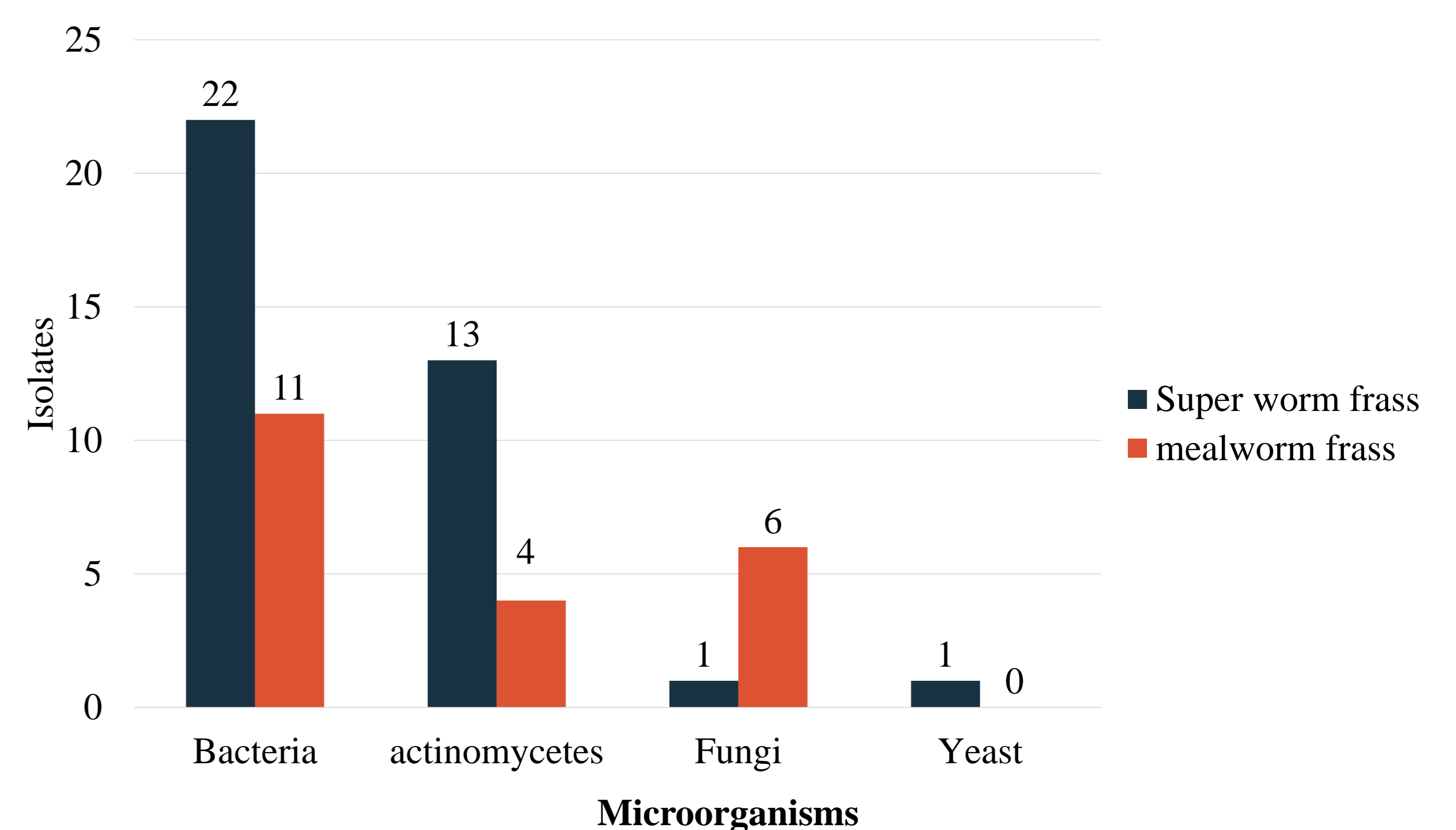


Figure 2 : Comparing microbial isolates of super worm frass and mealworm frass

Table 2. Microbial isolates for promoting plant growth

Insect frasses	No. of isolates		
	Nitrogen-fix	Phosphorus solubilization	Cellulase production
Super worm	2	-	1
Mealworm	4	3	3

## Conclusion

- Super worm frass and Mealworm frass enhance water holding capacity, enrich in nutrient concentration and promote plant growth.
- Therefore, nutritional content and associated microbiota, can be potentially used as a bio-organic fertilizer in organic farming.