

Insect-derived byproducts as amendments in specialty crop production

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BACKGROUND

The application of soil amendments is a common practice towards increasing soil health. Some of the most promising amendments include composting with black soldier flies (*Hermetia illucens*; BSF) and recycling waste from cricket production facilities. The advantages of utilizing amendments include improving soil fertility, increasing water hold capacity, and stimulating soil microbial communities. **This study aimed to assess the application of three insect-derived soil amendments on specialty crop production.**

METHODOLOGY

- BSF Frass, BSF Pupal cases, and Kickin Frass® were utilized in this experiment (Fig. 1).
- Amendments plus synthetic fertilizers were applied (Table 1).
- Bok choy seedlings were transplanted and carrot were direct seeded after amendment applications.
- Yield was measured at full maturity.
- Soil samples were collected and processed before harvesting the plants.
- To measure soil aggregate stability, a sample was collected, air-dried, and exposed to an external force (Fig. 4).
- To measure bulk density, a soil sample was collected, oven dried, and weighed (Fig. 2).



Figure 1. Amendments application.



Figure 2. Bulk density test.

Table 1. Amendment application rates for carrot and bok choy production

Carrot	Fertilizer Application (gr/3 sq. ft.)			
	Frass/Pupal cases	Urea	0-0-50	9-23-30
Treatments				
Control - conventional fert.	-	4.536	5.897	11.340
Cricket Frass + Fert	131.995	4.443	6.350	-
BSF Frass + Fert	218.631	4.536	2.268	-
BSF Pupal cases +Fert	381.471	-	3.175	-

Bok Choy	Fertilizer Application (gr/3 sq. ft.)			
	Frass/Pupal cases	Urea	0-0-50	9-23-30
Treatments				
Control - conventional fert.	-	7.711	1.361	8.165
Cricket Frass + Fert	112.944	8.165	2.722	-
BSF Frass + Fert	187.333	7.257	-	-
BSF Pupal cases +Fert	327.040	0.907	-	-

RESULTS

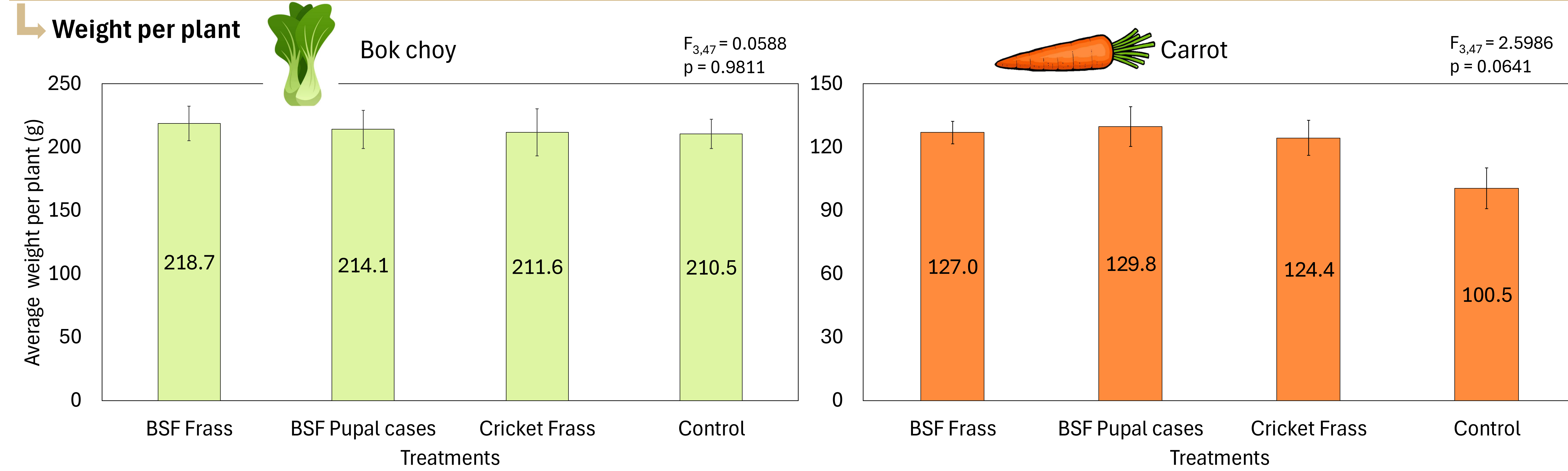


Figure 3. Average weight per plant for bok choy and carrot production (\pm standard error of the mean).

Soil aggregate stability



Figure 4. Soil aggregate stability test.

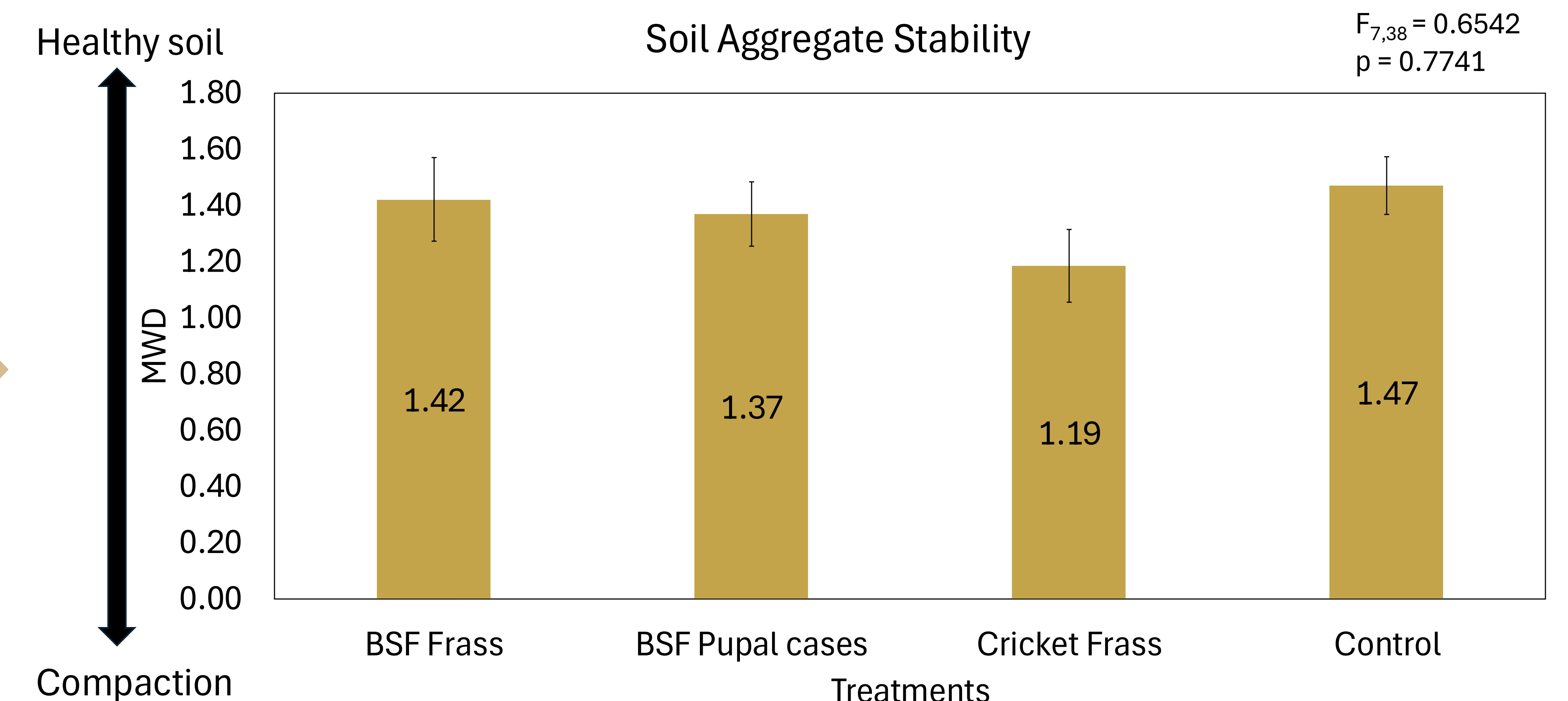


Figure 5. The soil aggregate stability results (Bok choy and carrot results combined).

Bulk density

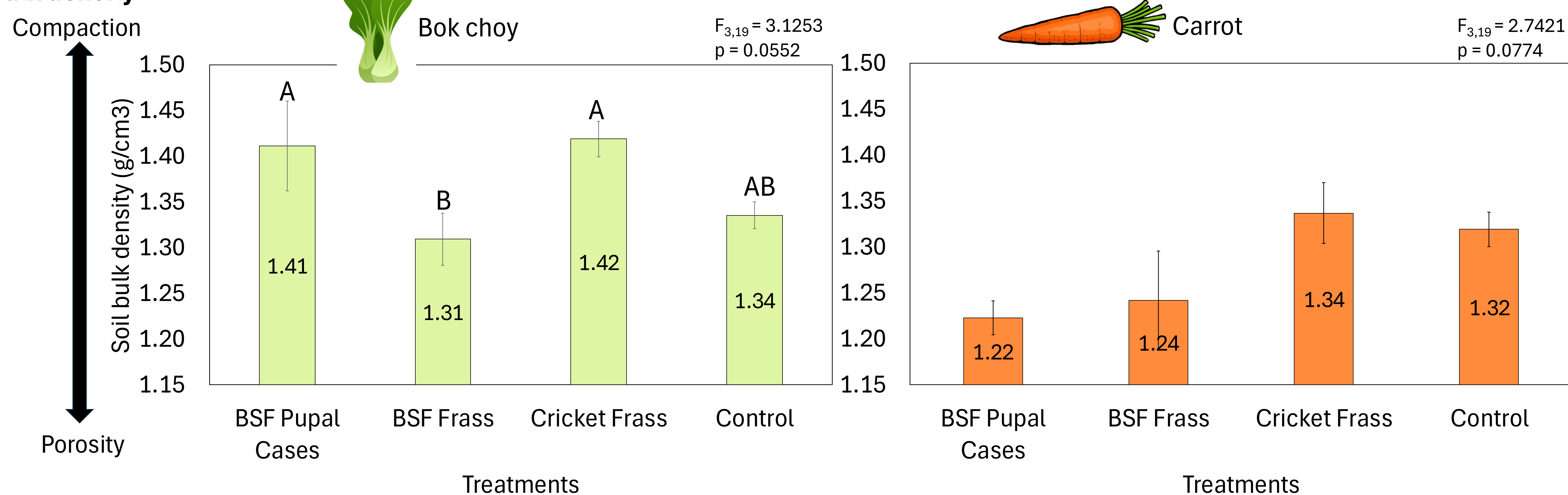


Figure 6. The bulk density results of bok choy and carrot soil (\pm standard error of the mean).

CONCLUSIONS

- Insect-derived soil amendments can replace synthetic fertilizers; we achieved the same yield as our control plots where all the nutrition was supplied via synthetic fertilizer.
- Insect-derived soil amendments may change soil physical properties but should be evaluated over longer time frames. We found evidence for increased porosity (as measured by bulk density) with the application of BSF frass in the production of bok choy, but not with carrot.