COMPOSITIONS AND RELATED METHODS FOR AGRICULTURE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application No. 62/450,017, filed on January 24, 2017, and U.S. Provisional Application No. 62/583,736, filed on November 9, 2017, the contents of which are hereby incorporated herein by reference in their entireties.

BACKGROUND

Certain invertebrates, such as nematodes and arthropods (e.g., insects, e.g., European honey bees (*Apis melliferia*) or silkworms (*Bombyx mori*)), are utilized in agriculture for pollination efforts and pest control as well as in commerce for the production of commercial products, such as honey or silk. To cultivate beneficial nematodes and arthropods for use in agricultural or commercial industries, there is a need in the art for ways to promote the growth and fitness of beneficial invertebrates.

SUMMARY

Disclosed herein are compositions and methods for modulating the fitness of invertebrates for agriculture or commerce. The composition includes an agent that alters a level, activity, or metabolism of one or more microorganisms resident in a host, the alteration resulting in a modulation in the host's fitness.

In one aspect, the present disclosure refers to a method for increasing fitness of a honeybee, the method comprising: administering to the honeybee a composition comprising an effective amount of organophosphorous insecticide-metabolizing bacteria formulated with an insect comestible carrier, wherein the organophosphorous insecticide-metabolizing bacteria are selected from the group consisting of Bartonella apis, Parasaccharibacter apium, Frischella perrara, Snodgrassella alvi, Gilliamela apicola, Bifidobacterium spp, and Lactobacillus spp., and are able to colonize the gut of the honeybee, thereby increasing the fitness of the honeybee.

In one example, provided herein is a method for increasing the fitness of a honeybee, the method including administering to the honeybee a composition including an effective amount of an organophosphorus insecticide-metabolizing bacteria formulated with an insect comestible carrier.

In some examples, the administration involves delivering the composition to a honeybee hive or at least one habitat where the honeybee grows, lives, reproduces, or feeds.

In some examples, the composition may be a liquid, a solid, an aerosol, a paste, a gel, or a gas.

In some examples, the organophosphorus insecticide may be fenitrothion.

In some examples, the carrier may be a seed coating.

In some examples, the honeybee may be in a honeybee colony.

In one example, provided herein is a composition including an effective amount of an organophosphorus insecticide-metabolizing bacteria formulated with an insect comestible carrier as a liquid, a solid, an aerosol, a paste, a gel, or a gas.

In some examples, the organophosphorus insecticide-metabolizing bacteria metabolize fenitrothion.

In some examples, the carrier is a seed coating.

In some examples, the organophosphorus insecticide-metabolizing bacteria are at a concentration of at least 100,000 cells/ml (e.g., at least about 100,000 cells/ml, at least about 150,000 cells/ml, at least about 200,000 cells/ml, at least about 250,000 cells/ml, at least about 300,000 cells/ml, at least about 350,000 cells/ml, at least about 400,000 cells/ml, at least about 450,000 cells/ml, or at least about 500,000 cells/ml).

CLAIMS

1. A method for increasing fitness of a honeybee, the method comprising:

administering to the honeybee a composition comprising an effective amount of organophosphorous insecticide-metabolizing bacteria formulated with an insect comestible carrier, wherein the organophosphorous insecticide-metabolizing bacteria are selected from the group consisting of Bartonella apis, Parasaccharibacter apium, Frischella perrara, Snodgrassella alvi, Gilliamela apicola, Bifidobacterium spp, and Lactobacillus spp., and are able to colonize the gut of the honeybee, thereby increasing the fitness of the honeybee.

2. The method of claim 1, wherein the administration comprises delivering the composition to a honeybee hive or at least one habitat where the honeybee grows, lives, reproduces, or feeds.

3. The method of any one of claims 1-2, wherein the composition is a liquid, a solid, an aerosol, a paste, a gel, or a gas.

4. The method of any one of claims 1-3, wherein the organophosphorous insecticide is fenitrothion.

5. The method of any one of claims 1-4, wherein the carrier is a seed coating.

6. The method of any one of claims 1-5, wherein the honeybee is in a honeybee colony.