Squid Juice and Chitin as a Nematode Suppressant

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Plant-parasitic nematodes (PPNs) cause billions of dollars in crop losses each year. PPNs, including Soybean Cyst Nematodes (CSNs), attack plant root systems, reduce nutrient uptake and growth, and can even cause crop loss and death. Controlling and suppressing the damage caused by nematodes can be challenging. Costly, synthetic, nematicides, including fumigants and organophosphates, are becoming heavily regulated due to their potential to contaminate ground water and harm both human health and the environment (Desaeger & Csinos, 2005; Jones et al., 2017).

To address the challenge of PPNs, GreenFlow has developed organic, environmentally friendly products, including Squid Juice, that contain a natural nematode suppressant: chitin. Chitin is the building block of crustacean shells, fungal cell walls, and insect exoskeletons. Chitin differs from conventional synthetic nematicides in that it does not directly poison nor kill nematodes, but instead promotes the growth of beneficial soil microorganisms, that suppress nematodes, and by priming the plants immune system to increase their biological nematode resistance.

Research shows that when chitin is added to the soil, it recruits and promotes the growth of beneficial microorganisms that can utilize chitin as a food source. These microorganisms, which include species of *Streptomyces*, *Bacillus*, *Pseudomonas*, and *Trichoderma,* secrete enzymes that break down chitin, called chitinases, into the soil. Because nematode cuticles and especially their eggs shells contain chitin, and chitin-like polymers, nematodes are very vulnerable to environments that contain these enzymes and the microorganisms that make them. As a result, plants grown in soil amended with chitin have been experimentally shown to have far less nematode damage due to an increase in beneficial nematode-suppressing microorganisms (Hallmann & Sikora, 1996, Shapira et al., 2021).

Chitin also plays a very important role in activating plant immune systems. Plants directly detect chitin, and chitin fragments (subunits) in the soil, and respond by activating their own immune systems to protect themselves from nematodes and other pests. This response includes activating various genes associated with defense and even making their own chitinases (De Jonge & Thomma, 2009). Research, in multiple crops, has shown that using chitin to trigger an immune response can significantly reduce nematode damage (Wesemael et al., 2011).

In the world of chitin, however, not all chitin is created equal. The vast majority of chitin is α-chitin. This type of chitin, often derived from crustacean and insect shells, is relatively insoluble, with a tightly packed crystal structure, making it less accessible to beneficial microbes. At GreenFlow we specialize in β-Chitin, a rare form of Chitin that is typically only found in squid and other marine organisms. β-Chitin, compared to α-chitin, is much more soluble with a unique, less tightly packed crystalline, structure that makes it more bioactive and available to beneficial microbes (Kong et al., 2010; Kurita, 2006).

Please reach out to GreenFlow to learn more about our unique β-Chitin products and how our customers use them to combat nematodes in their fields!

All forms of chitin are currently recognized as an environmentally friendly nematode suppressant by the USA Environmental Protection Agency (EPA, Case 6063) and classified as low risk biopesticides under the Canadian Pest Management Regulatory Agency (PMRA).

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