

Harnessing Secondary Metabolites from Nematode Bacterial Symbionts: Application in Pest Management

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The EPA lists no fewer than twenty-five² types of pesticides all designed to “prevent, destroy, repel, or mitigate a pest, or is a plant regulator, defoliant, desiccant, or nitrogen stabilizer”¹. So, what is this extensive armamentarium used for? According to the EPA, we need this smorgasbord of chemicals to ensure that the global food crop production will keep pace with the growing needs of the burgeoning earth’s population expected to reach 10 Billion people in about 3 decades (the so-called 10BPQ³). That sounds like a cogent need, and even a noble objective—stamp out global hunger by protecting crops from attack by destructive pests. But, of course, there is no free lunch! So, what is the downside to covering the global fertile soils with a widespread and repeated use of all these poisons? According to a recent study⁴, pesticides are much nastier than the EPA definition would lead you to believe: “A pesticide is a **toxic chemical** substance or a mixture of substances or biological agents that are intentionally released into the environment to avert, deter, control and/or **kill and destroy populations** of insects, weeds, rodents, fungi or other harmful pests. Pesticides work by attracting, **seducing and then destroying** or mitigating the pests”. While they do their nasty work on pests, these chemicals also constitute a huge, and ever increasing, burden of toxin that cover our earth, bodies of water, and the air we breathe. Fortunately, recognition of this imminent and prevalent threat to our environment, has resulted recently in a concerted effort to the use of biological control of pests in which non-pest biologicals are used to achieve the same aim of protecting crops while imposing a minimum of destruction on our environment.

It is with this objective in mind that our speaker, Professor Patricia Stock, and her team have been exploring the bacterial world for a source of biological control of pests, including parasitic nematodes which thrive on plant roots by parasitizing the rhizosphere sucking away nutrients and so killing the plants. Her bi-directional approach to controlling pests also includes the use of nematodes, as bio-pesticide agents, due to their voracious appetite for other plant pests. The beauty of these approaches to plant pest controls is that “...*that in the last 20 years nematodes have been formulated and commercialized,*” Stock says. “*They are more expensive than a chemical product, but so far they have been demonstrated not to harm humans, livestock, beneficial insects or the environment*”. In today’s seminar, Patricia Stock will explain how her approaches to pest control are beginning a new trend in the development of pesticides, an approach that is nothing short of a revolution.

¹<https://www.epa.gov/pesticides> ²<https://www.epa.gov/ingredients-used-pesticide-products/types-pesticide-ingredients>

³<https://www.express.co.uk/news/science/820099/POPULATION-CRISIS-10-BILLION-global-famine> ⁴Effects of Pesticides on Environment Isra Mahmood et al. 2016 https://www.researchgate.net/.../286042190_Effects_of_Pesticides_on_Environment

⁵<https://www.stocklab-insectpathogens.com/> ⁶<https://uanews.arizona.edu/story/four-questions-finding-alternative-pesticides>

⁷<https://uanews.arizona.edu/story/stealth-worms-may-improve-insect-pest-control>