

Entomopathogenic nematodes for biocontrol

What are Entomopathogenic nematodes...

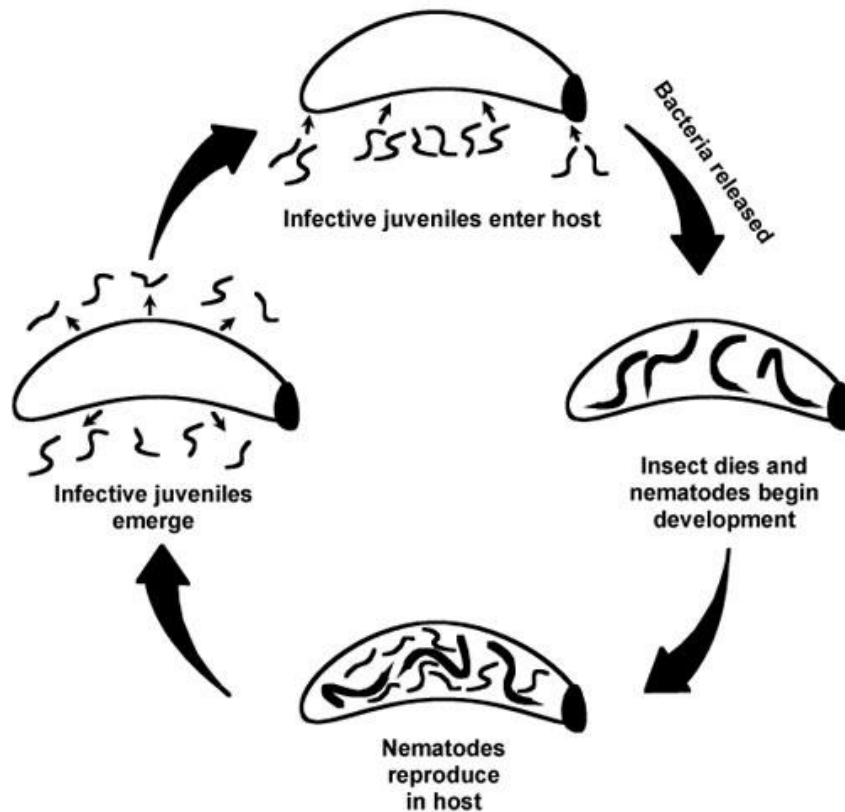
Entomopathogenic nematodes (EPNs) are pathogens of insects that occur naturally in the soil. In combination with their symbiotic bacteria, they can be used in an integrated control programme against many insect pests. Such biological control agents have a wide host range and have the ability to actively search for their host, while remaining harmless to other organisms and the environment. There is a dire need for new and innovative methods to control agricultural pests, as numerous pest insects have developed resistance against broad-spectrum insecticides. Together with the environmental impact of these insecticides and the safety aspect regarding humans and animals, the need to develop new technologies, including EPNs for pest management, is high.

How does it work...

Steinernematids and heterorhabditids are two groups of EPNs. The non-feeding, infective juvenile seeks out insect hosts and initiates infections. When a host has been located, the nematodes penetrate into the insect body cavity, usually via natural body openings (mouth, anus, spiracles) or areas of thin cuticle. Once in the body cavity, a symbiotic bacterium (*Xenorhabdus* for steinernematids, *Photorhabdus* for heterorhabditids) is released from the nematode gut, which multiplies rapidly and causes rapid insect death. The nematodes feed upon the bacteria and liquefying host, and mature into adults. Steinernematid infective juveniles may become males or females, whereas heterorhabditids develop into self-fertilizing hermaphrodites although subsequent generations within a host produce males and females as well.

The life cycle is completed in a few days, and hundreds of thousands of new infective juveniles emerge in search of fresh hosts. Thus, EPNs are a nematode-bacterium complex. The nematode may appear as little more than a biological syringe for its bacterial partner, yet the relationship between these organisms is one of classic mutualism. Nematode growth and reproduction depend upon conditions established in the host cadaver by the bacterium. The bacterium further contributes anti-immune proteins to assist the nematode in overcoming host defences, and anti-microbials that suppress colonization of the cadaver by competing secondary invaders. Conversely, the bacterium lacks invasive powers and is dependent upon the nematode to locate and penetrate suitable hosts.

EPN life cycle



Why use them...

Using EPNs will result in fewer chemicals used in orchards and fields. This will help maintain the biodiversity as chemicals that are currently used to eliminate the natural enemies. Since the EPNs are environmentally safe the products will have a lesser impact on the environment and also be beneficial to farm workers as chemical pesticides pose a risk to human health. Insecticides leave residues on fruit but EPNs however do not leave any residue on fruit which is ideal as local and international customers are demanding lower maximum residue levels (MRLs) on fruit and fruit products. Exports form a vital part of the agricultural output in the Western Cape. The restrictions on the use of undesirable pesticides imposed on producers by retailers can jeopardise access to these markets. Having access to viable alternatives will ensure South Africa remains an exporter.

What does nemlab do...

Nemlab will be the only company in South Africa selling indigenous species of EPNs. Nemlab will produce EPNs on a large scale at our own facility using the *in vivo* nematode production process which has been streamlined for commercialization. Our EPNs will be sold in two different formulations (nematode carriers) as a biopesticide. High on our priority list is quality control and a system will be developed in order to ensure batch control and traceability to each batch in order to contain contamination or spoilage when it occurs and provide a focus on producing a high quality product. EPNs can be used in the deciduous fruit and citrus industry, as well as the vegetable and flower market.