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Biological control of Mediterranean fly *Ceratitis capitata* with entomopathogenic nematodes: from laboratory assays to field application

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Mediterranean fly *Ceratitis capitata*, Medfly is an important pest of fruits, including peaches. During its life cycle, medfly passes a significant amount of time in the soil; mature larvae drop and pupate in the soil or they overwinter in fallen fruits. We explored the use of entomopathogenic nematodes (EPN) for controlling these stages of Medfly, particularly for off-season or early season control. In laboratory studies, using soil microcosms, we assessed the efficacy and residual activity of commercially available (EPNs) *Heterorhabditis bacteriophora*, *Steinernema carpocapsae*, and *Steinernema feltiae*. *Steinernema feltiae* provided the highest suppression, up to 50% because it had the highest immediate activity and long residual activity (4 weeks). Furthermore, *S. feltiae*, and to a lesser degree *S. carpocapsae*, were able to move and infect medfly larvae inside infested apples and oranges in the surface of the soil wherein EPN were applied, reducing significantly adult medfly emergence (60–78%). We furthermore examined the efficacy of these species in low and high temperatures indicative of winter and late spring season conditions (10°C vs 25°C), as well as dose regimes: low dose 1.5 mi/m² vs moderate dose 2.5 mi/m². Moderate dose led to higher suppression but at low temperatures, efficacy of nematode was harder to sustain. In field trials, low (1.5 mi/m²) and high doses of (2.5 mi/m²) of *S. feltiae* were applied in late March 2021 (early-season) and on October 2021 (off-season) and fly emergence was monitored in yellow sticky traps set in field cages. A suppression of emerging Medflies by 50-65% was observed. These results suggest that an EPN application scheme where a single, relatively low dose of *S. feltiae* in autumn, (off season) or spring (early season), targeting overwintering medfly larvae can reduce substantially the number of adult medflies emerging later in the growing season.