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Potential for management of *Protopulvinaria pyriformis* (Cockerell) (Hemiptera: Coccidae) in organic avocado in eastern Sicily, Italy

ABSTRACT

Organic avocado (*Persea americana* Mill. (Lauraceae) farming is a growing industry in eastern Sicily, and in this environment *Protopulvinaria pyriformis* (Cockerell) (Hemiptera: Coccidae) is a key pest. Biological control strategies against this invasive scale are thus crucial for the sustainability of this cropping system. A field trial was performed to record the natural enemy complex in early autumn, and for comparing the efficacy of a paraffinic oil application (Biolid E® at 2L/ha), of the release of adults ($1/m^2$) of the predator *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae), and of their combined application, i. e. oil spray and after one week predator release. In the pretreatment sampling a high proportion of ovipositing female, 38. 64% of the entire population, was recorded. The natural parasitoid community of *P. pyriformis* consisted of two primary parasitoids and one facultative hyperparasitoid species. *Metaphycus helvolus* (Compere) (Hymenoptera: Encyrtidae) accounted for 81% of the parasitoids recovered; *Microterys nietneri* (Motschulski) (Hymenoptera: Encyrtidae) for 8%, and the secondary parasitoid *Pachyneuron muscarum* (L.) (Hymenoptera: Pteromalidae) for 11%. The mean percentage of parasitism recorded was 2. 45%, however, an encapsulation rate of 1. 78% was also observed. Adults and larvae of generalist predators belonging to the genera *Scymnus* spp, *Exochomus* spp. (Coleoptera: Coccinellidae) and larvae of *Chrysopa* spp. (Neuroptera: Chrysopidae) were also noticed actively feeding on immature stages of the soft scale. The number of live scales (N2-oviposting females) was reduced by 54. 16, 55. 73 and 19. 58 % following the oil application, the oil plus predator release and predator alone, respectively. While, in the control plots the number of live scales increased by 23. 4%, and no changes in the presence of natural enemies was recorded in the sprayed plots. The recorded data suggest that any pesticide application should take into account and thus respect the activity of the rich natural enemy assemblage. In addition, artificial releases of *C. montrouzieri* were not able to effectively control the scale population.

Keywords: Pyriform scale; natural enemies; Coccinellidae; Encyrtidae; IPM

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