

Bioassay Results On Field Persistence Of Two Pink Bollworm Parasitic Nematodes

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Abstract

Steinernema carpocapsae (Weiser) and *S. riobravis* Cabanillas, Poinar and Raulston applied in the field at the rate of 1 billion nematodes/acre equivalent persisted in the soil for 63 and 6 days, respectively. Persistence of *S. riobravis* in the field may offer the potential for introduction and permanent establishment of this nematode for pink bollworm (PBW), *Pectinophora gossypiella* (Saunders), control in southwestern cotton growing areas.

Introduction

Late instar laboratory-reared pink bollworm (PBW), *Pectinophora gossypiella* (Saunders), larvae were reported susceptible to both *Steinernema carpocapsae* (Weiser) Kapow selection and *S. riobravis* Cabanillas, Poinar and Raulston insect parasitic nematodes in small scale spring and summer field trials (Lindegren, et al. 1992 and 1994). Field studies in 1994 were conducted to determine the persistence of the nematodes in the soil following application in April.

Materials and Methods

Both *S. carpocapsae* and *S. riobravis* infective juvenile (IJ) nematodes were produced at the USDA-ARS Western Cotton Research Laboratory, Phoenix, AZ using the *in vivo* method described by Lindegren et al. (1993a). Plots (90 sq ft) were treated with *S. carpocapsae*, *S. riobravis* or water only on April 25 (25 IJ/cm²). Treatments were replicated 4 times.

Irrigations of 0.39 acre ft of water (262 gal/plot) were made on all plots on the day of nematode application. Nematodes were applied in an 8-liter water suspension using a plastic sprinkler can. Subsequent irrigations were at bimonthly intervals.

Soil samples (90.5 cm³) were taken from each plot on the day of treatment, 1 day following treatment and thereafter at weekly intervals. Soil samples were spread in 25 x 140 mm plastic petri dishes and moistened with 3 ml water. Ten late instar PBW larvae were introduced and the dishes were incubated at 26.7°C. Larval mortality was recorded after 3 days.

Results and Discussion

Soil sample bioassays showed that nematodes persisted in the field for 63 (end of test) and 6 days with a maximum PBW mortality of 100 and 92.5% for *S. riobrans* and *S. carpocapsae*, respectively (Fig. 1). Percentage PBW mortalities decreased from over 90% on the day of treatment for both nematode species to 10% on day 15 and 5% on day 7 following treatment for *S. riobrans* and *S. carpocapsae*, respectively. Percentage mortalities for *S. riobrans* increased thereafter following irrigations, but not for *S. carpocapsae*. Data analysis is preliminary and additional experiments are being conducted.

The Kapow selection of *S. carpocapsae* is vulnerable to temperatures over 90° F (Lindgren et al. 1993b) and, in this test, persisted in the soil for about a week following applications in April with increasing soil temperatures. Possibly, *S. carpocapsae* nematodes should be applied in early spring and late fall to take advantage of its more cool temperature activity (Lindgren et al. 1994) and potential use against overwintering larvae.

In the lower Rio Grande Valley where summer high temperatures exceed 90° F, Raulston et al. (1992) reported that *S. riobrans* was established in some corn fields and that each year, 40% or more corn ear worm, *Helicoverpa zea* (Boddie), larvae are parasitized as they enter the soil to pupate. Lindgren et al. (1994) suggested that *S. riobrans* with its greater tolerance to high temperatures may be the nematode of choice for PBW control in hot, dry desert climates. Applications of *S. riobrans*, utilizing its long persistence capability, could be at flower bud occurrence (mid-May to early June), boll formation (late June through July) and after plow down (in early November). Applications made in June and July may afford an opportunity to infect PBW larvae tunneling out of developing bolls and entering the soil to pupate.

References

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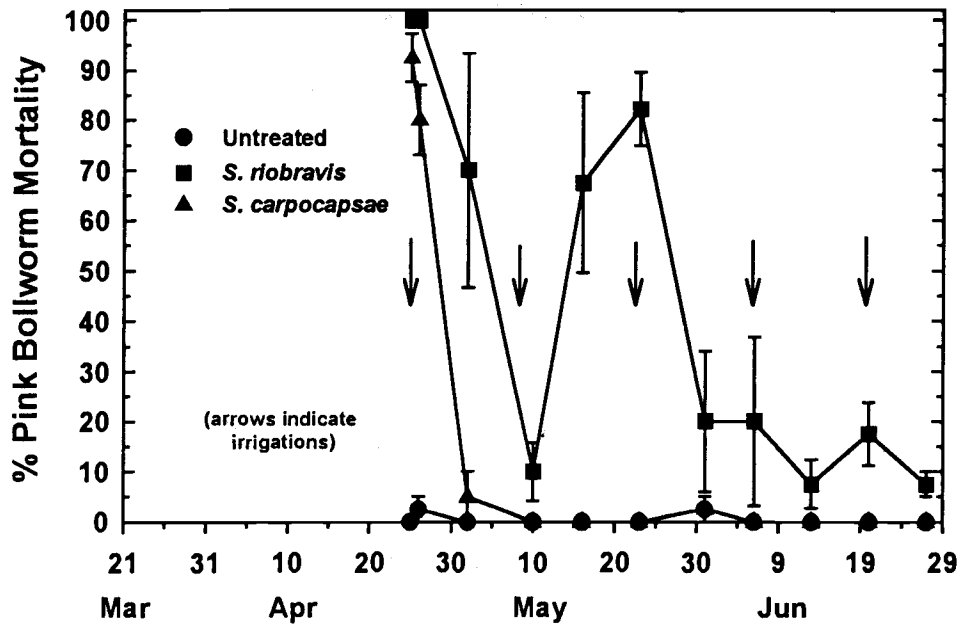


Figure 1. Persistence of *Steinernema riobravis* and *S. carpocapsae* Kapow selection nematodes in plots treated April 25, 1994 at 25 nematodes/cm² soil surface. Persistence was based on pink bollworm mortality in nematode treated and untreated soil bioassays.