Tolerance to soil type of pink ground pearl *Eumargarodes laingi* Jakubski (Hemiptera: Margarodidae) on sugarcane

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Abstract

A glasshouse pot trial evaluated the ability of the margarodid *Eumargarodes laingi* Jakubski to colonize sugarcane roots in six Bundaberg soil types. Soils from a sand to a clay supported pink ground pearls, but cyst numbers were significantly higher in silty clay loams. These findings have local quarantine implications used to minimize the spread of the pest.

Introduction

Pink ground pearls, *Eumargarodes laingi* Jakubski, are the most damaging of the four species of margarodids known to feed on the roots of sugarcane in eastern Australia (Dominiak *et al.* 1989). They were originally found on the red volcanic clay soils east of Bundaberg, but recently have been recorded from a wide variety of soil types (Walker and Allsopp 1993).

Ground pearls can easily be transported on machinery contaminated with infested soil (Dominiak 1990). Cane harvesters, farm vehicles and the tramways which take cane to the mills are likely sources of spread. As little is known of the potential of *E. laingi* to survive in soils other than the red volcanics, we used a pot trial to evaluate this potential in a range of Bundaberg soil types.

Materials and methods

Six Bundaberg soil types were selected to provide a wide range of textural characteristics (Table 1). Soil was taken from each site and placed into 20 L pots with five replicates of each soil arranged in a randomized complete-block design. Two pre-germinated single-shoot pieces of sugarcane cultivar Q141, a cultivar known to be susceptible to *E. laingi*, were planted into each pot on 21 October 1991. Adult females of *E. laingi* were collected from the soil surface of infested fields three days later (Dominiak *et al.* 1992). We placed 30 females on the soil surface of each pot and lightly covered them with soil.

Plants were grown in a glasshouse at Bundaberg and were watered regularly to maintain near field capacity in each soil type. In July 1992, the *E. laingi* cysts were separated from the soil by swirling small quantities of soil with water in a bucket and decanting the water with the floating cysts through a 1 mm sieve. Each quantity of soil was swirled twice. Cysts were counted and a random group of 100 cysts from each pot was weighed; all cysts were weighed if there were fewer than 100 cysts. Differences in cyst numbers between soil types were tested using Friedman two-way analysis of variance and the means separated using the method of Conover (1980). Differences between mean weights were tested with standard analysis of variance.

Results

There were significant differences in cyst numbers between soil types (Friedman statistic 19.3, df=5, P=0.0017). Highest numbers were in the two silty clay loams and the lowest in the loam and sand (Table 2). There were no significant differences between soil types and mean weight 100 cysts (F=1.3, df=5,28, P=0.31) (Table 2).

Discussion

Our results demonstrate that *E. laingi* can survive in all soil types tested (Table 2) which cover the range of Bundaberg soil types on which sugarcane is grown. This finding confirms the general observations of Dominiak *et al.* (1989) of the widespread occurrence of *E. laingi* in the Bundaberg area and the observation of Spink and Dogger (1961) that *E. laingi* can survive in black sandy soil.

We have also demonstrated that population levels are likely to be different in different soils. Our results confirm the field survey results of Walker and Allsopp (1993) where the highest numbers of *E. laingi* were found in silty clay loams, lower numbers occurred in clays and sandy loams and the lowest numbers were in loams. However, the weights of surviving individuals were not affected by soil type. We consider this indicates that the effect of soil type is through direct mortality, perhaps of the mobile first-instar nymphs, rather than through secondary mechanisms such as the nutrition or growth of the host plant.

Other species of ground pearls also show preferences for different soil types. *Margarodes cadeti* Foldi, *M. meridionalis* Morrison and *Neomargarodes niger* Green all prefer sandy soils (Foldi 1984, Hou *et al.* 1986, Barnes *et al.* 1954), but there were no significant differences between soils in numbers of *Promargarodes* spp. in the survey of Walker and Allsopp (1993).

Given the potential for *E. laingi* to spread (Dominiak 1990) and the species' ability to survive in a wide range of soils (Table 2), *E. laingi* poses a threat to all of the Bundaberg area. Despite the identification of tolerant cultivars (Allsopp and McGill 1996) and given the poor performance of insecticide controls (Dominiak *et al.* 1996), preventing spread of the pest through general hygiene (Dominiak 1990)

Table 1. Clay, silt and sand contents of soils evaluated in pots.

Soil type[A]	Gravimetric content (%)[B]		
	Clay	Silt	Sand
Clay	57	23	20
Silty clay loam (1)	34	40	26
Silty clay loam (2)	25	39	36
Loam	15	22	63
Sandy loam	12	10	78
Sand	4	3	93

[A]Soil classification used by McDonald *et al.* (1984).
[B]Determined by the method of Piper (1942).

Table 2. Number and weight of *E. laingi* cysts (mean (SE)) in different soil types in pots.

Soil type	Mean number of cysts[A]	Mean weight of 100 cysts (mg)
Clay	447.0 (241.6) bc	651.8 (35.4) a
Silty clay loam (1)	3547.8 (1027.5) a	646.2 (59.4) a
Silty clay loam (2)	4318.2 (1419.0) a	701.2 (70.4) a
Loam	155.8 (51.6) c	745.0 (46.0) a
Sandy loam	620.6 (53.3) b	608.6 (75.5) a
Sand	118.4 (41.3) c	632.6 (84.0) a

[A]Means followed by the same letter are not significantly different (P=0.05).

should remain a high priority for the district's cane growers.

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