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Scope for Integrated Management of the Leucaena Psyllid, *Heteropsylla cubana* by Using Resistant Plant Varieties and the Predator, *Curinus coeruleus*

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Abstract

An experiment was carried out to examine the scope for integrated management of the leucaena psyllid, *Heteropsylla cubana* by using resistant plant varieties and release of the exotic coccinellid predator, *Curinus coeruleus*. During the outbreak season, November 1990 to March 1991, three potentially resistant leucaena varieties from Hawaii along with the native Thai variety were tested by releasing the predator on to infested caged plants at Petchabun province in Thailand. Results showed that K x I hybrid (hybrid between *Leucaena diversifolia* K156 and *L. pallida*) was highly resistant to the leucaena psyllid in contrast with the native Thai variety of *L. leucocephala* which was highly susceptible. *L. leucocephala* variety K636 was the next most susceptible, followed by *L. leucocephala* variety K584. Release of the predator, *Curinus coeruleus* at a density of ten adults per m^2 reduced the pest density. The results suggest the feasibility of integrating the use of resistant varieties and release of the predator for leucaena psyllid management. However, more studies under farm conditions are needed.

Keywords: biological control, *Leucaena* psyllid, resistant varieties

Introduction

A number of research papers indicated that some varieties of leucaena were resistant to the psyllid, *Heteropsylla cubana*, owing to the existence of diploid or tetraploid chromosomes. The tolerant *Leucaena leucocephala* lines reported from USA were K527, K538, K584, K591, K656 and K558 (Othman and Prine, 1984; Sorrenson and Brewbaker, 1984, 1987). In Taiwan, the damage rating scores showed that *Leucaena pallida* and *L. diversifolia* were resistant to psyllid attack (Pan, 1987). In West Timor, Indonesia, *L. leucocephala* was severely attacked by *H. cubana* while *L. pallida* (K 376) *and L. diversifolia* were well-adapted and showed psyllid resistance (Mella *et al.*, 1989). In Thailand, a field experiment in Chumpon province indicated that K156 (*L. diversifolia*) and K636 (*L. leucocephala*) had highest resistance among all tested varieties (Yantasath *et al.*, 1987). Reports also indicated that the coccinellid, *Curinus coeruleus* was a very effective predator of *H. cubana* (Attajarusit and Nanta, 1990; Napompeth, 1988; Winotai, 1989) and could be successfully mass reared under tropical environmental conditions (Attajarusit, 1998) Therefore, this study was aimed at integrating the use of the effective predator *C. coeruleus* and the resistant varieties for a pest management programme under field conditions in Thailand.

Materials and Methods

The experiment was carried out in Petchabun province in Thailand during the outbreak season, November 1990 to March 1991. The experimental design was Randomised Complete Block with three replications and five treatments (five leucaena varieties), i.e. native variety of *L. leucocephala*, *L. leucocephala* K636, *L. leucocephala* K584, K x I hybrid (hybrid between *L. diversifolia* K156 and *L. pallida)* and the native variety of *L. leucocephala* without *C. coeruleus* which served as control. Each treatment consisted of 20 luecaena planted in a large fine-screen cage, 2 x 2 x 2 m, anchored at each corner by strong wires for wind protection. There were 100 plants within one replication. Before the start of the experiment (0 day), the number of eggs, nymphs and adults on leaf No. 3 of the terminal shoot of each plant was counted and recorded. The predator, *Curinus coeruleus* was released at the rate of ten adult individuals per m^2, i.e. 40 individuals per cage. Number of all developmental stages of *H. cubana* were counted and recorded at 15, 30 and 45 days after the predator release. Native variety of *L. leucocephala* without *C. coeruleus* served as control. For egg count, grading scores were used; scores 1, 2, 3, 4 and 5 were assigned when the eggs occupied 0, 25, 50, 75 and 100 percent of the total leaf area of the sampled leaf, respectively.

Results

The data were subjected to Factorial Analysis with three variables, three replications, five treatments and four observation times (0, 15, 30 and 45 days). The values were compared using Duncan's New Multiple Range Test (DMRT). Comparison of the number of eggs, nymphs, and adults of the psyllid before and after the release of the predator are shown in Tables 1, 2 and 3, respectively.

Table 1 shows that a consistently high number of eggs was laid in the untreated control (native variety of *L. leucocephala* with no predator release) throughout the experimental period. No eggs were present on the hybrid K x I and significantly lower number of eggs was present on the variety K584 even with no predator release. After 45 days of predator release, the number of eggs laid on the native variety and variety K636 was significantly reduced compared to the pre-release numbers and the control.

Table 1. Comparison of eggs of *Heteropsylla cubana* on different leucaena varieties before and after the release of *Curinus coeruleus*

Days after predator release	Mean score of eggs				
	Control	Native variety	K636	K584	K x I hybrid
0	5a	5a	5a	3b	1c
15	5a	5a	4ab	3b	1c
30	5a	4ab	3bc	3bc	1c
45	4a	3b	2bc	3b	1c

Means followed by a common letter are not significantly different at 5% level of significance by DMRT.

Table 2 shows that initially the mean number of *H. cubana* nymphs was significantly lower in the K x I hybrid and K584 variety compared with all other varieties. After the release of the predator, the number of nymphs was reduced significantly in all varieties at 30 and 45 days, compared with the untreated control.

Table 2. Number of *Heteropsylla cubana* nymphs on different leucaena varieties before and after the release of *Curinus coeruleus*

Days after predator release	Mean no. of nymphs				
	Control	Native variety	K636	K584	K x I hybrid
0	477a	484a	552a	182b	9c
15	538a	480a	95b	47b	5b
30	592a	157b	154b	35b	10b
45	245a	144b	63bc	22c	1c

Means followed by a common letter are not significantly different at 5% level of significance by DMRT.

Table 3 shows that the mean number of adults did not show much variation between treatments and between observation dates. Analysis of variance showed that the F value was significant (at 5 percent level) only at 45 days after predator release, but even these differences were very small. As with eggs and nymphs, the hybrid K x I was the most resistant.

Table 3. Number of *Heteropsylla cubana* adults on different leucaena varieties before and after the release of *Curinus coeruleus*

Days after predator release	Mean no. of adults				
	Control	Native variety	K636	K584	K x I hybrid
0	6.0	7.3	6.3	3.3	1.6
15	6.3	5.0	3.3	3.6	1.0
30	5.3	3.3	3.3	2.3	1.0
45	5.3c	3.3ab	3.3ab	2.3b	1.0a

Means followed by a common letter are not significantly different at 5% level of significance by DMRT.

Discussion

The results of this study indicate the possibility of using resistant varieties of leucaena in combination with heavy rate of release of *C. coeruleus* for psyllid management. Of all the tested varieties of leucaena, the hybrid *K* x I was highly resistant to all the stages of the psyllid. The native variety of *L. luecocephala* was the most susceptible. The variety K636 was the next most susceptible, followed by K584, although both these varieties were reported to be resistant to the psyllid in Taiwan (Pan, 1987) and southern Thailand (Yantasath *et al.*, 1987). High-density release of the predator reduced the infestation of eggs and nymphs in the susceptible varieties. Lack of a clear-cut effect on adult densities is apparently due to sampling inefficacy because of their mobile nature.

From this study, the following conclusions for non-chemical management of leucaena psyllid can be made: (i) Leucaena *hybrid* K x I is practically resistant to the psyllid, *H. cubana*;

(ii) Release of the predator, *Curinus coeruleus*, at a high density of ten adult individuals pe m^2 can reduce the pest density after 15 days of the release; (iii) Integrating the release of th predator, *Curinus coeruleus with* the use of resistant plant varieties for psyllid management feasible. However, as the present results are based on screened cage experiments, studie under farm conditions are needed before recommendations for field practice can be made.

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