

KARACA, I.¹; SENAL, D.¹; COLKESEN, T.²; ÖZGÖKÇE, M.S.³

¹Department of Plant Protection, University of Cukurova, 01330 Adana, Turkey

²Department of Plant Protection, University of Sutcu Imam, K. Maras, Turkey

³Department of Plant Protection, University of Yuzuncuyil, Van, Turkey.

OBSERVATIONS ON THE OLEANDER SCALE, *ASPIDIOTUS NERII* BOUCHÉ (HEMIPTERA: DIASPIDIDAE) AND ITS NATURAL ENEMIES ON BLUELEAF WATTLE IN ADANA PROVINCE, TURKEY.

ABSTRACT

OBSERVATIONS ON THE OLEANDER SCALE, *ASPIDIOTUS NERII* BOUCHÉ (HEMIPTERA: DIASPIDIDAE) AND ITS NATURAL ENEMIES ON BLUELEAF WATTLE IN ADANA PROVINCE, TURKEY.

The biology of *Aspidiotus nerii* Bouché and the overall efficiency of its natural enemies (the aphelinid parasitoid *Aphytus melinus* DeBach and the coccinellid predators *Chilocorus bipustulatus* (L.) and *Rhyzobius lophantae* (Blaisdell)) were studied. Forty leaves were collected at weekly intervals from 5 blueleaf wattle trees (*Acacia saligna*) from four compass bearings; all live and dead *A. nerii* and the number and stage of all parasitised scales were counted. There were two population peaks of *A. nerii* per year, in May/June and July/August. The number of parasitoids, however, fluctuated considerably, especially during the autumn and winter. The scale stage parasitised was primarily the adult female, followed by the pupae and then a few 2nd-instar nymphs. First-instar nymphs were never attacked by parasitoids but predators fed on all stages.

Key words: *Acacia cyanophylla*, damage, aspect, population density, mortality, shelter, wind breaks.

INTRODUCTION

Blueleaf wattle (*Acacia saligna* (Labill.) - generally referred to as *A. cyanophylla* Lindley in the Mediterranean region) is used as an ornamental tree in parks and gardens and also for stabilising sand dunes. In addition, it is used as a wind-break around citrus orchards. *A. saligna* is an Australian tree widely grown in the Mediterranean, which can tolerate drought and high temperatures and can be grown on highly calcareous soils.

One of the most important pests of blueleaf wattle is *Aspidiotus nerii* Bouché (Hemiptera: Diaspididae) which can cause leaf-fall and dieback when present in large populations. When used as a wind-break around citrus orchards, the presence of *A. nerii* might be considered to be beneficial because the scale does not attack the citrus but it can act as a source of predators and parasitoids. Thus, the coccinellids *Chilocorus bipustulatus* (L.) and *Rhyzobius lophantae* (Blaisdell) and the aphelinid *Aphytus melinus*

DeBach are important biocontrol agents both on *A. nerii* and on the diaspidid scales in the citrus orchards (*Aonidiella aurantii* (Maskell), *Cbrysomphalus dictyospermi* (Morgan) and *Lepidosaphes beckii* Newman, among others (Uygun *et al.*, 1995)).

In this study, the population dynamics of *A. nerii* and its natural enemies was investigated.

MATERIALS AND METHODS

The populations of *A. nerii* on five randomly selected, unsprayed, heavily infested, blueleaf wattle trees were studied between March 1966 and February 1997, on the campus of Cukurova University, Adana, Turkey. Ten leaves were taken from the north, east, south and west side of each tree, giving 40 leaves per tree and 200 leaves per sampling date. The leaves were then taken back to the laboratory in an ice-chest and all dead and live *A. nerii* were counted along with the number and stage of the parasitised scales; damaged scale covers were considered to be due to the feeding activity of predators. Parasitised scales were identified by the emergence holes in the scale covers. In addition, all the rest of the scales were checked for the eggs, larvae or pupae of *A. melinus*. Percentage parasitisation was then calculated using the following formula:

$$\% \text{ parasitised} = \frac{\text{No. of parasitised scales}}{(\text{No. live scales} + \text{no. parasitised scales} + \text{no. scales showing damage by predators}) \times 100}$$

The efficiency of predators was indicated by the feeding damage to the scale covers, although it was not possible to separate the damage done to the scale covers by the two main predators (*C. bipustulatus* and *R. lophantae*). The mortality due to the predators was therefore calculated using the following formula:

$$\% \text{ mortality due to predators} = \frac{\text{No. scale covers showing damage by predators}}{(\text{No. live scales} + \text{no. parasitised scales} + \text{no. scales showing damage by predators}) \times 100}$$

RESULTS AND DISCUSSION

AFFECTS OF ASPECT ON THE DENSITY OF *A. NERII* AND *A. MELINUS*:

The mean number of *A. nerii* collected per leaf during the year from the four compass points are shown in Table 1 and this indicates that there was no significant difference in the populations on the north, south and west sides of the trees, but that there was a small but significant reduction on the east side. Similarly, the number of parasitised individuals was also lower on the east side (Table 1).

Table 1. Population density of live *Aspidiotus nerii* and *Aphytis melinus* on blueleaf wattle trees (overall mean/leaf/year).

Quadrant	<i>A. nerii</i>	<i>A. melinus</i>
North	3.32 ± 0.35 ^a	3.26 ± 0.31 ^a
East	2.51 ± 0.31 ^b	2.39 ± 0.23 ^b
South	3.80 ± 0.42 ^a	3.37 ± 0.39 ^a
West	3.28 ± 0.28 ^a	3.54 ± 0.37 ^a

Means within the same column sharing the same letter do not differ significantly at $P=0.05$ (Bonferroni-test).

POPULATION DENSITY OF *A. NERII*:

The changes in population density (as no. per leaf) of *A. nerii* are shown in Figs 1 & 2. The population started to increase in May as the temperature increased to over 20°C. There were two peaks during the year, suggesting that *A. nerii* had two generations, one in May-June and the other in July-August. Papacek & Smith (1981), in a laboratory study, also found that *A. nerii* took two months to complete a generation. During the autumn and winter, the population was very low, never more than two individuals per leaf. The composition of the population throughout the year is shown in Fig. 2 and it is clear that it is the immature stages which are most abundant.

PARASITISATION BY *A. MELINUS*:

The percentage parasitisation by *Aphytis melinus* per leaf is shown in Fig. 3. The population was rather low during the spring and summer but rose again during the autumn and continued with a varying population throughout the winter. The reason for this low population of *A. melinus*, especially in the

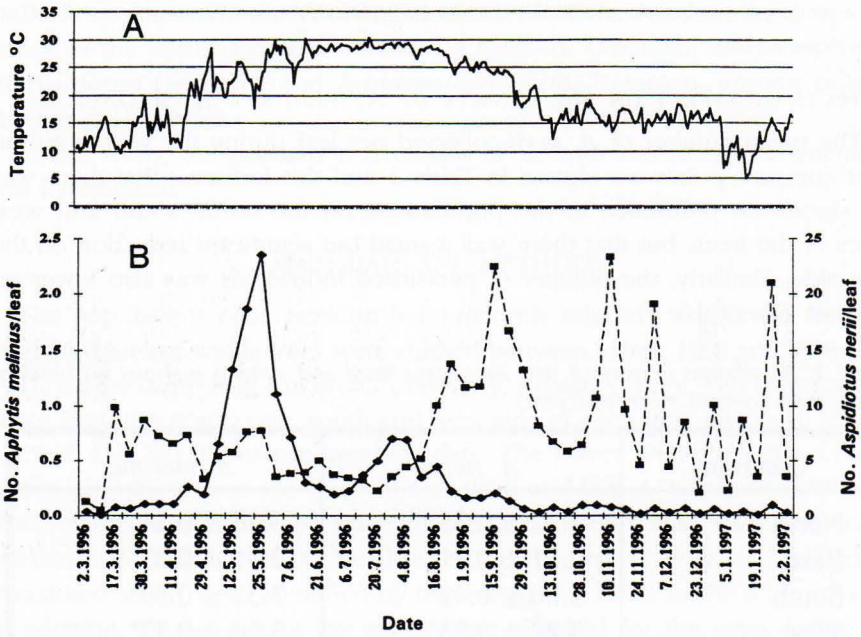


Fig. 1. A. Temperature (°C) and B. Mean number of live *Aspidiotus nerii* (—◆—) and *Aphytis melinus* (- ■ -) per leaf for the period March 1996 to February 1997 at Adana, Turkey.

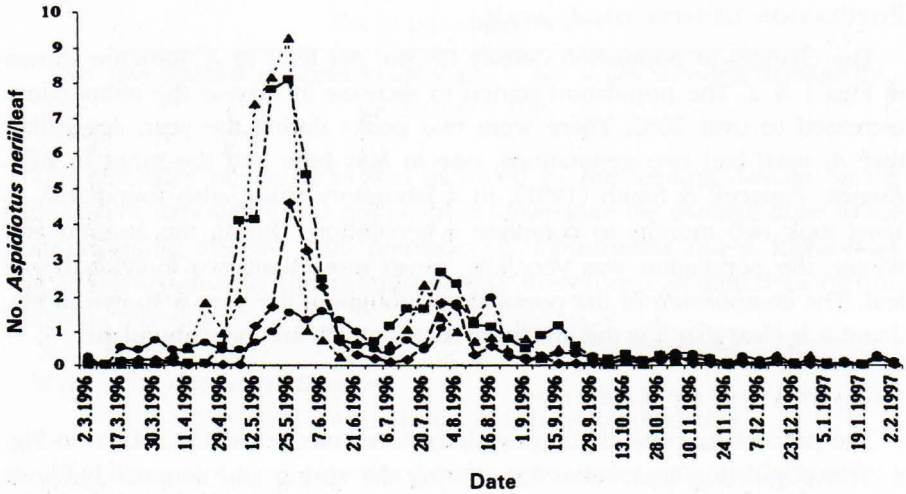


Fig. 2. Mean number of live 1st- (▲) and 2nd-instar (■) nymphs, pupae (◆) and adult females (●) of *Aspidiotus nerii* per leaf on each sampling occasion.

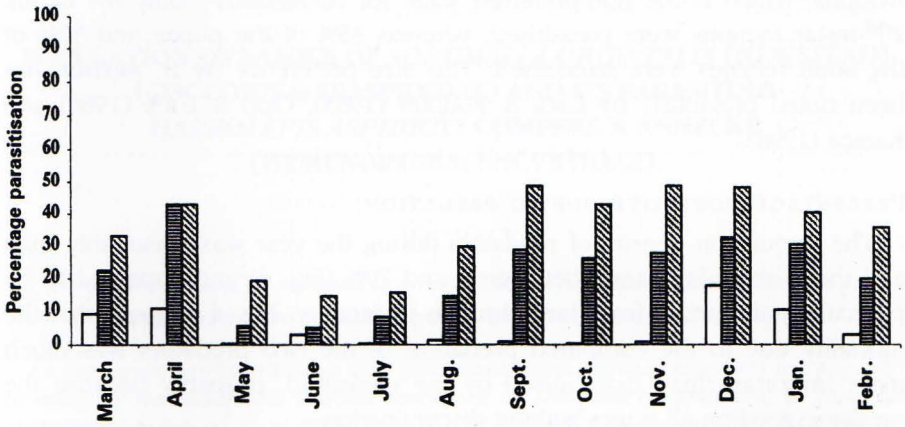


Fig. 3. Percentage parasitisation by *Aphytus melinus* of 2nd-instar nymphs (white bars), pupae (horizontally hatched bars) and adult females (diagonally hatched bars) of *Aspidiotus nerii* per month.

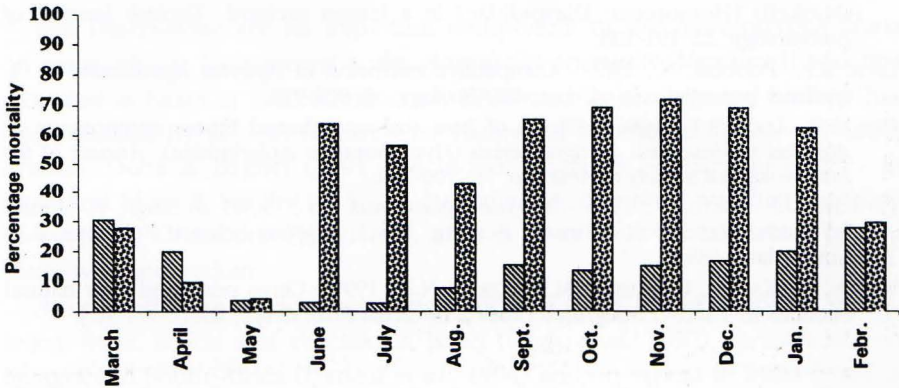


Fig. 4. Percentage mortality of *Aspidiotus nerii* each month caused by the parasitoid *Aphytus melinus* (diagonally hatched bars) and the predators *Chilocorus bipustulatus* and *Rhyzobius lophantae* (dotted bars).

spring, was probably due to the high proportion of 1st- and 2nd-instar nymphs, which is the non-preferred stage for *A. melinus* - only 8% of the 2nd-instar nymphs were parasitised, whereas 35% of the pupae and 57% of the adult females were parasitised. This size preference by *A. melinus* has been noted previously by Luck & Podoler (1985), Opp & Luck (1986) and Karaca (1998).

PERCENTAGE MORTALITY DUE TO PREDATION:

The population density of predators during the year was reasonably high and the % mortality varied between 5 and 70% (Fig. 4) and appeared to be particularly important from June through to January. Fig. 4 suggests that the mortality due to the combined predation of the two predators was much more important than that caused by the parasitoid, probably because the predators feed on all stages without discrimination.

The results suggest that the natural enemies of *A. nerii* should be able to maintain the scale at a relatively low level. Thus, the use of blueleaf wattle as a wind-break could provide both shelter for the orchard and a useful supply of natural enemies for the diaspidid scales on the citrus.

REFERENCES

- KARACA, I., 1998 - Parasitization efficiency of *Aphytus melinus* DeBach (Hymenoptera: Aphelinidae) as affected by host size and size distribution of *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) in a lemon orchard. *Turkish Journal of Entomology*, 22: 101-108.
- LUCK, R.F., PODOLER, N., 1985 - Competitive exclusion of *Aphytus lignanensis* by *A. melinus*: potential role of host size. *Ecology*, 66: 904-913.
- OPP, S.B., LUCK, R.F., 1986 - Effects of host size on selected fitness components of *Aphytus melinus* and *A. lignanensis* (Hymenoptera: Aphelinidae). *Annals of the Entomological Society of America*, 79: 700-704.
- PAPACEK, D.F., SMITH, D., 1985 - *Aphytus lignanensis*. Pp 373-381 in Singh, R, Moore, R.F. (eds) Handbook of Insect Rearing, Vol 1. Elsevier Science Publisher B.V. Amsterdam. 488pp.
- UYGUN, N., KARACA, I., ULUSOY, M.R., TEKELI, N.Z., 1995 - Citrus pests and their natural enemies in Turkey. *Integrated Control in Citrus Fruit Crops*, 18(5): 171-183.