

**ESTABLISHMENT OF *APHIDIUS RHOPALOSIPHI*,
A PARASITOID OF THE ROSE-GRAIN APHID
IN NEW ZEALAND**

M.W. STUFKENS and J.A. FARRELL

Entomology Division, DSIR, Lincoln

SUMMARY

Aphidius rhopalosiphi (Aphidiidae) was introduced into New Zealand from Britain and France in April-June 1985, as a biological control agent against the rose-grain aphid (*Metopolophium dirhodum*) on cereals. After rearing in quarantine at Lincoln, a total of 186,000 parasitoids were released at 20 sites in Southland, Canterbury, Marlborough and Manawatu in 1985-86. A survey of 197 cereal crops in the South Island in late 1986 showed that 47% were infested with *A. rhopalosiphi*. Parasitoid population density in Canterbury was up to 50 per 100 tillers and was comparable with that reported for *A. rhopalosiphi* in Europe.

INTRODUCTION

The rose-grain aphid (RGA), *Metopolophium dirhodum* Walker (Hemiptera: Aphididae), appeared in New Zealand in 1982. RGA is a pest of cereals, causing significant loss of yield due to feeding activity (Stufkens and Farrell 1985a) and the transmission of barley yellow dwarf virus disease (Stufkens and Farrell 1986; 1987). Introduction of a parasitoid as a biological control agent against RGA was planned in 1985. The species recorded as the most frequent parasitoid of RGA in southern England (Dean *et al* 1981) and western France (Rabasse and Dedryver 1983) is *Aphidius rhopalosiphi* De Stefani (syn. *A. uzbekistanicus* Luzh. syn. *A. frumentarius* De Stefani, Hymenoptera: Aphidiidae) and this species was therefore selected for introduction.

METHODS

Introduction of *A. rhopalosiphi*

The parasitoids were supplied from southern England by Dr W. Powell and from western France by Dr J.M. Rabasse. Shipments in RGA mummies were received on 2 April 1985 (250 mummies) and 9 June 1985 (1000 mummies).

Parasitoids emerging from the mummies were identified as *A. rhopalosiphi* by Dr P. Cameron (DSIR). These were reared through three generations in the quarantine laboratory at Lincoln. RGA were provided as hosts, feeding on barley plants at temperatures of 18 °C (light) - 15 °C (dark) with a 16h light — 8h dark regime.

TABLE 1: Numbers (x 1000) of *A. rhopalosiphi* mummies released at cereal sites between July 1985 and January 1987.

Counties	No. of sites	Releases			TOTAL
		1985	1986	1987	
Manawatu	1	5			5
Marlborough	3		3		3
Cheviot (C)	1			5	5
Eyre (C)	1		2		2
Ellesmere, Papanui (C)	6	149	6		155
Ashburton (C)	2	5	3		8
Southland, Wallace	6		3	5	8
TOTAL	20	159	17	10	186

(C) Canterbury counties

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Release

Table 1 shows the programme of releases from June 1985 to January 1987. French stock were released in Ellesmere (20,000 mummies) and Ashburton (5,000 mummies) counties in 1985. The balance of releases in 1985 (134,000 mummies) were of English origin. Releases in 1986-87 were of pooled English and French origin.

Recoveries

A. rhopalosiphi was recovered at the Lincoln release site from July 1985 onwards. South Island cereal-growing areas were surveyed between November 1986 and January 1987 in order to follow establishment of the parasitoid. Cereal crops (sites), encountered on road transects, were inspected for a total of 15 minutes and mummified RGA were collected and returned to the laboratory, where emerging parasitoids were identified.

Population density monitoring

Numbers of RGA and mummies of *A. rhopalosiphi* were recorded by taking weekly samples of 360 tillers on autumn and spring-sown barley at Lincoln between 1 October and 17 December 1986, and on wheat and barley from 15 sites (total 300 tillers) in Eyre county (Canterbury) on 22 December 1986. This was similar to the work of Rabasse and Dedryver (1983) who recorded numbers of *Aphidius* spp. mummies (mainly *A. rhopalosiphi*) and RGA on winter wheat at Reguigny, Brittany, by taking weekly samples of 300 tillers between 22 May and 8 July 1975.

RESULTS AND DISCUSSION

Table 2 shows that 63% (90/143) of sites in Canterbury yielded *A. rhopalosiphi* (total 227). A total of 18 *A. rhopalosiphi* were recovered 6 weeks after releases in Southland, but only empty mummies were recovered in Marlborough 10 weeks after release up to 1 km from release sites. No *A. rhopalosiphi* have been recovered in Manawatu (P. McGregor, pers. comm.).

TABLE 2: Recoveries of *A. rhopalosiphi* and hyperparasites from cereal sites (November-December 1986). Values are for total sites surveyed, number of sites where *A. rhopalosiphi* was present, total *A. rhopalosiphi* recovered and numbers of the hyperparasites* reared from RGA mummies.

Counties	Total sites	Sites present	Total recovered	No hyper-parasites
Marlborough	23	0		
Cheviot, Hurunui (C)	12	8	20	
Eyre, Oxford (C)	34	27	38	2
Ellesmere, Papanui (C)	54	32	75	6
Ashburton (C)	33	16	64	4
Strathallen (C)	10	7	30	
Southland, Wallace	31	3	18	1
TOTAL	197	93	245	13

**Alloxysta infusata*, *Pachyneuron aphidis*, *Dendrocerus* sp.

(C) Canterbury counties

Mummies of *A. rhopalosiphi* were recovered near Timaru and Cheviot (Table 2), 60-90 km distant from sites of releases approximately 1 year previously. Winged immigrant RGA were found parasitized by *A. rhopalosiphi* on spring barley at Lincoln in 1985 and 1986. Adult *A. rhopalosiphi* (52) were taken 7.5 m above ground level in a suction trap at Lincoln during December 1986. This indicates parasitoids have dispersed over considerable distances both in the host and by adult flight. Further surveys are required to follow establishment in Southland and Marlborough and to attempt recoveries in Manawatu.

Fig. 1 indicates the seasonal progression of the ratios of numbers of mummies and RGA at Lincoln and Reguigny (Rabasse and Dedryver 1983), together with the data point from Eyre. The figure also shows the seasonal increase of Canterbury parasitoid

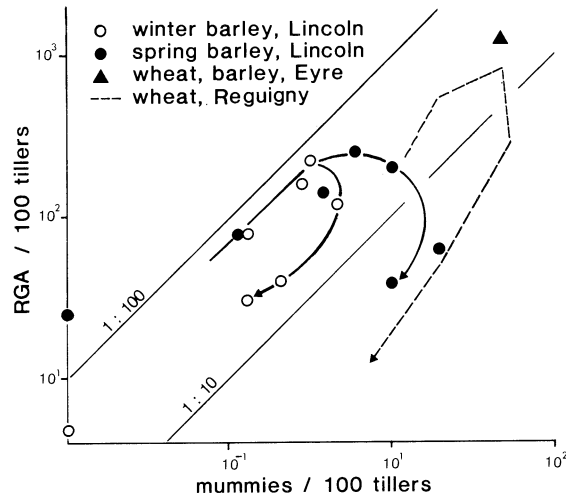


Fig. 1: Progress of the relationship between numbers of RGA and numbers of *A. rhopalosiphi* mummies at Lincoln (1986), Eyre (1986) and Reguigny (1975) (see text). Arrows indicate the temporal sequence of data points. Diagonal lines indicate parasitoid: RGA ratios of 1:100 and 1:10.

population densities at the times of peak aphid numbers, between late October (Lincoln winter barley), early December (Lincoln spring barley) and late December (Eyre wheat and barley). The progress curve for Reguigny indicates that the maximum parasitoid numbers (50 mummies/100 tillers) and parasitoid/prey ratios (approximately 1:3) found there were similar to that in Canterbury. The ratio of accumulated totals of mummies (239) and live RGA (5466) in Lincoln samples (Fig. 1) was 1:23. Dean *et al* (1981) recorded ratios of between 1:7 and 1:433 at Rothamsted, England, in the years 1972-79. Their data comprised several parasitoid species, mainly *A. rhopalosiphi*, and both RGA and the English grain aphid, *Sitobion avenae*.

The maximum parasitoid/prey ratios of approximately 30% recorded at Lincoln occurred during the decline phase of the aphid population, as at Reguigny. Ratios during the aphid increase phase were 2% at Lincoln and 7% at Reguigny (Fig. 1). Further research on the effect of these levels of parasitism on the regulation of RGA populations is required.

The establishment of *A. rhopalosiphi* in Canterbury has been marked by rapid dispersal and distribution on a high proportion of cereal crops. Maximum population density of *A. rhopalosiphi* and parasitoid/prey ratios were comparable with those recorded in southern England and western France. The suitability of the Canterbury habitat for *A. rhopalosiphi* may be associated with the cycle of cereal crops and cereal regrowth (Stufkens and Farrell 1985b) in a mild maritime climate that allows survival and reproduction of prey and parasitoid throughout the year.

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