INOCULATION OF WASP NESTS WITH THE PARASITOID *SPHECOPHAGA VESPARUM*

B.J. DONOVAN, J.W.M. MARRIS, N.C. SCHROEDER and P.E.C. READ

DSIR Plant Protection, Canterbury Agriculture and Science Centre, Lincoln, Private Bag, Christchurch

Read *et al* (1990) report on the release of the introduced wasp parasitoid *Sphecophaga vesparum vesparum* (Curtis) throughout much of New Zealand, for attempted suppression of the adventive wasps *Vespula germanica* (F.), the German wasp, and *V. vulgaris* (L.), the Common wasp. The release method chosen was mass-rearing of overwintering 'yellow' cocoons under controlled conditions, and placement of these diapausing parasitoids in the field in protective wooden release boxes during winter (Donovan *et al* 1989). Parasitoids would emerge from the boxes during spring/early summer and females would seek wasp nests to attack. The establishment of the parasitoid at Pelorus Bridge, Marlborough, is proof that at this site, this release method has succeeded (Read *et al* 1990).

The success of this method is dependent upon female parasitoids locating and entering wasp nests, after emerging from release boxes. A number of factors may limit the scale of successful attack on wasp nests, such as adverse weather, predation by spiders and perhaps wasps, and the mechanism of entry of parasitoids into wasp nests, about which little is known.

Donovan and Read (1987), in preliminary tests, showed that the direct inoculation of adult and immature parasitoids into nests of both species of wasps resulted in attack. However, numbers of parasitoids introduced, nests used and wasps killed were small, the former due to the lack of availability of material from the parasitoid mass-rearing culture which had been developed only a few months earlier. With refinements to mass-rearing, greater supplies of all stages of parasitoids became available, which led to the opportunity to examine methods of nest inoculation in greater depth.

Three approaches were adopted:

1. Release of adult female parasitoids. Recently-emerged mass-reared parasitoids were placed into 400 ml clear plastic containers. The lids of the containers were drilled with about 80, 3.5 mm diameter holes, which were large enough to allow parasitoids to escape, but which were sufficiently small to prevent the entry of all but exceptionally small wasps. Before nest inoculation, a cardboard disk was taped over the container lids to prevent parasitoid escape.

   To prepare nests for inoculation, soil was carefully removed to expose an area of involucrum (the insulating envelope surrounding the combs) slightly bigger than the lid of the container. The exposed involucrum was then cut away, the cardboard removed from the container lid, and the container was inserted lid first into the hole in the involucrum. Emerging parasitoids then had direct access to the wasp nest combs which contained hosts. The container was then covered with soil.

2. Insertion of uncapped comb containing pre-emergent cocoons. Combs from the parasitoid mass-rearing culture were uncapped (i.e. the silk cappings of wasp pupal cells were removed to expose parasitoid cocoons), all white cocoons which would produce brachypterous female parasitoids within a few days were counted, yellow overwintering cocoons were removed, and the combs were marked with felt pen for later recognition. Nests were prepared as for adult parasitoid release, but in addition a piece of comb of the same size as the comb containing the parasitoid cocoons was also removed. The parasitised comb was then inserted in the cavity and the piece of involucrum and surrounding soil were replaced.

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3. Insertion of capped comb containing parasitoid immatures. After uncapping a small number of cells to confirm the presence of parasitoids, the release methods were identical to those for method two. However, these combs almost certainly would have contained yellow cocoons in addition to white cocoons. Parasitoids that emerged from yellow cocoons probably left the nests without ovipositing (Donovan *et al* 1989).

After the cessation of almost all wasp activity in autumn, nests were excavated, and the cocoons formed were counted and evaluated as emerged or non-emerged. Three Common wasp nests were not attacked after inoculation with adult parasitoids, but one nest appeared to have been poisoned, and the dismembered remains of adult parasitoids in two containers indicated that small wasps had gained entry. All other nests were attacked (Table 1). For these nests, the total number of parasitoid cocoons recovered was double the number of parasitoids used to inoculate the nests. Winged parasitoids emerged in and presumably flew from all nests, and all nests contained yellow cocoons that would continue to produce winged parasitoids for up to 4 years.

Nest inoculation by the methods used here does result in attack on wasp nests. Whether parasitoids will spread from these nests to other nests in future seasons remains to be determined but there is every indication that they should (Read *et al* 1990).

TABLE 1: Parasitoid release and recovery in inoculated wasp nests.

Parasitoids released			Cocoons recovered				Total
Stage	No.	Date	Yellow		White		
			intact	emerged	intact	emerged	
V. germanica							
Uncapped	108	12 Mar	10	15	0	16	41
V. vulgaris							
Adults	32	12 Feb	103	34	1	81	219
Adults	50	14 Feb	10	15	1	4	30
Adults	50	20 Feb	494	68	2	178	742
Uncapped	54	28 Feb	107	18	1	20	146
Uncapped	54	28 Feb	60	67	6	95	228
Uncapped	100	6 Mar	4	4	0	15	23
Uncapped	86	6 Mar	88	8	1	29	126
Uncapped	125	8 Mar	27	11	1	14	53
Uncapped	102	8 Mar	3	0	0	0	3
Uncapped	116	8 Mar	5	14	0	0	19
Uncapped	120	12 Mar	75	23	5	51	154
Capped	?	29 Mar	1	5	0	1	7
Totals	889 + ?		987	282	18	504	1791
Means	74 + ?		75.9	21.7	1.4	38.8	137.8

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