Section VI
Biological and Cultural Control

MANAGEMENT OF POTATO AND COLE CROP INSECTS

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1. We have conducted several studies to determine the possible overwintering sites for the Colorado potato beetle (CPB) parasite, Doryphorophaga doryphorae. In a field experiment, emergence cages were placed over 3 different areas of ground based on the type of foliage that was there the previous season prior to adult diapause (hairy nightshade, potatoes growing where a large population of first generation adults had defoliated the plants, and potatoes where the 2nd generation adult CPB adults were seen in large numbers just prior to diapause). Emergence of CPB adults started April 23 and were recorded every other day through July 17. The following numbers of CPB adults were recorded: site 1 -- 37, site 2 -- 87, and site 3 -- 531. No D. doryphorae were recovered.

In another field experiment, 2000 late 4th instar CPB larvae were put in 10 cages (200/cage) on September 6, 1984. A sample of 100 was dissected and the rate of parasitism by D. doryphorae was 58%. The CPB adults emerged from September 28 to October 10 and the tachinid parasites emerged from October 10 to November 16. In the spring of 1985, no emergence of the fly was observed.

2. Overwinter-diapause field cage studies with CPB established that diapause lasted from one to four years. In 1981, pits were dug, lined with plastic, and covered with a cage. One thousand field collected (2nd generation) CPB were put in each cage, fed potato foliage and allowed to enter the soil. The number of adults emerging from these 10 cages were: 1982 -- 3,459; 1983 -- 935; 1984 -- 30; and 8 adults in 1985.

3. Two tests were conducted to establish at what depth the adult CPB overwinter in the soil. In the first experiment, plastic 5-gallon buckets were filled with soil and placed into the ground. Fifty fall collected adults were placed on the surface and allowed to dig in for diapause. The results were: 57 beetles did not dig in; 54 were at 0-4"; 269 at 4-8"; 15 at 8-12"; and 1 below 12". In the second study, 2' cubes were carved in the ground with a ditch-digger. There were 6 replications; the soil was removed in 4" increments and sifted to determine the numbers of adult CPB present. The results were: 30 at 0-4"; 41 at 8-8"; 14 at 8-12"; 5 at 12-16" and 0 at both 16-20" and 20-24".

4. Field tests with the fungus, Beauvaria bassiana have established its potential as a component in a management scheme for the regulation of CPB. Studies were conducted to evaluate the potential of foliar applications of B. bassiana. Two different rates of fungus were evaluated when applied at 4-day intervals during egg hatch. The high treatment rate produced 4 times as many fungal cadavers (larval) as the low rate. Adult survival for field treated and laboratory reared 4th stage larvae was reduced 27% in the low rate and 91% in the high rate. Field emergence of the first generation adults was reduced 27% at the low rate and 65% at the high rate. The low treatment yielded over 2 times as many marketable potatoes as the control and the high treatment ca. 5.5 times as many

5. In an effort to reduce the cost of rearing Perillus bioculatus, laboratory tests evaluating several feeding regimens were evaluated. When Perillus were fed CPB only, the total egg production was 2,157 egg with 47% hatching. Perillus fed looper larvae only produced a total of 57 eggs with a 49% hatch. Those perillus fed looper larvae as nymphs and looper and CPB larvae as adults produced 1,511 eggs with a 56% hatch.

Most eggs were laid by Perillus which were fed looper larvae as nymphs and in which all nymphal Perillus received CPB eggs as part of their adult diet. The ones that were alternately fed CPB eggs and looper larvae produced 1,514 eggs and the ones that were fed CPB eggs and larvae for one week and then loopers only produced 1,134.

6. Research effort has been initiated on the development and validation of a model system for the maximization of biological control agents in multipest management programs using 3 lepidopteran pest species and cole crops as the model system. This year field activity focused on identifying beneficial agents for Artogeia rapae, Plutella xylostella, and Trichoplusia ni. The following beneficial agents were recovered: Cotesia rubecula, Cotesia glomerata, Pteromalus puparum, Phyxe vulgaris, and a granulosis virus from A. rapae; Diadigma insulare, Micropletis plutellae, Tetrastichus sokolowski and an unidentified parasite species from P. xylostella. Cotesia rubecula, a solitary parasite of the imported cabbage worm, A. rapae, was collected at Yakima in 1984. This species was accidently established in British Columbia ca. 1963 and this is the first record from the United States although a number of introductions were made in 1968 in other parts of the U.S. Parasitism exceeded 90% at 2 Washington locations for August collections in 1985.