

## POTENTIAL OF STINKBUG PREDATORS IN COLORADO POTATO BEETLE CONTROL

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The Colorado potato beetle (CPB) is the single most important defoliating pest of potatoes worldwide as well as in the U.S. Insecticide resistance is a serious and recurring problem in the control of the beetle and sole dependence on insecticidal controls has promoted rapid development of resistance and led to detrimental environmental effects including groundwater contamination. Research at USDA/ARS, Yakima, Wa. is focused on developing effective integrated management strategies with emphasis on biological control. CPB is a suitable candidate for management with biological control agents because potatoes can tolerate up to 20% defoliation with no reduction in yield. Several parasites, predators, and pathogens are being evaluated including current effort on establishing the potential of stinkbug predators in suppressing CPB. Augmentative release studies have been conducted by inoculating cage and field plots with laboratory produced predators. The stinkbug predators reduced CPB populations by 80%. The cost of producing this predator has been significantly reduced by new and novel rearing procedures. Multiple releases of the predator provided the greatest level of suppression. Inoculative releases of this predator in conjunction with additional biological control agents should provide the integrated management package we need.

In a 1987 field cage study, two stinkbug predators of the Colorado potato beetle, Perillus bioculatus and Podisus maculivertris were evaluated for control of high populations of CPB. Tests were conducted in 6' x 6' x 6' walk-in cages with 5 treatments and 3 replications. Perillus was evaluated at 3 levels: 20, 30, and 40 early third instars per cage and Podisus at the 30 level. The control was CPB only. Four potato plants were grown in each cage and 15 egg masses of CPB added (potential of 450 larvae/plant). Predators were released following hatch and checked periodically and damage ratings made. Adult beetles were collected and counted to evaluate predation. There were no differences in reduction of CPB regardless of predator treatment; all treatment levels provided approximately 50% control. The lowest levels of foliage damage resulted when Perillus were released at 30 and 40 per cage.

In a 1988 field cage study, the stinkbug predator Perillus was evaluated at one level of CPB and the following levels of predators/cage: 0, 8, 16, 24, and 32. Four potato plants were grown in each cage and CPB egg masses were placed on the plants and allowed to hatch to provide a CPB population of ca. 400 per cage. Predators (early 3rd stage) were released following CPB hatch and there were six replications.

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This Presentation is part of the Proceedings of the 1990 Washington State Potato Conference & Trade Fair.

Damage ratings of foliage were made and adult beetles were collected and counted to evaluate predation. Eight predators/cage (2/plant) reduced the CPB populations 16% and as the number of predators increased there was a consistent reduction of beetles with 32 predators/cage (8/plant) eliminating 68% of the beetles. Foliage damage decreased as the number of predators increased.

In field plots in 1988, releases of Perillus were evaluated at 3 levels against naturally occurring CPB populations. Plots consisted of 48 potato plants and there were 4 replications. Perillus (early 3rd stage) were released at the following rates per plant: 0, 1, and 3. Weekly counts were made on stages of both CPB and the predator and damage rating and harvest evaluations conducted. Peak number of 5th stage Perillus occurred on June 30 and adult Perillus populations peaked on July 7. Prior to the release of predators on June 17, population levels of adult beetles and egg masses were similar (ca. 6 and 9, respectively). By July 7, the predators at a rate of 1/plant had reduced the CPB larval populations by 40% and 3 predators/plant had reduced it over 80%. Plots with 1 predator/plant yielded 33% more potatoes and those with 3 predators/plant yielded 60% more than the plots with no predators.

Field tests in 1989 were conducted with both stinkbug predators and CPB to test the following: (1) determine what effect the timing of colonization of the overwintering adult CPB had on season long CPB population dynamics, feeding damage and yield of potatoes and (2) determine the impact the timing of the colonization has on inoculative releases of predators. Treatments evaluated were: (1) Perillus (3/plant) at plant emergence, (2) Perillus (3/plant) at plant emergence plus 2 more release at 3 week intervals, (3) Podisus (3/plant) at plant emergence, (4) Podisus (3/plant) at plant emergence plus 2 more releases at 3 week intervals, (5) Perillus (3/plant) at 20 days post emergence, (6) Perillus (3/plant) at 20 days post emergence, (7) CPB only at 10 days post emergence, (8) CPB only at 20 days post emergence, (9) CPB only at plant emergence, and (10) no CPB or predators. All plots except those of treatment 10 received 6 adult CPB/plant. Plots consisted of 40 potato plants and there were 4 replications. Row cover was used to exclude local CPB adults.

Field tests established the following: (1) Delayed colonization of potato by overwintering CPB adults does not reduce damage but in fact caused increased damage, (2) Both predator species can have a reductive impact on CPB populations when released at 3/plant (early 3rd stage) at initiation of egg deposition by CPB and Perillus has the greater effect, and (3) three releases of the predators at 3 week intervals increased this reductive effect.