# IMPACT OF ALFALFA ON PREDATION OF COTTON INSECT PESTS IN NEW MEXICO Jane Breen Pierce Patricia E Monk New Mexico State University, Agricultural Science Center Artesia, NM

## Abstract

Alfalfa can be a source of beneficial arthropods for other crops. Field trials were conducted over 2 years on an experiment station farm to evaluate the impact of hay on predation in adjacent cotton using cotton bollworm eggs from a laboratory colony. Eggs were placed in transects to measure the impact of distance to hay, direction and time of year in both trials. Eggs were removed after 48 hours and examined for evidence of predation.

Predation was significantly higher in alfalfa compared to cotton in 2008, with 78% in alfalfa compared to 48-58% in cotton. In 2009 there was not significant difference in predation rates between cotton and hay, with an average 73-76% predation in cotton, and 79% predation in alfalfa. The primary predators were ladybug adults, nabids and various spiders in both 2008 and 2009. There was no difference in predation from 10-80 feet into cotton. Predation was higher in the west quadrant of cotton, likely due to prevailing winds from the west.

The numbers of predators was not consistent with predation rates in 2009. Predation rates in cotton were high in 2009, despite over ten times fewer predators than alfalfa. Also, the highest predation in alfalfa, 98%, was after predator numbers had fallen in late September.

### **Introduction**

Crops growing in close proximity to cotton may exert important effects on insect pests of cotton by increasing the population of predators or parasitoids in the area. In California, 20ft strips of alfalfa for every 300-500 feet of cotton serves as an effective source of natural enemies of insect pests of cotton (Stern et al. 1969). Whitcomb and Bell (1964) noted that predators increased in cotton after alfalfa fields were cut in Arkansas.

In New Mexico, alfalfa is likely an important source of predators for cotton. This study was initiated to start to understand the role of alfalfa in providing predators to cotton in New Mexico. Bollworm eggs were attached to plants in the field then examined in the lab for evidence of predation to determine the impact of distance from alfalfa, direction and time of year.

Two field trials were conducted over two years at a university farm. The degree of predation was evaluated by setting up five transects from alfalfa into cotton in each of 4 directions. Each transect had approximately 50 eggs attached to a plant 10 feet into the alfalfa stand and 10, 30, and 80 feet into the block of cotton. Field to lab bioassays were conducted five times over the season to determine the degree of predation. Eggs were collected from a laboratory colony and were approximately 12 hours old when they were placed in the field. Eggs were retrieved from the field after 48 hours, then examined under a dissection microscope to determine rate of predation. Predators were sampled directly, with 50 sweeps per sample.

#### Results

In 2008, predation was significantly higher in alfalfa compared to cotton with an average 78% predation of eggs over the season compared to 48-58% predation in cotton (Figure 1). In 2009 there was no significant difference in season long mean predation rates with 79% predation in alfalfa and 73-76% in cotton. Predation was not reduced over the relatively short distances into cotton (10, 30 and 80 feet) in 2008 or 2009. In 2008 predation was lower 1000 feet into cotton (Pierce and Monk 2009). Prevailing winds from the west did seem to impact predation rates in 2009 with significantly higher predation, 85%, in cotton in the west quadrant compared to 68-72% in cotton in east, south and north quadrants. There was no significant difference in direction in 2008. There was also no significant difference in predation in the 4 borders of alfalfa either year.



Figure 1. Impact of distance from alfalfa on predation of cotton bollworm eggs attached to plants



Figure 2. Impact of direction from alfalfa to cotton on predation of cotton bollworm eggs attached to plants.

Time of year did, as expected, have some impact on rate of predation with less predation in September both years. In 2008 there was only 35% predation of eggs September 23 compared to 53-77% predation from July 18 to August 27 (Figure 3). In 2009, predation rates were higher than in 2008, with 65% predation in late September and 73-88% predation from July 17 to August 23. There was no difference in predation related to height of hay which was 3" tall on July 29 and August 24 but 23" and 18" tall on July 17 and August 10 respectively.



Figure 3. Impact of time of year on predation of cotton bollworm eggs attached to alfalfa and cotton plants.

Cotton had fewer of predators compared to hay (Figures 4 and 5). There were never more than 2 predators of any type per 50 sweeps in cotton in 2009. Mid season, in July and early August, alfalfa produced over 10 times more ladybugs, spiders, collops beetles and nabids than cotton. Yet despite fewer predators, predation rates in cotton were high, 73-80%. Predation in cotton was only significantly lower than alfalfa one time, on August 24, when alfalfa had 98% predation compared to 77% in cotton.



Figure 4. Number of predators collected in 2009 per 50 sweeps in cotton



Figure 5. Number of predators collected in 2009 per 50 sweeps in alfalfa

Nabids were the most commonly collected predator in 2008 and 2009 in alfalfa. (Fig 4 and 5) Ladybugs were very prevalent in July in 2009. Nabids, spiders and collops beetle numbers peaked August 10 in 2009 with 15, 10 and 6 per 50 sweeps respectively. Their numbers dropped quickly in August, dropping to less than 3 per 50 sweeps by August 24.

In 2008, predator numbers were very consistent with predation levels (Pierce and Monk 2008). However, in 2009 highest predation levels were August 24, with 98% predation. This was after the number of predators had dropped precipitously. Previous data collected in commercial fields suggested that predation in cotton might rely on regular immigration of predators (Pierce and Monk 2009). The discrepancy between predator number and predation levels in 2009 could be due to frequent movement between cotton and alfalfa and a preference for alfalfa as a habitat. On the other hand, the very high predation rate in alfalfa in September, after predator numbers fell suggests that the number of predators in these cotton plots might simply have been high enough.

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