

# Aphid Management on Head Lettuce Using Imidacloprid and Foliar Insecticides



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In the production of desert lettuce, growers and PCAs have a several options for aphid management on spring crops. First, there is the responsive approach that relies on foliar insecticide sprays to reduce aphid numbers. A number of insecticides are available that have cost-effective activity against aphids when applied as foliar sprays targeted at aphid populations as they begin colonizing plants. There is also the preventative approach where growers can apply neonicotinoids at-planting, 1<sup>1/2</sup> to 2 inches below the seedline. The insecticide is taken up by the plant roots, systemically translocated throughout young plants for several weeks following emergence, and ultimately prevent aphid colonization early in plant development. Both approaches can be very effective, and both can be used on the same crop. Imidacloprid has been the standard soil insecticide applied on spring lettuce for aphid control for over 20 years and continues to provide long residual control. More recently, Movento, with its excellent systemic activity against aphids via foliar application, has been incorporated into lettuce IPM programs along with other conventional insecticides with aphid activity. However, the question has recently been posed: Is either approach to aphid management better than the other. To address this question, research funded by the *Arizona Iceberg Lettuce Research Council* was conducted in the spring on 2011 and 2012 in Yuma, Arizona to examine soil-applied imidacloprid (Alias 2F and Admire Pro), used alone or in combination with foliar aphicides, for preventing contamination by the local aphid complex on head lettuce.

The objective of these studies was to evaluate control of aphids on head lettuce using either foliar-applied insecticides, soil-applied insecticides or a combination of both. Small-plot, field studies were conducted at the University of Arizona, Yuma Agricultural Center in the spring growing season. In all the trials, head Lettuce was direct seeded into double row beds on 42 inch centers. Plots for each trial consisted of 2 beds , 45' long and were arranged in a randomized complete block design with 4 replications. Rates for each compound are provided in the tables for each study.

Aphid populations were assessed by estimating the number of aphids per plant in whole plant, destructive samples. On each sampling date, 6-10 plants were randomly selected from each plot and placed individually into large 5-gal tubs. Each plant was sampled by visually examining all plant foliage and counting the number of apterous (non-winged) aphids present. At harvest, 10 plants were randomly selected from each plot and sampled by visually examining all foliage within a harvested head (plus cap leaf and 2 wrapper leaves) and recording the number of live aphids present in each individual head. Mean aphids per head (species combined) and the percentage of heads contaminated with greater than 1, 5 or 10 live aphids were calculated at harvest. Data were analyzed as a 1-way ANOVA using a protected LSD F test to distinguish treatment mean differences. Mean were log transformed ( logX+1) prior to analysis and actual means are shown in tables.

## **Spring 2011 – Trial I**

Head Lettuce ( 'Navajo') was direct seeded on 7 Dec, 2010. Alias (16 oz/ac) was applied at planting in 20.5 gpa final solution and injected 2" below the seedline as is the local standard practice . Foliar sprays were applied on 22 Jan and 22 Feb (Movento, 5 oz or Assail, 4 oz + Hero, 11 oz in non-Alias treated plots) and on 6 Mar (Movento or Assail+Hero in both Alias-treated and non-Alias treated plots) with a CO<sub>2</sub> operated boom sprayer at 40psi and 21.5 gpa. A broadcast application was delivered through 2 TXVS-18

ConeJet nozzles per bed. An adjuvant, DyneAmic, was applied at 0.375 % vol/vol. Plants were periodically sampled from 19 Jan to 18 Mar. Harvest was conducted on 27 March.

**Summary:** The aphid complex consisted primarily of *Acyrtosiphon lactucae* (no common name) with a light number of green peach aphid and lettuce aphids present at harvest. All the treatments, with the exception of the Assail+Hero on non-*Alias* treated lettuce, significantly reduced aphid contamination at harvest. Although *Alias* used alone without additional foliar sprays, reduced aphid contamination to very low levels, the most consistent treatment in preventing head contamination was the *Alias* at-plant treatment followed by a foliar application of Movento.

### **Spring 2011 – Trial II**

Head Lettuce ('Synergene 352') was direct seeded on 2 Nov, 2010. *Admire Pro* was applied at two rates (7 and 10 oz/ac) at planting in 20.5 gpa final solution and injected 2" below the seedline as is the local standard practice. Foliar sprays were applied on 22 Jan (Movento, 5 oz or Assail, 4 oz + Hero, 11 oz in non-*Admire Pro* treated plots) and on 11 Feb (Movento or Assail+Hero in both *Admire Pro*-treated and non- *Admire Pro* treated plots) with a CO<sub>2</sub> operated boom sprayer at 40psi and 21.5 gpa. A broadcast application was delivered through 2 TXVS-18 ConeJet nozzles per bed. An adjuvant, DyneAmic, was applied at 0.375 % vol/vol. Plants were periodically sampled from 16 Dec to 18 Feb. Harvest was conducted on 25 Feb.

**Summary:** The aphid complex consisted of almost equal proportions of *A. lactucae* and green peach aphids. Because of the low aphid pressure throughout the trial and at harvest, only a single foliar application was made in the non-*Admire Pro* and *Admire Pro* treated plots. Also, given this low aphid pressure, all treatments prevented significant aphid contamination at harvest.

### **Spring 2012**

Head Lettuce ('Winter King') was direct seeded on 3 Jan, 2012. *Admire Pro* was applied at planting in 20.5 gpa final solution and inject 2" below the seedline. Foliar sprays were applied on 22 Feb (Movento and Closer in non-*Admire Pro* treated plots) and 31 Mar (Movento and Closer in both *Admire Pro* treated and non-treated plots) with a CO<sub>2</sub> operated boom sprayer at 40psi and 21.5 gpa. A broadcast application was delivered through 2 TXVS-18 ConeJet nozzles per bed. An adjuvant, DyneAmic, was applied at 0.25 % vol/vol. Harvest was conducted on 12 Apr.

**Summary:** Aphid pressure was heavier in 2012 and the aphid complex consisted predominantly of *A. lactucae* with a few lettuce aphids present at harvest. All the treatments significantly reduced aphid contamination at harvest, but lettuce treated with *Admire Pro* and without additional foliar sprays had unacceptable aphid contamination. In this trial, two applications of Closer, a new insecticide with an anticipated registration date of early 2013, and Movento applied to non-*Admire Pro* treated lettuce reduced aphid contamination to very low levels, but the most consistent treatments were the *Admire Pro* at-plant treatment followed by a single foliar application of Closer 12 days before harvest.

### **Conclusions/Recommendations**

Depending on aphid pressure during the spring growing season, imidacloprid soil applications may or may not provide season long control of aphids, particularly *A. lactucae* which has been abundant the past 2 years. Under low population pressure, a single imidacloprid application (*Admire Pro*) at the high rate prevented significant contamination at harvest. In contrast, under heavier population pressure, the use of a foliar spray following the at-planting treatment of imidacloprid (*Admire Pro*, 7 oz/ac) was needed to prevent aphid contamination. Given the current economics of imidacloprid and the cost-effective aphid control that can be achieved by using higher rates ( e.g., *Alias*, 16-24 oz, *Wrangler*, 10-12 oz or *Admire Pro*, 7-10.4 oz), it is recommended that growers apply imidacloprid at-planting applications on their spring lettuce plantings (mid-November through December). If aphids move onto crops late in the crop season and begin to colonize, foliar products like Movento, Assail, Beleaf, and Closer (upon EPA registration) can be effectively applied.

**Spring 2011 – Trial I** Seasonal Aphid abundance on lettuce treated with soil and foliar insecticides

Soil Treatment	Foliar Treatment	Mean Aphids / Plant							
		19-Jan	28-Jan	4-Feb	12-Feb	21-Feb	2-Mar	11-Mar	18-Mar
Alias, 16 oz	Movento, 5 oz	0.2 a	0.4 a	0.4 a	0.2 b	0.1 b	0.7 b	3.4 b	1.4 b
Alias, 16 oz	Assail, 4 oz+ Hero, 11 oz	0.3 a	0.3 a	0.2 a	0.2 b	0.1 b	2.2 b	11.1 b	1.4 b
Alias, 16 oz	-	0.1 a	0.4 a	0.1 a	0.1 b	0.3 b	2.0 b	6.0 b	6.4 b
-	Movento, 5 oz	1.0 a	0.3 a	0.1 a	1.0 b	0.8 b	1.4 b	1.8 b	2.7 b
-	Assail, 4 oz+ Hero, 11 oz	1.2 a	0.7 a	0.5 a	1.9 b	4.5 a	1.4 b	2.3 b	5.4 b
Untreated	-	1.6 a	1.8 a	0.9 a	6.6 a	6.9 a	38.6 a	130.4 a	13.6 a

**Spring 2011 – Trial I** Aphid contamination at harvest (Mar 27) in lettuce treated with soil and foliar insecticides

Soil Treatment	Foliar Treatment	Mean Aphids per Head	% Heads infested with 1 or > aphids	% Heads infested with 5 or > aphids	% Heads infested with 10 or > aphids
Alias, 16 oz	-	1.0 cd	28 c	15 cd	10 cd
Alias, 16 oz	Movento, 5 oz	0.1 d	3 d	3 d	0 d
Alias, 16 oz	Assail, 4 oz + Hero, 11 oz	1.0 cd	23 cd	15 cd	5 cd
-	Movento, 5 oz	3.1 bc	45 bc	38 bc	28 c
-	Assail, 4 oz + Hero, 11 oz	10.6 a	88 a	85 a	68 a
Untreated	-	5.6 ab	63 ab	55 b	50 b

**Spring 2011 – Trial II** Seasonal Aphid abundance on lettuce treated with soil and foliar insecticides

Soil treatment	Foliar treatment	Mean aphids / Plant						
		16-Dec	6-Jan	13-Jan	20-Jan	28-Jan	5-Feb	18-Feb
Admire Pro, 10 oz	--	0.0	0.2	0.2	0.1	0.4	0.6 b	0.3 c
Admire Pro, 7 oz	--	0.0	1.5	0.1	0.5	0.6	0.6 b	0.6 c
Admire Pro, 10 oz	Movento, 5 oz	0.0	0.1	0.1	0.2	0.3	0.4 b	0.3 c
Admire Pro, 10 oz	Assail, 4 oz + Hero, 11 oz	0.0	0.2	0.2	0.2	0.4	0.5 b	0.4 c
Admire Pro, 7 oz	Movento, 5 oz	0.0	0.6	0.2	0.5	0.3	0.5 b	0.5 c
Admire Pro, 7 oz	Assail, 4 oz + Hero, 11 oz	0.0	0.9	0.1	0.0	0.5	0.1 b	1.2 bc
--	Movento, 5 oz	0.0	0.8	0.7	1.0	1.2	0.3 b	0.1 c
--	Assail, 4 oz + Hero, 11 oz	0.0	0.5	0.6	1.8	2.5	0.5 b	4.1 a
Untreated	Untreated	0.0	0.2	0.6	0.5	1.6	2.5 a	4.6 a

**Spring 2011 – Trial II** Aphid contamination at harvest (Feb 25) in lettuce treated with soil and foliar insecticides

Soil treatment	Foliar treatment	Mean Aphids per Head	% Heads infested with 1 or > aphids	% Heads infested with 5 or > aphids
Admire Pro, 10 oz	-	0.8 b	20.0 bcd	3.0 b
Admire Pro, 7 oz	-	1.1 b	17.5 cd	5.0 b
Admire Pro, 10 oz	Movento, 5 oz	0.1 b	7.5 d	0.0 b
Admire Pro, 10 oz	Assail, 4 oz+Hero, 11 oz	0.1 b	2.5 d	0.0 b
Admire Pro, 7 oz	Movento, 5 oz	0.7 b	32.5 bc	3.0 b
Admire Pro, 7 oz	Assail, 4 oz+Hero, 11 oz	0.2 b	15.0 cd	0.0 b
--	Movento, 5 oz	0.1 b	2.5 d	0.0 b
--	Assail, 4 oz+Hero, 11 oz	0.8 b	37.5 b	3.0 b
Untreated	Untreated	3.4 a	82.5 a	25.0 a

**Spring 2012** Seasonal aphid abundance on lettuce treated with soil and foliar insecticides

Soil Treatment	Foliar Treatment	<i>Aphid / Plant</i>					
		17-Feb	24-Feb	2-Mar	15-Mar	29-Mar	8-Apr
Admire Pro, 7 oz	-	1.5 a	3.1 a	3.1 a	1.9 a	2.8 b	11.7 b
Admire Pro, 7 oz	Movento, 5 oz	1.4 a	4.9 a	3.2 a	2.1 a	1.9 b	1.9 cd
Admire Pro, 7 oz	Closer, 2.8 oz	1.6 a	5.0 a	2.9 ab	1.5 a	2.3 b	0.9 d
-	Movento, 5 oz	1.4 a	4.3 a	1.2 b	1.5 a	6.0 a	3.4 cd
-	Closer, 2.8 oz	1.5 a	4.4 a	1.1 b	2.7 a	5.9 a	4.6 bc
Untreated	-	1.4 a	4.3 a	5.7 a	3.4 a	11.2 a	37.9 a

**Spring 2012** Aphid contamination at harvest (Apr 12) in lettuce treated with soil and foliar insecticides

Soil Treatment	Foliar Treatment	<i>Mean Aphids per Head</i>	<i>% Heads infested with 1 or &gt; aphids</i>	<i>% Heads infested with 5 or &gt; aphids</i>	<i>% Heads infested with 10 or &gt; aphids</i>
Admire Pro, 7 oz	-	11.7 b	64.3 b	60.7 b	35.7 c
Admire Pro, 7 oz	Movento, 5 oz	1.9 cd	29.3 c	21.4 c	3.6 c
Admire Pro, 7 oz	Closer, 2.8 oz	0.9 d	14.3 d	10.7 c	0.0 c
-	Movento, 5 oz	3.4 cd	64.3 b	28.6 c	3.6 c
-	Closer, 2.8 oz	4.6 bc	60.7 dc	28.6 c	10.7 c
Untreated	-	37.9 a	92.9 a	92.9 a	82.1 a