# CO-APPLICATION OF THE DIMAIDE INSECTICIDES IN SNAP BEANS[1]

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**Abstract.** Multiple applications of pyrethroid insecticides are used to manage European corn borer, *Ostrinia nubilalis* Hübner, in snap bean, but new diamide insecticides may reduce application frequency. The objective of this study was to examine the potential for improving control of *O. nubilalis* in processing snap bean with diamide insecticides. Specifically, we compared *O. nubilalis* control with chlorantraniliprole, cyantraniliprole, and bifenthrin at three different phenological snap bean stages (i.e., bud, bloom, pod formation) to determine the duration of residual activity for each insecticide under field conditions in snap bean, and co-applied cyantraniliprole and bifenthrin insecticides with either herbicides or fungicides at each vegetative stage to determine if tank mixing cyantraniliprole and bifenthrin with common agrochemicals would reduce *O. nubilalis* control, and finally we confirmed the suitability of diamide insecticides for *O. nubilalis* control using commercial snap bean fields and processing plant contamination data, over two consecutive field seasons. Cyantraniliprole applications timed either during bloom or pod formation controlled *O. nubilalis* better than similar timings of bifenthrin. Co-applications of insecticides with fungicides controlled *O. nubilalis* as well as insecticide applications alone. Insecticides applied either alone or with herbicides during bud stage did not control this pest. In commercial snap bean fields, yield and quality were equivalent in fields treated once with chlorantraniliprole and twice with pyrethroids. Diamides are an excellent alternative to pyrethroids for manage *O. nubilalis* in snap bean. Adoption of diamides by snap bean growers could improve the efficiency of production by reducing the number of sprays required each season.

**Table 1. Average *O. nubilalis* infestation (mean percentage±SE) of snap bean pods and plants treated at three phenological plant stages with chlorantraniliprole cyantraniliprole and bifenthrin in 2012.**

| Phenological stage | Insecticide | Plant damage | Pod damage |
|---|---|---|---|
| **untreated**[a] | - | 18.5±5.2 | 8.7±2.5 |
| **bud** | bifenthrin | 9.0±6.4a | 2.6±1.2a |
| | chlorantraniliprole (51.2 g AI $ha^{-1}$) | 4.1±3.3ab | 1.9±1.1a |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 1.0±0.7b | 0.7±0.3a |
| **bloom** | bifenthrin | 0.7±0.4b | 1.4±0.4a |
| | chlorantraniliprole (51.2 g AI $ha^{-1}$) | 0.0±0.0b | 0.0±0.0a |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 0.0±0.0b | 0.2±0.1a |
| **pod formation** | bifenthrin | 0.0±0.0b | 0.0±0.0a |
| | chlorantraniliprole (51.2 g AI $ha^{-1}$) | 0.0±0.0b | 0.3±0.1a |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 0.0±0.0b | 0.0±0.0a |

[a]Untreated controls were not included in analyses, but have been provided for comparison.
[b]Within each vegetative structure column, means followed by the same lower-case letter do not differ significantly (Tukey HSD test at $P$=0.05).

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**Table 2. Average *O. nubilalis* infestation (mean percentage±SE) of snap bean pods and plants treated at three phenological plant stages with cyantraniliprole and bifenthrin in 2013 and 2014.**

| Vegetative stage | Insecticide | Plant damage | | Pod damage | |
|---|---|---|---|---|---|
| | | 2013 | 2014 | 2013 | 2014 |
| **untreated**[a] | - | 63.5±9.8 | 13.3±3.8 | 14.8±4.6 | 6.0±1.4 |
| **bud** | bifenthrin | 22.1±10.1a | 11.3±3.5a | 5.0±2.7a | 4.4±1.5a |
| | cyantraniliprole (100 g AI $ha^{-1}$) | 19.4±7.5ab | 6.9±2.2ab | 3.7±1.2a | 2.8±1.0ab |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 20.5±2.0a | 9.6±6.4ab | 2.4±0.5ab | 2.4±1.5ab |
| **bloom** | bifenthrin | 12.5±3.9abc | 1.2±1.2ab | 3.7±2.0ab | 0.4±0.2b |
| | cyantraniliprole (100 g AI $ha^{-1}$) | 1.5±1.1bc | 1.4±0.7ab | 0.2±0.1bc | 0.8±0.4ab |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 1.7±1.3bc | 1.0±0.7ab | 0.1±0.1c | 0.8±0.3ab |
| **pod formation** | bifenthrin | 7.7±3.4abc | 0.0±0.0b | 1.2±0.7abc | 0.7±0.5b |
| | cyantraniliprole (100 g AI $ha^{-1}$) | 0.8±0.8c | 3.8±2.2ab | 0.2±0.1bc | 0.6±0.3ab |
| | cyantraniliprole (150 g AI $ha^{-1}$) | 0.5±0.5c | 1.1±1.1b | 0.0±0.0c | 0.5±0.2b |

[a]Untreated controls were not included in analyses, but have been provided for comparison.
[b]Within each vegetative structure and year column, means followed by the same lower-case letter do not differ significantly (Tukey HSD test at $P$=0.05).

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