

New Insecticides for Desert Produce and Melon Crops

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In the past 25 years, there has been an unprecedented development of insecticide chemistry that has resulted in the registration of a number of key products in desert crops. Among these were several breakthrough chemistries that have had a major impact on how PCAs manage insects on leafy vegetables and melons. The first important chemical class developed were the neonicotinoids with the registration of imidacloprid (Admire 2F) in 1993. It was the first selective, systemic insecticide developed for whiteflies and aphids. Since then a number of other neocotinoid compounds have been registered (acetamiprid, thiamethoxam, acetamiprid, clothianidin, dinotefuran). The second major breakthrough chemistry to be developed for desert crops were the spinosyns lead by the registration of Success/Entrust in 1997 and followed most recently with Radiant in 2008. The spinosyns were one of the first Reduced-risk chemistries developed, and have excellent activity against both Lep larvae and thrips. This was followed by the Ketoenols (Tetramic acid derivatives) with the registration of Oberon in 2003 and later Movento in 2008. Movento was the first fully systemic insecticide to adequately control whiteflies and aphids via foliar application. Finally, the anthranilic diamide chemistry was developed most recently and included two active ingredients, chlorantraniliprole (Coragen, Besiege) and cyantraniliprole (Exirel, Verimark, Minecto Pro) that provide activity against chewing and sucking insects via foliar sprays, and for the first time, activity through soil, systemic activity. There have also been a number of other key chemistries that play a key role in desert IPM programs with products such as Courier, Knack, Beleaf, Intrepid, Proclaim, Sivanto, Sequoia and others. Without question though, the products now available for use in desert vegetable crops are more effective and safer to use than compounds used prior to 1993.

In 2019, several new insecticide products have recently been registered for management of key insect pests found on desert produce crops. PQZ (pyrifluquinazon) just recently received its Arizona label and is currently registered for use against sucking pests in leafy vegetables and melons. Similarly, Sefina and Versys (afidopyropen) are registered for sucking insects in leafy vegetables and melons. Two other compounds, Cormoran (an in-can mixture of novaluron and acetamiprid) and Harvanta (cyclaniliprole) have been available for a year or so, and are active against Leps. At the Yuma Agricultural Center (YAC) we have been working with these compounds to better understand their insecticidal activity and fit in local IPM programs. Below, information is provided on each of these compounds with a description of their route of activity, MOA, effective spectrum and rates and Key Desert Fit. Furthermore, we provide a product summary and an Index of Efficacy for each compound that ranks their comparative efficacy against the local standards. These ranking were derived from evaluations in multiple field trials and applications conducted at YAC. The product was given an A if it showed consistently good control comparable to the industry standard; a B when inconsistent control was measured relative to the local standard, and a C when its activity was not economically effective (consistently poor control relative to the standard and untreated check). Finally a summary of the label attributes for each compound is provided.

Cormoran (*acetamiprid + novaluron*)

Chemistry:	Mixture of Neonicotinoid and Benzoylureas
IRAC Mode of Action:	4A, Nicotinic AChR agonist + 15, Chitin synthesis inhibitor
Route of Activity:	Foliar contact/ingestion; translaminar
Effective Spectrum:	Leps, Diamondback moth (DBM), Whitefly
Recommended Rates:	12 oz
Key Desert Fit:	Foliar alternative for DBM in brassica crops

Pest	No. Trials	No. Sprays	IPM Standards	Comparative Efficacy
Aphids	1	2	Movento	B
Whitefly -Adult/nymph	4	9	Movento, Exirel	B
Whitefly - CYSDV	3	7	Venom, Exirel	B
Leps/DBM	4	11	Radiant, Proclaim	B

A	Excellent activity; As good as the standard
B	Inconsistent activity; Not as good as the standard
C	Not economically effective

Cormoran (*acetamiprid + novaluron*) is formulated as a dispersible concentrate insecticide, and is currently registered for use on Brassica vegetables and melons in Arizona. It is an in-can mixture of the neonicotinoid acetamiprid with novaluron, an insect growth regulator. Because it has IGR activity, it can be very slow acting, particularly against Leps. In limited trials conducted at YAC, it has shown activity against whitefly adults and immatures, but has been inconsistent in suppressing CYSDV in cantaloupes. Most of the adult whitefly activity appears to be due to the acetamiprid component, albeit at a reduced rate (3.3 oz) from top of the label Assail. It has significant activity against diamondback moth larvae and provides an alternative mode of action for use in DBM resistance management programs. However, Cormoran has not been shown to be as effective against beet armyworm and cabbage looper as standard products. According to the label, Cormoran is toxic to bees exposed to direct treatment.

Harvanta 50SL (*cyclaniliprole*)

Chemistry:	Anthranillic diamide
IRAC Mode of Action:	Group 28, ryanodine receptor modulators
Route of Activity:	Foliar -contact/translaminar;
Effective Spectrum:	Leps, Diamondback moth
Recommended Rates:	16.4 oz
Key Desert Fit:	Foliar alternative for Leps in Leafy and Brassica vegetables

Pest	No. Trials	No. sprays	IPM Standard	Comparative Efficacy
Leps, DBM	4	11	Radiant, Proclaim	A
Whitefly -Adults	2	6	Movento, Exirel	C
Thrips	1	2	Radiant, Lannate	C

A	Excellent activity; As good as the standard
B	Inconsistent activity; Not as good as the standard
C	Not economically effective

Harvanta (*cyclaniliprole*) is a 3rd generation diamide currently registered for use in Leafy vegetables, Brassica head and stem vegetables, and melons. Like other diamides (i.e., chlorantraniliprole and cyantraniliprole), it is a neurotoxin and considered a ryanodine receptor agonist. It has activity as a foliar spray, providing translaminar activity on treated leaf surfaces. In limited efficacy trials, Harvanta has shown good knockdown and residual activity against Leps such as beet armyworm, cabbage looper and diamondback moth comparable to the other diamides and local standards. Based on limited research, it appears to lack economic activity against whitefly adults in melons and western flower thrips in lettuce. Additional trials will be conducted in 2019 to confirm this. According to the label, Harvanta is highly toxic to bee and other pollinating insects exposed to direct treatment or to residue in/on blooming crops or weeds.

Versys/Sefina (*afidopyropen*)

Chemistry:	Pyropenes
IRAC Mode of Action:	Group 9D; Chordotonal TRPV channel modulator
Route of Activity:	Ingestion / translaminar;
Effective Spectrum:	Aphids, Whiteflies/CYSDV
Recommended Rates:	Versys: 1.5 oz Sefina: 14 oz
Key Desert Fit:	Versys is a foliar alternative for aphids in produce crops and Sefina is an alternative for whiteflies/CYSDV in melons

Pest	No. Trials	No. Sprays	IPM Standard	Comparative Efficacy
Whitefly -Adult/nymph	10	26	Movento, Exirel	A
Whitefly - CYSDV	7	16	Venom, Exirel	A
Aphids	13	29	Movento	A
Thrips	1	2	Radiant, Lannate	C

A	Excellent activity; As good as the standard
B	Inconsistent activity; Not as good as the standard
C	Not economically effective

Sefina and Versys (*afidopyropen*) were recently labeled for use in Arizona on Leafy vegetables, Brassica head and stem vegetables, and melons. This compound is not a new chemistry, but rather is a Chordotonal TRPV channel modulator and acts by disrupting the feeding of sucking pests. As a foliar spray in fall melons, Sefina has shown to be very effective against adult whitefly and CYSDV suppression, similar to Venom. This is presumably due to rapid feeding cessation by adults once they ingest the product. Similarly, Versys has shown to very effective against green peach aphid in lettuce and brassica crops, comparable to the current industry standards (Movento, Sivanto, Beleaf, Sequoia). However, local information is lacking on foxglove aphid activity, but we're hoping to gather data this season. In a single trial, it did not provide economic activity against western flower thrips. According to the label, Sefina and Versys are not acutely toxic to bees, are considered bee safe, and should have no long-term effect on colony health. Overall, these products provide growers with effective alternatives for whitefly/CYSDV and aphid control on desert crops.

PQZ (*pyrifluquinazon*)

Chemistry:	Quinazolinone
IRAC Mode of Action:	Group 9B, Chordotonal TRPV channel modulator
Route of Activity:	Foliar contact / translaminar
Effective Spectrum:	Whiteflies/CYSDV, Aphids
Recommended Rates:	3.2 oz
Key Desert Fit:	A foliar alternative for whiteflies/CYSDV in melons

Pest	No. Trials	No. Sprays	IPM Standard	Comparative Efficacy
Whitefly -Adult/nymph	40	102	Movento, Exirel	A
Whitefly - CYSDV	26	72	Venom, Exirel	A
Aphids	18	38	Movento	A
Thrips	2	5	Radiant, Lannate	C

A	Excellent activity; As good as the standard
B	Inconsistent activity; Not as good as the standard
C	Not economically effective

PQZ (*pyrifluquinazon*) was registered just last week in Arizona for use on leafy vegetables, brassica vegetables and melons. It has a similar mode of action to Sefina and Versys (chordotonal TRPV channel modulator) and acts as a selective feeding blocker against sucking insects. We have extensive local research experience with PQZ against aphids and whiteflies. It has consistently shown excellent activity against whitefly adults as a foliar spray, and provides significant CYSDV suppression, as good or better than the existing standards due to its mode of action as a feeding disruptor. PQZ is considered bee safe; no bee or pollinator restrictions are listed on the label. PQZ, along with Sefina, should become important products for whitefly management in desert melons. It has also shown consistent knockdown and residual control of aphids comparable to the standards. It is weak against western flower thrips, but has shown activity against citrus thrips in lemons. Overall, PQZ provides PCAs with a much-needed alternative for effective whitefly/CYSDV management on desert crops.

Product	Active ingredient	IRAC MOA	Formulation	Effective Spectrum	Desert Veg Crops	Rates	Maximum product allowed	PHI	REI	Bee safety
PQZ	<i>pyrifluquinazon</i>	9B	SC-suspension concentrate; 1.87 lb AI /gal	Whiteflies, Aphids	Brassica head and stem vegetables; Leafy vegetables; Cucurbits	2.4-3.2 oz	4.8 oz	1-day	12 hr	1
Versys	<i>afidopyropen</i>	9D	DC-dispersible concentrate; 0.83 lb AI /gal	Aphids	Brassica head and stem vegetables; Leafy vegetables	1.5 oz	14 oz	0-day	12 hr	2
Sefina	<i>afidopyropen</i>	9D	DC-dispersible concentrate; 0.42 lb AI /gal	Whiteflies	Cucurbits	14 oz	28 oz	0-day	12 hr	2
Cormoran	<i>Novaluron + Acetamiprid</i>	15 + 4A	DC-0.84lb AI /gal novaluron; +0.67 lb AI /gal acetamiprid	Leps, DBM, Whiteflies	Brassica head and stem vegetables; Cucurbits	9-12 oz	Cucurbits, 35.0 oz ; Brassica, 23 oz	7-day	12 hr	3
Harvanta	<i>cyclaniliprole</i>	28	50 SL - soluble concentrate; 0.42 lb AI /gal	Leps, DBM,	Brassica head and stem vegetables; Leafy vegetables; Cucurbits	10.9-16.4 oz	65.6 oz	1-day	4 hr	4

¹ no bee or pollinator restrictions on the label

² Versys/Sefina are not acutely toxic to bees, use at the maximum single application rate may have some short-term behavioral effects on adult bees, but is not expected to have long-term impacts on bees and overall colony health.

³ This product is toxic to bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.

⁴ This product is highly toxic to bee and other pollinating insects exposed to direct treatment or to residue in/on blooming crops or weeds. Protect pollinating insects by following label directions intended to minimize drift and reduce risk to these organisms.