Technical Information

FENPYROXIMATE

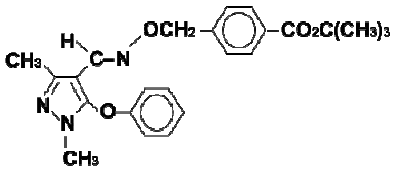
Acaricide / Insecticide

NIHON NOHYAKU CO., LTD.

■ Physical and Chemical Properties

Common name (ISO) : Fenpyroximate
Chemical name(IUPAC) : *tert*-butyl (*E*)-α-(1,3-dimethyl-5-phenoxypyrazol-4-ylmethyleneaminoxy)-*ρ*-toluate
Melting point : 101.2 –102.4 ºC
Water solubility : 0.015 mg/L (20 ºC)
Partition coefficient : Log Pow = 5.01 (20 ºC)
Formulation : 5%SC(w/w), 5%EC(w/w)

Structure formula:



■ Toxicology (Technical)

Mammalian toxicity

Acute oral LD_{50} (Rat)	: (female)	245 mg/kg
Acute dermal LD_{50} (Rat)	: (male)	>2,000 mg/kg
Skin irritation (Rabbit)	:	Non irritation
Eye irritation (Rabbit)	:	Slightly irritation
Mutagenicity (Ames test)	:	Negative

Ecotoxicity

Rainbow trout, LC_{50} (96hr)	: 0.00105 mg/L
Daphnia, EC_{50}(48hr)	: 0.00328 mg/L
Algae, ErC_{50}(0-72hr)	: 0.00554 mg/L

■ Target Pests

Order	Species	Registered Country	Formulation
Acarina	*Tetranychus urticae,* Two-spotted spider mite	Global	SC, EC
	Tetranychus pacificus, Pacific spider mite	USA	SC, EC
	Panonychus citri, Citrus red mite	Global	SC, EC
	Panonychus ulumi, European red mite	Global	SC, EC
	Oligonychus coffeae, Tea red spider mite	Asia	SC, EC
	Brevipalpus phoenicis, Flat mite	Brazil	SC
	Phyllocoptruta oleivora, Citrus rust mite	Global	SC, EC
	Aculus schlechtendali, Apple rust mite	Global	SC
	Polyphagotarsonemus latus, Broad mite	Asia	SC
	Steneotarsonemus ananas, Pineapple mite	Asia	SC
Hemiptera	*Empoasca vitis,* Grape leafhopper	EU	SC
	Diaphorina citri, Asian citrus psyllid	USA	EC
	Bemisia tabaci, Tobacco whitefly	USA	EC
	Planococcus ficus, Vine mealybug	USA	EC
	Pseudaulacaspis pentagona, White peach scale	Japan	SC


Tetranychus urticae


Panonychus citri


Panonychus ulumi


P. oleivora


P. latus


Empoasca vitis


Diaphorina citri

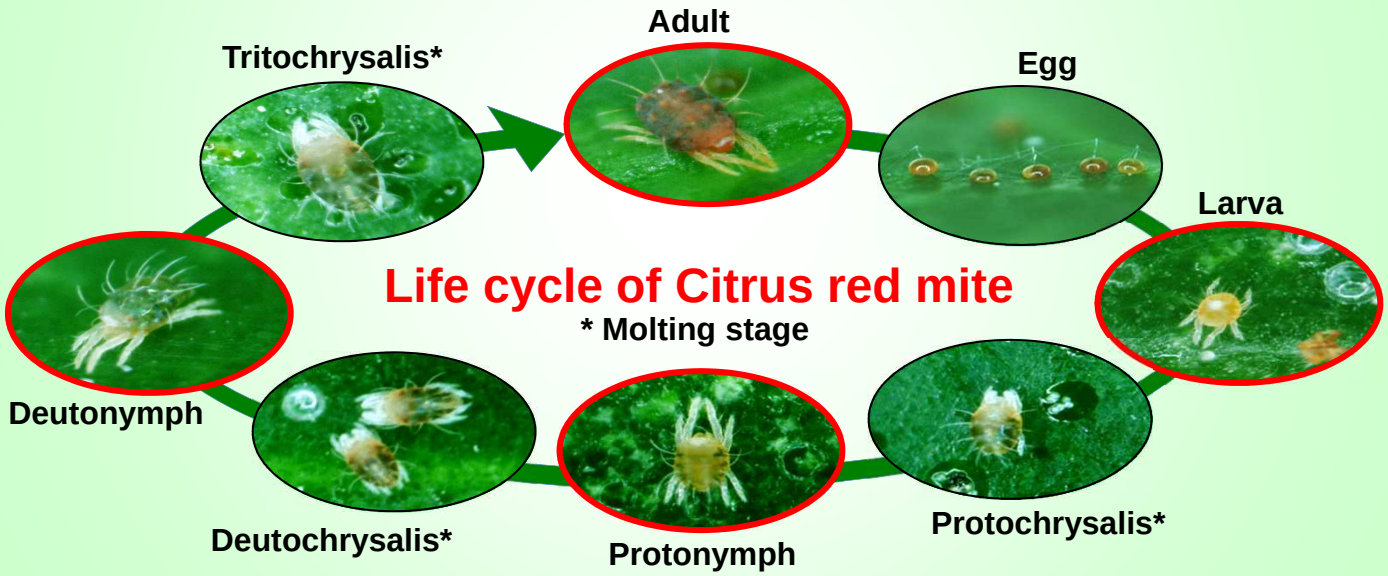

Bemisia tabaci


Planococcus ficus


P. pentagona

■ Stage wise Activity against Spider mite

Species	LC_{50} (ppm)			
	Female Adult	Egg	Larva	Protonymph
Two-spotted spider mite	**0.32**	**36**	**0.11**	**0.17**
Citrus red mite	**0.30**	**51**	**1.0**	**1.2**

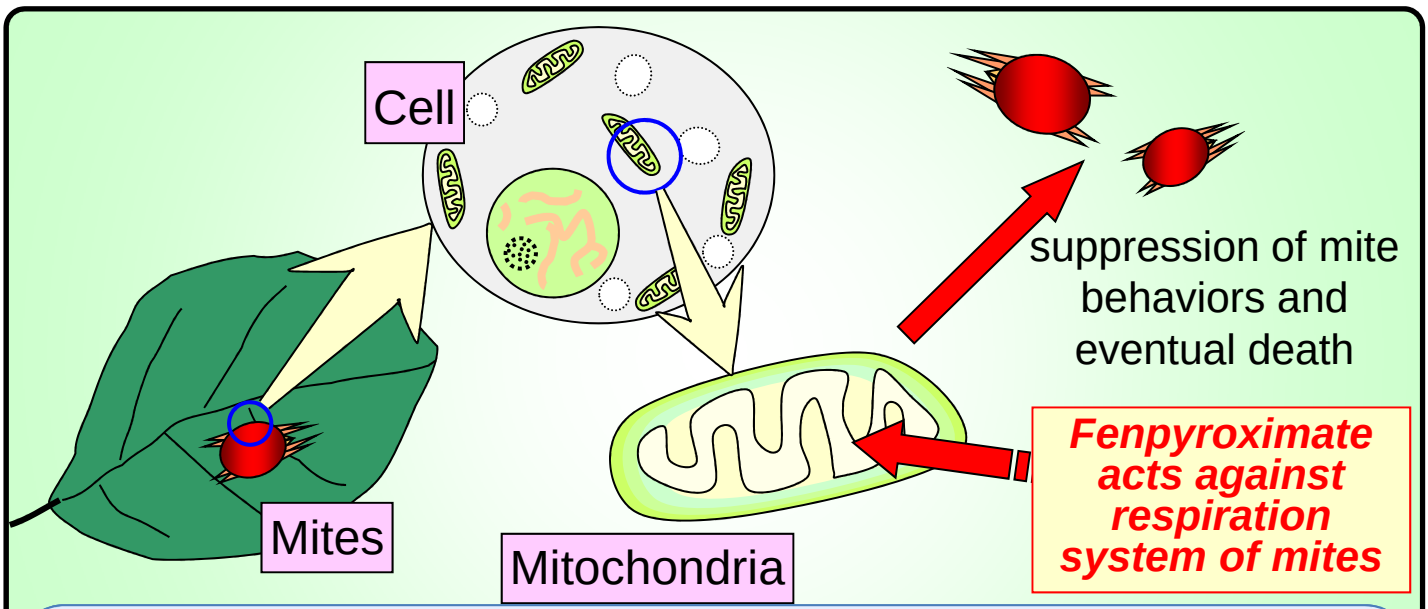


Fenpyroximate is Effective to All Developmental Stages

■ Mode of Action

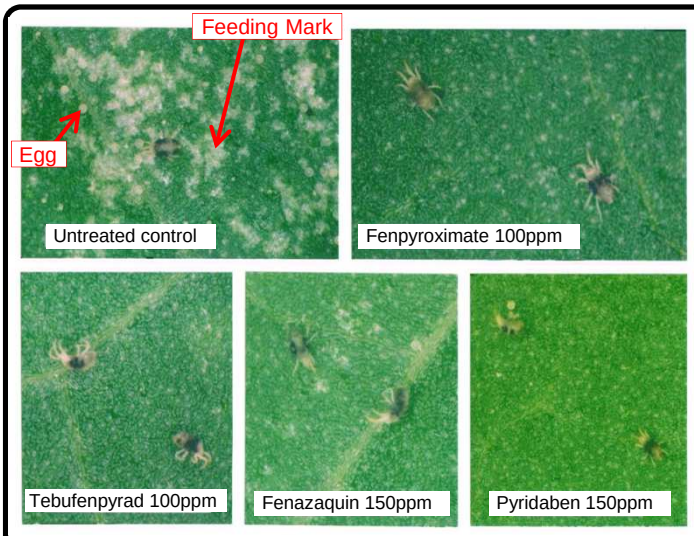
Group 21A: Mitochondrial complex I electron transport inhibitors*

*Insecticide Resistance Action Committee



Fenpyroximate inhibits the electron transfer system, complex I of an energy metabolism (respiratory system) in the mitochondria, and belongs to the Group 21A: **M**itochondrial Complex I **E**lectron **T**ransfer **I**nhibitor (**METI**) Acaricides. Fenazaquin, Pyridaben, Pyrimidifen and Tebufenpyrad belong to the same group. **Successive generations of Mites should not be treated with compounds from the same MoA Group (IRAC Recommendation). ⇒Rotational use**

■ Suppression of Oviposition and Feeding



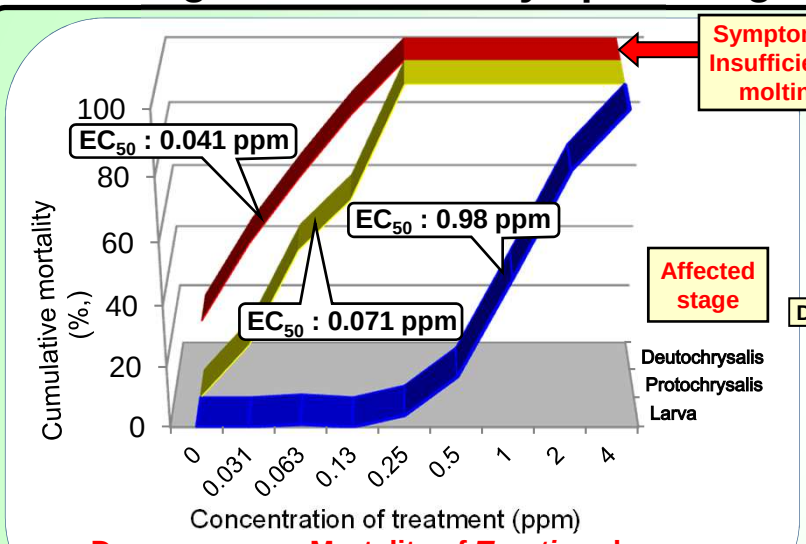
Chemical	Mortality (%)	Reduction of feeding (%)	Reduction of oviposition (%)
Fenpyroximate	**100**	**98.8**	**92.6**
Tebufenpyrad	100	99.3	98.7
Fenazaquin	100	99.3	99.2
Pyridaben	100	97.0	91.5
Untreated	0	-	(235.5)*

* Mean number of laid eggs

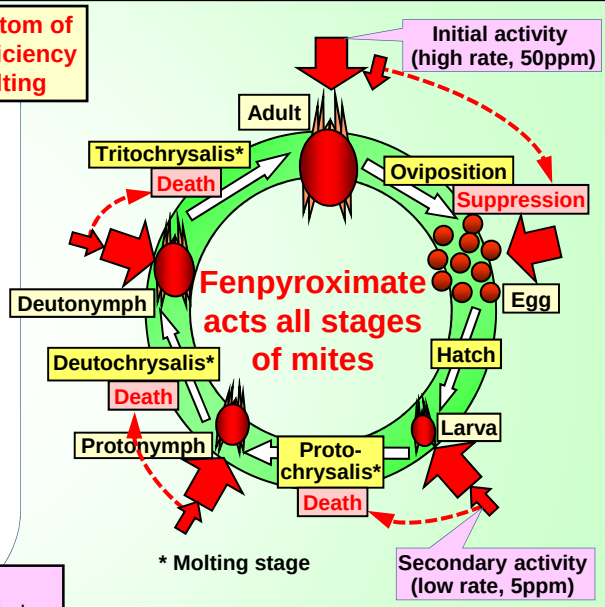
Method: Kidney beans leaves were sprayed with a test solution. *T. urticae* were released on the treated leaf disk. The mortality was assessed, the laid eggs were counted and the photographs were taken on 24 hours after the release. The photographs were analyzed by the image processor.

Symptoms appear to be alive, but feeding damage and oviposition were stopped. The control was promptly established.

■ Molting Inhibition on Nymphal Stage



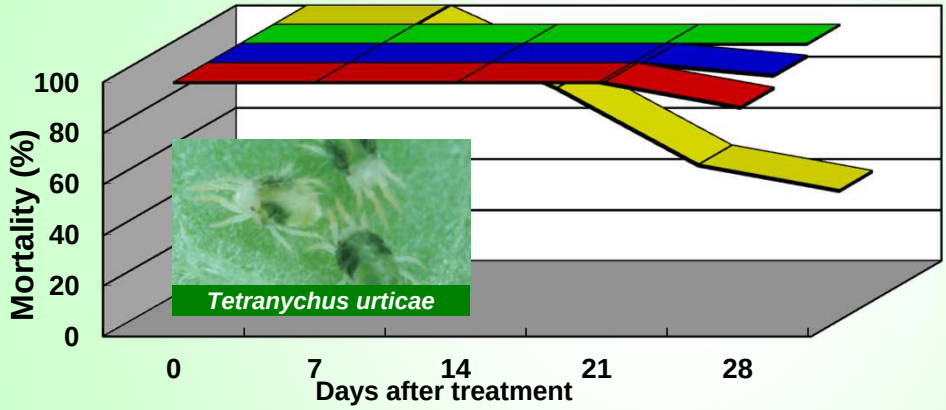
Dose response Mortality of *T. urticae* larvae



Method: Newly hatched larvae of *T. urticae* were treated. The cumulative mortality through larva to successive developmental stages were investigateded

The molting periods require a lot of energy to make the next instar body. Fenpyroximate shows the efficacy at molting stage due to reducing energy production by its inhibition of respiration.

■ Effect Persistency

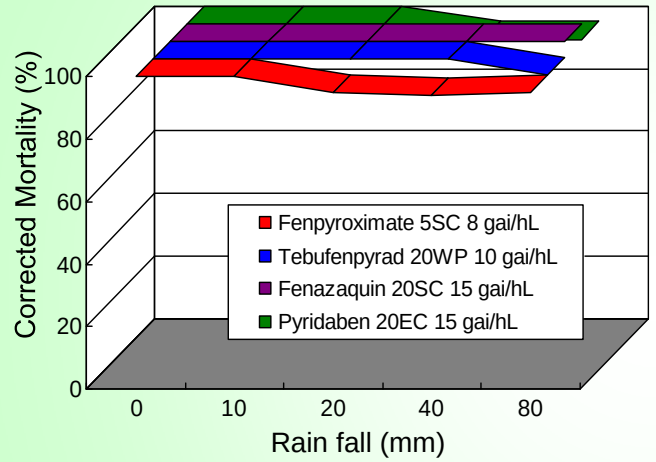


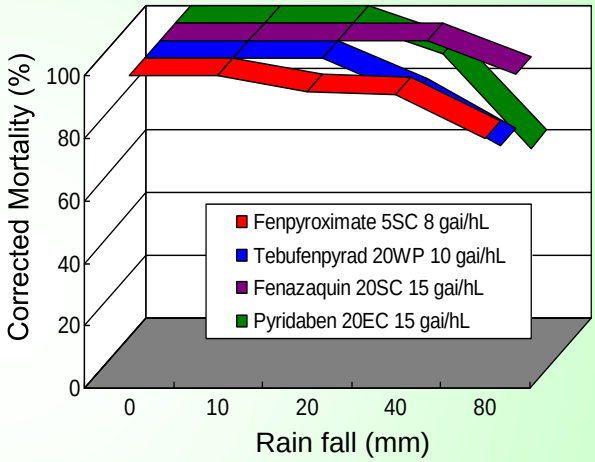
Method: Insecticidal solution was sprayed to potted kidney beans plant with 500L/ha volume. 0, 7, 14, 21 and 28 DAT, leaf disc was made and female adults o *T. urticae* were released. The mortality was checked at 2 days after inoculation.

Effect Persistency METI Acaricides against *T. urticae*

Fenpyroximate shows long lasting effect for 4 weeks at recommended rate.

■ Rain Fastness





Rain-fastness of METI Acaricides on Kidney bean and Citrus leaves

Method: Potted kidney beans plants and Grapefruit plants were sprayed with a test solution (1,000 L/ha). After fully dried, the pots were set under artificial rainfall (rain strength: 40mm/hr). Treated leaves were sampled and were released with ten female adults of *T. urticae* on the **lower leaf surface** and ten female adults of *P. citri* on the **upper leaf surface.** Assessment was made on 2 days after the release.

Fenpyroximate shows good rain fastness even upper leaf surface of citrus.

■ Side Effect on Natural Enemies and Beneficial Insects

Classify	Scientific name	Stage	Effect
Predaceous mite	*Amblyseius fallacis*	Adult	slight
	A. longispinosus	Adult	slight
	A. deleoni	Adult	moderate
	Phytoseiulus persimilis	Adult	moderate
	Typhlodromus sp.	Mobile	none
Predaceous spider	*Lycosa pseudoannulate*	Mobile	none
	Misumenops tricuspidatus	Mobile	none
Parasitic wasp	*Ephedrus japonicus*	Pupa	slight
	Aphytis yanonnensis	Pupa	moderate
	Apanteles glomeratus	Pupa	moderate
Predaceous bug	*Orius sp.*	Mobile	slight
Predaceous thrips	*Scolothrips sp.*	Mobile	none
Predaceous rove beetle	*Oligota sp.*	Adult	slight
Predaceous ladybird	*Harmonia axyridis*	Adult	slight
Predaceous lacewing	*Chrysopa nipponensis*	Larva	none
Honeybee	*Apis mellifera*	Worker	none
Bumble bee	*Osmia cornifrons*	Worker	none
Silkworm	*Bombyx mori*	4th instar larva	slight


Amblyseius californicus


Phytoseiulus persimilis


Lycosa seudoannulate


Orius strigicollis


Harmonia axyridis

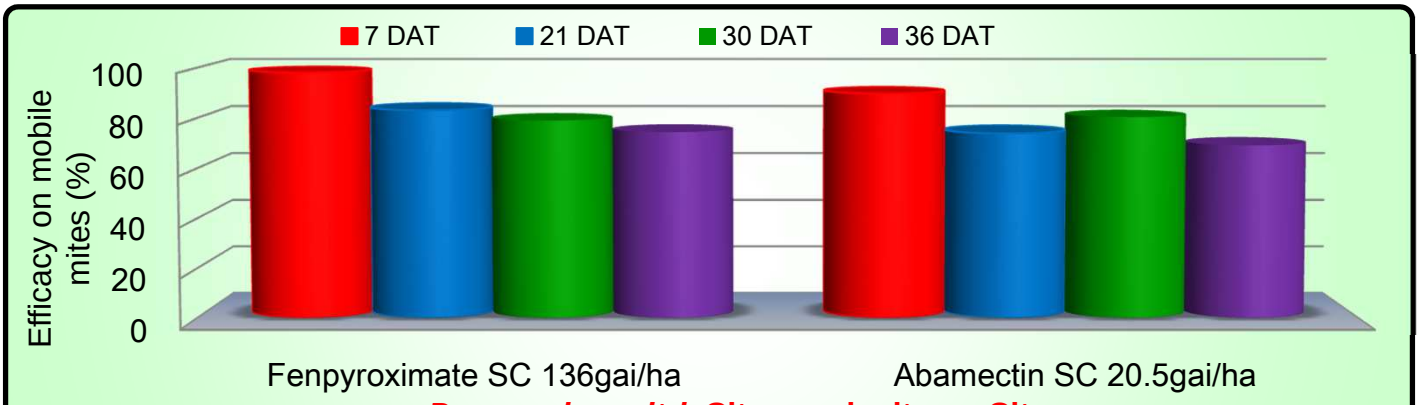

Apis mellifera


Bombyx mori

At recommended rate: 5.0 – 7.5 gai/hl (50 – 75 ppm) of 5SC
none: <25% reduction, slight harmful: 25-50% reduction,
Moderate harmful: 50-75% reduction, Very harmful: >75% reduction

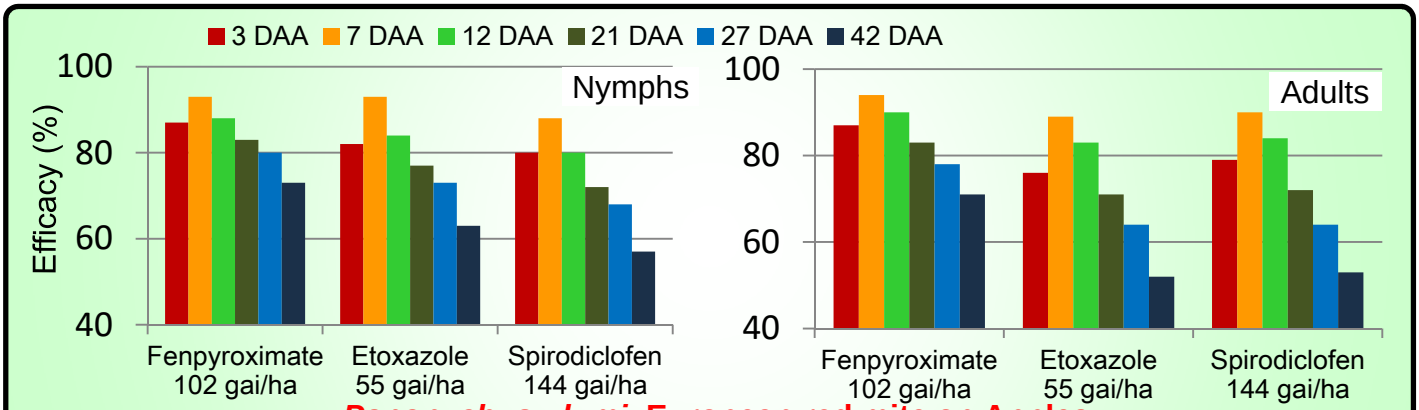
Fenpyroximate is recommended IPM compatible product because of its low impacts.

■ Field trials as Acaricide



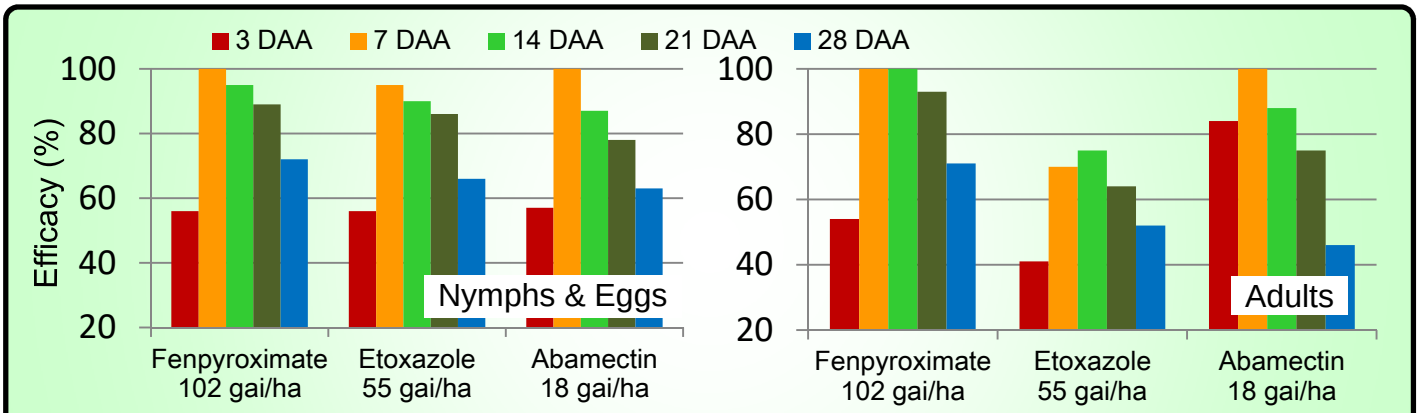
***Panonychus citri*, Citrus red mite on Citrus**

Location: Lindcove, CA, USA. Application: 30 August, 2015. Spray volume: 935L/ha.



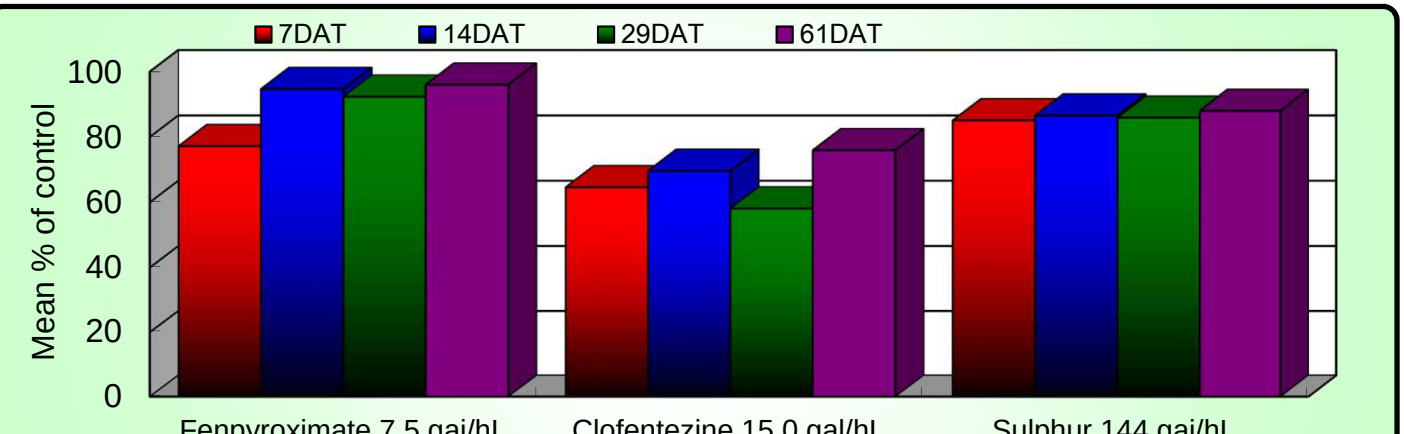
***Panonychus ulumi*, European red mite on Apples**

Location: Pella, Greece. Application: 12 June, 2015. Spray volume: 1500L/ha.



***Tetranychus urticae*, Two-spotted spider mite on Aubergine**

Location: Ionia, Thessaloniki, Greece. Application: 25 August, 2015. Spray volume: 1000L/ha.



***Aculus schlechtendali*, Apple rust mites on Apples**

Location: Hattersheim, Germany. Application: 17 June, 1992. Spray volume: 1000L/ha.

■ Proper application timing for Mite Control

Control Efficacy of Fenpyroximate against *Panonychus ulmi* on Apple with Different Population

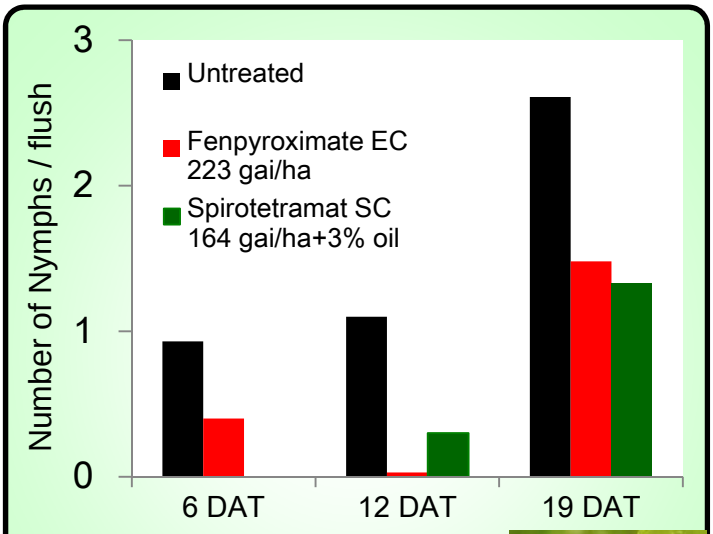
Treatment	Number of mites / leaf at treatment	Control Efficacy (%) 2 DAT	7 DAT	15 DAT	21 DAT
Fenpyroximate 2.5 gai/hL	1.7	93	100	96	81
	9.2	67	88	52	78
	110	48	63	15	-
Fenpropathrin 25.0 gai/hL	1.1	78	92	71	52
	10.8	49	71	57	25
	121	31	25	0	-

Application date: June 21, 1989, Spray Volume: 900-1,000 L/ha, Location: Italy

Apple trees with different population density of spider mites in the same orchard were selected and treated. The results showed that the effect of the tree with low density was excellent, and it was poor and too late control for the tree with high density.

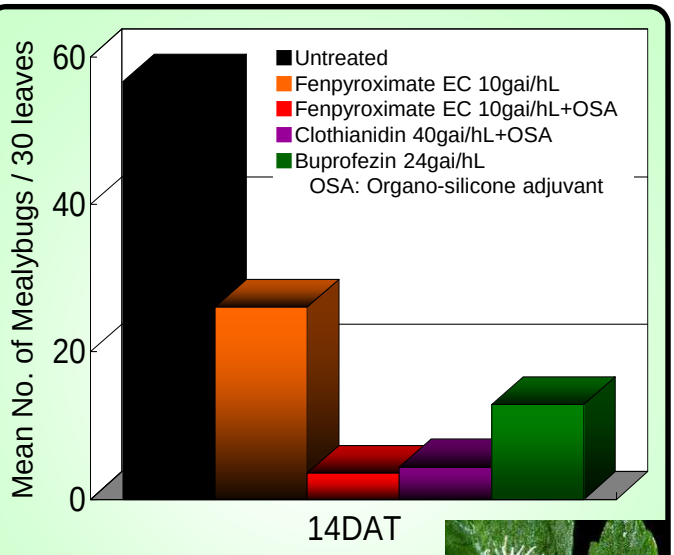
Early (preventive) application is most effective.

■ Field trials as Insecticide



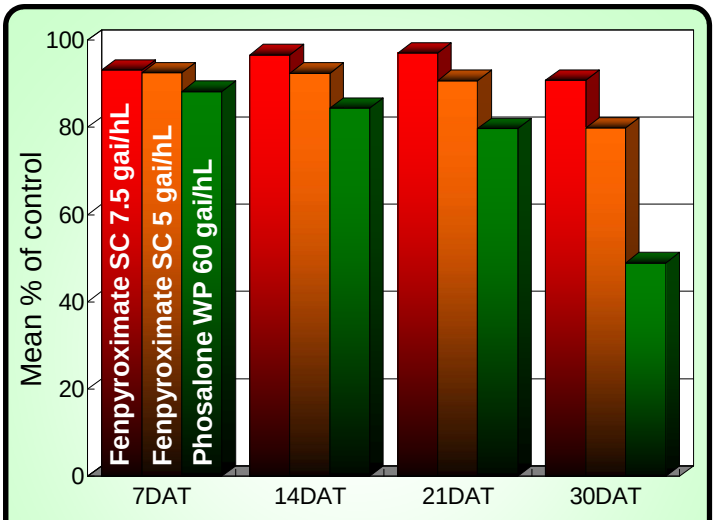
***Diaphorina citri*, Asian citrus psyllid on Citrus**

Location: Henry Yonce, Labelle, FL, USA
Application: 27 August, 2010 (emerging new flush)
Spray volume: 851 L/ha.



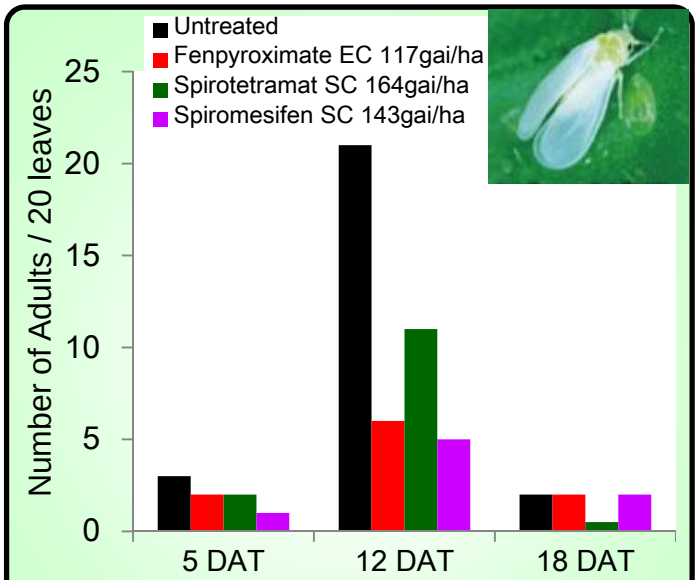
***Peudococcus longispinus*, Long tailed Mealybug on Grapes**

Location: Shepparton VIC, Australia
Application: 7 Feb., 2012.
Spray volume: 1000 L/ha.



***Empoasca vitis*, Grape leafhopper on Grapes**

Location: Reguengos de Monsaraz, Portugal.
Application: 18 July, 2001.
Spray volume: 1022 L/ha.



***Bemisia tabaci*, Tobacco whitefly on Tomato**

Location: UF GCREC, Wimauma, FL, USA
Application: 3 June, 2010
Spray volume: 842 L/ha.

NIHON NOHYAKU CO., LTD.
19-8, KYOBASHI 1-CHOME, CHUO-KU, TOKYO, JAPAN

PICTURE OF COVER
The spider mite is a female adult of citrus red mite eating a grapefruit leaf. The picture was taken using a special technique called Cryo-Scanning Electron Microscopy (Cryo-SEM). The spider mite was instantaneously frozen in liquid nitrogen and photographed in Cryo-SEM under <-100°C of specimen stage. After taking a photograph, the spider mite walked when it's returned to room temperature. This picture is an electron micrograph of a living spider mite taken in the vacuum condition.