



Benzpyrimoxan Technical Guide

Benzpyrimoxan

Benzpyrimoxan (BPX) is a novel insecticidal active ingredient invented by NIHON NOHYAKU CO., LTD. BPX has excellent activity against planthoppers, which are severe pests of rice in many countries.



Your
Best Partner to
Beat Plant hoppers for
Beautiful Paddy fields



The BPX logo is designed with a musical note and staff because BPX is believed to harmonize every element of crop production such as nature, cultivation techniques and crop protection technologies.

Excellent hopper control with novel power

Excellent efficacy against planthoppers in rice

BPX shows good performance against brown planthopper (BPH) and whitebacked planthopper (WBPH).



Nilaparvata lugens
Brown planthopper
(BPH)



Sogatella furcifera
Whitebacked planthopper
(WBPH)

Novel mode of action (MoA)

BPX is an ecdysone titer disruptor. This is a novel MoA which shows unique ecdysis disruption symptoms and does not show cross resistance with existing molecules currently used in planthoppers.

Soft on beneficials

Safe for spiders, mirid bugs, honeybees, etc. BPX has an excellent fit in integrated pest management (IPM) programs by preserving natural enemies.

Physicochemical properties and Toxicology

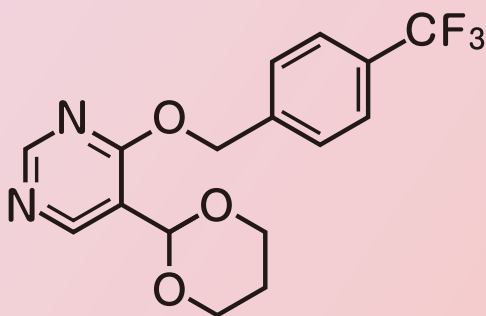
Name

- ▶ Common name: Benzpyrimoxan (ISO)
- ▶ Chemical name: 5-(1,3-dioxan-2-yl)-4-[4-(trifluoromethyl)benzyloxy]pyrimidine (IUPAC)

Physicochemical properties

- ▶ Appearance: Light brown to white colored crystalline powder
- ▶ Solubility in water: 5.04 mg/L (19.9-20.2°C)
- ▶ Partition coefficient: log Pow = 3.42 (24.5°C)

Chemical structure



Toxicology

- ▶ Acute oral: Rat Male LD₅₀ > 2000 mg/kg
 - ▶ Acute dermal: Rat Male and Female LD₅₀ > 2000 mg/kg
 - ▶ Aquatic organisms: Carp LC₅₀ = 2.2 mg/L (96 hours)
 - ▶ Mutagenicity: Ames Negative
 - ▶ Primary eye irritation: Rabbit Slightly irritant
 - ▶ Primary skin irritation: Rabbit Slightly irritant
 - ▶ Skin sensitization: LLNA Non sensitizer
- Maximization test: Sensitizer

Insecticidal spectrum

	Pest		Activity*
Hemiptera	Brown planthopper	<i>Nilaparvata lugens</i>	++++
	White backed planthopper	<i>Sogatella furcifera</i>	+++
	Small brown planthopper	<i>Laodelphax striatella</i>	+++
	Green rice leafhopper	<i>Nephotettix cincticeps</i>	++
	Tea green leafhopper	<i>Jacobiasca formosana</i>	+
	Sorghum plant bug	<i>Stenotus rubrovittatus</i>	+
	Brown wing green bug	<i>Plautia crossota</i>	-
	Cotton aphid	<i>Aphis gossypii</i>	++
	Green peach aphid	<i>Myzus persicae</i>	+
	Sweetpotato whitefly Biotype Q	<i>Bemisia tabaci</i>	+
	Mulberry scale	<i>Pseudaulacaspis pentagona</i>	-
Lepidoptera	Diamond back moth	<i>Plutella xylostella</i>	-
Thysanoptera	Western flower thrips	<i>Frankliniella occidentalis</i>	-
Diptera	Tomato leaf miner	<i>Liriomyza sativae</i>	-
Coleoptera	Rice water weevil	<i>Lissorhoptrus oryzophilus</i>	-
Orthoptera	Rice grasshopper	<i>Oxya</i> spp.	-
Acarina	Two spotted spider mite	<i>Tetranychus urticae</i>	-

BPX selectively controls planthoppers and has low activity on other pests.

*Mortality < 1 +++++ : Excellent
 LC₉₀ 1-3 +++ : High
 [mg a.i./L] 3-30 ++ : Moderate
 30-100 + : Low
 >100 - : Very low or None

Effect of BPX on beneficial organisms

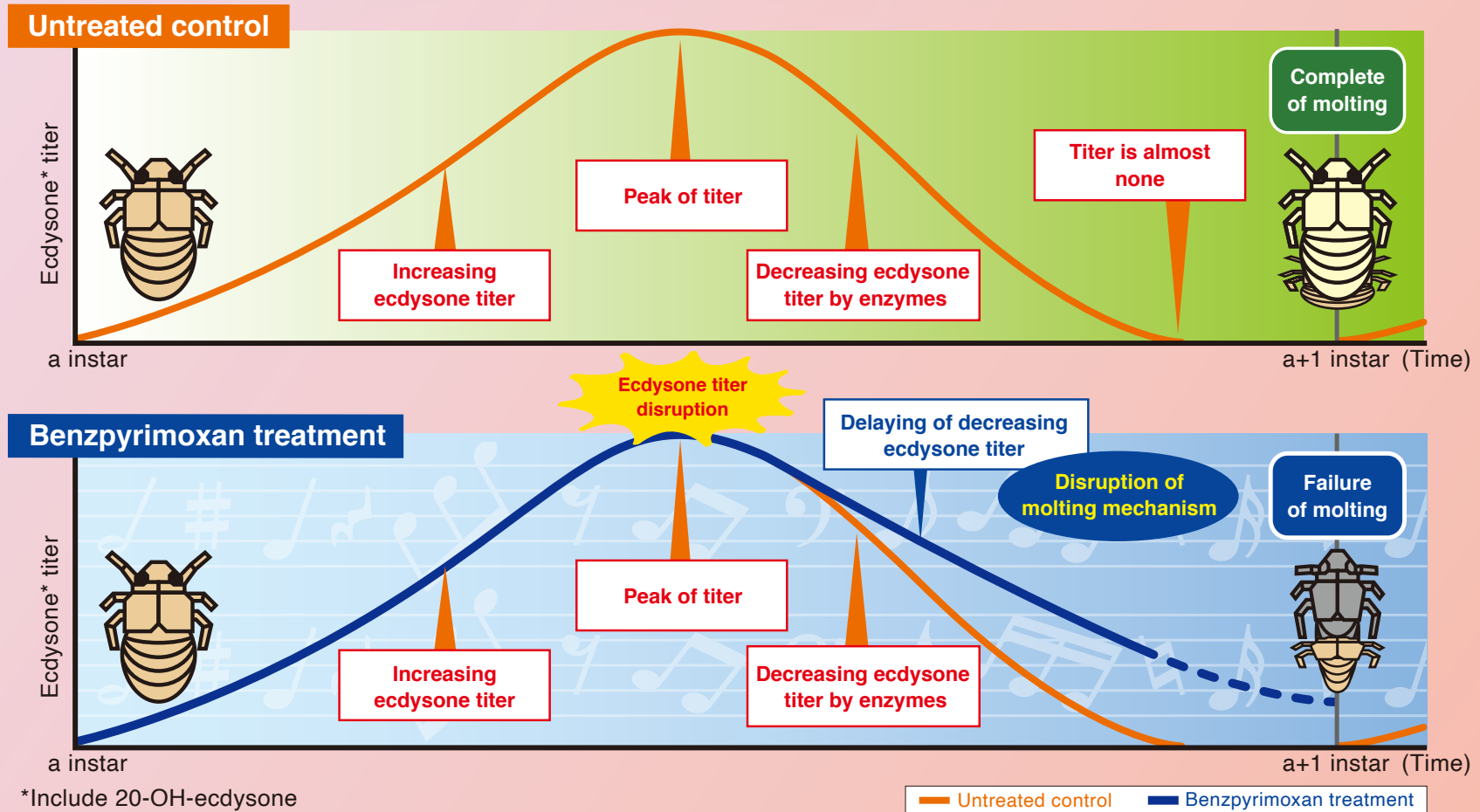
Species	Method		Observation	LC ₅₀ [mg a.i./L]
White butterfly parasite wasp <i>Cotesia glomerata</i>	Pupa	Pupa dipping	After 5 days	> 200
Silk moth <i>Bombyx mori</i>	Larva	Leaf spray	After 5 days	> 100
Phytoseiulus predatory mite <i>Phytoseiulus persimilis</i>	Egg	Egg and feed spray	After 4 days	> 200
Neoseiulus predatory mite <i>Neoseiulus californicus</i>	Egg	Egg and feed spray	After 4 days	> 100
Wolt spider <i>Pardosa pseudoannulata</i>	Adult	Crop spray	After 7 days	> 100
Cyrtorhinus mirid bug <i>Cyrtorhinus lividipennis</i>	Nymph	Feed dipping	After 9 days	> 200
Tytthus mirid bug <i>Tytthus chunensis</i>	Nymph	Feed dipping	After 10 days	> 100
Microvelia water strider <i>Microvelia</i> spp.	Nymph	Nymph and feed spray	After 4 days	> 100

Species	Method		Observation	LD ₅₀ , LC ₅₀
Western honey bee <i>Apis mellifera</i>	Adult	Acute oral	After 48 hrs	> 100 µg a.i./bee
		Acute dermal	After 48 hrs	> 100 µg a.i./bee
	Hive	Greenhouse Spray for crop	After 19 days	No effect for larvae (100 mg a.i./L)

Beneficial organisms are highly tolerant to BPX, which makes BPX an excellent fit for IPM.

Mode of Action

BPX interferes with ecdysone metabolism which causes ecdysone titers to remain higher than normal during the molting process. As a result, ecdysis is disrupted leading to the planthopper's death.



Symptoms of BPX in BPH

 BPX applied to BPH 4th instar (25 °C)

Start of molting



After 3 min.



Dorsal epidermis crack

After 5 min.

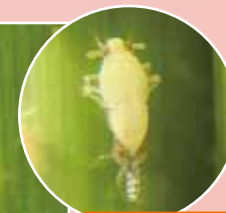


Appear the head of 5th instar

After 10 min.



Continual trying of molting



Finish of molting by normal nymph

After 15 min.



Behavior become dull

After 30 min.



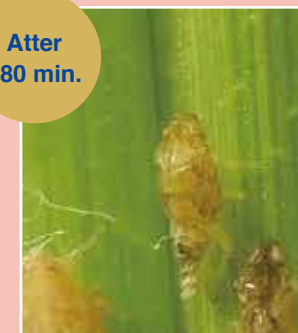
Behavior become dull more

After 60 min.



Stop molting behavior

After 180 min.



Dead

Nymph dies during molting.

Stage wise insecticidal activity for BPH



1st instar



3rd instar



5th instar



Adult

LC ₉₀ [mg a.i./L]				
1 st instar	3 rd instar	5 th instar (0 days old)	5 th instar (1-2 days old)	Adult
0.3-1	0.3-1	0.3-1	> 3	> 100

High insecticidal activity against the nymphal stage.

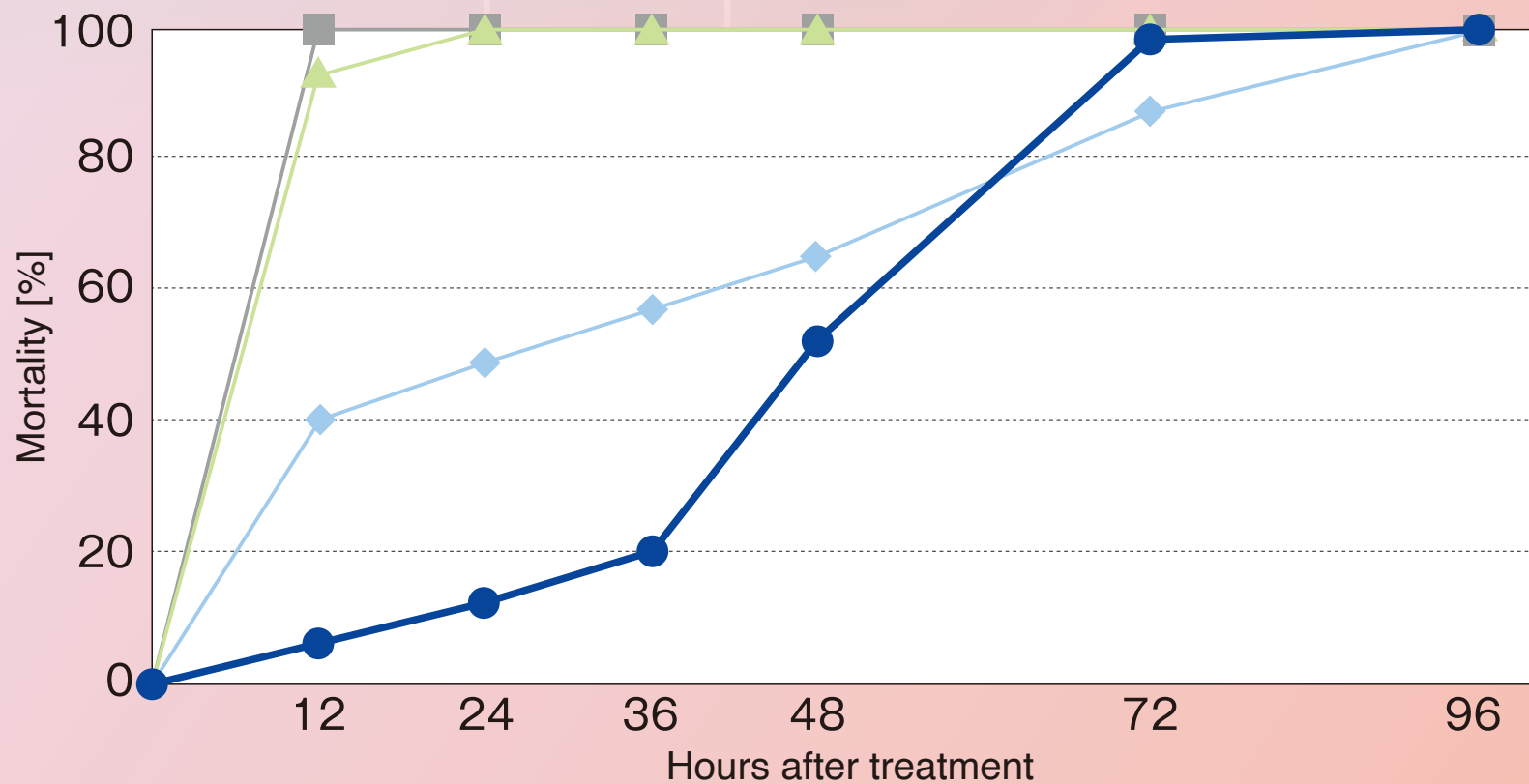
Uptake pathway

LC90 [mg a.i./L] against BPH 3 rd instar		
Dermal + Oral	Dermal	Oral
0.3-1	0.3-1	1

Both dermal and oral exposure contributes to the insecticidal activity of BPX.

Speed of action

against BPH 4th instar (25 °C)

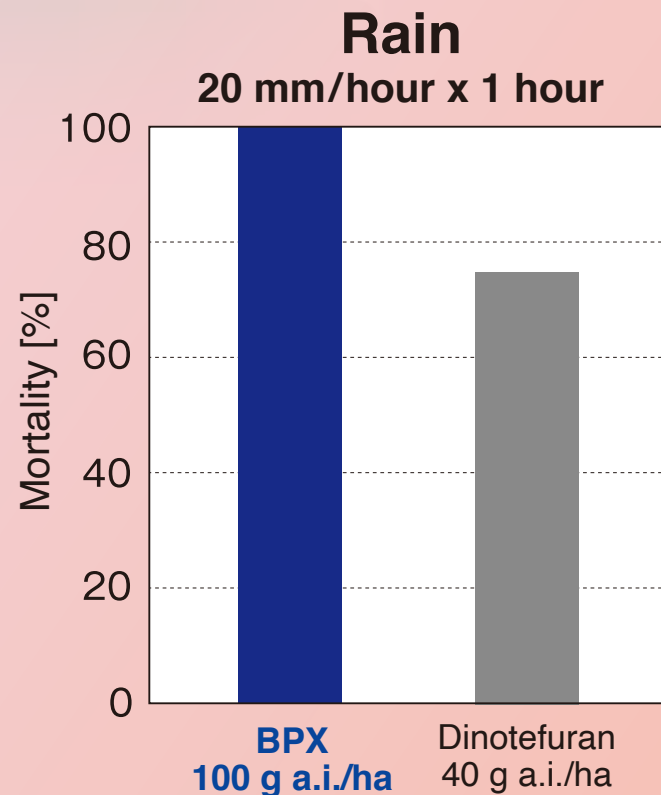
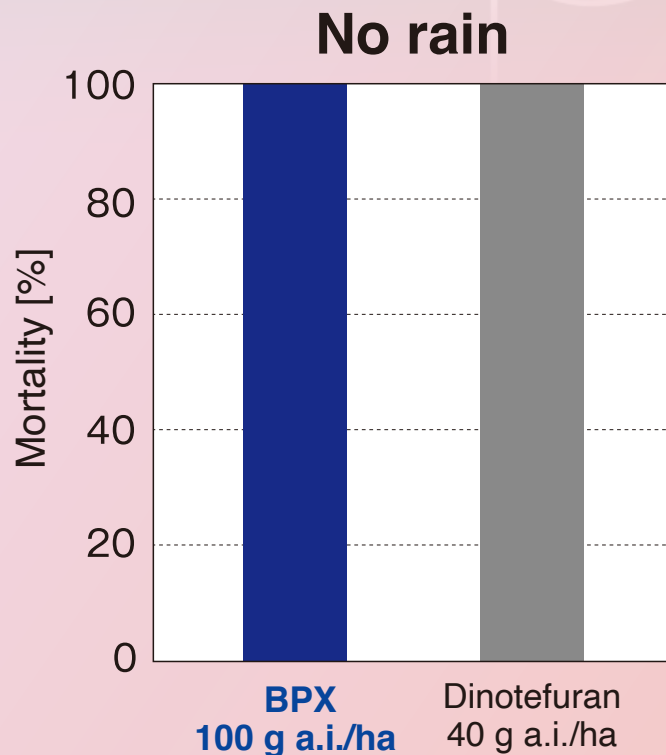


BPX requires 3-4 days to induce BPH mortality due to BPX's MoA.

- BPX (100 mg a.i./L)
- ◆ Buprofezin (200 mg a.i./L)
- ▲ Dinotefuran (67 mg a.i./L)
- Etofenprox (100 mg a.i./L)

Rainfastness on rice

 against BPH 3rd instar (23-29 °C)



Artificial rainfall was applied 2 days after treatment before BPH nymphs were released on rice. Mortality was calculated at 7-9 days after releasing nymphs.

BPX shows good rainfastness. Once the spray solution has dried, BPX treatments followed by a rain-simulation have equal efficacy to treatments not followed by a rain-simulation.

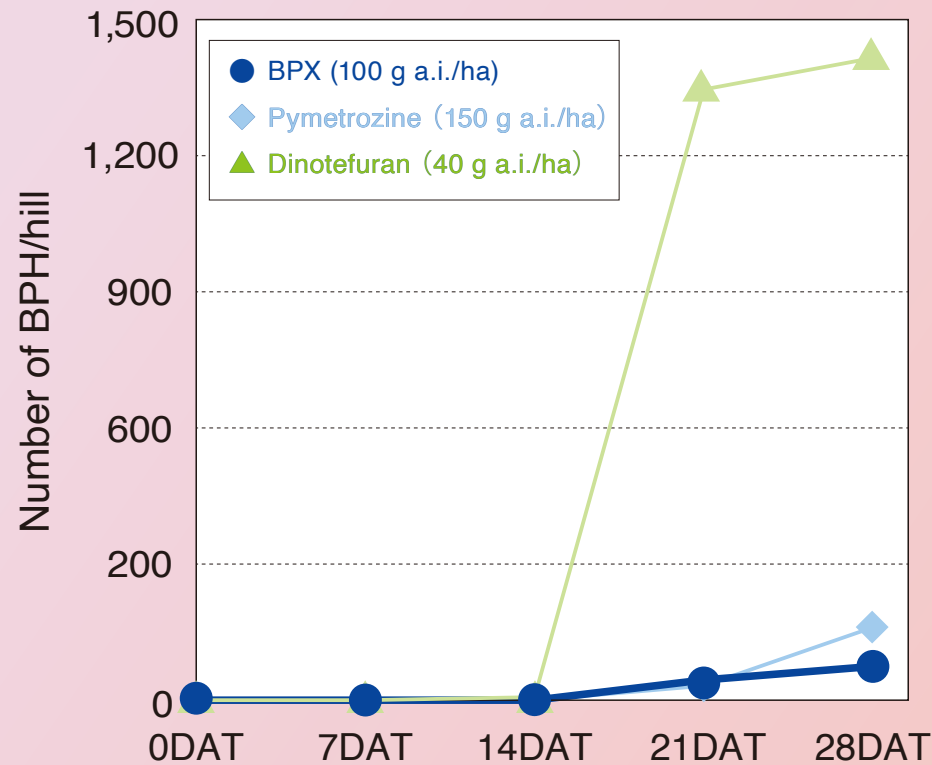
Insecticidal activity against wild populations of BPH

Population	Year collected	LC90 [mg a.i./L]	
		BPX	Dinotefuran
Karnataka, India	2018	0.1-0.3	1-3
Andhra Pradesh, India	2019	0.1-0.3	1-3
Wakayama, Japan (Susceptible population)	1983	0.3-1	0.03-0.1

BPX shows high activity against wild populations of BPH, which is comparable to that of the susceptible population.

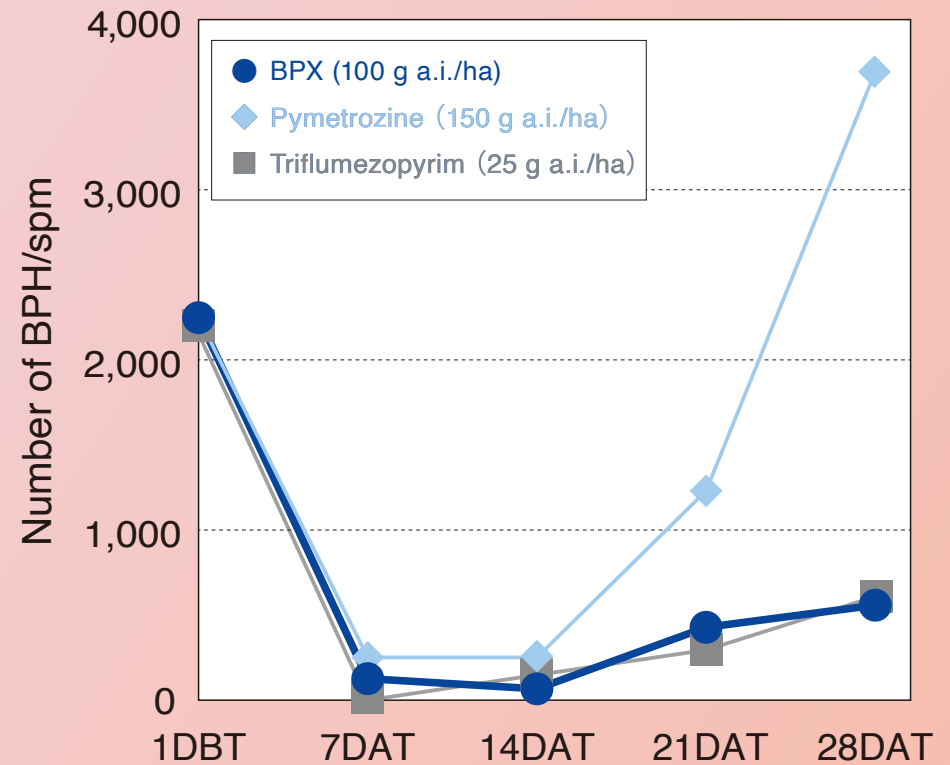
Field trial

India (2021)



Place: West Godavari, Andhra Pradesh
 Date: 6th Jan., 2021(Planting), 26th Feb., 2021(Spray)
 Spray volume: 500 L/ha Rainfall in trial period: None Rice variety: Swarna

Vietnam (2020)



Place: Thạnh Trị, Sóc Trăng
 Date: 1st Jun., 2020(Sowing), 8th Jul., 2020(Spray)
 Spray volume: 400 L/ha Rainfall in trial period: None Rice variety: ST24

DAT = day after treatment DBT = day before treatment

BPX controls BPH for at least 14 days.

FAQ

Q Does BPX have any efficacy against adult hoppers?

A: BPX has not been shown to cause mortality in adults. There is also no evidence of sub-lethal effects such as reduced life-span or reduced fecundity.

Q Is there phytotoxicity risk by BPX treatment for rice?

A: Phytotoxicity risk for rice is very low, so BPX is a crop friendly solution for hopper control.

Q Does BPX show systemic action?

A: BPX has no or very low systemic action. Good spray coverage is required for best efficacy.

Q Does BPX show vapor action?

A: No vapor action from BPX has been detected.

Q How many times can BPX be sprayed in one crop season?

A: For resistance management purposes, no more than one application per season is recommended.

