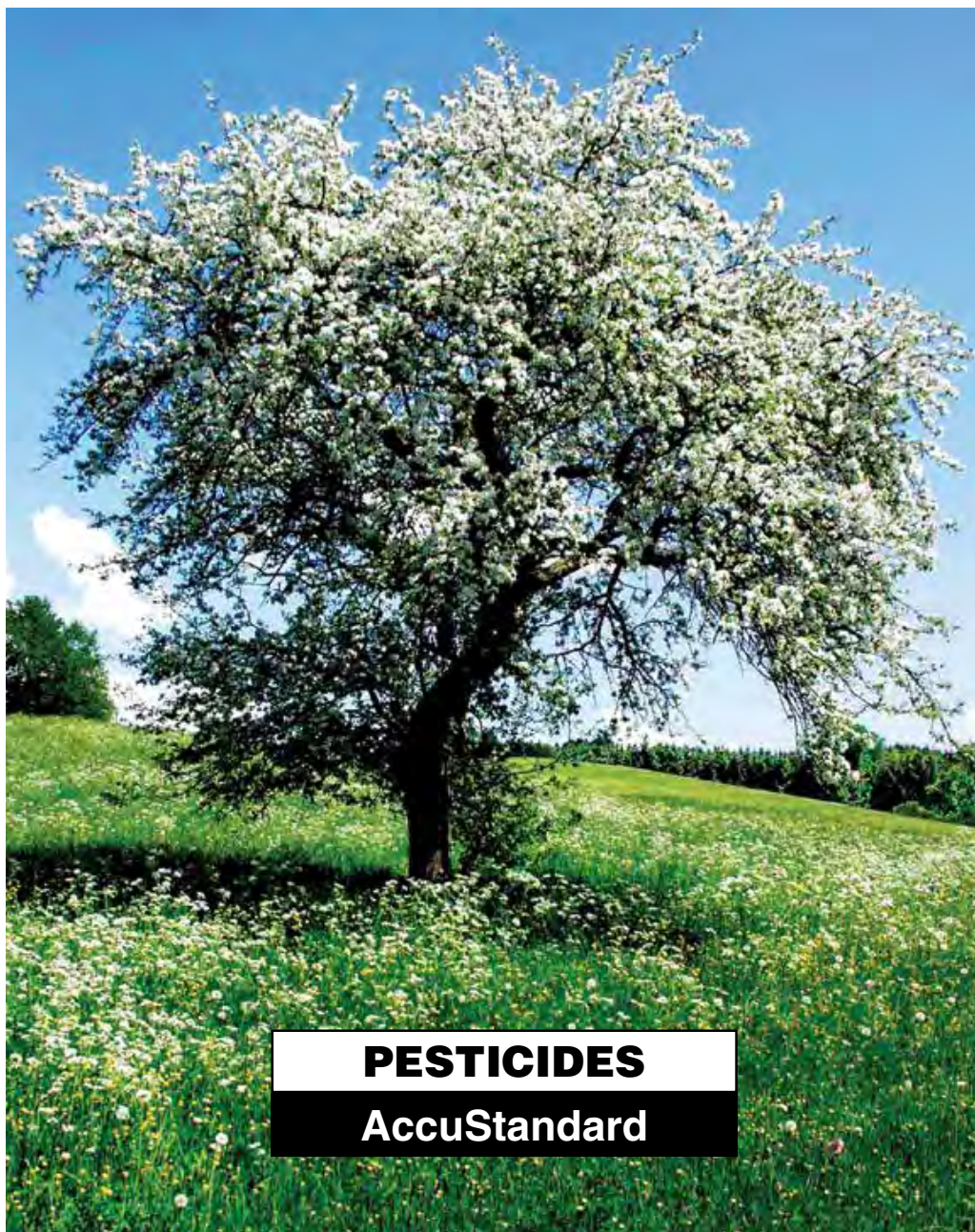




# Certified Reference Standards

## Fipronil, its Metabolites & Neonicotinoids

Link to the decline  
in Bee Populations



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## UPDATE...honeybee colony collapse disorder (CCD)

On-going research into honeybee colony collapse disorder (CCD) has revealed that pesticides may be a contributing factor. A recent article in TIME magazine has highlighted the continuing disappearance of honeybees. There are several possibilities any one of which may be solely responsible or working synergistically to contribute to the honeybee decline. Included in this group are the Neonicotinoid pesticides. More recently, Fipronil and Fipronil metabolites also have been suspected as possible causative agents.



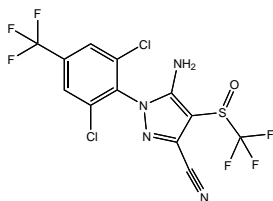
### Fipronil, and its Metabolites

- Linked to the decline of honeybees
- Fipronil is in the phenyl pyrazole class of pesticides
- Fipronil is a broad-spectrum insecticide used in commercial products such as flea and tick control pet collars
- Anaerobic metabolism in soil results in Fipronil sulfide
- Oxidative degradation in soil results in the metabolite Fipronil sulfone
- Photodegradation results in the formation of a very persistent metabolite, Fipronil desulfinyl
- Fipronil metabolites are more toxic to organisms than the parent compound

#### Fipronil Standards

##### Fipronil

(±)-5-Amino-1-(2,6-dichloro-α,α,α-trifluoro-p-tolyl)-4-trifluoromethylsulfanyl pyrazole-3-carbonitrile

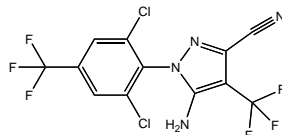


**CAS** 120068-37-3 **MF** C<sub>12</sub>H<sub>14</sub>Cl<sub>2</sub>F<sub>6</sub>N<sub>4</sub>OS **MW** 437.16  
**PS** S **SOL** A, D, T **SG** 1.87 g/cm<sup>3</sup>  
**MP** 196 - 202 °C **BP** 510 °C **FP** 262 °C

Matrix	Cat. No.	Unit
Neat	P-738N	10 mg
100 µg/mL in MeOH	P-738S *	1 mL
100 µg/mL in Acetone	P-738S-A	1 mL

##### Fipronil Desulfinyl

5-Amino-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-(trifluoromethyl)-1H-pyrazole-3-carbonitrile

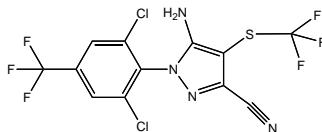


**CAS** 205650-65-3 **MF** C<sub>12</sub>H<sub>14</sub>Cl<sub>2</sub>F<sub>6</sub>N<sub>4</sub> **MW** 389.08  
**MP** 189-190 °C

Matrix	Cat. No.	Unit
100 µg/mL in Acetone	P-782S-A	1 mL

##### Fipronil Sulfide

5-Amino-1-(2,6-dichloro-4-trifluoromethylphenyl)-4-(trifluoromethyl)thiopyrazole-3-carbonitrile

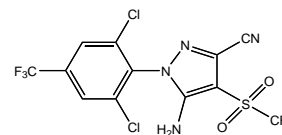


**CAS** 120067-83-6 **MF** C<sub>12</sub>H<sub>14</sub>Cl<sub>2</sub>F<sub>6</sub>N<sub>2</sub>S **MW** 421.15  
**PS** S **SG** 1.76 g/cm<sup>3</sup> **MP** 184-185 °C **BP** 393 °C  
**FP** 192 °C

Matrix	Cat. No.	Unit
Neat	P-781N-5MG	5 mg
100 µg/mL in Acetone	P-781S-A	1 mL

##### Fipronil Sulfone

5-Amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4-(trifluoromethyl)sulfonyl-1H-pyrazole-3-carbonitrile



**CAS** 120068-36-2 **MF** C<sub>12</sub>H<sub>14</sub>Cl<sub>2</sub>F<sub>6</sub>N<sub>4</sub>O<sub>2</sub>S **MW** 453.15 **PS** S **SG** 1.85 g/cm<sup>3</sup> **MP** 207 - 208 °C  
**BP** 532 °C **FP** 275 °C

Matrix	Cat. No.	Unit
100 µg/mL in Acetone	P-780S-A *	1 mL

#### Fipronil & Metabolite Kit

**P-FIP-MET-KIT \*** **4 x 1 mL**  
Each in 100 µg/mL in Acetone

Fipronil (P-738S-A)  
Fipronil sulfone (P-780S-A)  
Fipronil sulfide (P-781S-A)  
Fipronil desulfinyl (P-782S-A)

\* To delay premature breakdown of thermally labile products in transit a **ColdPAK** is recommend.

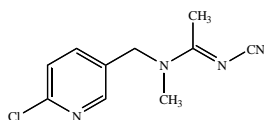
- Featured in the TIME magazine article on honeybee decline, August 19, 2013
- Linked to the decline of honeybees and maybe a contributing factor in colony collapse disorder (CCD)
- Toxicity levels may not kill bees directly; low level exposures may limit the ability of honeybees to forage, collect pollen and return to their hive
- Besides direct contamination, Neonicotinoids exposure can be from dust, pollen and/or nectar



### Neonicotinoid Standards

#### Acetamiprid

N-((6-chloro-3-pyridinyl)methyl)-N'-cyano-N-methylethanimidamide

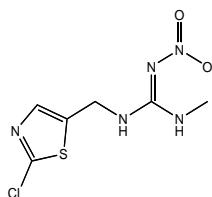


**CAS** 135410-20-7 **MF** C<sub>10</sub>H<sub>11</sub>ClN<sub>3</sub> **MW** 222.67  
**PS S SOL** H, D, A **SG** 1.33 g/cm<sup>3</sup> **MP** 98 - 99 °C  
**BP** ~350 °C **FP** 167 °C

Matrix	Cat. No.	Unit
Neat	P-820N	10 mg
100 µg/mL in AcCN	P-820S-CN	1 mL

#### Clothianidin

(E)-1-(2-chloro-1,3-thiazol-5-ylmethyl)-3-methyl-2-nitroguanidine

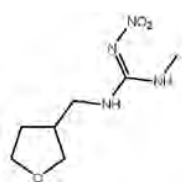


**CAS** 210880-92-5 **MF** C<sub>8</sub>H<sub>8</sub>ClN<sub>3</sub>O<sub>2</sub>S **MW** 249.68  
**PS S SOL** A, AE **SG** 1.68 g/cm<sup>3</sup> **MP** 145-147 °C  
**BP** 435 °C **FP** 217 °C

Matrix	Cat. No.	Unit
Neat	P-947N	10 mg
100 µg/mL in MeOH	P-947S	1 mL

#### Dinotefuran

(RS)-1-Methyl-2-nitro-3-(tetrahydro-3-furylmethyl)guanidine

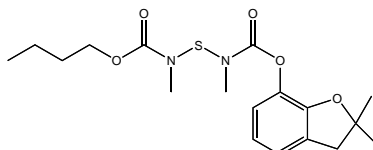


**CAS** 165252-70-0 **MF** C<sub>7</sub>H<sub>14</sub>N<sub>3</sub>O<sub>3</sub> **MW** 202.21 **PS S**  
**SOL T SG** 1.42 g/cm<sup>3</sup> **MP** 107-108 °C  
**BP** Decomposes ~208 °C **FP** N/A

Matrix	Cat. No.	Unit
100 µg/mL in AcCN	P-986S-CN	1 mL

#### Furathiocarb

2,3-Dihydro-2,2-dimethyl-7-benzofuryl 2,4-dimethyl-6-oxa-5-oxo-3-thia-2,4-diazadecanoate

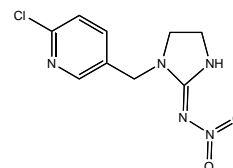


**CAS** 65907-30-4 **MF** C<sub>16</sub>H<sub>26</sub>N<sub>2</sub>O<sub>5</sub>S **MW** 382.48  
**PS S SG** 1.15 g/cm<sup>3</sup> **MP** 42.6 - 45.7 °C  
**BP** 160 °C **FP** N/A

Matrix	Cat. No.	Unit
100 µg/mL in MeOH	P-569S	1 mL

#### Imidacloprid

1-(6-Chloro-3-pyridinylmethyl)-N-nitro-2-imidazolidinimine



**CAS** 138261-41-3 **MF** C<sub>9</sub>H<sub>10</sub>ClN<sub>3</sub>O<sub>2</sub> **MW** 255.66  
**PS S SOL** D, IPA, T **SG** 1.54 g/cm<sup>3</sup> **MP** 144 °C  
**BP** N/A **FP** N/A

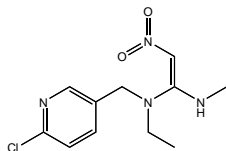
Matrix	Cat. No.	Unit
Neat	P-596N	10 mg
100 µg/mL in MeOH	P-596S	1 mL

Property Key		Solubility Key (SOL)	
<b>CAS</b>	Chemical Abstract Service Number	<b>A</b>	Acetone
<b>MF</b>	Molecular Formula	<b>CN</b>	Acetonitrile (AcCN)
<b>MW</b>	Molecular Weight	<b>D</b>	Methylene chloride
<b>PS</b>	Physical State (Solid, Liquid)	<b>DMSO</b>	Dimethyl sulfoxide
<b>SOL</b>	Solubility	<b>EA</b>	Ethyl acetate
<b>SG</b>	Specific Gravity (g/cm <sup>3</sup> )	<b>H</b>	Hexane
<b>MP</b>	Melting Point (°C)	<b>IPA</b>	Isopropanol
<b>BP</b>	Boiling Point (°C)	<b>MeOH</b>	Methanol
<b>FP</b>	Flash Point (°C)	<b>MC</b>	Methyl cellosolve
		<b>T</b>	Toluene
		<b>TP</b>	Isooctane
		<b>W</b>	Water

Additional Neonicotinoid Standards  
on next page

### Nitenpyram

(E)-N-(6-chloro-3-pyridylmethyl)-N-ethyl-N'-methyl-2-nitrovinylidenediamine

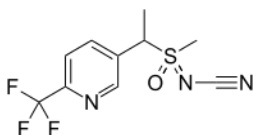


**CAS** 120738-89-8 **MF** C<sub>11</sub>H<sub>15</sub>ClN<sub>3</sub>O<sub>2</sub> **MW** 270.72  
**PS S SOL** MeOH, D, A **SG** 1.40 g/cm<sup>3</sup> **MP** 82 °C  
**BP** N/A **FP** >70 °C

Matrix	Cat. No.	Unit
Neat	P-858N	10 mg
100 µg/mL in AcCN	P-858S-CN	1 mL

### Sulfoxaflor

N-[Methoxyoxodio][1-(6-trifluoromethyl)-3-pyridyl]ethyl]-y4-sulfanylidene]cyanamide

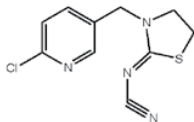


**CAS** 946578-00-3 **MF** C<sub>10</sub>H<sub>10</sub>F<sub>3</sub>N<sub>3</sub>OS **MW** 277.27  
**PS S SOL** A, EA, MeOH **SG** 1.52 g/cm<sup>3</sup>  
**MP** 112.9 °C **BP** 363.8 °C **FP** 173.8 °C

Matrix	Cat. No.	Unit
100 µg/mL in MeOH	P-1133S	1 mL

### Thiacloprid

(3-((6-Chloro-3-pyridinyl)methyl)-2-thiazolidinylidene) cyanamide

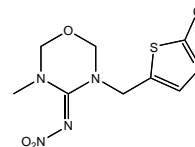


**CAS** 111988-49-9 **MF** C<sub>10</sub>H<sub>9</sub>ClN<sub>3</sub>S **MW** 252.72  
**PS S SOL** H, A, EA **SG** 1.46 g/cm<sup>3</sup> **MP** 136 °C  
**BP** Decomposes ~270 °C **FP** 210 °C

Matrix	Cat. No.	Unit
Neat	P-838N	10 mg
100 µg/mL in AcCN	P-838S-CN	1 mL

### Thiamethoxam

3-(2-Chloro-5-thiazolylmethyl)tetrahydro-5-methyl-N-nitro-4H-1,3,5-oxadiazin-4-imine



**CAS** 153719-23-4 **MF** C<sub>8</sub>H<sub>10</sub>ClN<sub>3</sub>O<sub>3</sub>S **MW** 291.72  
**PS S SOL** A, EA, T **SG** 0.47 g/cm<sup>3</sup> **MP** 140 °C  
**BP** N/A **FP** N/A

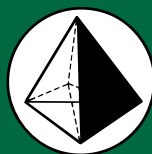
Matrix	Cat. No.	Unit
Neat	P-866N	10 mg
100 µg/mL in AcCN	P-866S-CN	1 mL

#### Property Key

**CAS** Chemical Abstract Service Number  
**MF** Molecular Formula  
**MW** Molecular Weight  
**PS** Physical State (Solid, Liquid)  
**SOL** Solubility  
**SG** Specific Gravity (g/cm<sup>3</sup>)  
**MP** Melting Point (°C)  
**BP** Boiling Point (°C)  
**FP** Flash Point (°C)

#### Solubility Key (SOL)

**A** Acetone  
**CN** Acetonitrile (AcCN)  
**D** Methylene chloride  
**DMSO** Dimethyl sulfoxide  
**EA** Ethyl acetate  
**H** Hexane  
**IPA** Isopropanol  
**MeOH** Methanol  
**MC** Methyl cellosolve  
**T** Toluene  
**TP** Isooctane  
**W** Water



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