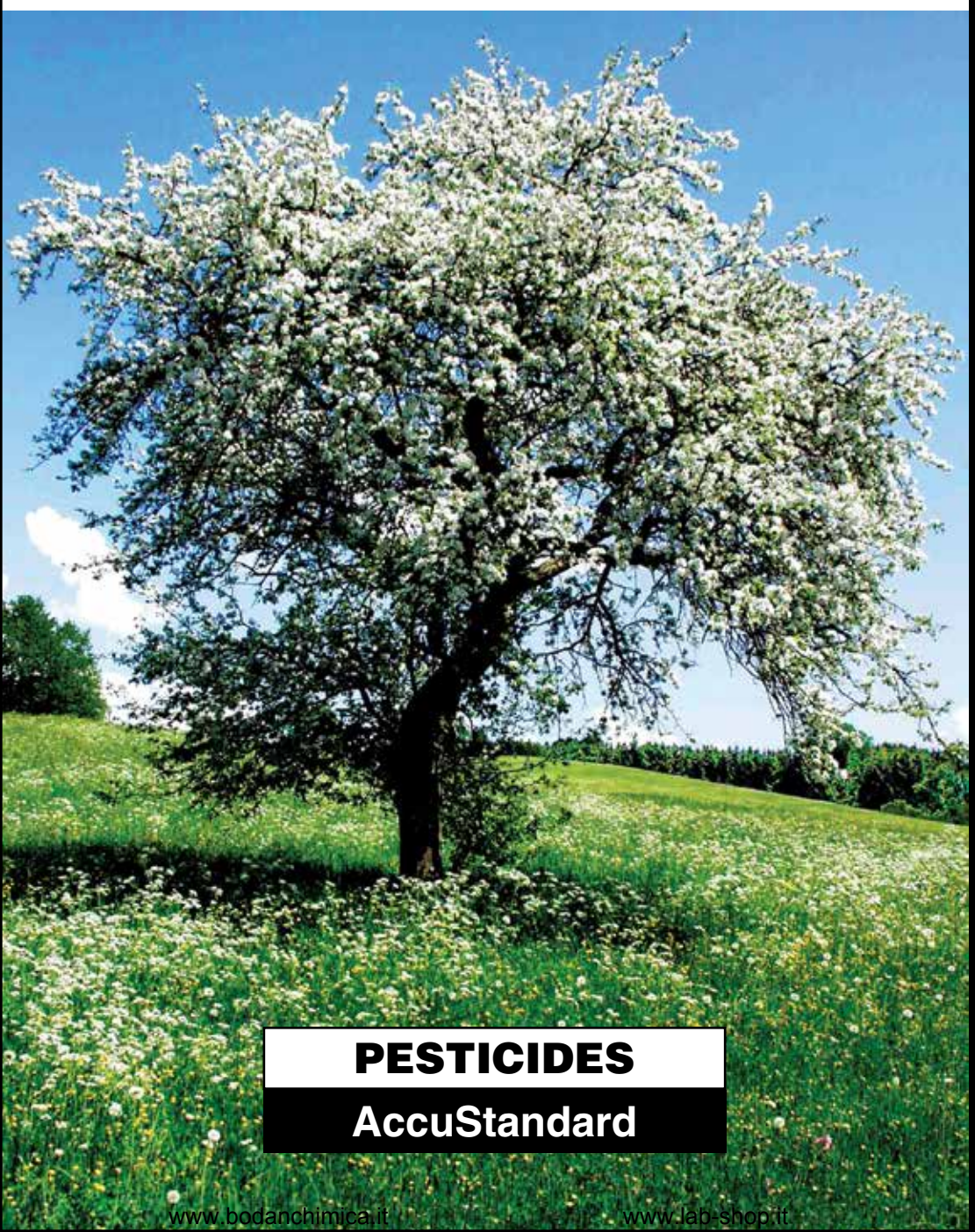
Certified Reference Standards

Neonicotinoids Fipronil, its Metabolites &

Link to the Decline in Bee Populations



PESTICIDES

AccuStandard

Honeybee Colony Collapse Disorder (CCD)

Neonicotinoid pesticides have been linked to Colony Collapse Disorder (CCD) and directly to bee fatalities.

Now, researchers believe that neonicotinoids also produce long-term adverse effects on the quality and efficiency of bee pollination.

Based on a recently published article in C&EN (Nov. 23, 2015), it appears that bees exposed to these pesticides become less effective pollinators. According to the article, bee colonies exposed to a neonicotinoid pesticide visited apple blossoms less frequently and carried less pollen to their hives. The authors conclude that "This shows that exposure to pesticide can reduce the delivery of pollination services by bumblebees".

A related event involves a lawsuit against the US EPA to ban the pesticide Sulfoxaflor. This pesticide uses a mode of action similar to that of the neonicotinoids, and may have the same adverse effect on bees. Environmental and beekeeper groups won the lawsuit forcing the EPA to ban the sale of the pesticide.

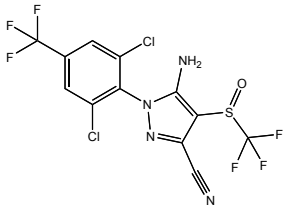
Fipronil, and its Metabolites

- 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-alpha,alpha, alpha-trifluoro-p-tolyl)-4-trifluoromethylsulfinyl pyrazole-3-carbonitrile



CAS 120068-37-3 **MF** $C_{12}H_4Cl_2F_6N_4OS$ **MW** 437.16
PS S **SG** 1.87 g/cm^3 **MP** 196-202 °C **BP** 510 °C
FP 262 °C **SOL** M,A,D,H,T,CN,TP,EA

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

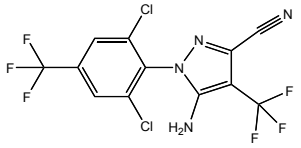
Fipronil & Metabolite Kit

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)

Fipronil desulfinyl

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

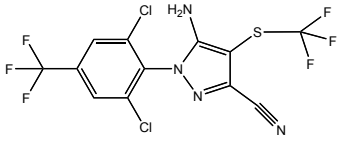


CAS 205650-65-3 **MF** $C_{12}H_4Cl_2F_6N_4$ **MW** 389.08
MP 189-190 °C **SOL** A,D,CN

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

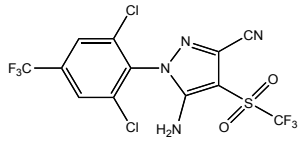


CAS 120067-83-6 **MF** $C_{12}H_4Cl_2F_6N_4S$ **MW** 421.15
PS S **SG** 1.76 g/cm^3 **MP** 184-185 °C **BP** 393 °C
FP 192 °C **SOL** A,D,CN

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** $C_{12}H_4Cl_2F_6N_4O_2S$
MW 453.15 **PS** S **SG** 1.85 g/cm^3 **MP** 207-208 °C
BP 532 °C **FP** 275 °C **SOL** A,D,CN

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

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

❄ **ColdPAK** is recommend to maintain integrity of product

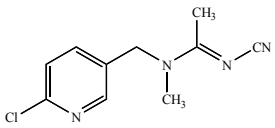
Neonicotinoids

- 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

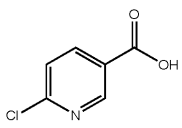


CAS 135410-20-7 **MF** $C_{10}H_{11}ClN_4$ **MW** 222.67
PS S **SG** 1.33 g/cm^3 **MP** 98-99 °C **BP** ~350 °C
FP 167 °C **SOL** M,A,D,CN,EA,H

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

6-Chloropyridine-3-carboxylic acid

6-Chloronicotinic acid

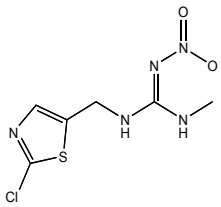


CAS 5326-23-8 **MF** $C_6H_4ClNO_2$ **MW** 157.55 **PS** S
SG 1.50 g/cm^3 **MP** 190-192 °C **FP** 150 °C **SOL** M

Matrix	Cat. No.	Unit
NEAT	P-1267N	10 mg
100 µg/mL in MeOH	P-1267S ♟	1 mL

Clothianidin

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

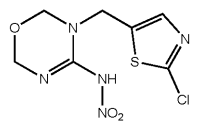


CAS 210880-92-5 **MF** $C_6H_8ClN_5O_2S$ **MW** 249.68
PS S **SG** 1.68 g/cm^3 **MP** 145-147 °C **BP** 435 °C
FP 217 °C **SOL** A,EA,D,M,CN,W

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

N-Desmethylthiamethoxam

3-[(2-Chloro-1,3-thiazol-5-yl)methyl]-N-nitro-1,3,5-oxadiazinan-4-imine

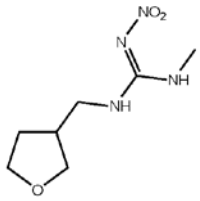


CAS 171103-04-1 **MF** $C_7H_8ClN_5O_3S$ **MW** 277.69
PS S **SOL** M

Matrix	Cat. No.	Unit
100 µg/mL in MeOH	P-1266S	1 mL

Dinotefuran

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

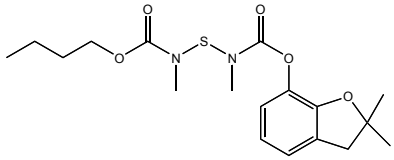


CAS 165252-70-0 **MF** $C_7H_{14}N_4O_3$ **MW** 202.21
PS S **SG** 1.42 g/cm^3 **MP** 107-108 °C
BP Decomposes~208 °C **SOL** M,CN,H,T

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



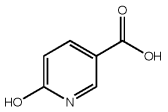
CAS 65907-30-4 **MF** $C_{18}H_{26}N_2O_5S$ **MW** 382.48
PS S **SG** 1.15 g/cm^3 **MP** 42.6-45.7 °C **BP** 160 °C
SOL M,A,T,H,CN,IPA

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

♟ Pesticides containing a carboxyl group may autoesterify in Methanol. These standards are intended for use after making the methyl derivative. For analysis of the parent compound we suggest a non-hydroxylic solvent such as Acetonitrile.

6-Hydroxypyridine-3-carboxylic acid

2-Hydroxy-5-pyridinecarboxylic acid, 6-Hydroxynicotinic acid

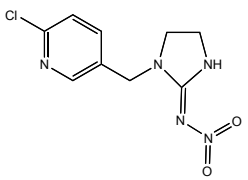


CAS 5006-66-6 **MF** $C_6H_5NO_3$ **MW** 139.11 **PS** S
SG 1.50 g/cm^3 **MP** 314-316 °C **BP** >400 °C
FP >200 °C **SOL** M

Matrix	Cat. No.	Unit
NEAT	P-1226N	10 mg
100 µg/mL in MeOH	P-1226S ♟	1 mL

Imidaclorid

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



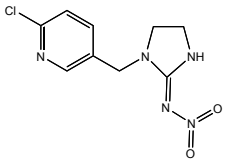
Marathon, Merit

CAS 138261-41-3 **MF** $C_9H_{10}ClN_5O_2$ **MW** 255.66
PS S **SG** 1.54 g/cm^3 **MP** 144 °C
SOL M,A,D,CN,EA,T,H,W,IPA

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

2-Imidazolidone

N,N'-Ethyleneurea



2-Oxoimidazolidine

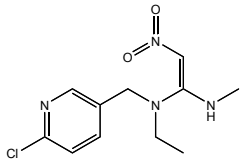
CAS 120-93-4 **MF** $C_3H_6N_2O$ **MW** 86.09 **PS** S
SG 1.15 g/cm^3 **MP** 129-132 °C **FP** 265 °C **SOL** M

Matrix	Cat. No.	Unit
NEAT	P-1224N	10 mg
100 µg/mL in MeOH	P-1224S ❄	1 mL

Neonicotinoid Standards continued on back

Nitenpyram

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

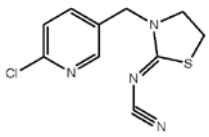


CAS 120738-89-8 **MF** $C_{11}H_{15}ClN_4O_2$ **MW** 270.72
PS S **SG** 1.40 g/cm^3 **MP** 82 °C **FP** >70 °C
SOL M,A,CN,W,D,EA,T

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

Thiacloprid

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



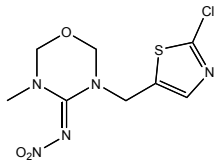
Calypso

CAS 111988-49-9 **MF** $C_{10}H_9ClN_4S$ **MW** 252.72
PS S **SG** 1.46 g/cm^3 **MP** 136 °C
SOL W,H,D,A,EA,CN,DMSO,M

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

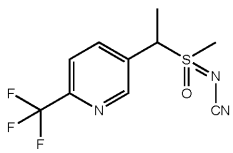


CAS 153719-23-4 **MF** $C_8H_{10}ClN_5O_3S$ **MW** 291.72
PS S **SG** 0.47 g/cm^3 **MP** 140 °C
SOL W,A,EA,D,T,M,H,CN

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

Sulfoxaflor

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

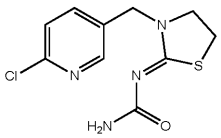


CAS 946578-00-3 **MF** $C_{10}H_{10}F_3N_3OS$ **MW** 277.27
PS S **SG** 1.52 g/cm^3 **MP** 112-113 °C
BP Decomposes ~167 °C **SOL** M

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

Thiacloprid-amide

[3-(6-Chloro-3-pyridylmethyl)thiazolidin-2-ylidene] urea



CAS 676228-91-4 **MF** $C_{10}H_{11}ClN_4OS$ **MW** 270.74
PS S **SG** 1.50 g/cm^3 **MP** 171 °C **BP** >400 °C
FP >200 °C **SOL** M,CN

Matrix	Cat. No.	Unit
100 µg/mL in MeOH	P-1223S	1 mL