

A World Compendium

The Pesticide Manual

Twentieth Edition


Editor: J A Turner

SAMPLE MAIN ENTRY PAGE



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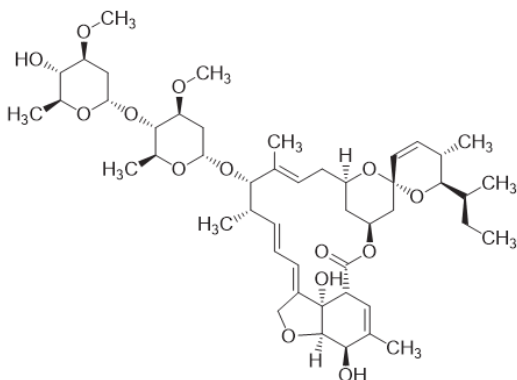
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1 abamectin

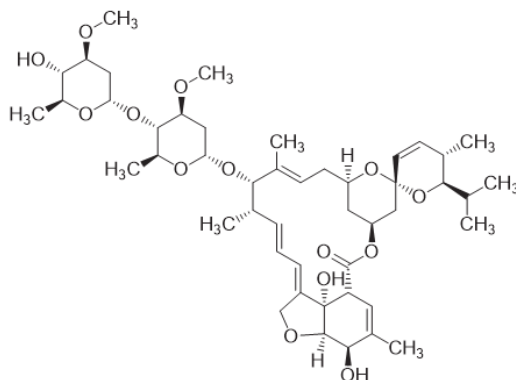
Acaricide; Insecticide; Nematicide

Target Site Glutamate-gated chloride channel (GluCl) allosteric modulation

Class avermectin IRAC 6 IRAC Nematicide N-2



avermectin B_{1a}



avermectin B_{1b}

Main Entries

NOMENCLATURE:

abamectin

Common name: abamectin (BSI, E-ISO, ANSI); abamectine ((f) F-ISO)

Chemical Abstracts name Avermectin B₁ **CAS RN** [71751-41-2] **Other Names** avermectin

B1 **Development codes** MK 0936 (Merck & Co.); C 076 (Ciba); L-676863 (Merck & Co.)

EPA PC code 122804

avermectin B_{1a}

IUPAC name (10E,14E,16E)-(1R,4S,5'S,6S,6'R,8R,12S,13S,20R,21R,24S)-6'-[(S)-sec-butyl]-21,24-dihydroxy-5',11,13,22-tetramethyl-2-oxo-3,7,19-trioxatetracyclo[15.6.1.^{14,8}.

0^{20,24}]pentacos-10,14,16,22-tetraene-6-spiro-2'-(5',6'-dihydro-2'H-pyran)-12-yl 2,6-dideoxy-4-

O-(2,6-dideoxy-3-O-methyl- α -L-*arabino*-hexopyranosyl)-3-O-methyl- α -L-*arabino*-hexopyranoside

Chemical Abstracts name 5-O-demethylavermectin A_{1a} **CAS RN** [65195-55-3] **EC No.**

265-610-3

avermectin B_{1b}

IUPAC name (10E,14E,16E)-(1R,4S,5'S,6S,6'R,8R,12S,13S,20R,21R,24S)-21,24-dihydroxy-6'-isopropyl-5',11,13,22-tetramethyl-2-oxo-3,7,19-trioxatetracyclo[15.6.1.^{14,8}.

0^{20,24}]pentacos-10,14,16,22-tetraene-6-spiro-2'-(5',6'-dihydro-2'H-pyran)-12-yl 2,6-dideoxy-4-

O-(2,6-dideoxy-3-O-methyl- α -L-*arabino*-hexopyranosyl)-3-O-methyl- α -L-*arabino*-hexopyranoside

Chemical Abstracts name 5-O-demethyl-25-de(1-methylpropyl)-25-(1-methylethyl)avermectin

A_{1a} **CAS RN** [65195-56-4] **EC No.** 265-611-9

PHYSICAL CHEMISTRY:

abamectin

Composition Mixture containing >80% avermectin B_{1a} and <20% avermectin B_{1b}.

Physical form Colourless to pale yellow crystals. **M.p. (°C)** 161.8–169.4 (decomp.) **V.p. (mPa)** <0.0037 (25 °C) **log K_{ow}** 4.4 (pH 7.2) **Henry (Pa m³ mol⁻¹, calc.)** <0.159

S.g./Bulk density (20–25 °C) 1.18 **Water solubility (mg/l, 20–25 °C)** 0.0203

Organic solubility (g/l, 20-25 °C) Soluble in acetone (72), dichloromethane (470), ethyl acetate (160), hexane (0.11), methanol (13), octanol (83), toluene (23) **Specific rotation** $[\alpha]_D^{22} = +55.7^\circ$ (c = 0.87, CHCl₃)

avermectin B_{1a}

Mol. wt. 873.1 **M.f.** C₄₈H₇₂O₁₄

avermectin B_{1b}

Mol. wt. 859.1 **M.f.** C₄₇H₇₀O₁₄

COMMERCIALISATION:

History Anthelmintic and acaricidal activity of a group of chemically related compounds, the avermectins, reported by I. Putter *et al.* (*Experientia*, 1981, **37**, 963). A mixture of two of these, avermectin B_{1a} and avermectin B_{1b}, introduced in 1985 as an acaricide and insecticide by Merck Sharp & Dohme Agvet (now Syngenta AG). Isolated from fermentation of *Streptomyces avermitilis*, a naturally occurring soil Actinomycete. USA rights transferred to Amvac Chemical Corp. in 2017. **Manufacturers** AgroDragon; Anhui Huaxing; Bailing; Fertiagro; FMC; Golden Harvest; Honbor; Hui Kwang; Jiangsu FengYuan; Jiangsu Inter-China Group Corporation; Jingbo; Labor; Rotam; Segal; Sharda; Suzhou Hengtai; Syngenta; Synwill; Tide; Zhejiang Shenghua Biok **Selected products** Aakomectine (Aako); Abacide (Mauget); Agrimec (Syngenta); Avicta (Syngenta); Biok (UPL Iberia); Dynamec (Syngenta); Pixel (Aako); Romectin (Rotam); Samcotin (Agrivet); Sunmectin (Sundat); Timectin (Tide); Vertimec (Syngenta); Vibamec (Vipesco); Zoro (FMC) **Selected mixtures** Accel (+ metaflumizone) (*Nihon Nohyaku; Ishihara Sangyo*); Envidor Speed (+ spirodiclofen) (*Gowan Intl*)

APPLICATIONS:

Spectrum and route of action Insecticide, acaricide and nematocide active by both contact and ingestion, limited systemicity, but exhibits translaminar mobility. **Site of action** Allosterically activates glutamate-gated chloride channels (GluCl_s) resulting in increased chloride ion flow and causing paralysis. **Uses** Control of motile stages of mites, leaf miners, suckers, Colorado beetles, etc. in ornamentals, cotton, citrus, pome fruit, nuts, vegetables, potatoes and other crops, at 5.6–28 g/ha for mites, and at 11–22 g/ha for leaf miners; control of nematodes, as a seed treatment; control of fire ants. **Phytotoxicity** May be phytotoxic to pome fruit when mixed with captan. **Product analysis** HPLC-UV **Residues analysis** HPLC-FLD of a derivative (T. Wehner *et al.* in *Comp. Anal. Profiles*, Ch. 4; *Resid. Anal. Methods*); (**soil, water**) HPLC-FLD of a derivative, LC-MS/MS (*Environ. Chem. Methods*); see also *Pestic. Anal. Man.*, **II**, 180.449 **CIPAC Code** 495 **Formulation types** EC **Compatibility** Not compatible with captan.

REGULATORY:

Toxicological & environmental reviews *JMPR Mtg.* (1992), (1994), (1995), (1997), (2000), (2015), (2018); *JMPR Evaln. I* (1994), (1997), (2000), (2015), (2018); *JMPR Evaln. II* (1992), (1994), (1997), (2015); *JECFA* 47 (1996); *EFSA Sci. Rep.* (2008) **147**, 1; *EFSA Jou.*, 2016, **14**, 4491; *ibid.*, 2022, **20**, 7544; G. Lankas & L. R. Gordon in *Ivermectin and Abamectin*, p. 8. **EU status** Approved **EU Approval Expiration** 31/03/2038 **EPA registration status** Registered **Toxicity class: WHO (a.i.)** Ib

MAMMALIAN TOXICOLOGY:

Acute oral (LD₅₀, mg/kg) rats 6.7 (in oil); rats 8.7–12.8; mice 13.6; rats 221 (in water)
Acute inhalation (LD₅₀, mg/L) rats 0.034 (4 h) **Acute dermal (LD₅₀, mg/kg)** rats 1914; rabbits >2000 **Skin irritation** Not an irritant (rabbits) **Eye irritation** Not an irritant (rabbits)
Skin sensitisation Not a sensitiser (guinea pigs) **NOEL** for rats (two-generation reproduction)

study) 0.12 mg/kg b.w. daily. **ADI-RfD** (JMPR) ADI 0.002 mg/kg b.w. [2001] (for sum of abamectin and 8,9-Z- isomer); (JMPR) ADI 0.001 mg/kg b.w. [1995] (for residues not containing Δ -8,9- isomer); (JMPR) ADI 0.001, aRfD 0.003 mg/kg b.w. [2018]; (EU) ADI 0.0025, aRfD 0.005, AOEL 0.0025 mg/kg b.w. [2008]; (EFSA) ADI 0.0012, aRfD 0.0012, AOEL 0.0012 mg/kg b.w. [2020]; (EPA) aRfD 0.005 mg/kg b.w., cRfD 0.0004 mg/kg b.w. [2013].

ECOTOXICOLOGY:

Birds Acute oral LD₅₀ for mallard ducks 26, bobwhite quail >2000 mg/kg. Dietary LC₅₀ for mallard ducks 383 mg/kg diet. **Fish** LC₅₀ (96 h) for rainbow trout 0.007, bluegill sunfish 0.0096, fathead minnows 0.0147, zebrafish 0.049 mg/l. **Daphnia** EC₅₀ (48 h) 0.00056 mg/l. **Algae** EC₅₀ (72 h) for *Pseudokirchneriella subcapitata* >100 mg/l. **Other aquatic spp.** LC₅₀ (96 h) for pink shrimps 0.0016, blue crabs 0.153 mg/l. **Worms** LC₅₀ (14 d) for earthworms 33 mg/kg soil. **Bees (LD₅₀, µg/bee)** 0.001 (contact); 0.004 (oral) (24 h)

ENVIRONMENTAL FATE:

abamectin

Animal Metabolism Metabolises by O-demethylation, hydroxylation, oleandrosyl ring cleavage and oxidation. **Animal Absorption and Excretion** Absorption c. 86% and >92% rapidly excreted in faeces (primarily) (oral administration). **Plants** Degrades primarily by photolysis on the plant surfaces. **Soil/Environment** Degrades by microbial action to form several oxidised products. **Hydrolytic Stability (DT₅₀)** stable (pH 4–7), 213 d (pH 9) (25 °C) **Photolytic Stability (DT₅₀)** 2 d

avermectin B_{1a}

Soil (DT₅₀) 12.4–48.3 d (lab, aerobic, 9 soil types), 80 d (lab, anaerobic), 0.26–1.7 d (field, 5 sites) **Soil Adsorption Coefficients (ml/g)** K_f 76.8–334 (5 soil types, geomean 125.2), K_{oc} 571–7893 (5 soil types, geomean 6588) **Hydrolytic Stability (DT₅₀)** stable (pH 5-7), 206.2 d (pH 9, 25 °C)

avermectin B_{1b}

Soil/Environment Degrades, mostly by oxidation, to form a variety of products. **Soil (DT₅₀)** 11.2–65.7 d (8 soil types), 1.8 d (field) **Soil Adsorption Coefficients (ml/g)** K_f 18.2–334 (7 soil types); K_{oc} 1495–7893 (7 soil types)