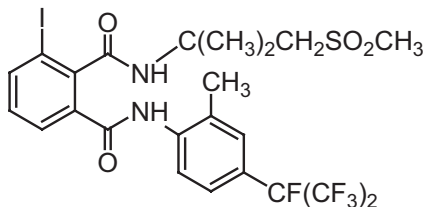


386 flubendiamide

Insecticide

IRAC 28; diamide



NOMENCLATURE: Common name flubendiamide (BSI, E-ISO, (m) F-ISO)

IUPAC name 3-iodo-*N'*-(2-mesyloxy-1,1-dimethylethyl)-*N*-{4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-*o*-tolyl}phthalamide

Chemical Abstracts name *N*²-[1,1-dimethyl-2-(methylsulfonyl)ethyl]-3-iodo-*N*¹-[2-methyl-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]phenyl]-1,2-benzenedicarboxamide

CAS RN [272451-65-7] **Development codes** NNI-0001; AMSI 0085; R-41576

PHYSICAL CHEMISTRY: Composition Tech is ≥95.0 %. **Mol. wt.** 682.4

M.f. C₂₃H₂₂F₇IN₂O₄S **Form** White crystalline powder. **M.p.** 217.5–220.7 °C

V.p. <1 × 10⁻¹ mPa (25 °C) **K_{ow} logP** = 4.2 (25 °C) **S.g./density** 1.659 (20 °C) (*EPA Fact Sheet*) **Solubility** In water 29.9 µg/l (20 °C). In *p*-xylene 0.488, *n*-heptane 0.000835, methanol 26.0, 1,2-dichloroethane 8.12, acetone 102, ethyl acetate 29.4 (all in g/l) (*EPA Fact Sheet*).

Stability Stable in acidic and alkaline media (pH 4–9). Aqueous photolysis DT₅₀ 5.5 d (distilled water, 25 °C).

COMMERCIALISATION: **History** Reported by T. Nishimatsu *et al.* (*Proc. Int. Conf. on Pesticides*, Kuala Lumpur, Malaysia, 2005 and *Proc. BCPC Int. Congr.*, Glasgow, 2005, **1**, 57). Discovered by Nihon Nohyaku Co., Ltd and developed jointly by Nihon Nohyaku and Bayer CropScience. Registered in Japan and Thailand in 2007. **Patents** US 6603044; EP 1006107.

Manufacturers Bayer CropScience; Nihon Nohyaku

APPLICATIONS: **Biochemistry** Activates the ryanodine receptor, a calcium release channel which is involved in muscle contraction. **Mode of action** Active by ingestion. **Uses** For control of both adult and larval lepidopterous insects in maize, cotton, tobacco, pome and stone fruit, nuts, grapes, rice, turf and vegetables, at 34–180 g/ha per application. **Formulation types** SC; WG.

Selected products 'Belt' (Bayer CropScience); 'Phoenix' (Nihon Nohyaku); 'Takumi' (Nihon Nohyaku).

TOXICOLOGICAL & ENVIRONMENTAL REVIEWS: *EPA Fact Sheet*, Aug. 2008.

MAMMALIAN TOXICOLOGY: **Oral** Acute oral LD₅₀ for male and female rats >2000 mg/kg.

Skin and eye Acute percutaneous LD₅₀ for male and female rats >2000 mg/kg. Slight eye irritant; not a skin irritant (rabbits). Not a skin sensitiser (guinea pigs). **Inhalation** LC₅₀ for rats >0.0685 mg/l (*EPA Fact Sheet*). **NOEL** **NOAEL** (1 y) for male rats 1.95, female rats 2.40 mg/kg b.w. daily. **ADI/RfD** (EPA) aRfD 0.995, cRfD 0.024 mg/kg [2008]. **Other** Negative in Ames test.

ECOTOXICOLOGY: See also *Pflanz.-Nachr. Bayer (Engl. Ed.)* (now *Bayer CropScience J.*), 2007, **60**(2), 167–182. **Birds** Acute oral LD₅₀ for bobwhite quail >2000 mg/kg. **Fish** LC₅₀ (96 h) for carp >548 µg/l. **Daphnia** LC₅₀ (48 h) >60 µg/l. **Algae** E_bC₅₀ (72 h) for *Pseudokirchneriella subcapitata* 69.3 µg/l. **Bees** LD₅₀ (48 h, oral and contact) >200 µg/bee.

Other beneficial spp. Inactive against beneficial species; EC₅₀ for *Encarsia formosa* and *Aphidius colemani* >400 mg/l, for *Coccinella septempunctata bruckii*, *Amblyseius cucumeris* and *Phytoseiulus persimilis* >200 mg/l, for *Chrysoperla carnea* and *Aphidoletes aphidimyza* >100 mg/l.

ENVIRONMENTAL FATE: **Animals** Only partially absorbed, with peak blood and plasma concentration in 6–12 h, and rapidly excreted within 24 h, mainly via faeces. Metabolism took place mainly by multistep-oxidation of the aniline methyl group followed by glucuronidation. Glutathione conjugates of the phthalic acid moiety were detected as minor metabolites. In faeces of rats, unchanged parent was the major component, with, at low dose levels, significant quantities of the benzoic acid (male rats) and benzyl alcohol (male and female). **Plants** See *Pflanz.-Nachr. Bayer (Engl. Ed.)*, 2007, **60**(2), 141–166. **Soil/Environment** Stable to hydrolysis in the lab.; aqueous and soil photolysis appear to be the main routes of degradation in the environment, DT₅₀ 5.5 d and 11.6 d, resp. Anaerobic aquatic DT₅₀ 365 d. Soil DT₅₀ (field) 210–770 d (3 soils). Slightly to hardly mobile, K_{foC} 1076–3318 l/kg. Half-lives of flubendiamide and of its primary metabolite, des-iodo flubendiamide, suggest that they will accumulate in soil and water after successive applications.