FUNGICIDE

Isofetamid

New chemical class of SDHI

Isofetamid is a novel SDHI (Succinate Dehydrogenase Inhibitor, FRAC code 7) fungicide discovered and under development by ISK.

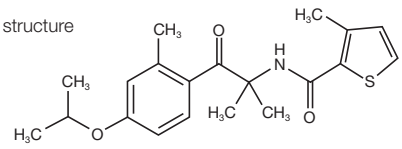
Isofetamid is a new chemical group (phenyl-oxo-ethyl thiophene amide) based on its thiophene carboxamide moiety. Due to this unique chemical structure, Isofetamid remains highly effective against the majority of fungal isolates that have developed resistance to other SDHI fungicides.

As a broad-spectrum fungicide, Isofetamid exhibits excellent activity against a broad range of fungi, but is especially effective on the Ascomycota (such as *Botrytis* spp., *Sclerotinia* spp., *Monilinia* spp., *Venturia* spp.) at low dose rates.

In addition to its outstanding efficacy, Isofetamid has no negative impacts on beneficial insects and mites, making it an excellent choice for integrated pest management programs.

Physico-Chemical Properties

Chemical structure



Class : Phenyl-oxo-ethyl thiophene amide
IUPAC name : N-[1,1-dimethyl-2-(4-isopropoxy-o-tolyl)-2-oxoethyl]-3-methylthiophene-2-carboxamide
Molecular weight : 359.48
Molecular formula : $C_{20}H_{25}NO_3S$
Vapour pressure : 4.2×10^{-7} Pa (25°C)
Water solubility : 5.33 mg/L (20°C)
Form : White Solid (powder)
Development code : IKF-5411

Toxicology & Ecotoxicology

Rat LD_{50} (oral) : > 2,000 mg/kg (f)
Rat LD_{50} (dermal) : > 2,000 mg/kg (m/f)
Rat LC_{50} (inhalation) : > 4.82 mg/L (m/f)

Skin irritation : non irritant (rabbit)
Eye irritation : slightly irritating to eyes (rabbit)
Skin sensitization : not a sensitizer (mouse, guinea pig)

Avian LD_{50} (acute oral) : > 2,000 mg/kg (quail, m/f)
Avian LD_{50} (subacute oral) : > 5,000 ppm in feed (quail)

Fish LC_{50} : > 7.12 mg/L (carp, 96 h)

Bees LD_{50} (acute oral) : > 30 µg a.i./bee (48 h)
Bees LD_{50} (acute contact) : > 100 µg a.i./bee (48 h)

Daphnia magna EC_{50} : 4.7 mg/L (48 h)

Product

Trade Names	KENJA, ZENBY, KRYOR, HAREGI, KABUTO, ASTUN, etc.	
Formulations	40%SC	
Registered Countries	Asia	China, Japan, Korea
	Europe	Belgium, Bulgaria, Czech Republic, France, Germany, Greece, Hungary, Italy, Luxembourg, Poland, Portugal, Romania, Spain, Slovenia, UK, etc.
	Oceania	Australia
	Americas	Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA, etc.

Always read and follow the product label instructions in your country.

Characteristics

- SDHI class (FRAC code 7) with broad-spectrum fungicidal activity
- Flexible molecular structure makes it effective on major SDHI resistant isolates
- Inhibits all growth stages of fungal life cycle
- Good persistence and rainfastness
- Extension of shelf life by pre-harvest application
- High safety for crop and beneficial organisms

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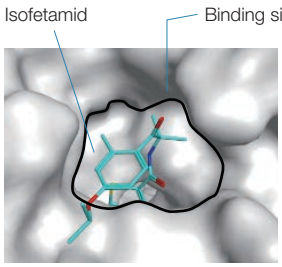
Mode of Action

Isofetamid acts specifically on the succinate dehydrogenase (SDH) of Complex II, a key enzyme of the mitochondrial respiratory chain at the crossroads of two metabolic pathways essential to fungal cell life.
By inhibiting SDH, Isofetamid impairs energy (ATP) production by the respiratory chain and the synthesis of amino acids, lipids and fatty acids (metabolites essential to cell function) at the Krebs cycle stage.

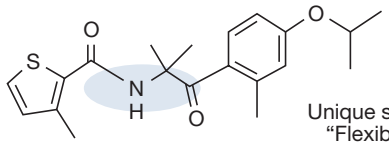


Simulation modeling of enzyme 3D structure

Advantages of Isofetamid for resistance management

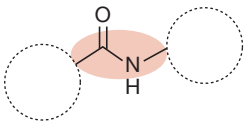
Isofetamid can control numerous isolates with confirmed resistance to other SDHI fungicides, including SdhB H272R and H272Y, which are the two most common field-collected isolates.
Research has confirmed that Isofetamid fits the mutated binding pocket of SDHI-resistant fungal isolates (SdhB H272R and H272Y). It is hypothesized that the unique molecular structure of Isofetamid gives the molecule flexibility at the binding site, allowing Isofetamid to retain efficacy on these mutants. Other SDHI fungicides have a rigid structure, are unable to bind at sites where mutations have occurred, and are therefore ineffective as control options.

Isofetamid



Unique structure
"Flexible bond"

Other SDHIs



"Rigid bond"

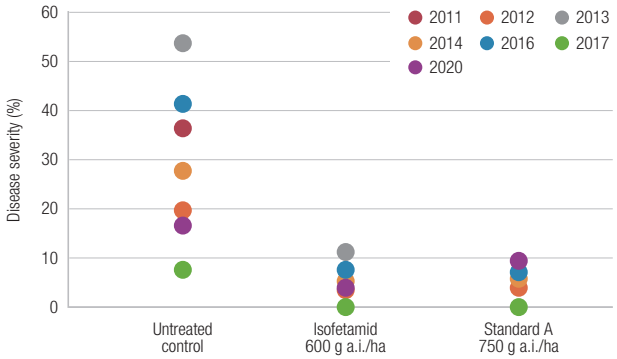
	Isofetamid	SDHI A	SDHI B	SDHI C	SDHI D
Standard	S	S	S	S	S
SdhB H272Y	S	R	S	MR	R
SdhB H272R	S	R	S	S	S
SdhB N230I	S	R	MR	MR	R
SdhB P225F	R	R	R	R	R
SdhB H272L	R	R	R	MR	R

S:Sensitive, MR:Moderately Resistant, R: Resistant

Fungicidal spectrum

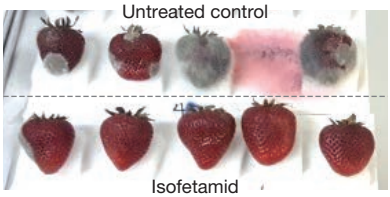
Botrytis spp.	*Cercospora* spp.	
Monilinia spp.	*Mycosphaerella* spp.	
Sclerotinia spp.	*Passalora* spp.	
Venturia spp.	*Pseudocercospora* spp.	
Corynespora spp.	*Elsinoë* spp.	
Didymella spp.	*Ramularia* spp.	
Wilsonomyces spp.	*Alternaria* spp.	
Cladosporium spp.	*Rhizopus* spp.	
Diaporthe spp.	and Powdery mildew	etc.

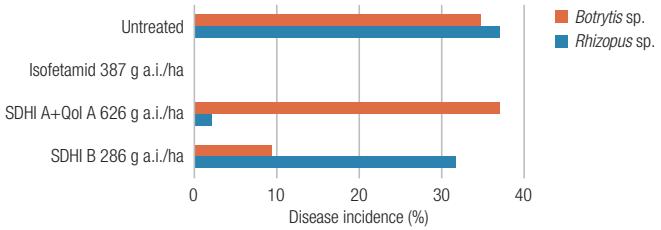
Stable control against Gray mold (Grape field trials in EU)



Control of fruit rots on strawberries during storage

After Isofetamid applications in the field, fruit were collected the next day and stored on trays at room temperature. Postharvest disease incidence was evaluated 7days after harvest.





Multiple disease control (Cucumber field trials in Japan)

Disease name	Commercial standard	Disease Incidence or Severity (%)		
		Isofetamid 266 ppm	Standard	Untreated control
Sclerotinia rot *Sclerotinia sclerotiorum*	Dicarboximides 250 ppm	1.4	0.5	44.5
Gray mold *Botrytis cinerea*	Anilino-pyrimidines 200 ppm	0.2	1.6	34.4
Gummy stem blight *Didymella bryoniae*	Dicarboximides 500 ppm	0.3	0.4	16.8
Corynespora leaf spot *Corynespora cassiicola*	TPN 400 ppm	0.9	2.4	11.7
Powdery mildew *Podosphaera xanthii*	Quinoxaline 83 ppm	0.5	6.7	64.5

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