GOKILAHT®-S

Technical Information

SUMITOMO CHEMICAL Co., Ltd.

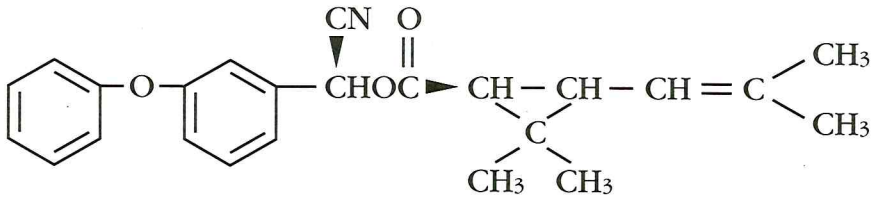
CONTENTS

I. Introduction

Gokilaht®-S is an optical isomer of Gokilaht® (common name:cyphenothrin) which has one asymmetric carbon atom in its alcohol moiety and two such atoms in the acid moiety. Gokilaht®-S consists of the (1*R*)-*cis and* (1*R*)-*trans* esters with the (*S*)-alcohol. Since only the (*S*)-alcohol shows lethal activity, Gokilaht®-S theoretically has 2 times higher lethal activity against pest insects than Gokilaht®. However, the knockdown activity of Gokilhat®-S to Gokilaht® differs among kinds of pest insects.
This brochure describes biological activity of Gokilaht®-S against houseflies, mosquitoes and cockroaches in comparison with Gokilaht® and permethrin.

II. Chemical and physical properties

Chemical name : (*S*)-*α*-cyano-3-phenoxybenzyl (1*R*)-*cis*,*trans*-chrysanthemate
Common name : *d*-*d*-*T*-cyphenothrin
Structural formula :



Empirical formula : $C_{24}H_{25}O_3N$
Molecular weight : 375.47
Appearance : Slightly yellowish and transparent liquid
Specific gravity : d_4^{25} 1.09
Vapor pressure : 8.7×10^{-7}mmHg at 20℃
Solubility : Soluble in most of organic solvents Hardly soluble in water

III. Toxicity

Acute Oral Toxicity to Rats of Gokilaht® and Gokilaht®-S (EET-0011/SMT-0001)

Sex/Product	LD_{50}(mg/kg)	
	Gokilaht®	Gokilaht®-S
Male	318 (219-463)*	188 (168-218)
Female	419 (281-624)	220 (157-307)

* Figures in parentheses indicate 95% confidence limits.

Based on close similarities in chemical composition and acute toxicity, the overall toxicity of Gokilaht®-S is not likely to be greatly different from that of the original Gokilaht®.

IV. Biological efficacy

1) Primary lethal activity

Test insects : Houseflies (*Musca domestica*)
Mosquitoes (*Culex pipiens pallens*)
Cockroaches (*Blattella germanica*)
Test method : Topical application (YYE-20-0013)

(HPR:07286)

Chemical	LD_{50}(μg/insect)		
	Housefly(female)	Mosquito(female)	Cockroach(female)
Gokilaht®-S	0.0050(190)*	0.0012(200)	0.10(210)
Gokilaht®	0.0095(100)	0.0024(100)	0.21(100)
Permethrin	0.011(86)	0.0053(45)	0.32(66)

* Figure in parenthesis indicates relative activity to Gokilaht®.

Lethal activity of Gokilaht®-S against houseflies, mosquitoes and cockroaches is almost two times higher than that of Gokilaht® as being theoretically expected.

2) Knockdown activity against flying insects

Test insects : Houseflies(*Musca domestica*)
Mosquitoes (*Culex pipiens pallens*)
Test method : Peet Grady method (YYE-20-0005)
Formulation used : Water based aerosol

(HPMR-931006)

Compounds	Conc. %	KT_{50}(min)	
		Housefly	Mosquito
Gokilaht®-S	0.075	6.29	10.86
	0.15	4.87	9.24
Gokilaht®	0.3	4.12	7.47
	0.075	7.92	14.25
	0.15	6.26	11.91
Permethrin	0.3	5.21	9.35
	0.075	12.26	19.44
	0.15	9.43	14.67
	0.3	6.51	12.50

Regression equation between KT_{50}(min) values and concentrations(%)

Compounds	Insects	Equation*
Gokilaht®-S	Housefly	Log Y=0.4489 - 0.3052Log X
	Mosquito	Log Y=0.7359 - 0.2699Log X
Gokilaht®	Housefly	Log Y=0.5551 - 0.3021Log X
	Mosquito	Log Y=0.8164 - 0.3040Log X
Permethrin	Housefly	Log Y=0.5827 - 0.4566Log X
	Mosquito	Log Y=0.9216 - 0.3186Log X

* Y: KT_{50}(min), X: Concentration(%)

Relative knockdown activity of Gokilaht®-S to Gokilaht® and Permethrin against housefly.

Compounds	Conc. %	Corrected KT_{50}(min)	Equivalent Conc. % of Gokilaht®-S	Relative activity
Gokilaht®	0.075	7.85	0.0346	2.2times
	0.15	6.37	0.0686	2.2times
	0.3	5.17	0.1359	2.2times
	(Av.)			(2.2times)
Permethrin	0.075	12.48	0.0076	9.9times
	0.15	9.10	0.0213	7.0times
	0.3	6.63	0.0601	5.0times
	(Av.)			(7.3times)

Relative knockdown activity of Gokilaht®-S to Gokilaht® and Permethrin against mosquito.

Compounds	Conc. %	Corrected KT_{50}(min)	Equivalent Conc. % of Gokilaht®-S	Relative activity
Gokilaht®	0.075	14.40	0.0272	2.8times
	0.15	11.66	0.0595	2.5times
	0.3	9.45	0.1296	2.3times
	(Av.)			(2.5times)
Permethrin	0.075	19.05	0.0097	7.7times
	0.15	15.28	0.0218	6.9times
	0.3	12.25	0.0495	6.1times
	(Av.)			(6.9times)

Relative knockdown activities of Gokilaht®-S to Gokilaht® and permethrin are 2.2 and 2.5, and 7.3 and 6.9 times higher against houseflies and mosquitoes, respectively.

3) Lethal activity against flying insects

Test insect : Houseflies (*Musca domestica*)

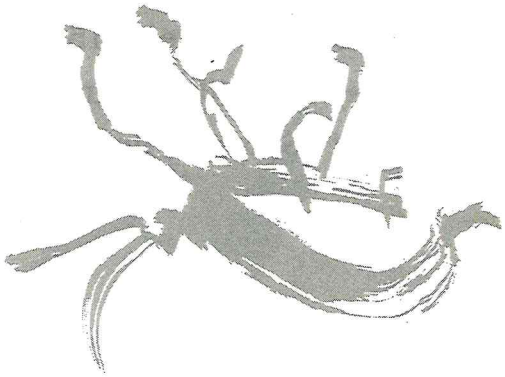
Test method : Glass chamber method for flying insects (YYE-20-0012)

Formulation used : Oil liquid formulation

(HPMR-950807)

Compounds	Conc. %	Mortality %	LC_{50}(%)
Gokilaht®-S	0.00156	19.3	0.0031 (232)*
	0.00313	51.7	
	0.00625	78.3	
	0.0125	96.3	
Gokilaht®	0.00313	18.3	0.0072 (100)
	0.00625	36.0	
	0.0125	75.0	
	0.025	98.3	
Permethrin	0.00313	26.7	0.0059 (122)
	0.00625	50.9	
	0.0125	77.7	
	0.025	92.5	

* Relative lethal activity



4) Knockdown activity against crawling insects

Test insect : German cockroaches (*Blattella germanica*)
Test method : CSMA cockroach spray method(YYE-20-0014)
Formulation used : Emulsifiable concentrate

(HPMR-940719)

Compounds	Conc. % and KT_{50}(min)			
	0.05	0.1	0.2	0.4
Gokilaht®-S	8.1	7.8	5.2	-
Gokilaht®	16.4	10.6	5.6	-
Permethrin	-	>20	>20	15.9

Regression equation between KT_{50}(min) values and concentrations(%)

Compounds	Equation*
Gokilaht®-S	Log Y=0.5192 - 0.3197Log X
Gokilaht®	Log Y=0.2210 - 0.7751Log X
Permethrin	Can not be obtained.

* Y: KT_{50}(min), X: Concentration(%)

Relative Knockdown activity of Gokilaht®-S to Gokilaht®

Compounds	Conc. %	Corrected KT_{50}(min)	Equivalent Conc. % of Gokilaht®-S	Relative activity
Gokilaht®	0.05	16.96	0.006	8.3 times
	0.1	9.91	0.032	3.1 times
	0.2	5.79	0.173	1.2 times
	(Av.)			(4.2 times)

Relative knockdown activity of Gokilaht®-S to Gokilaht® is 4.2 times higher against German cockroaches. The concentration of Gokilaht®-S which provides KT_{50} value of 15.9 min at 0.4% of permethrin can be obtained as 0.007% from the regression equation of Gokilaht®-S. This suggests Gokilaht®-S has 57 times higher knockdown activity than permethrin.

5) Lethal activity against crawling insects

Test insect : German cockroaches (*Blattella germanica*)
Test method : CSMA cockroach spray method (YYE-20-0014)
Formulation used : Oil liquid formulation

(HPMR-950806)

Compounds	Conc.%	Mortality	LC_{50}(%)
Gokilaht®-S	0.00625	30.0	0.010 (340)*
	0.0125	52.5	
	0.025	90.0	
	0.05	100	
Gokilaht®	0.0125	17.5	0.034 (100)
	0.025	42.5	
	0.05	82.5	
	0.1	100	
Permethrin	0.025	20.0	0.044 (61)
	0.05	62.5	
	0.1	85.0	
	0.2	100	

* Relative lethal activity

6) Flushing out activity against crawling insects

Test insect : German cockroaches (*Blattella germanica*)

Test method : Flushing out test method (YYE-20-0006)

Formulation used : Emulsifiable concentrate

(HPMR-940719)

Compounds	Conc. % and FT_{50}(min)			
	0.05	0.1	0.2	0.4
Gokilaht®-S	2.93	2.17	1.48	-
Gokilaht®	5.00	4.29	2.28	-
Permethrin	-	6.85	5.26	4.75

Regression equation between FT_{50}(min) values and concentrations(%)

Compounds	Equation*
Gokilaht®-S	Log Y=-0.1681 - 0.4927Log X
Gokilaht®	Log Y=-0.0033 - 0.5664Log X
Permethrin	Log Y= 0.5599 - 0.2641Log X

* Y: KT_{50}(min), X: Concentration(%)

Relative flushing out activity of Gokilaht®-S to Gokilaht® and Permethrin

Compounds	Conc. %	Corrected FT_{50}(min)	Equivalent Conc. % of Gokilaht®-S	Relative activity
Gokilaht®	0.05	5.42	0.015	3.3 times
	0.1	3.66	0.033	3.0 times
	0.2	2.47	0.073	2.7 times
	(Av.)			(3.0 times)
Permethrin	0.1	6.67	0.0097	10.3 times
	0.2	5.55	0.014	14.3 times
	0.4	4.62	0.020	20.0 times
	(Av.)			(14.9 times)

Relative flushing out activity of Gokilaht®-S to Gokilaht® and permethrin are 3.0 and 14.9 times higher against German cockroaches.

V. Emergency and first aid procedures

Remove contaminated clothing immediately and wash skin thoroughly with soap and water. If eyes are splashed, rinse them immediately for at least 15 minutes with a large volume of water. In case this material is swallowed, consult a doctor as soon as possible.

VI. Precautions for safe handling and use

[Steps to be taken in case material is released or spilled]

In case of spill (liquid), soak it up immediately with a suitable absorbent, such as sawdust or granular absorbent clay.
Then, scrub contaminated area with detergent and water. Put wastes in a disposal container. During the clean-up operation, wear protective clothing and equipment, such as worksuit, hat, face-shield, safety glasses, mask, rubber or plastic apron and boots.

[Waste disposal method]

Dispose of waste in accordance with governmental or the local authorities' regulations.

[Precautions to be taken in handling and storing]

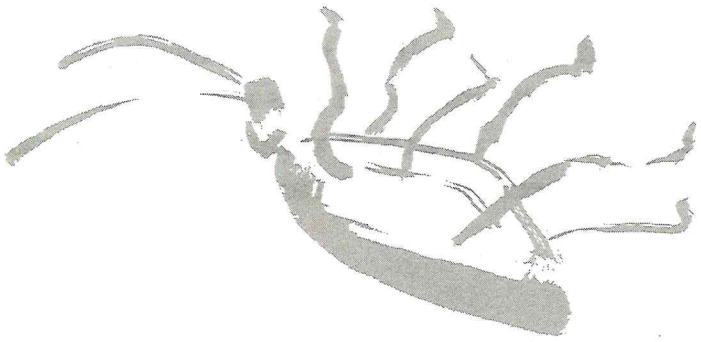
Wear protective clothing and equipment such as worksuit, hat, face-shield, safety glasses, mask, rubber gloves, rubber or plastic apron and boots.
In order to keep protective clothing and equipment clean, wash them every day as soon as any obvious contamination is observed.
Keep the working place well-ventilated to minimize the worker's inhalation of mists containing this material. Store Gokilaht-S under cool, dry and well-ventilated conditions.

Toxic quantities of hydrogen cyanide may collect in the headspace of drums, jugs or other containers which have contained this materials.
Persons opening these containers should do so in well-ventilated areas and should wear appropriate respiratory protection if necessary.

[Other precautions]

Do not mix this material with water except for formulation. Do not use, dilute or pour this material under high temperature or near flames. Do not expose to it to heat for a long time.

The above information (V and VI) is believed to be accurate and represents the best information currently available to us. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.



MEMORANDUM

MEMORANDUM