

**CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION
PUBLIC REPORT 2007-6**

Active Ingredient: Metofluthrin
Tracking ID Number 217959

DESCRIPTION OF ACTION

Sumitomo Chemical Company, LTD. (Sumitomo) submitted an application for California registration of Deckmate Mosquito Repellent, EPA Reg. No. 10308-31. Deckmate Mosquito Repellent is a repellent for the protection of humans and companion non-food animals against mosquitoes. The product contains the active ingredient metofluthrin, which has not previously been registered in the United States. Sumitomo requested that the Department of Pesticide Regulation (DPR) accept its application for registration of Deckmate Mosquito Repellent concurrently with submission of Sumitomo's application to the U.S. Environmental Protection Agency (U.S. EPA) for federal registration. California Notice 2005-10 allows DPR to accept applications for registration of pesticide products containing new active ingredients concurrently with the submission of an application for U.S. EPA federal registration. Sumitomo applied for registration of Deckmate Mosquito Repellent with the U.S. EPA on November 12, 2004.

The U.S. EPA registered Deckmate Mosquito Repellent conditionally on April 9, 2007. Under the conditions of registration U.S. EPA identified a number of labeling deficiencies and required Sumitomo to submit a copy of the revised printed label before releasing the product for shipment.

DPR evaluated the product label and data for Deckmate Mosquito Repellent and found them acceptable to support registration. Precautionary and first aid statements and other protective measures on the product label adequately mitigate the potential health risks to users. DPR does not expect significant adverse environmental impacts to result from registration of Deckmate Mosquito Repellent. The data adequately substantiates Deckmate Mosquito Repellent as an effective mosquito repellent. Before Deckmate Mosquito Repellent can be approved for registration in California, Sumitomo must provide a final printed label that is in compliance with the U.S. EPA conditions of registration as described above.

BACKGROUND

Registrant:	Sumitomo Chemical Company, LTD.
Common name:	Metofluthrin
Chemical name:	E-isomer (8.4%): 2,3,5,6-tetrafluoro-4-(methoxymethyl)benzyl (E)-(1R,3R)-2,2-dimethyl-3-(prop-1-enyl)cyclopropanecarboxylate Z-isomer (91.6%): 2,3,5,6-tetrafluoro-4-(methoxymethyl)benzyl (Z)-(1R,3R)-w,w-dimethyl-3-(prop-1-enyl)cyclopropanecarboxylate
Brand name:	Deckmate Mosquito Repellent
Uses:	Mosquito repellent
Pests controlled:	Mosquitoes
Type of registration:	Full Registration

Deckmate Mosquito Repellent consists of an impregnated, pleated paper strip that contains 1.82% metofluthrin weight to weight (w/w) corresponding to approximately 200 milligrams of metofluthrin per strip. Metofluthrin is a vapor-active pyrethroid that is effective against mosquitoes. The Deckmate Mosquito Repellent label states that one strip can be used for up to 36 hours. Two Deckmate Mosquito Repellent strips are recommended for protecting an outside area of approximately 10 feet by 10 feet.

SCIENTIFIC REVIEW

A. Chemistry

1. **Product Chemistry:** DPR evaluated the submitted chemistry studies for Deckmate Mosquito Repellent. The product chemistry, residue chemistry, and environmental fate data support registration of Deckmate Mosquito Repellent. The results are summarized in Tables 1 and 2.

Table 1. Physical and Chemical Properties of Technical Metofluthrin	
Properties	Values
Physical state	Pale yellow liquid
Density (20 °C)	1.21 grams (g)/centimeter ³ (cm)
pH (1% solution)	5.24 @ 25 °C
Boiling point	334 °C
Melting point	-54 °C
Viscosity (20 °C)	19.3 mm ² /sec
Partition coefficient (K _{ow})	E-isomer 1.1 x 10 ³ (Log _p = 5.0) Z-isomer 9.4 x 10 ⁴ (Log _p = 5.0)
Water solubility	E-isomer 0.67 mg/L @ (20°C) Z-isomer 0.50 mg/L @ (20°C)
Vapor pressure	9.47 x 10 ⁻⁴ Pa (7.10 x 10 ⁻⁶ mmHg)
Storage stability /corrosion	Stable and non-corrosive in commercial containers for one year at ambient temperature

2. **Residues in Food and Animal Feed:** Sumitomo did not submit residue data. In accordance with California Notice 2004-7, these data are no longer required).
3. **Environmental Fate:** The metofluthrin environmental fate data included hydrolysis, aquatic photolysis, aerobic soil metabolism, and soil adsorption/desorption coefficient. DPR found the studies to be satisfactory. Sumitomo did not provide anaerobic soil metabolism or field dissipation data. Sumitomo requested that DPR grant a waiver for these data based on the

proposed use pattern for Deckmate Mosquito Repellent, which they contend would not result in residues in soil. DPR agrees that the anaerobic soil metabolism and terrestrial field dissipation data are not required at this time, but would require these data for any future product registrations containing metofluthrin for agricultural uses.

Comparison of the metofluthrin environmental fate data to the U.S. EPA and California Environmental Protection Agency (Cal/EPA) ground water leaching criteria indicate that metofluthrin has the potential to leach. However, metofluthrin has very low aqueous solubility. Consequently, metofluthrin is not persistent or mobile in the soil, and would not be expected to leach to ground water. The potential to leach is summarized in Table 2.

Table 2. Comparison of U.S. EPA and Cal/EPA Groundwater Leaching Criteria with Environmental Fate Study Results for Metofluthrin				
Parameter	Potential to Leach Value (U.S. EPA)	Potential to Leach Value (Cal/EPA)	Experimental Value	Criteria Exceeded
Water solubility	> 30 ppm	> 3 ppm	0.67 ppm E-isomer 0.50 ppm Z-isomer	No
Soil adsorption coefficient (K_d)	< 5 ml/g		113 ml/g (sandy clay loam) 119 ml/g (clay loam) 54.6 ml/g (sandy loam)	No No No
K_{oc}		<1,900 ml/g	2729 ml/g (clay loam) 4075 ml/g (sandy loam) 11855 ml/g (loam)	No
Hydrolytic half-life	> 30 days	> 14 days	E-isomer 30.7 days Z-isomer 33.5 days	Yes
Aerobic soil metabolic half-life	> 21 days	> 610 days	2.3 to 3.5 days	No

B. Toxicology

Sumitomo submitted adequate toxicology studies to conduct complete toxicological evaluations of Deckmate Mosquito Repellent. DPR evaluated the submitted data to determine the potential for adverse health effects. The product label adequately identifies the potential acute toxicity hazards indicated by the data reviewed. The first aid statements and PPE are adequate for the indicated acute toxicity hazards. The acute toxicity parameters for metofluthrin, the active ingredient in Deckmate Mosquito Repellent, are summarized in Table 3.

Table 3. Summary of Acute Toxicity of Deckmate Mosquito Repellent

Type of Study	Acute Toxicity Values	Acute Toxicity Category
Acute oral	LD ₅₀ > 2000 mg/kg	III
Acute dermal	LD ₅₀ > 2000 mg/kg	III
Acute inhalation	LC ₅₀ 1080 mg/m ³ to 1960 mg/m ³	III
Primary eye irritation	N/A	IV
Primary dermal irritation	N/A	IV
Dermal sensitization	N/A	Not a Sensitizer
Signal word	N/A	CAUTION
<p>*Acute Toxicity Values expressed as: LD₅₀ = Lethal dose that kills 50% of the test population LC₅₀ = Lethal environmental concentration that kills 50% of the test population N/A = Not applicable</p>		

DPR found the submitted toxicology studies for metofluthrin sufficient to satisfy the data requirements of the Birth Defects Prevention Act (Food and Agricultural Code section 13121, et al.). Neurotoxicity was observed in a number of studies. A possible increase in liver tumors was noted in the rat combined chronic toxicity and oncogenicity studies. Also, possible hepatic necrosis was observed in the mouse subchronic dietary toxicity study. DPR prioritizes pesticide active ingredients for risk assessment based on of the nature the potential adverse health effects, the number of potential adverse effects, the number of species affected, no observable effect levels (NOELs), the potential for human exposure, use patterns, and other similar factors. Based on these criteria, pesticides with the greatest potential for health problems are placed in high priority, with other chemicals being in moderate or low priority. At this time, DPR gives metofluthrin a high priority for risk assessment. The purpose of the risk assessment would be to appraise the potential for metofluthrin to cause adverse health effects in humans if exposed to the pesticide through legal use. A summary of toxicology data with additional metofluthrin toxicity information is available on the DPR public website at: <http://www.cdpr.ca.gov/docs/toxsums/pdfs/5943.pdf>.

C. Health & Safety

DPR's evaluation of the medical management information on the Deckmate Mosquito Repellent label and the acute toxicity study results indicate that the product label bears all of the required statements and warnings regarding safety to handlers and other persons who may be exposed to

the pesticide. The product label bears an adequate First Aid statement. In addition, the product label requires handlers to wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco. The instructions also direct handlers to remove and wash contaminated clothing before reuse.

D. Fish & Wildlife

The registrant submitted fish and wildlife toxicity studies, including studies on bobwhite quail, mallard duck, rainbow trout, carp, and *Daphnia magna*. The submitted data are adequate to characterize the toxicity to wildlife and aquatic animals from an environmental exposure. Table 4 summarizes the results of these studies.

Table 4. Summary of Fish & Wildlife Toxicity Values*			
Test Animal	Type of Study	Acute Toxicity Value	Relative Toxicity
Bobwhite quail	Acute oral dose	>2250 mg/kg LD ₅₀ 486 mg/kg NOEC	Relatively non-toxic
Bobwhite quail	Feeding (8 day)	>5620 ppm LC ₅₀ >5620 ppm NOEC	Relatively non-toxic
Mallard duck	Feeding (8 day)	>5620 ppm LD ₅₀ 3160 ppm NOEC	Relatively non-toxic
Rainbow trout	Water exposure (96 hrs)	1.2 ppb LC ₅₀ 0.71 ppb NOEC	Extremely toxic
Carp	Water exposure (96 hrs)	3.06 ppb LC ₅₀ 0.71 ppb NOEC	Extremely toxic
<i>Daphnia magna</i>	Water exposure (48 hrs)	4.7 ppb EC ₅₀ 3.0 ppb NOEC	Extremely toxic
<p>* The test substance used for the studies was the technical active ingredient.</p> <p>** Acute Toxicity Values expressed as: LD₅₀ = Lethal dose that kills 50% of the test population LC₅₀ = Lethal environmental concentration that kills 50% of the test population EC₅₀ = Concentration of a toxicant causing a defined non-lethal effect in 50% of the test population NOEC = No observed effect concentration</p>			

The data indicate that metofluthrin is relatively non-toxic to birds, and extremely toxic to rainbow trout, carp, and *Daphnia magna*. Deckmate Mosquito Repellent consists of an impregnated pleated paper strip that contains the active ingredient metofluthrin. The paper strips

are to be hung in outside areas and in barns and kennels to repel biting mosquitoes. When used as directed, DPR does not expect metofluthrin to be released into soil or waterways.

E. Efficacy

Metofluthrin is a vapor-active pyrethroid that is found to be an effective repellent against mosquitoes. The Deckmate Mosquito Repellent label claims that one strip will repel biting mosquitoes for up to 36 hours. Laboratory and field trials were conducted to evaluate the mosquito repellent activity of metofluthrin against *Aedes aegypti* adult female mosquitoes that had been starved 24 hours prior to testing. Test results demonstrate that Deckmate Mosquito Repellent strips that had been exposed to the open air for up to 60 hours prior to testing effectively repelled mosquitoes.

ALTERNATIVES

Deckmate Mosquito Repellent strips effectively repels biting mosquitoes for up to 36 hours per strip. Metofluthrin vaporizes at normal temperatures without heating, unlike other mosquito repellents that are currently available for similar uses. The high vapor pressure and repellent activity of metofluthrin provide an effective mosquito repellent. Each strip contains an indicator which dissolves or disappears as the metofluthrin in the strip vaporizes. When the indicator is not visible the Deckmate Mosquito Repellent strip is no longer effective and should be replaced. Deckmate Mosquito Repellent strips are not for indoor use. They are recommended for protection of humans against mosquitoes on decks, patios, campsites, cabanas and other outdoor areas. They are also recommended for use in well-ventilated stables, barns and kennels to protect companion non-food animals such as horses, ponies and dogs from mosquitoes. Deckmate Mosquito Repellent states that the product is effective against mosquitoes that may carry West Nile virus, western equine encephalitis, and California viral encephalitis. A number of mosquito repellents with other active ingredients are registered in California. However, an effective integrated pest management strategy requires the flexibility of a large number of comparable, but not exactly equivalent, pesticides in order to reduce the development of resistance.

CONCLUSION

DPR evaluated the product label and scientific data submitted to support the registration of Deckmate Mosquito Repellent. The label and data were found acceptable to support registration. The acute health risks to human from exposure to metofluthrin are minimal due to its low mammalian toxicity. The precautionary and first aid statements on the product label, and the recommended protective measures mitigate potential health risks to persons who may be exposed to these pesticides. If a risk assessment conducted by DPR determines that exposure to metofluthrin may result in unacceptable margins of exposure, further restrictions will be placed on the use of metofluthrin at that time. Before Deckmate Mosquito Repellent can be registered in California, Sumitomo must provide a final printed label that is in compliance with the U.S. EPA conditions of registration.