United States Environmental Protection Agency
Office of Prevention, Pesticides and Toxic Substances (7501C)

Pesticide
Fact Sheet

Name of Chemical: Acequinocyl
Reason for Issuance: Conditional Registration
Date Issued: September 26, 2003

1. DESCRIPTION OF CHEMICAL

Generic Name:	3-dodecyl-1,4-dihydro-1,4-dioxo-2-naphthyl-acetate
Common Name:	Acequinocyl
Trade Name:	Kanemite
EPA PC Code:	006329
Chemical Abstracts Service (CAS) Number:	57960-19-7
Year of Initial Registration:	2003
Pesticide Type:	Miticide
Chemical Family:	Quinoline
Function/Mode of Action	The major metabolite of acequinocyl (deacetylated acequinocyl) inhibits electron transfer by binding the Qo Center at complex III in the mitochondria.
Classification of End-Use Product	This product is not a restricted use pesticide
U.S. Producer:	Arvesta Corporation

2. USE PATTERNS AND FORMULATIONS

Application Sites: Acequinocyl is registered for use on ornamental plants grown in commercial greenhouses and shadehouses for control of various mites.

Types of Formulations: 96.8% technical product
15.8% soluble concentrate end-use product

Use Summary: The formulated product, which is a soluble concentrate product containing 15.8% acequinocyl is diluted in water and applied as a full coverage foliar spray "to drip" at 0.06 lb. a.i./100 gallons on roses and impatiens and from 0.06-0.125 lb. a.i./100 gallons on other ornamentals. The maximum application rate per crop cycle is 0.3 lb. ai/A on roses and impatiens and 0.6 lb. a.i./A on other ornamentals. Successive applications of the pesticide are not recommended in order to reduce any potential for development of resistence.

3. SCIENCE FINDINGS

Acequinocyl is a member of the quinoline class of insecticides/miticides and has been designated as a "reduced risk" pesticide by EPA. The available product chemistry, toxicology, ecological effects and environmental fate data for acequinocyl are summarized below, along with the estimated risks to human health and the environment from its use on ornamental crops grown in commercial greenhouses and shadehouses:

Chemical Characteristics

PROPERTY	TECHNICAL	END-USE
Color	Light Brown (TGAI) Soft Yellow (PAI)	Pale Yellow
Physical State	Flakes (TGAI) Crystals (PAI)	liquid suspension
Odor	faintly earthy (TGAI) non-detectable (PAI)	detergent-like
Oxidation/reduction	none	no reaction
Flammability	not highly flammable	no flash point
Explodability	not explosive	not explosive
Storage Stability	data gap	stable for 2 years

PROPERTY	TECHNICAL	END-USE
Miscibility	NA	NA
Corrosion Characteristics	data gap	non-corrosive
pH	6.94 (TGAI)	7.10
Viscosity	NA	405.95 cS (20°C) 217.23 cS (40°C
Melting Point-TGAI	59.6°C	NA
Boiling Point-TGAI	could not be measured, TS changed over 200°C	NA
Relative density-TGAI	1.13 at 20°C	1.04
Dissociation constants in water-TGAI	could not be measured, low solubility in water	NA
Partition coefficient (n-octanol/water)-TGAI	log Pow 6.2	NA
Water solubility; column elution method; shake flask method-TGAI	in water = 6.69ug/L at 20°C	NA
Vapor pressure-TGAI	1.69x10-6 Pa at 25°C	NA

Toxicology Characteristics

A. Acute Toxicity Data on Technical Acequinocyl and End-Use Product (15.8% SC)

STUDY	TECHNICAL PRODUCT		END-USE PRODUCT	
	RESULTS	TOXICITY CATEGORY	RESULTS	TOXICITY CATEGORY
acute oral toxicity; mouse; LD50	5000 mg/kg bw	IV	5000 mg/kg bw	IV
acute oral toxicity; rat; LD50	5000 mg/kg bw	IV	5000 mg/kg bw	IV
acute dermal toxicity; LD50	2000 mg/kg bw	III	5000 mg/kg bw	IV
acute inhalation; LC50	0.84 mg/L	III	4.49 mg/L	IV
primary eye irritation	not an eye irritant	IV	no irritation at 24 hrs. or subsequently	IV

STUDY	TECHNICAL PRODUCT		END-USE PRODUCT	
	RESULTS	TOXICITY CATEGORY	RESULTS	TOXICITY CATEGORY
primary dermal irritation	not a dermal irritant	IV	no dermal reaction	IV
dermal sensitization	not a dermal sensitizer	negative	data gap	data gap

B. Subchronic Toxicity Data

The subchronic studies (28-day dermal study and subchronic feeding study) used in the risk assessment for acequinocyl are summarized in the table under Toxicological Endpoints, below.

C. Mutagenicity

Acequinocyl was not mutagenic in 1) Salmonella typhimurium/Escherichia coli assay, 2) in vitro mammalian cell gene mutation assay, 3) in vitro mammalian cytogenetics, and 4) a micronucleus assay with mouse erythrocytes. Overall, the data suggest that acequinocyl is negative for mutagenicity in vitro and in vivo.

D. Carcinogenicity

Carcinogenicity data are required for food use pesticides and for non-food use pesticides when chronic exposure of handlers and/or bystanders may occur as a result of the pesticide's use. The use of acequinocyl on greenhouse/shadehouse grown ornamentals is expected to result in short- and intermediate-term handler exposure but is not expected to result in chronic exposure to the pesticide. Therefore, cancer risk is not a concern for this use of acequinocyl, and carcinogenicity studies are not required.

Toxicological Endpoints

The toxicological endpoints used in the human health risk assessment for acequinocyl are summarized in the table below. The identified short-term (1 - 30 days) dermal toxicological endpoint of 200 mg a.i./kg bw/day is based upon increased blood clotting times seen in a 28-day rat dermal study. The intermediate-term (1 - 6 months) dermal endpoint is the same and is identified from the same study. A short-term (1 - 30 days) inhalation endpoint (30 mg a.i./kg bw/day) was identified from a subchronic rat study where the effect seen was reddish urine, which is indicative of the clotting abnormalities seen in the 28-day dermal study. An intermediate-term (1 - 6 months) inhalation endpoint was identified and is the same as the short-term inhalation endpoint.

Sub-Chronic Toxicity Summary and Endpoint Selection for Acequinocyl

Exposure Scenario	Dose Used in Risk Assessment	Level of Concern for Risk Assessment	Study and Toxicological Effects
Short-Term Dermal (1 to 30 days)	Dermal Study NOAEL = 200 mg/kg/day	Occupational LOC for MOE = 100	28-day Dermal Toxicity Study in the Rat Increased clotting factor times.
Intermediate-Term Dermal (1 to 6 months)	Dermal Study NOAEL = 200 mg/kg/day	Occupational LOC for MOE = 100	28-day Dermal Toxicity Study in the Rat Increased clotting factor times.
Short-Term Inhalation (1 to 30 days)	Oral study NOAEL= 30 mg/kg/day (inhalation absorption rate = 100%)	Occupational LOC for MOE = 100	Subchronic feeding study in the rat Reddish urine observed between week 2 and sacrifice. Increased prothrombin times in males and increased activated partial thromboplastin times in both sexes.
Intermediate-Term Inhalation (1 to 6 months)	Oral study NOAEL= 30 mg/kg/day (inhalation absorption rate = 100%)	Occupational LOC for MOE = 100	Subchronic feeding study in the rat Reddish urine observed between week 2 and sacrifice. Increased prothrombin times in males and increased activated partial thromboplastin times in both sexes.

Human Exposures and Risks

A. Residential: No residential exposure is expected, since the pesticide is not for use in or around residential areas.

B. Commercial Handlers: Data from the Pesticide Handler Exposure Database (PHED) were used to estimate exposure of handlers to acequinocyl.

Short Term : The combined Margin of Exposure (MOE) for the most highly exposed handler in an ornamental greenhouse setting (a single individual who mixes, loads, and applies the materials using high-pressure, hand-wand equipment) is 3,397, which is well over the target MOE of 100. Based primarily upon the proposed use practices, the Agency expects that,

typically, commercial and private (i.e., grower) pesticide handlers will experience short-term exposures (1 - 30 days). The label directs that sequential applications should not be made.

Intermediate: Although the Agency does not typically expect intermediate-term handler exposures, the risks estimated for short-term exposures are conservative and adequate to protect handlers who might experience intermediate-term exposures. As stated above under Short Term, the estimated exposure and risk to a mixer/loader/applicator using high pressure, hand-wand equipment on greenhouse ornamentals are well over the target MOE of 100.

C. Post-Application; Agricultural Workers:

Short Term: The transfer coefficient data from Agricultural Re-Entry Task Force (ARTF) studies were used in conjunction with the applicant-submitted chemical-specific dislodgeable foliar residue (DPR) dissipation data from chrysanthemums grown in a greenhouse. The DPR study evaluated acequinocyl and its metabolite, acequinocyl-OH (deacetylated acequinocyl). The resulting MOE was greater than 33,000, corrected to reflect the 2X maximum label rate used in the DFR study. The Agency expects post-application agricultural exposures to workers would typically be short-term (1-30 days). Mites are typically "hot spot" (i.e., relatively small areas) pests; therefore, entire facilities typically need not be treated for mites. Acequinocyl is not to be applied sequentially.

Intermediate Term: Although the Agency does not typically expect intermediate-term handler exposures, the risks estimated for short-term exposures are conservative and adequate to protect workers who might experience intermediate-term exposures. The short- and intermediate-term dermal and inhalation endpoints are the same, and do not exceed EPA's level of concern.

Environmental Characteristics

The environmental fate data supportive of the non-food use of acequinocyl in greenhouses and shadehouses are described below:

A. Hydrolysis: Based on the submitted supplemental study, acequinocyl undergoes rapid hydrolysis under neutral and alkaline pH conditions and is considered stable under acidic conditions. Deacetylated acequinocyl was reported to be the major metabolite.

B. Aerobic Soil Metabolism: Based on the available study, observed half-lives of degradation in the sandy loam and silt soils were less than 2 days. Deacetylated acequinocyl was reported to be the major metabolite.

C. Adsorption/Desorption/Leaching: Based on the available studies, acequinocyl is expected to exhibit low mobility in soil and is expected to exhibit low potential to leach to ground water.

Ecological Characteristics/Risk

The ecological effects data considered in the qualitative risk assessment for the proposed use in greenhouses/shadehouses are described below. A quantitative ecological risk assessment of the proposed greenhouse use is not needed, since limited environmental exposure is expected from this indoor use.

A. Birds: It is not expected that the proposed use of acequinocyl would result in exposure levels that would be of concern to birds. Based on the available acute avian studies, acequinocyl is characterized as practically non-toxic to moderately toxic to birds.

B. Fish: It is not expected that adverse effects to fish would result from the proposed use of acequinocyl, due to its use indoors and the fact that acequinocyl's solubility limit is 2-3 orders of magnitude lower than the concentration at which the toxic effects occur. Additional acute toxicity testing is being requested, using the metabolite itself to ascertain whether the reported toxic effects are due to parent, metabolite, or both. Based on the results of the available acute fish studies, acequinocyl is characterized as slightly (formulated product tested) to moderately (technical product tested) toxic to freshwater fish, and slightly (formulated product tested) to highly toxic (technical product tested) to estuarine/marine fish.

C. Aquatic Invertebrates: Further acute toxicity testing for aquatic invertebrates is needed to fully characterize the toxicity to invertebrates. The additional testing includes (1) testing on either daphnids or mysids using deacetylated acequinocyl itself to ascertain whether the toxic effects reported are due to the parent, the deacetylated acequinocyl, or both, and (2) testing with the metabolite in a sediment toxicity test using freshwater invertebrates as the test organism. Results of the available acute freshwater invertebrate study conducted with the formulated product show acequinocyl to be slightly toxic, and a study using the technical product showed very high toxicity to the test species. In the available estuarine/invertebrate studies, both conducted with the technical product, acequinocyl was shown to be very highly toxic to the test species.

Additional studies are to be conducted on the end-use formulation to further characterize its toxicity to aquatic invertebrates. To mitigate the risk to aquatic invertebrates during the period that the studies are in progress, labeling will be required in connection with the Environmental Hazards to advise the user that the pesticide is very highly toxic to invertebrates, such as Eastern oysters and mysid shrimp, and that drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. In addition, the end-use product is not expected to present a significant risk to invertebrates, based on its lower toxicity (slightly toxic) and the nature of the use (indoors in commercial greenhouses/shadehouses).

D. Mammals: It is not expected that the proposed use of acequinocyl would result in exposure levels that would be of concern to mammals. Mammalian studies show acequinocyl to be of very low toxicity to mammals.

4. SUMMARY OF REGULATORY POSITION AND RATIONALE

Based on the available data as described in this document, there is adequate information to support a registration decision under FIFRA section 3(c)(7)(C) for the conditional registration of the pesticide

products, acequinocyl technical and the formulated product described in this document, for use on ornamental plants grown in commercial greenhouses and shadehouses.

Use, Formulation, Manufacturing Process or Geographic Restrictions

The formulated product falls under the scope of the Worker Protection Standard (WPS) and must be used only in accordance with its labeling and the WPS, 40 CFR part 170. The formulated product label includes the WPS restrictions cited below.

A restricted entry interval of 12 hours.

The standard WPS drift restriction of not applying in any way that will contact workers or other persons, either directly or through drift, and the statement that only protected workers may be in the area during application.

Use of Personal Protective Equipment (PPE) by applicators and other handlers, consisting of long-sleeved shirt and long pants, socks, shoes and chemical resistant gloves made of waterproof material.

The label bears the following additional use restriction statements.

Not for use in or around residential sites. For use only in commercial greenhouses and shadehouses.

Restrictions for Use on Ornamental Crops Grown in Greenhouses:

< Do not apply through any type of irrigation system.
< Do not contaminate water, food or feed by storage or disposal.
< DO NOT contaminate water when disposing of equipment washwaters.

5. SUMMARY OF DATA GAPS

The additional data listed below must be provided to the Agency as conditions of registration. Upon receipt and evaluation of the requested information, the Agency will reassess the registration, and, if appropriate, will remove these conditions.

< One year storage stability and corrosion characteristics (technical)
< Skin sensitization study (end-use product)
< Additional data to upgrade the aerobic soil metabolism study
< Additional data to upgrade the hydrolysis study
< Adsorption/desorption study

- Freshwater invertebrate (Daphnia) study
- Acute sediment toxicity test for freshwater invertebrates conducted with the major metabolite
- Acute toxicity to freshwater fish study conducted with the major metabolite
- Acute toxicity to aquatic invertebrates study conducted with the major metabolite

6. CONTACT PERSON AT EPA

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