

CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION

PUBLIC REPORT 2004-5

Acequinocyl

Tracking ID 191890 N & 191891 N

DESCRIPTION OF ACTION

Arvesta Corporation submitted an application seeking California registration of Acequinocyl Technical, EPA Reg. No. 66330-39 and Shuttle 15 SC Miticide EPA Reg. No. 66330-38. The end-use product is intended to control spider mites on greenhouse and shadehouse grown ornamental and nursery plants. These products contain the new active ingredient acequinocyl.

Acequinocyl was designated as a “reduced risk” pesticide by the United States Environmental Protection Agency (U.S. EPA). U.S. EPA conditionally registered Acequinocyl Technical on September 26, 2003. U.S. EPA is requiring the registrant to submit the following studies within one year or the product registration will be subject to cancellation: acute toxicity studies for aquatic organisms (*Daphnia magna*, blue gill or rainbow trout, Mysid shrimp). In addition, within two years, a one-year storage stability study and a corrosion characteristics study must be submitted to U.S. EPA. Kanemite 15 SC, an alternative brand name for Shuttle 15 SC Miticide, was also registered conditionally on November 6, 2003 by U.S. EPA. U.S. EPA is requiring the registrant to submit the following information and studies within one year or the product registration will be subject to cancellation: a dermal sensitization study and acute toxicity studies for aquatic organisms (*Daphnia magna*, blue gill or rainbow trout, Mysid shrimp).

The Department of Pesticide Regulation (DPR) evaluated the product labels and scientific data supporting registration of these products and found them to be acceptable to support registration. The acute health risks from exposure to acequinocyl are minimal due to its low mammalian toxicity. The Precautionary and First Aid statements on the product label, as well as label directions requiring work clothing and other protective measures, adequately mitigate potential health risks to persons who may come in contact with the pesticide. DPR does not expect any significant adverse environmental impacts to result from registration of these products.

BACKGROUND

Registrant:	Arvesta Corporation
Common name:	Acequinocyl
Chemical name:	3-dodecyl-1,4-dihydro-1,4-dioxo-2-naphthyl acetate
Brand names:	Acequinocyl Technical and Shuttle 15 SC Miticide
Uses:	To formulate end use miticides to control spider mites on ornamental plants and nursery plants grown in greenhouses and shadehouses
Pests controlled:	Spider mites
Type of registration:	Unconditional

Acequinocyl Technical is a powder composed of 96.8 % Acequinocyl. This product is intended solely for manufacturing end-use products. Shuttle 15 SC Miticide is formulated as a flowable

concentrate containing 1.25 pounds (lbs.) of acequinocyl per gallon of product. Shuttle 15 SC Miticide is intended to control spider mites infesting indoor (greenhouse and shadehouse) grown ornamental, floral, foliage and nursery container crops. The label recommends applications of 6.4-12.8 ounces (0.06-0.125 lbs. of acequinocyl) per 100 hundred gallons of water as a full coverage spray. The lower rate is recommended for roses (except miniature roses) and impatiens with the low to higher rates recommended for all other ornamental crops. Depending on the ornamental crop, a maximum of 0.3-0.6 lb. of acequinocyl can be applied per crop cycle.

Acequinocyl's mode of action is to inhibit electron transfer in the mitochondria of spider mites. It provides contact and residual control of all spider mite life stages, including eggs. Thorough coverage is necessary for good control. Shuttle 15 SC Miticide is relatively harmless to most predacious mites and beneficial insects, and can be used in Integrated Pest Management (IPM) and resistance management programs. Acequinocyl is effective against various mite species including those that have developed resistance to other miticides. The label resistance management program recommends the user not to make consecutive applications of Shuttle 15 SC Miticide. Rotation with other miticides with different modes of action is recommended when season long mite control is needed.

SCIENTIFIC REVIEW

A. Chemistry

1. Product Chemistry: DPR evaluated the submitted chemistry studies for Acequinocyl Technical and Shuttle 15 SC Miticide and the summarized results are in the following tables.

Table I. Physical and Chemical Properties of Acequinocyl Technical

Properties	Values
Physical state	Light brown flakes
Odor	Faint earthy smell
Bulk density	1.154
PH	6.94
Solubility (water)	6.69 ug/L at 20° C
Vapor pressure	1.69 x 10 ⁻⁶ Pa at 25° C
Partition coefficient	Log Pow 6.2
Storage stability	Data being generated

Table II. Physical and Chemical Properties of Shuttle 15 SC Miticide

Properties	Values
Physical state	Pale yellow liquid
Odor	Detergent-like
Density	1.04
PH (1% suspension)	7.10
Storage stability	Stable for two years

DPR found the product chemistry data to be satisfactory to meet the regulatory data requirements to support registration of these products.

2. Residues in Food and Animal Feed: The Acequinocyl Technical and Shuttle 15 SC Miticide product labels do not include any food or feed uses. Therefore, residue data are not required to support registration of these products. However, in anticipation of future agronomic registrations, residue studies on pome fruits, citrus fruits, almonds and pistachios and animal metabolism studies were submitted. The data were reviewed and found adequate to support the proposed tolerances and use directions on the proposed use patterns.
3. Environmental Fate: The acequinocyl environmental fate data reviewed included: soil adsorption/desorption, hydrolysis, aqueous and soil photolysis, aerobic soil and aquatic metabolism, anaerobic soil metabolism, and field dissipation studies. The studies were found to be acceptable. Soil adsorption/desorption studies were conducted in various loam and sandy soils and the K_{oc} values indicate acequinocyl is immobile in soil. The hydrolysis study was conducted in water with pHs at 1, 4, 7, and 9 for a period of <1-30 days. Acequinocyl is stable under acidic conditions that can occur in the environment (pH 4), with a half-life of 74 days (estimated from linear regression). However, in neutral to lightly alkali conditions, acequinocyl hydrolyzes readily with a half-life of two days or less. In water, acequinocyl is very unstable in the presence of sunlight (photolysis) and has a half-life of less than one hour. On soil, acequinocyl is much more stable in sunlight with an estimated half-life of 14.5 days. The aerobic soil metabolism study indicated (through linear regression) that acequinocyl is relatively unstable with a half-life of 16-39 days. Similarly, with aquatic conditions, the aerobic metabolism of acequinocyl in sediments is 12-13 days. With anaerobic soil conditions, the study results were extremely variable with an estimated half-life (linear regression) ranging from 8-1000 days. Three terrestrial field dissipation studies (California, Georgia and New York) were reviewed and the results indicate acequinocyl has a short half-life in soil of 2-14 hours. The results from the soil column leaching study demonstrate that acequinocyl does not move easily through the soil profile. In the four types of soils tested, most of the radiolabeled acequinocyl remained in the top layer of soil.

The submitted product and environmental fate data support registration of the subject products. The data indicate acequinocyl is unlikely to leach into groundwater because its water solubility is low, it is bound tightly to soil particles, hydrolyzes easily, and it dissipates readily from the soil. The use of acequinocyl is expected to have minimal impact on the environment and it is not expected to leach into groundwater.

B. Toxicology

DPR reviewed the toxicology studies submitted by Arvesta Corporation and found them adequate to conduct a complete toxicological evaluation of Acequinocyl Technical and Shuttle 15 SC Miticide. DPR evaluated the submitted data to ascertain the potential for adverse health effects from exposure. The acute toxicity parameters for Acequinocyl Technical and Shuttle 15 SC Miticide are summarized in the following tables.

Table III. Acute Toxicity of Acequinocyl Technical

Type of Study	Acute Toxicity Values	Acute Toxicity Category
Acute Oral	LD ₅₀ (M/F) >5000 mg/kg	IV
Acute Dermal	LD ₅₀ (M/F) >2000 gm/kg	III
Acute inhalation	LC ₅₀ (M/F) >0.84 mg/L	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

N/A- Not applicable.

Table IV. Acute Toxicity of Shuttle 15 SC Miticide

Type of Study	Acute Toxicity Values	Acute Toxicity Category
Acute Oral	LD ₅₀ (M/F) >5000 mg/kg	IV
Acute Dermal	LD ₅₀ (M/F) >2000 mg/kg	III
Acute inhalation	LC ₅₀ (M/F) >4.56 mg/L	IV
Primary eye irritation	N/A	IV
Primary dermal irritation	N/A	IV
Dermal Sensitization	N/A	Not a sensitizer
Signal word	N/A	CAUTION

N/A- Not applicable.

DPR's evaluation of the acute toxicity data indicates that Acequinocyl Technical and Shuttle 15 SC Miticide are low in mammalian toxicity. The precautionary language on the product labels adequately identifies all acute toxicity hazards noted in the studies.

DPR found the submitted toxicology studies adequate to satisfy the data requirements of the Birth Defects Prevention Act (Food and Agricultural Code section 13121 *et. al.*). Possible adverse health effects were observed in the rat chronic toxicity and reproduction studies. A neurotoxicity study is not required at this time. DPR has not yet prioritized acequinocyl for risk assessment. DPR prioritizes pesticide active ingredients for risk assessment based on the nature of the potential adverse health effects, number of potential adverse health effects, number of species affected, no observed effect levels (NOELs), potential for human exposure, use patterns, and similar factors. Based on these criteria, pesticides with the greatest potential for health problems are placed in high priority, with other chemicals being placed in moderate or low priority. The purpose of the risk assessment would be to appraise the potential for acequinocyl to cause adverse health effects in humans if exposed to the pesticide as the result of a legal use. Further toxicity information is available in DPR's Summary of Toxicology Data for acequinocyl, available on DPR public website at <http://www.cdpr.ca.gov/docs/toxsums/pdfs/5801.pdf>

C. Health & Safety

An evaluation of the medical management information on the Acequinocyl Technical and Shuttle 15 SC Miticide labels and the acute toxicity study results indicate that the product labels bear all of the required statements and warnings regarding safety to handlers and other persons who may be exposed to the products. The product labels bear adequate First Aid statements. In addition, the labels for Acequinocyl Technical and Shuttle 15 SC Miticide require persons handling and applying these products to wear long-sleeved shirt and long pants, chemical-resistant gloves made of waterproof material, and shoes plus socks. Workers wearing only work clothing are not allowed to enter a treated field until 12 hours after an application. The product label for Shuttle 15 SC Miticide requires that persons entering a treated area before the 12-hour restricted-entry interval (REI) has elapsed must wear coveralls, chemical-resistant gloves made of waterproof material, and shoes plus socks if they are going to contact treated plants, soil or water.

D. Fish & Wildlife

The registrant submitted fish and wildlife toxicity studies, including studies on rats, bluegill sunfish, Japanese quail, *Daphnia magna*, honeybees, mallard ducks, Mysid shrimp, oysters, rainbow trout and sheepshead minnows. The submitted data are adequate to characterize toxicity to wildlife and aquatic animals from an environmental exposure. Table V summarizes the results of these studies.

Table V. Summary of Toxicity Studies for Wildlife*

Test Animal	Type of Study	Acute Toxicity Value**	Relative Toxicity
Rat, male/female	Single acute oral dose	5000 mg/kg (LD ₅₀)	Relatively non-toxic
Mallard duck	Single acute oral dose	>2000 mg/kg (LD ₅₀)	Relatively non-toxic
Mallard duck	Feeding study (5 days)	>5000 ppm (LC ₅₀)	Relatively non-toxic
Japanese quail	Single acute oral dose	>2000 ppm (LD ₅₀)	Relatively non-toxic
Japanese quail	Feeding study (5 days)	>5000 ppm (LC ₅₀)	Relatively non-toxic
Bluegill sunfish	Water exposure (96 hrs.)	>3.3 mg a.i./L (LC ₅₀)	Moderately toxic
Rainbow trout	Water exposure (96 hrs.)	>33 mg a.i./L (LC ₅₀)	Slightly toxic
<i>Daphnia magna</i>	Water exposure (48 hrs.)	3.9 ug a.i./L (EC ₅₀)	Extremely toxic
Sheepshead minnow	Water exposure (96 hrs.)	>10 mg a.i./L (LC ₅₀)	Slightly toxic
Mysid shrimp	Water exposure (96 hrs.)	0.93 ppb (LD ₅₀)	Extremely toxic
Oyster	Water exposure (96 hrs.)	0.63 ppb (EC ₅₀)	Extremely toxic
Honeybee	Contact (48 hrs.)	>100 ug/bee (LD ₅₀)	Relatively non-toxic

*The test substance used for the studies was technical acequinocyl.

**Acute toxicity values expressed as: a. LD₅₀= lethal dose that will kill 50% of test population, b. LC₅₀= lethal environmental concentration that will kill 50% of test population and c. EC₅₀ concentration that caused some effect that can lead to death.

The data indicate that acequinocyl is relatively non-toxic to vertebrate animals, birds and honeybees, slightly to moderately toxic to fish, and extremely toxic to oysters and freshwater invertebrates. The proposed use pattern, in greenhouses and shadehouses, is not expected to result in exposure to aquatic environments. The aquatic and terrestrial degradation studies indicate that acequinocyl breaks down readily in the environment under most conditions. In

addition, the Shuttle 15 SC Miticide label bears language warning against the contamination of water and intertidal areas below the mean high water mark. The use of Shuttle 15 SC Miticide is not expected to pose a threat to wildlife when used in accordance with label directions.

E. Efficacy & Phytotoxicity

The submitted efficacy studies demonstrate that Shuttle 15 SC Miticide provides effective control of spider mites on a variety of indoor-grown ornamental plants. Phytotoxicity studies indicate that Shuttle 15 SC Miticide is not phytotoxic to a wide range of ornamental crops with the exception of two crops. Phytotoxicity was observed when Shuttle 15 SC Miticide was applied to miniature roses and impatiens. Applications on roses and impatiens are limited to the 6.4 oz. of product per 100 gallons of water rate and use on miniature roses is not recommended. Because of the wide range of ornamental crops Shuttle 15 SC Miticide could potentially be used on, the label recommends treatment on a small number of plants before any large-scale application is made.

ALTERNATIVES

Acequinocyl is active on all spider mite life stages and is relatively harmless to predacious mites and beneficial insects. It is used best in combination with other miticides in an integrated pest management (IPM) program to control spider mites. Because acequinocyl has a different mode of action, Shuttle 15 SC Miticide can be used in rotation with carbamate, organophosphate and other miticides like pyridaben and propargite to control mite infestations and slow resistance development.

CONCLUSION

DPR evaluated the product labels and scientific data submitted to support the registrations of Acequinocyl Technical and Shuttle 15 SC Miticide and found them acceptable to support registration. The acute health risks to humans from exposure to acequinocyl are minimal due in part to its low mammalian toxicity. The Precautionary and First Aid statements on the product labels, as well as the required work clothing and other protective measures, mitigate potential health risks to persons who may be exposed. If a risk assessment is conducted and DPR determines that exposure to acequinocyl may result in unacceptable margins of exposure, further restrictions will be placed on the use of acequinocyl at that time. The submitted data also indicate significant adverse environmental impacts are not expected to occur from the use of Acequinocyl Technical and Shuttle 15 SC Miticide. When used in accordance with label directions, Shuttle 15 SC Miticide will be effective for its intended use.