

ZEAL MITICIDE FOR COTTON

Michael J. Ansolabehere
Valent USA Corporation
Fresno, CA

Abstract

Zeal™ is a new miticide that received EPA registration in 2003 for crops including cotton. Zeal contains a new active ingredient (etoxazole) with a new mode of action and has no cross resistance to miticide products currently on the market. Zeal is primarily active against major tetranychidae mites (spider mites and red mites) in egg and larval stages of growth. Foliar applications of Zeal can be made for control of mites infesting cotton, apple, pear and strawberry crops. Valent U.S.A. Corporation is developing Zeal as part of Integrated Pest Management (IPM) and Insect Resistance Management (IRM) programs for row crop and tree fruit mite control. Mites controlled by Zeal include Twospotted Spider Mite, Citrus Red Mite, European Red Mite, Pacific Spider Mite, Carmine Spider Mite, and Southern Red Mite. Zeal exhibits low mammalian toxicity and is safe on most beneficial insects.

Discussion

Zeal is formulated as 72% water dispersible granules and use rates are 0.03 to 0.045 lb ai/A (2/3 to 1 oz pr/A) for cotton. Zeal can be applied with ground equipment in 10 to 50 gallons water per acre or with aerial equipment in 3 to 10 gallons water per acre. Coverage is essential for good control and higher water volumes will assure better coverage. Because of Zeal's mode of action, best results are obtained when applications are made when mite populations are low. The pre-harvest interval for Zeal in cotton is 28 days and only one application can be made during the growing season.

Chemical Name and Structure

Active Ingredient

Common Name: Etoxazole (BSI)

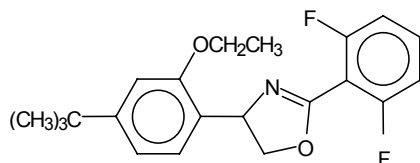
Chemical Class: 2,4-Diphenyloxazoline derivative

Trade Names & Other Designations: Zeal™, TetraSan™ 5 WDG Miticide, V-1283, S-1283

CAS Number: 153233-91-1

Molecular Formula: C₂₁H₂₃F₂NO₂

Structural Formula:



Chemical Name: 2-(2,6-difluorophenyl)-4-[4-(1,1-dimethylethyl)-2-ethoxyphenyl]-4,5-dihydrooxazole

Physical Properties

Active Ingredient

Water Solubility: 7.04 x 10⁻⁵ g/L @ 20°C

Vapor Pressure: 7.0 x 10⁻⁶ Pascals @ 25 °C

Chemical Stability: Stable at ambient temperature

Molecular Weight: 359.4

Odor: None

Formulation

Type: water dispersible granules

Percent Active Ingredient: 72 %

Appearance: brown granules

Bulk Density: 27.8 lbs./cu. Ft.

pH: 6.43 (1% solution in water)

Mode of Action

Zeal controls susceptible mites by inhibiting the molting process through disruption of the cell membrane. Zeal has excellent contact activity against juvenile stages from egg to larvae and nymphs and has no acute toxicity to adult mites. Since evidence of etoxazole activity depends upon mite development, control may not be observable for several days. Zeal exhibits pronounced translaminar movement in plant leaves. Translaminar movement is important because a major obstacle to effective mite control is getting the product to where the pests are located on the plant, often the undersides of leaves.

Environmental Fate

Etoxazole is relatively short-lived in the environment under aerobic conditions, and is immobile in most agricultural soils (K_{oc} 4910- 11,000). Biological catalysis appears to be the primary mechanism for metabolism in soils.

Etoxazole Half-lives

Hydrolysis:	9.6 days at pH 5, 161 at pH 7, 165 at pH 9
Soil Photolysis:	22.0 to 24.3 days
Aerobic Soil Metabolism:	9.9 to 52 days
Field Dissipation:	1 to 11 days

Health and Ecological Effects

Short Term Health Effects (Formulated Product - 72 WDG)

Test	LD ₅₀ /LC ₅₀	Observation	Toxicity Category
Oral Toxicity	4274 mg/kg		IV
Dermal Toxicity	>5000 mg/kg (both sexes)		IV
Inhalation Toxicity	>2.28 mg/L		IV
Eye Irritation	Mildly irritating		III
Skin Irritation	Slightly irritating		IV
Dermal Sensitization	No skin sensitization		

Long Term Health Effects (Technical)

This product is not expected to be a chronic, developmental, or reproductive hazard when used according to the label directions, and is not mutagenic or oncogenic.

Ecological Effects (Technical)

Etoxazole Technical is practically nontoxic to mammals and avian species. It is moderately to highly toxic to fish and moderately to very highly toxic to aquatic invertebrate species. It is practically nontoxic to bees.

Summary

Zeal with a new mode of action will be a useful tool for cotton growers to control mites and mitigate the potential of mite resistance. Zeal will be available for use in many cotton growing states in 2004.

Table 1. Efficacy of etoxazole against *Tetranychus urticae* in cotton.

Treatment	Total Motiles Per Cotton Leaf						
	Precount	3 DAT*	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT
Untreated Control	2.47	1.05	8.77 b	15.23 b	9.45 b	4.72 b	1.05 b
Etoxazole – 0.030 lb ai/A	2.77	1.65	0.75 a	0.38 a	0.23 a	0.52 a	0.60 ab
Etoxazole – 0.045 lb ai/A	2.57	0.08	0.22 a	0.00 a	1.43 a	0.00 a	0.00 a
Abamectin – 0.007 lb ai/A	4.88	0.38	1.42 a	0.52 a	0.38a	0.08 a	0.00a

Means within a column followed by the same letter do not significantly differ (P=0.05, Duncan's New Multiple Range Test)

Applied on 7/9/02 with a back pack sprayer – 20 gpa

* DAT = days after treatment