United States Environmental Protection Agency

Office of Prevention, Pesticides and Toxic Substances (7501C)

Pesticide Fact Sheet

Name of Chemical: Flucarbazone-sodium
Reason for Issuance: Conditional Registration
Date Issued: September 29, 2000

1. DESCRIPTION OF CHEMICAL

Generic Name:	4,5-dihydro-3-methoxy-4-methyl-5-oxo-*N*-[[2(trifluoromethoxy)phenyl] sulfonyl]-1*H*-1,2,4-triazole 1-carboxamide, sodium salt
Common Name:	Flucarbazone-sodium
Trade Name:	Everest™
EPA Shaughnessy Code:	114009
Chemical Abstracts Service (CAS) Number:	181274-17-9
Year of Initial Registration:	2000
Pesticide Type:	Herbicide
Chemical Family:	Sulfonylurea
U.S. Producer:	Bayer Corporation

2. USE PATTERNS AND FORMULATIONS

Application Sites:	Flucarbazone-sodium is registered for use on spring wheat, including durum, and winter wheat.
Types of Formulations:	95.6% technical product Two 70% end use products (Everest™ 70% Water Dispersible Granular Herbicide and Everest™ 70% Water Dispersible Granular Herbicide in Water-Soluble Packets).

Types and Methods of Application:	Ground application only using standard commercial sprayers in 5 to 10 gals. of water per acre.
Application Rates:	An application rate of 0.41 ounces of product (0.018 pounds active ingredient) per acre is recommended for green foxtail control. A rate of 0.61 ounces of product (0.027 pounds active ingredient) per acre is recommended for wild oat control and suppression of yellow foxtail and ryegrass. A single postemergent application is made at least 60 days prior to harvest.
Carrier:	Water

3. SCIENCE FINDINGS

Flucarbazone-sodium is a member of the sulfonylurea chemical class of herbicides. It has been designated by the EPA as a reduced-risk pesticide and has been reviewed under a "work-share" agreement with Canada's Pesticide Management Regulatory Agency (PMRA). The review of available product chemistry, environmental fate, toxicology, ecological effects and residue chemistry data for flucarbazone-sodium has been completed. The data indicate that flucarbazone-sodium is of low acute and chronic toxicity to humans. It is neither a developmental nor reproductive toxicant and has been classified as "not likely to be carcinogenic to humans". The data also indicate that flucarbazone-sodium poses little risk to nontarget organisms, with the exception of nontarget, terrestrial plants. It is practically non-toxic to birds, mammals, insects (honey bees) and aquatic invertebrates. It is practically non-toxic to freshwater fish on an acute basis and slightly toxic to fish on a chronic basis. There is concern about the potential for flucarbazone-sodium and/or its metabolites to contaminate ground and surface water, based on their environmental fate characteristics. The data and estimated risks to human health and the environment from its use on wheat are summarized below:

Chemical Characteristics

PROPERTY	TECHNICAL	END-USE
Physical State	crystalline powder	solid
Color	colorless	N/A
Odor	odorless	N/A
Melting Point	200C (under decomposition)	N/A
Density	1.59 g/mL @ 20	29-34 lb./ft^3
Solubility (Water)	44 g/L @ 20C in neutral, acid and alkaline conditions	N/A

PROPERTY	TECHNICAL	END-USE
Vapor Pressure	$<1 \times 10^{-9}$ mm Hg @ 20C	N/A
Octanol/Water Partition Coefficient	log K_{ow} = -0.89, -1.84 and -1.88 @ pH 4, 7 and 9, respectively	N/A
pH	6.4 (1% solution)	7 - 8 @ 25C (5% aqueous suspension)

Toxicology Characteristics

ACUTE TOXICITY (EVEREST™ TECHNICAL)			
GDLN	**Study Type**	**Results**	**Tox. Cat.**
870.1100	Acute Oral- Rat	LD_{50} > 5000 mg/kg (M) LD_{50} > 5000 mg/kg (F)	4
870.1200	Acute Dermal -Rat, Rabbit	LD_{50} > 5000 mg/kg (M & F)	4
870.1300	Acute Inhalation-Rat	LC_{50} > 5.13 mg/L	4
870.2400	Primary Eye Irritation-Rabbit	Slight irritation, cleared by 72 hours	3
870.2500	Primary Skin Irritation-Rabbit	Non-irritating	4
870.2600	Dermal Sensitization-Rat	Not a sensitizer	N/A

ACUTE TOXICITY (END USE PRODUCT:EVEREST™)			
GDLN	**Study Type**	**Results**	**Tox. Cat.**
870.1100	Acute Oral- Rat	LD_{50} > 5,000 mg/kg (M & F)	4
870.1200	Acute Dermal -Rat	LD_{50} > 2,000 mg/kg (M & F)	3
870.1300	Acute Inhalation-Rat	LC_{50} > 5.113 mg/L air (M & F)	4
870.2400	Primary Eye Irritation-Rabbit	Minimally irritating	4
870.2500	Primary Skin Irritation-Rabbit	Non-irritating	4

GDLN	Study Type	Results	Tox. Cat.
870.2600	Dermal Sensitization-Guinea Pig	Not a sensitizer	N/A

SUBCHRONIC/CHRONIC TOXICITY (FLUCARBAZONE-SODIUM)	
Guideline No./ Study Type	**Results**
870.3100 28-Day oral toxicity in rodents (rats)	NOAEL = 27 mg/kg/day in males and 25 mg/kg/day in females. LOAEL = 266 mg/kg/day in males and 251 mg/kg/day in females based on immunological changes in both sexes.
870.3100 90-Day oral toxicity in rodents (rats)	NOAEL = 73.5 mg/kg/day in males and 102 mg/kg/day in females LOAEL = 287 mg/kg/day in males and 358 mg/kg/day in females based on immunological findings in both sexes
870.3100 28-Day oral toxicity in rodents (mice)	NOAEL = > 4,554 mg/kg/day in males and 6,429 mg/kg/day in females. LOAEL > 4,554 mg/kg/day in males and 6,429 mg/kg/day in females. There were no signs of toxicity attributable to treatment at any dose level.
870.3100 90-Day oral toxicity in rodents (mice)	NOAEL = > 2,083 mg/kg/day in males and 3,051 mg/kg/day in females. LOAEL > 2,083 mg/kg/day in males and 3,051 mg/kg/day in females. There were no signs of toxicity attributable to treatment at any dose level.
870.3150 28-Day oral toxicity in nonrodents (dogs)	NOAEL = 164 mg/kg/day in males and 171 mg/kg/day in females. LOAEL = 1,614 mg/kg/day in males and 1,319 mg/kg/day in females based on decreased body weight gain, decreased food consumption, decreased T4 levels and increased thyroxine-binding capacity, induction of microsomal enzymes, increased liver weight and liver histopathology in both sexes.
870.3150 90-Day oral toxicity in nonrodents (dogs)	NOAEL = 33.8 mg/kg/day in males and 35.2 mg/kg/day in females with the occurrence of slight, adaptive induction of hepatic microsomal enzymes. LOAEL = 162 mg/kg/day in males and 170 mg/kg/day in females based on decreased T4 levels, increased thyroxine-binding capacity, induction of microsomal enzymes, gross pathology and histopathology in the stomach, and histopathology in the liver in both sexes.
870.3200 21/28-Day dermal toxicity in rabbits	NOAEL$1,000 mg/kg/day for both sexes. LOAEL > 1,000 mg/kg/day There were no signs of toxicity attributable to treatment at any dose level.
870.3250 90-Day dermal toxicity in rats	NA

Guideline No./ Study Type	Results
870.3465 90-Day inhalation toxicity in rats	NA
870.3700a Prenatal developmental toxicity in rats	**Maternal** NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day **Developmental** NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day
870.3700b Prenatal developmental toxicity in rabbits	**Maternal** NOAEL = 100 mg/kg/day LOAEL = 300 mg /kg/day based on decreased food consumption and increased clinical signs **Developmental** NOAEL = 300 mg/kg/day LOAEL = 500 mg/kg/day based on decreased fetal weight and increased incidence of delayed fetal ossification
870.3800 Reproduction and fertility effects in rats	**Parental/Systemic** NOAEL = 287 mg/kg/day for males and 340 mg/kg/day for females with a slight, increased incidence of moderate cecal enlargement occurring as an adaptive response to treatment. LOAEL = 800 mg/kg/day for males based decreased liver weight and 991 mg/kg/day for females based on decreased uterine weight and increased incidence of severe cecal enlargement. **Reproductive/Offspring** NOAEL = 287 mg/kg/day for males and 340 mg/kg/day for females LOAEL = 800 mg/kg/day for males and 991 mg/kg/day for females based on reduced pup weights, decreased liver weight in male pups, marbled liver, air filled stomach
870.4100b Chronic toxicity in dogs	NOAEL = 35.9 mg/kg/day in males and 37.1 mg/kg/day in females. LOAEL = 183 mg/kg/day in males and 187 mg/kg/day in females based upon body weight gain depression and increased N-demethylase levels in both sexes, decreased T4 levels and marginally increased liver weight in females.
870.4300 2-Year Chronic toxicity/carcinogenicity in rats	NOAEL = 125 mg/kg/day in males and females LOAEL = 1,000 mg/kg/day in males and females based on decreased body weight and increased food consumption in females, thickened mucosa of the glandular stomach in both sexes, inflammatory infiltrates (males), vacuolation of the squamous epithelium in the fore-stomach (females) and immunological effects in males. **no evidence of carcinogenicity**

Guideline No./ Study Type	Results
870.4200b 2-Year Carcinogenicity in mice	NOAEL = 275 mg/kg/day in males and 459 mg/kg/day in females LOAEL = 2,066 mg/kg/day in males and 3,212 mg/kg/day in females based on decreased body weight in both sexes and increased food consumption in males **no evidence of carcinogenicity**
Gene Mutation 870.5100 reverse gene mutation assay in bacteria	There was *no evidence* of induced mutant colonies over background
Gene Mutation 870.5100 reverse gene mutation assay in bacteria	There was *no evidence* of induced mutant colonies over background
870.5300 gene mutation assay in V79 cultured mammalian cells	No increase in mutant frequency above that of negative controls up to the limit dose
Cytogenetics 870.5375 *in vitro* mammalian cytogenetics assay	No increases in aberrant metaphases were observed up to the limit dose
870.5395, bone marrow micronucleus assay	There was no significant increase in the frequency of micronucleated polychromatic erythrocytes in bone marrow at 2000 mg/kg.
Other Genotoxicity 870.5550, Unscheduled DNA synthesis in primary rat hepatocytes	There was no evidence of unscheduled DNA synthesis up to cytotoxic levels.
870.6200a Acute neurotoxicity screening battery in rats	NOAEL = 500 mg/kg/day for males and females LOAEL = 2000 mg/kg/day based on increased incidence of perianal staining in males, decreased motor activity and locomotor activity in both sexes and increase in the incidence of animals exhibiting low levels of activity in open field in both sexes
870.6200b Subchronic neurotoxicity screening battery in rats	NOAEL = 147 mg/kg/day in males and 1,736 mg/kg/day in females LOAEL = 1,482 mg/kg/day based on decreased body weight, decreased body weight gain, and decreased food consumption in males. LOAEL > 1,736 mg/kg/day in females.

Guideline No./ Study Type	Results
870.6300 Developmental neurotoxicity in rats	NA
870.7800 Antibody Plaque-forming cell assay in male rats	NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day
870.7800 Antibody Plaque-forming cell assay in female rats	NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day
870.7800 Splenic T-cells, B-cells, and NK-cell assay in male rats	NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day
870.7800 Splenic T-cells, B-cells, and NK-cell assay in female rats	NOAEL = > 1,000 mg/kg/day LOAEL > 1,000 mg/kg/day
870.7800 Plaque-Forming cell assay in rats	NOAEL = 2,205 mg/kg/day in males and 2,556 mg/kg/day in females LOAEL > 2,205 mg/kg/day in males and 2,556 mg/kg/day in females
870.7485 Metabolism in rats	There were no sex-related differences in the absorption, distribution, metabolism or excretion. Based on urinary excretion, absorption was 15-30% and maximum plasma concentrations were achieved within 30 minutes. At sacrifice, tissues and carcass contained less than 1% of radioactivity. The highest residue in the tissues was in the liver. Greater than 90% of the administered dose was eliminated within 24 hours. The major component in urine and feces was unchanged parent which represented 90-95% of the administered dose.
870.7485 Metabolism in rats	Major component in urine and feces was unchanged parent which represented 94% of the administered dose. Less than 1% of the administered dose was recovered in the carcass, tissues, expired air, or cage wash. Highest residue was in the liver.
870.7485 Metabolism in rats	Metabolized via two pathways. One pathway involved the oxidative decarboxylation of sulfonamide lactate to form sulfonamide acetate. The other pathway involved the hydrolysis of sulfonamide lactate and sulfonamide acetate to give sulfonamide.
870.7485 Metabolism in rats	Approximately 70% absorption and elimination with 98% recovery in urine and feces. Several metabolites in addition to parent (17%). Less than 1% of the administered dose was recovered in the carcass, tissues, expired air, or cage wash. Highest residue was in the liver.

Guideline No./ Study Type	Results
870.7600 Dermal penetration	NA

NA - Not applicable.

Toxicological Endpoints

The dose at which no adverse effects are observed (the NOAEL) from the toxicology study identified as appropriate for use in risk assessment is used to estimate the toxicological level of concern (LOC). The lowest dose at which adverse effects of concern are identified (the LOAEL) is sometimes used for risk assessment if no NOAEL was achieved in the toxicology study selected. An uncertainty factor (UF) is applied to reflect uncertainties inherent in the extrapolation from laboratory animal data to humans and in the variations in sensitivity among members of the human population as well as other unknowns. An UF of 100 is routinely used, 10X to account for interspecies differences and 10X for intra species differences.

For dietary risk assessment (other than cancer) the Agency uses the UF to calculate an acute or chronic reference dose (acute RfD or chronic RfD) where the RfD is equal to the NOAEL divided by the appropriate UF (RfD=NOAEL/UF). Where an additional safety factor (SF) is retained due to concerns unique to the Food Quality Protection Act (FQPA), this additional factor is applied to the RfD by dividing the RfD by such additional factor. The acute or chronic Population Adjusted Dose (aPAD or cPAD) is a modification of the RfD to accommodate this type of FQPA Safety Factor.

For non-dietary risk assessments (other than cancer) the UF is used to determine the LOC. For example, when 100 is the appropriate UF (10X to account for interspecies differences and 10X for intraspecies differences) the LOC is 100. To estimate risk, a ratio of the NOAEL to exposures (margin of exposure (MOE) = NOAEL/exposure) is calculated and compared to the LOC.

The linear default risk methodology (Q*) is the primary method currently used by the Agency to quantify carcinogenic risk. The Q* approach assumes that any amount of exposure will lead to some degree of cancer risk. A Q* is calculated and used to estimate risk which represents a probability of occurrence of additional cancer cases (e.g., risk is expressed as 1×10^{-6} or one in a million). Under certain specific circumstances, MOE calculations will be used for the carcinogenic risk assessment. In this non-linear approach, a "point of departure" is identified below which carcinogenic effects are not expected. The point of departure is typically a NOAEL based on an endpoint related to cancer effects though it may be a different value derived from the dose response curve. To estimate risk, a ratio of the point of departure to exposure (MOE_{cancer} = point of departure/exposures) is calculated.

The acute, sub-chronic and chronic (non-cancer) toxicological endpoints that have been established for flucarbazone-sodium are summarized in the following table.

TOXICOLOGICAL DOSES AND ENDPOINTS FOR USE IN HUMAN RISK ASSESSMENT			
Exposure Scenario	**Dose Used in Risk Assessment, UF**	**FQPA SF and Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary females 13-50 years of age	NOAEL = 300 mg/ kg/day UF = 100 **Acute RfD** = 3.0 mg/ kg/day	FQPA SF = 1X **aPAD** = acute RfD / FQPA SF = 3.0 mg/kg/day	Developmental Toxicity Study - rabbit Developmental LOAEL = 500 mg/kg/day based on decreased fetal body weight and delayed ossification
Chronic Dietary all populations	NOAEL= 35.9 mg/kg/day UF = 100 **Chronic RfD** = 0.36 mg/kg/day	FQPA SF = 1X **cPAD** = chronic RfD / FQPA SF = 0.36 mg/kg/day	One year dog feeding study LOAEL = 183 mg/kg/day based on decreased body weight gain, decreased thyroxine, increased N-demethylase, and increased liver weight
Short-Term (1-7 days) Dermal (Occupational/ Residential)	dermal study NOAEL= 1,000 mg/kg/day	**LOC for MOE** = 100 (Occupational) **LOC for MOE** = 100 (Residential)	21-Day Dermal Toxicity Study - rabbit LOAEL > 1,000 mg/kg/day no effects at highest dose tested
Intermediate-Term (1 week - several months) Dermal (Occupational/ Residential)	oral study NOAEL = 33.8 mg/kg/day (dermal absorption rate = 25%)	**LOC for MOE** = 100 (Occupational) **LOC for MOE** = 100 (Residential)	90-Day Feeding Study - Dogs LOAEL = 162 mg/kg/day based on decreased thyroxine, increased thyroxine-binding capacity, induction of microsomal liver enzymes, gross pathology and histopathology in the stomach, and histopathology in the liver

Exposure Scenario	Dose Used in Risk Assessment, UF	FQPA SF and Level of Concern for Risk Assessment	Study and Toxicological Effects
Short-Term (1-7 days) Inhalation (Occupational/ Residential)	oral study NOAEL = 100 mg/kg/day (inhalation absorption rate = 100%)	**LOC for MOE** = 100 (Occupational) **LOC for MOE** = 100 . (Residential)	Developmental Toxicity Study - rabbit Maternal LOAEL = 300 mg/kg/day based on decreased food consumption and increased clinical signs
Intermediate-Term (1 week - several months) Inhalation (Occupational/ Residential)	oral study NOAEL = 33.8 mg/kg/day (inhalation absorption rate = 100%)	**LOC for MOE** = 100 (Occupational) **LOC for MOE** = 100 (Residential)	90-Day Feeding Study - Dogs LOAEL = 162 mg/kg/day based on decreased thyroxine, increased thyroxine-binding capacity, induction of microsomal liver enzymes, gross pathology and histopathology in the stomach, and histopathology in the liver

Carcinogenicity

In accordance with the EPA Draft Guidelines for Carcinogen Risk Assessment (July, 1999), the Agency classified flucarbazone-sodium as "not likely to be carcinogenic to humans" by all routes of exposure based upon lack of evidence of carcinogenicity in rats and mice.

Metabolism

In metabolism studies in rats, there were no sex-related differences in the absorption, distribution, metabolism or excretion of flucarbazone-sodium. Based on urinary excretion, absorption was 15-30% and maximum plasma concentrations were achieved within 30 minutes. Greater than 90% of the administered dose was eliminated within 24 hours. The major component in urine and feces was unchanged parent which represented 90-95% of the administered dose. Other metabolites represented <1% of the administered dose and included sulfonic acid, hydroxysulfonamide, sulfonamide-N-glucuronide, hydroxysulfonamide-O-glucuronide, N-acetylsulfonamide, carbomethoxy sulfonamide, and carboethoxy sulfonamide.

Human Exposures and Risks

Acute Dietary Risk

The acute dietary exposure from food to flucarbazone-sodium and its metabolites of concern will occupy <1% of the aPAD for females 13 to 50 years old. Since an appropriate endpoint attributable to a single exposure was not identified for the general population, including infants and children, an acute exposure assessment was not performed for these population subgroups. In addition, there is potential for acute dietary exposure to flucarbazone-sodium in drinking water. After calculating Drinking Water Levels of Comparison (DWLOCs) and comparing them to the Estimated Environmental Concentrations (EECs) for surface and ground water, EPA does not expect the aggregate exposure to exceed 100% of the aPAD for the population of concern (females 13 to 50 years old). There are no uses of flucarbazone-sodium that would result in non-dietary exposure; therefore, the total aggregate risk for acute exposure includes only the risk from food and drinking water.

Aggregate Risk Assessment for Acute Exposure to Flucarbazone-sodium:

Population Subgroup	aPAD (mg/kg)	% aPAD (Food)	Surface Water EEC (ppb)	Ground Water EEC (ppb)	Acute DWLOC (ppb)
Females, 13 to 50 years old	3	<1	1.45	50	90000

Chronic Dietary Risk

Exposure to flucarbazone-sodium and its metabolites of concern from food will utilize 1 % of the cPAD for the U.S. population, <1% of the cPAD for all infants less than 1 year old and 2% of the cPAD for children 1 to 6 years old, the population subgroup with the highest estimated exposure to flucarbazone-sodium. In addition, there is potential for chronic dietary exposure to flucarbazone-sodium in drinking water. After calculating the DWLOCs and comparing them to the EECs for surface and ground water, EPA does not expect the aggregate exposure to exceed 100% of the cPAD. Again, since here are no uses of flucarbazone-sodium that would result in non-dietary exposure, the total aggregate risk for chronic exposure includes only the risk from food and drinking water.

Aggregate Risk Assessment for Chronic Exposure to Flucarbazone-sodium:

Population Subgroup	cPAD mg/kg/day	% cPAD (Food)	Surface Water EEC (ppb)	Ground Water EEC (ppb)	Chronic DWLOC (ppb)
U.S. Population	0.36	1	0.48	50	12,000
Infants less than 1 year old	0.36	<1	0.48	50	3,600
Children 1 to 6 years old	0.36	2	0.48	50	3,500

Occupational Risk

The level of concern (LOC) for occupational exposures to flucarbazone-sodium is for MOEs less than 100. Based on the use pattern, short-term exposures are expected for private applicators (farmers treating their own crops). Both short- and intermediate-term exposures may occur for commercial applicators. Based on the seasonal use pattern, long-term exposures are not expected.

The Pesticide Handlers Exposure Database (PHED) v 1.1 surrogate table was used to estimate worker exposure. For all exposure scenarios, 'open mixing' and 'open cab' were used to calculate exposures. As specified on the label, all exposures were calculated for workers wearing a single layer of clothing and gloves. All short- and intermediate-term MOEs are well above 100. The estimates indicate that the risks from worker exposure from the proposed use of flucarbazone-sodium do not exceed the level of concern.

Post-application activities related to wheat consist mainly of mechanical harvesting. However, there is potential for other cultural practices, such as irrigation and scouting, that may result in post-application exposures. Therefore, a screening level exposure assessment was performed using a high transfer coefficient (TC). This assessment is considered conservative and demonstrates that minimal risk is expected for the post-application exposure from the proposed

use of flucarbazone-sodium. The MOE for the worker with the highest potential dermal post-application exposure is 4800. These estimates indicate that the risks from potential post-application exposure from the proposed use of flucarbazone-sodium do not exceed the level of concern.

The interim Worker Protection Standard (WPS) restricted entry interval (REI) is 12 hours based on toxicity category III for primary eye irritation.

Environmental Characteristics

STUDY TYPE	HALF LIFE/OTHER
Hydrolysis (Half Life)	Stable at all pHs (5, 7, 9)
Photolysis in Water (Half Life)	Stable
Photolysis on Soil (Half Life)	No significant degradation of parent.
Aerobic Soil Metabolism (Half Life)	t-½ (parent) = 64 to 76 days. Sulfonamide and sulfonic acid degradates resistant to metabolism; O-desmethyl flucarbazone degradate rapidly hydrolyzes to N,O-dimethyltriazolinone (NODT), which itself degrades rapidly to N-methyltriazolinone (NMT); NMT is either immobilized in the soil or metabolized to CO_2.
Aerobic Aquatic Metabolism (Half Life)	No data available.
Anaerobic Aquatic Metabolism (Half Life)	t-½ (parent) = 66 to 104 days. Sulfonamide and NMT degradates resistant to anaerobic metabolism.
Mobility- Leaching (Parent)	Very mobile in all soils
Mobility-Leaching (Metabolites)	Sulfonamide, sulfonic acid, and NODT degradates very mobile in all soils. NMT irreversibly sorbed in all soils. O-desmethyl flucarbazone degradate hydrolyzed under experimental conditions, so mobility could not be determined.
Terrestrial Field Dissipation (Half Life)	t-½ (parent) = 9.5 to 15 days (Canadian sites); 22 days in ND site; 8 days in WA site. Sulfonamide degradate persistent for over 1 year; downward movement of parent and degradates observed.

Potential to Contaminate Drinking Water

Because of the high solubility and mobility of flucarbazone-sodium and the high mobility and persistence of its sulfonamide and sulfonic acid degradates, both surface and ground water contamination are likely to occur. The Agency used GENEEC and SCI-GROW models to estimate residues of flucarbazone-sodium in surface water and ground water and incorporated these estimates into the aggregate risk assessments discussed above under **Human Exposures and Risks**.

Ecological Characteristics/Risk

Terrestrial: Flucarbazone-sodium is practically non-toxic to birds on an acute and subacute dietary basis (LD_{50} > 2000 mg/kg; LC_{50} > 4621 ppm), practically non-toxic to mammals (LD_{50} > 5000 mg/kg) and practically non-toxic to honey bees (LD_{50} > 200 ug/bee).

Aquatic: Flucarbazone-sodium is practically non-toxic to freshwater fish on an acute basis (96-hour LC_{50} > 96.7 ppm). With chronic exposure, flucarbazone-sodium reduces fish growth at 2.75 ppm, with a No Observable Adverse Effects Concentration (NOAEC) established at 1.25 ppm (1250 ppb). It is practically non-toxic to freshwater invertebrates on an acute basis (EC_{50} > 109 ppm) and does not reduce reproduction of aquatic invertebrates at the NOAEC of 115 ppm (115,000 ppb). The NOAECs for fish and aquatic invertebrates are well above the peak estimated environmental concentration (EEC) in water of 1.42 ppb.

Plants: Vegetative vigor data for Flucarbazone-sodium indicate that onion is the most sensitive species of all terrestrial monocots and dicots tested, with an EC_{25} of 0.00034 lbs. active ingredient per acre. Calculated risk quotients for spray drift do not exceed the level of concern for terrestrial plants; however, calculated risk quotients for run-off do exceed the level of concern for terrestrial plants. Based on these calculations, the Agency has concluded that the use of flucarbazone-sodium on wheat poses risk to nearby non-target terrestrial plants, including endangered plants, due to exposure from runoff.

Aquatic plant testing with flucarbazone-sodium established an EC_{50} of 12.3 ppb for vascular plants (duckweed) and an EC_{50} of 2510 ppb for non-vascular plants (algae or diatom). Calculated risk quotients do not exceed the level of concern for either non-endangered or endangered aquatic plants.

Mechanism of Pesticidal Action

Flucarbazone-sodium is an inhibitor of the enzyme acetolactate synthase (ALS), also know as acetohydroxy acid synthase (AHAS) which catalyses the first reaction in the biosynthetic sequence leading to the branched chain amino acids valine, leucine and isoleucine. Within a few hours, this inhibited synthesis of the branched chain amino acids leads to a secondary inhibition of DNA synthesis and a rapid cessation of plant growth. In the field, seedlings of sensitive weeds stop growth, occasionally turn red because of stress anthocyanins synthesized, wither, then eventually die back.

4. SUMMARY OF REGULATORY POSITION AND RATIONALE

Available data provide adequate information to support the conditional registrations of Everest™ Technical and the Everest™ end-use products for use on wheat.

Use, Formulation, Manufacturing Process or Geographic Restrictions

Restrictions for Use on Wheat:

1. Do not apply by air.
2. Do not apply through any type of irrigation system.
3. Do not mix, load or clean spray equipment within 33 feet of well-heads or aquatic systems, including marshes, ponds, ditches, streams, lakes, etc.
4. Do not apply within 50 feet of well-heads or aquatic systems.
5. Do not apply when rain is expected within the next hour.
6. Make only one application per growing season at a maximum rate of 0.61 ounces of product per acre (0.027 pounds of the active ingredient, flucarbazone-sodium).
7. Observe a minimum interval to harvest of 60 days after treatment, after which wheat grain and straw from treated fields may be fed to livestock.

5. SUMMARY OF DATA GAPS

- Toxicology (28-day rat inhalation study)
- Residue Chemistry (Revised plant enforcement method which measures all residues of concern and additional field trial and processing data on metabolites of concern in wheat commodities; additional storage stability data on turnip tops and kale)
- Ecotoxicity (Seedling emergence and vegetative vigor testing of metabolites)
- Environmental Fate (Field dissipation data and an aerobic aquatic metabolism study)

6. CONTACT PERSON AT EPA

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