4-5-94

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

April 5, 1994

MEMORANDUM

SUBJECT: Transmittal of EFED Cover Memorandum for the Reregistration Eligibility Document for Difenzoquat (List A, Case #0223)

FROM: Sharlene R. Matten, Biologist
Science Analysis and Coordination Staff
Environmental Fate and Effects Division

THRU: Evert K. Byington, Chief
Science Analysis and Coordination Staff
Environmental Fate and Effects Division

TO: Lois Rossi, Chief
Reregistration Branch
Special Review and Reregistration Division

Summary

Difenzoquat (methyl sulfate) or AVENGE is a selective postemergence herbicide currently registered for use to control wild oats (Avena fatua) in barley, wheat, and alfalfa (seed crop in CA) and flax crops.

EFED concludes that there is sufficient data to make a preliminary environmental risk assessment for difenzoquat. Based on the acceptable data, difenzoquat does not appear to pose a serious acute or chronic environmental threat.

It is not possible to conclude from the preliminary environmental fate assessment the actual route of dissipation of difenzoquat in the field. Because different methods were used in the laboratory and field studies to extract difenzoquat from soil, it is not possible to conclude that difenzoquat is bound in the field soils. EFED is recommending that confirmatory studies comparing

the recovery of ^{14}C-difenzoquat between the methods used in laboratory and field studies and field dissipation studies be conducted to verify the route of dissipation.

Although, there are no data available on effects to non-target plants, it is anticipated that, since difenzoquat is an herbicide risk to non-target aquatic and terrestrial plants will be high. The required plant data are necessary in order to confirm this assessment for non-target plants.

Environmental Fate

The environmental fate assessment is not comprehensive because some environmental fate data requirements are unfulfilled: Terrestrial Field Dissipation (164-1), Droplet Size Spectrum (201-1), and Drift Field Evaluation (202-1).

A preliminary assessment of the environmental fate of difenzoquat indicates that soil binding appears to be the principal route of dissipation. This assessment is supported by laboratory data which shows a high degree of adsorption to soil but no degradation of the parent material.

However, the field dissipation studies contrast sharply with laboratory data and indicate that difenzoquat residues decline with time. Because different methods were used in the laboratory and field studies to extract difenzoquat from soil, it is not possible to conclude at this time that difenzoquat is bound in the field soils. The submitted laboratory and field studies do not provide a coherent description of the environmental fate of difenzoquat nor explain the discrepancies between laboratory data, which indicate persistence, and field data, which indicate slow to moderate dissipation. It appears from the laboratory data that difenzoquat is immobile in the soil and the potential for ground water contamination is minimal.

Typically, results from the field dissipation studies along with data from the other environmental fate studies would be used to determine the leaching potential of difenzoquat and whether groundwater monitoring studies are needed. However, it cannot be determined based solely on laboratory data how far through field soil difenzoquat or its degradates will move by leaching. Therefore, without acceptable terrestrial field studies, the potential for contamination of groundwater cannot be assessed. The information gained from further field terrestrial dissipation studies may enable EFED to determine the persistence, potential mobility and route of dissipation of difenzoquat under actual use conditions.

2

Recommendations:

EFED recommends the following confirmatory studies be performed to confirm the actual route of dissipation (i.e., binding to soil).

(1) The registrant should perform a non-guideline laboratory study comparing the recovery of ^{14}C-difenzoquat between the methods used in laboratory and field studies. This added bridging information is needed to assist EFED in determining if the major route of difenzoquat dissipation is soil binding. The soils in these new studies should be the same as used in the field studies.

(2) Upon review of data bridging laboratory and field extraction methodologies, EFED will reevaluate the need for further terrestrial field dissipation studies. However, if the registrant decides not to perform the bridging data, and since the field dissipation studies are so seriously flawed, EFED recommends that at least two addition field dissipation studies be conducted using the same methodology utilized in the laboratory studies. These studies may confirm the laboratory results and should address the route of dissipation of difenzoquat and any major degradates in actual use conditions. The information gained from these studies may enable EFED to determine the persistence, potential mobility and route of dissipation of difenzoquat under actual use conditions.

Environmental Risk Assessment

The following points represent the summary of the major environmental issues for difenzoquat:

Terrestrial Risk

From the data analyzed, difenzoquat only poses a slight to moderate potential for acute toxicity to avian and mammalian species. Chronic toxicity to avian and mammalian species has not been evaluated directly, but appears to be slight as noted by mammalian chronic testing. Therefore, there appear to be only minimal acute and chronic risks to avian and mammalian species from acute and dietary exposure to difenzoquat. No additional data is required.

Aquatic Risk

From the data analyzed, difenzoquat only poses a slight to moderate potential for acute toxicity to aquatic organisms. Chronic risk to fish is unlikely because expected exposure is < 0.01 the lowest LC_{50} values and only one application per season

is permitted. Therefore, there appear to be only minimal acute and chronic risks to aquatic species. No additional data is required.

Non-target Insect Risk

From the data analyzed, there is minimal risk to non-target insects.

Non-target Plant Risk

The following guideline requirements for non-target plants are not fulfilled. Therefore, the registrant will be required to complete Tier II Plant Testing: 123-1 (a) Seed Germination/Seedling Emergence; 123-1 (b) Vegetative Vigor; and 123-2 Aquatic Plant Growth.

Although, there are no data available on effects to non-target plants, it is anticipated that, since difenzoquat is an herbicide risk to non-target aquatic and terrestrial plants will be high. The required plant data are necessary in order to confirm lthis assessment for non-target plants.

Recommendations for Risk Mitigation

The EFED plant workgroup is in the process of formulating appropriate criteria to address the mitigation of non-target plant effects. Therefore, at this time, EFED can only offer the most conservative, generic risk mitigation measures for non-target plant effects:

(1) Reduce the total amount applied per year by reducing the use rate and/or reducing the number of applications per year to reduce the potential for off-site non-target plant risk.
(2) Ensure that all applications be soil incorporated to reduce run-off and other off-site movement.
(3) Elimination of aerial or air-blast applications to substantially reduce the potential for spray-drift exposure.
(4) Establish vegetative buffer zones to reduce run-off potential.

EFED will provide SRRD additional information to address non-target plant effects as it becomes available.

The following documents for the completed EFED Review of difenzoquat are attached:

1. EFED Summary RED Chapter
2. EFGWB Science Chapter
3. EF Science Chapter

4

If you have any questions concerning this case, please contact Sharlene Matten at 703-305-7974.

Attachments

cc w/o attachments:

Anne Barton
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PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

April 5 1994

MEMORANDUM

SUBJECT: EFED Summary Reregistration Eligibility Document for Difenzoquat (List A, Case # 0223)

FROM: Sharlene R. Matten, Biologist
Science Analysis and Coordination Staff
Environmental Fate and Effects Division

THRU: Evert K. Byington, Chief
Science Analysis and Coordination Staff
Environmental Fate and Effects Division

TO: Lois Rossi, Chief
Reregistration Branch
Special Review and Reregistration Division

Use Profile

Difenzoquat (methyl sulfate) or AVENGE is a selective postemergence herbicide registered for use to control wild oats (Avena fatua) in barley, wheat, rye, maize, ryegrass, alfalfa (seed crop in CA) and flax crops. Wild oats is one of the most serious annual weeds in the hard red spring wheat growing areas of Montana, North Dakota and Minnesota. Difenzoquat is currently registered on two crops, wheat and barley. A Special Local Need is also present on alfalfa seed crops in Kings County, California.

According to EPA's Qualitative Use Assessment (QUA) for this compound, about 1% of the barley and wheat crops are presently being treated with this pesticide, with the predominate use areas in the north central, and western United States (maximum acreage 8,313,000 and 77,286,000, respectively). The pesticide is applied once per growing season at rates of 0.6 to 1.0 lbs ai/A using

ground and aerial application.

Difenzoquat is applied as a postemergence broadcast-applied herbicide by ground or aerial equipment when wild oats are in the three to five leaf stage (tillering). Single active ingredient formulations include soluble concentrate/liquid and soluble concentrate/solid. The rates of application range from 0.6 to 1.0 lbs/A. This herbicide may be used on all varieties of barley and certain varieties of wheat. Because difenzoquat is highly selective in its weed control, it is usually tank mixed with broadleaf herbicides such as the amine salts or esters of MCPA (2-methyl-4-chlorophenoxyacetic acid) or 2,4-D (2,4-dichlorophenoxyacetic acid), metsulfuron methyl, chlorsulfuron, cereal fungicides and the growth regulator chlormequat chloride. Difenzoquat is readily absorbed by plants and is not significantly metabolized or further degraded. The exact herbicidal mode of action of difenzoquat is not understood.

Outstanding Data Requirements

Field Dissipation

164-1 Soil; Not fulfilled[1]

Accumulation

165-4 In Fish; Waived[2]

Spray Drift

201-1 Drift Field Evaluation[3]; Not Submitted
202-1 Drift Size Spectrum[3]; Not Submitted

Tier II Non-Target Plant Studies

123-1(a) Seed Germination/Seedling Emergence
123-2(b) Vegetative Vigor
123-2 Aquatic Plant Growth

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[1]Although satisfactory freezer storage stability data have been submitted, under present day review criteria these studies are not acceptable primarily because the soils were not sampled deep enough to define the extent of leaching. Furthermore, the registrant should describe a route of dissipation of difenzoquat and its residues.

[2]Waived as per the Graybeard decision (HMJ/SCT, 4/6/93)

[3]Spray drift data are required by 40 CFR §158.142 when aerial application and/or mist blower or other ground application are proposed and it is expected that the detrimental effect level of nontarget organisms (humans, domestic animals, fish, wildlife, and nontarget plants) expected to be present are exceeded. Furthermore, these data are required for all herbicides applied by air.

A. Environmental Assessment

1. Environmental Fate

a. Environmental Chemistry, Fate, and Transport

The following environmental fate studies submitted in support of reregistration have been reviewed and are included in the RED:

Hydrolysis (161-1) [MRID #41325403]

Difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) did not hydrolyze in sterile aqueous buffered solutions (pH 5, 7, and 9) that were incubated in the dark at 25 ^{0}C for 28 days. Using three different thin-layer chromatography systems, [^{14}C]difenzoquat was the only compound detected in the treated solutions at 28 days posttreatment. During the study, material balances ranged from 98.2 to 101.1% of the applied with no discernable pattern of decline.

Photolysis in water (161-2) [MRID #41325404]

Difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) did not degrade in sterile aqueous buffered (pH 7) solutions that were continuously irradiated with a xenon arc lamp at 25 ^{0}C for 28 days. Using three different TLC systems, [^{14}C]difenzoquat was the only compound detected in the irradiated and dark control solutions at 28 days posttreatment. During the study, material balances ranged from 98.6 to 101.6% of the applied with no discernable pattern of decline.

Photolysis on soil (161-3) [MRID #41325405]

Difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) did not degrade on sandy loam soil that was continuously irradiated with a xenon arc lamp for 28 days at 25 ^{0}C. Based on data from three different TLC systems, [^{14}C]difenzoquat comprised 98.0-99.8% of the applied radioactivity in the irradiated and dark control solutions at 28 days posttreatment. Two unidentified [^{14}C]compounds were each $\leq$1.4% of the applied in the irradiated and dark control solutions; unidentified "1" was detected at all sampling intervals, and unidentified "2" was detected only at 3 and 4 weeks posttreatment. During the study, the material balances ranged from 99.07 to 106.23% of the applied with no discernable pattern of decline.

Aerobic soil metabolism (162-1) [MRID #41903701]

Difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) did not degrade in aerobic sandy loam soil that was incubated for 1 year in the dark at 20 ^{0}C and 75% of 0.33 bar moisture. During

the study, extractable [^{14}C]residues totaled 96.9-98.9% of the applied; [^{14}C]difenzoquat was the only compound detected in the soil extracts at 12 months posttreatment. Unextracted [^{14}C]residues in the soil were 1.1-3.1% of the applied at all sampling intervals, and [^{14}C]volatiles (organic and $^{14}CO_2$) totaled <1% at 12 months posttreatment. During the study, the material balances ranged from 97.10 to 107.68% of the applied with no discernable pattern of decline.

Anaerobic soil metabolism (162-2) [MRID #41903702]

Difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) did not degrade in anaerobic (flooded plus oxygen-free atmosphere) sandy loam soil that was incubated in the dark at 20 ^{0}C for 2 months. During the study, extractable [^{14}C]residues associated with the soil totaled 96.5-102.2% of the applied; during anaerobic incubation, only 0.14-0.21% was associated with the floodwater. [^{14}C]Difenzoquat was the only compound detected in the soil extracts. Unextracted [^{14}C]residues in the soil were 1.18-2.48% of the applied at all sampling intervals. [^{14}C]Volatiles (organic and $^{14}CO_2$) were not detected during the aerobic portion of the experiment, and were not measured during the anaerobic portion of the experiment. During the study, the material balances ranged from 99.06 to 104.23% of the applied with no discernable pattern of decline.

Leaching and adsorption/desorption (163-1) [MRID #41703401]

Based on batch equilibrium experiments, difenzoquat (1,2-dimethyl-3,5-diphenyl pyrazolium methyl sulfate) was immobile in sandy loam, sandy clay loam, silt loam, and clay loam soils, with Freundlich $K_{adsorption}$ values of 124-685 in calcium chloride solutions and 181-2680 in water. The study author suggested that the difference between the calcium chloride and water solutions may result from the competitive interaction of the calcium chloride and difenzoquat methyl sulfate for binding sites due to the charged nature of difenzoquat methyl sulfate.

b. Environmental Fate Assessment

Except for field dissipation studies (164-1), all of the required environmental fate data requirements are fulfilled at this time.

Difenzoquat is persistent (the chemical did not degrade in any of the laboratory studies performed: hydrolysis, aqueous and soil photolysis, and aerobic and anaerobic soil metabolism). This chemical is relatively immobile (K_ds ranged from 124 to 685, K_{oc}s ranged from 23,071 to 36,231). In aged and unaged soil column leaching studies with sand, sandy loam and silt loam soils, 90.88 and 96.7% of the applied radioactivity remained in the top 3.5 inches of the columns after 20 inches of water was applied,

respectively, and 0.47-2.59 % was recovered in the leachates.

A preliminary assessment of the environmental fate of difenzoquat indicates that soil binding appears to be the principal route of dissipation. This assessment is supported by laboratory data which shows a high degree of adsorption to soil but no degradation of the parent material.

However, the field dissipation studies contrast sharply with laboratory data and indicate that difenzoquat residues decline with time. Because different methods were used in the laboratory and field studies to extract difenzoquat from soil, it is not possible to conclude at this time that difenzoquat is bound in the field soils. The submitted laboratory and field studies do not provide a coherent description of the environmental fate of difenzoquat nor explain the discrepancies between laboratory data, which indicate persistence, and field data, which indicate slow to moderate dissipation. It appears from the laboratory data that difenzoquat is immobile in the soil and the potential for ground water contamination is minimal.

Typically, results from the field dissipation studies along with data from the other environmental fate studies would be used to determine the leaching potential of difenzoquat and whether groundwater monitoring studies are needed. However, it cannot be determined based solely on laboratory data how far through field soil difenzoquat or its degradates will move by leaching. Therefore, without acceptable terrestrial field studies, the potential for contamination of groundwater cannot be assessed. The information gained from further field terrestrial dissipation studies may enable EFED to determine the persistence, potential mobility and route of dissipation of difenzoquat under actual use conditions.

EFED notes that when the six field dissipation studies were reviewed in 1975 they were judged supplemental but did not fulfill EPA Data Requirements for Registering Pesticides primarily because the soil freezer storage stability data was not provided. However, under present day review criteria these studies are not acceptable primarily because the soils were not sampled deep enough to define the extent of leaching and many details needed to judge the validity of the studies were lacking. In these field studies, half-lives varied from 49-75 days in California to 254-354 days in Oregon. Furthermore, the registrant should describe a route of dissipation of difenzoquat and its residues, whether difenzoquat binds to soil or not.

Recommendations:

EFED recommends the following confirmatory studies be performed if a more thorough environmental fate assessment is required.

(1) The registrant should perform a non-guideline laboratory study comparing the recovery of ^{14}C-difenzoquat between the methods used in laboratory and field studies. This added bridging information is needed to assist EFED in determining if the major route of difenzoquat dissipation is soil binding. The soils in these new studies should be the same as used in the field studies.

(2) Upon review of data bridging laboratory and field extraction methodologies, EFED will reevaluate the need for further terrestrial field dissipation studies. However, if the registrant decides not to perform the bridging data, and since the field dissipation studies are so seriously flawed, EFED recommends that at least two addition field dissipation studies be conducted using the same methodology utilized in the laboratory studies. These studies may confirm the laboratory results and should address the route of dissipation of difenzoquat and any major degradates in actual use conditions. The information gained from these studies may enable EFED to determine the persistence, potential mobility and route of dissipation of difenzoquat under actual use conditions.

If the registrant decides to perform new terrestrial field dissipation studies, EFRD recommends that the registrant follow the directions in the Standard Evaluation Procedure guidance document for terrestrial field dissipation studies (§ 164-1), 40 CFR Section 158.290 Subdivision N Guidelines, as well as PR Notice 86-5. These documents generally describe reporting and evaluation requirements which apply to studies conducted and submitted to support environmental fate studies.

2. Ecological Effects

a. Ecological Effects Data (Manufacturing Use)

(1) Terrestrial Data

Effects to Non-Target Birds

Avian toxicity requirements have been fulfilled with two dietary studies, 71-2(a) Bobwhite quail LC_{50} = 4,640 ppm (MRID # 52458), 71-2(b) Mallard LC_{50} = 10,388 ppm (MRID # 37928), and one oral study, 71-1(a) Bobwhite quail LD_{50} = 1,577 mg/kg (MRID # 58830). All avian dietary studies show that the compound is "practically non-toxic" to birds, while the oral toxicity study shows that the compound is "slightly toxic" to birds.

(2). Aquatic Data

(a). Effects on Freshwater Fish

The guideline requirements for freshwater fish, 72-1(a) and 72-1(c), are fulfilled for this compound. Aquatic testing on freshwater fish show that difenzoquat is "slightly to practically non-toxic" to fish. Test results for freshwater fish include 72-1(c) Acute Fish (rainbow trout) LC_{50} = 694 mg/L (MRID # 37926) and 72-1(a) Acute Fish (bluegill) LC_{50} = 46.5 -696 mg/L (MRID # 37926; MRID # DIF0601).

(b). Effects on Freshwater Invertebrates

Guideline requirement 72-2(a) is fulfilled for this compound. Aquatic testing on freshwater invertebrates indicated that difenzoquat is "moderately toxic" to invertebrates. Acute studies on freshwater invertebrates include 72-2(b) Daphnia magna EC_{50} = 2.63 ppm (MRID # 57909).

(3). Non-Target Insects Data

Difenzoquat is non-toxic to honey bees (no deaths when a dose equivalent of 36 lb/A was administered).

(4) Non-Target Plants Data

The following guideline requirements for non-target plants are not fulfilled. Non-target plant studies are required because difenzoquat is used on terrestrial food and terrestrial non-food sites, applied by ground rigs, the water solubility is greater than 10 ppm (difenzoquat solubility is 7.65 X 10^5 ppm) or the vapor pressure is greater than 1.0 X 10^5 mmg Hg at 25^0C and the TEP is not thorougly incorporated immediately after application (aerial application and chemigation).

Therefore, the registrant will be required to complete Tier II Plant Testing:

123-1 (a) Seed Germination/Seed Emergence
123-1 (b) Vegetative Vigor
123-2 Aquatic Plant Growth (The study should be conducted on each of the following species: Selenastrum capricornutum, Lemna gibba, Skeletonema costatum, Anabaena flos-aquae, and a freshwater diatom.)

b. Environmental Risk Assessment

Difenzoquat is applied to crops once per growing season at rates of 0.6 to 1.0 lbs ai/A. Although the mode of action for this herbicide is not currently understood, difenzoquat is readily

absorbed but not metabolized or degraded by plants. The only pest claim for this compound is for the control of wild oats (Avena fatua).

(1). Terrestrial Organisms

Difenzoquat acute toxicity values to birds suggest that difenzoquat presents a slight to moderate potential for toxicity to wildlife. These acute values are as follows: mallard ducks (LC_{50} = 10,388 ppm) and bobwhite quail (LC_{50} = 4,640 ppm).

The available data shows that difenzoquat is slightly to practical non-toxic to birds. In order to predict plant residues, the maximum application rate of 1 lb ai/A at one application per season will be used as follows:

	ppm
short grass	240
long grass	110
leafy crops	125
small insects	58
large insects	12
grain	10
fruit	7

The expected residues do not trigger adverse effects to avian or mammalian species from the present registered uses of this herbicide. Adverse chronic effects to birds are not expected from exposure to this compound because of its low acute avian toxicity values, the low mammalian toxicity and the use restriction of one application per season.

Chronic toxicity to wildlife has not been evaluated directly, but appears to be slight as noted by mammalian chronic testing. No further testing on wildlife will be required at this time. Difenzoquat chronic toxicity to wildlife appears to be slight. Testing conducted on mammalian species (rats) showed that through the major routes of exposure (dermal and inhalation), the following toxicological characteristics were noted:

1) Subchronic toxicity: Systemic NOEL was 2,500 ppm. No compound related effects were observed in 90-day feeding study.

2) Oncogenenicity: Negative at the 5,000 ppm level in rats.

3) Teratogenicity: Negative for teratogenicity, fetotoxicity and maternal toxicity in rats at 2,500 ppm.

4) Reproduction: A 3-generation rat reproduction study found the parental NOEL was equal to or greater than 2,500 ppm and reproductive/developmental NOEL was 500 ppm.

(2). Aquatic Organisms

Difenzoquat acute toxicity values to aquatic species suggest that difenzoquat presents a slight to moderate potential for toxicity. These acute values are as follows: rainbow trout (LC_{50} = 694 mg/L), acute bluegill (LC_{50} =46.5-696 mg/L) and Daphnia (LC_{50} = 2.6 ppm).

The aquatic risk from difenzoquat exposure was evaluated by comparing the preliminary estimated environmental concentrations (EEC) with EFED's Regulatory Risk Criteria (ie. runoff EEC > 1/2 LC_{50} Daphnia; 0.37 ug/L > 2.6 ppm), as well as, difenzoquat toxicity information and use pattern. The preliminary EEC's for this herbicide were calculated by using a water body scenario at a maximum rate of 1.0 lb ai/A for simulated ground and aerial application to 6 feet of water. These values are summarized as follows:

1) Ground Application = runoff 12.2 ug/L (0.012 ppm)

2) Aerial Application = runoff 7.3 ug/L (0.007 ppm)
drift 3.05 ug/L (0.003 ppm)

Chronic risk to fish is unlikely because expected exposure is < 0.01 the lowest LC_{50} values and only one application per season is permitted. No additional data is required.

The current uses of difenzoquat on wheat, alfalfa and barley appear to result in low toxic impact on aquatic organisms. This conclusion is based upon the following information: 1) moderate to slight toxicity of the herbicide to fish and aquatic invertebrates; 2) Preliminary EEC values that suggest no risk (these values are at least 2 orders of magnitude below the acute risk criteria); 3) restriction of one application per season; 4) mammalian data do not indicate chronic effects.

(3). Nontarget Insects

Difenzoquat is non-toxic to honey bees (no deaths when a dose equivalent of 36 lb/A was administered).

(4). Nontarget Plants

Difenzoquat is to be used as an herbicide that is applied aerially, there is a potential for direct exposure of the

toxicant to terrestrial and aquatic plants. In order to evaluate toxicity of this compound to plants, Tier II Plant Testing will be required. These studies are: 123-1(a) Seed Germination/Seedling Emergence, 123-2(b) Vegetative Vigor, and 123-2 Aquatic Plant Growth.

Although, there are no data available on effects to non-target plants, it is anticipated that, since difenzoquat is an herbicide risk to non-target aquatic and terrestrial plants will be high. The required plant data are necessary in order to confirm this assessment for non-target plants.

(5). Endangered and Threatened Species

EPA has been working with the U.S. Fish and Wildlife Service and other federal and state agencies to develop a program to avoid jeopardizing the continued existence of listed species from the use of pesticides. The Endangered Species Protection Program is expected to become final in 1994. Limitations on the use of maleic hydrazide will be required to protect endangered and threatened species, but these limitations have not yet been defined, and they may be formulation specific. OPP anticipates that consultation with the Fish and Wildlife Service will be conducted in accordance with the species-based priority approach described in the Program. After completion of the consultation, registrants will be informed if any required label modifications are necessary. Such modifications would most likely consist of the generic label statement referring pesticide users to use limitations contained in county Bulletins.

Although the Endangered Species Protection Program has not been finalized, it can be assumed that endangered plant species occurring in counties where wheat and barley are grown may be affected from exposure to this herbicide.

Labelling Requirements

1. <u>Manufacturing Use Product</u>

Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

2. <u>End Use</u>

Granular and Non-Granular End-Use Products

Do not apply directly to water, or to area where surface water is present or to intertidal areas below the mean high-water mix. Do not contaminate water when disposing of equipment wash water or rinsate.

3. Endangered/Threatened Species

At the present time, EPA is working with the U.S. Fish and Wildlife Service and other federal and state agencies to develop a program to avoid jeopardizing the continued existence of listed species from the use of pesticides. When this program goes into effect, endangered species precautionary labelling will be required.

Risk Mitigation

The EFED plant workgroup is in the process of formulating appropriate criteria to address the mitigation of non-target plant effects. Therefore, at this time, EFED can only offer the most conservative, generic risk mitigation measures for non-target plant effects:

(1) Reduce the total amount applied per year by reducing the use rate and/or reducing the number of applications per year to reduce the potential for off-site non-target plant risk.
(2) Ensure that all applications be soil incorporated to reduce run-off and other off-site movement.
(3) Elimination of aerial or air-blast applications to substantially reduce the potential for spray-drift exposure.
(4) Establish vegetative buffer zones to reduce run-off potential.

STUDY IDENTIFICATION:

Chudwudebe, A. 1991. Difenzoquat methyl sulfate (CL 84,777): Freezer stability of residues of CL 84,777 in soil at the 12-month interval. Laboratory Report No. C-3528. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41903703)

Gross, J. 1992. Difenzoquat methyl sulfate (CL 84,777): Freezer stability of residues of CL 84,777 in soil after twenty-four (24) months. Laboratory Report No. C-3781. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (42327501)

Mangels, G. 1989a. Difenzoquat (AC 84,777): Hydrolysis. Laboratory Project No. E-89-3. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41325403)

Mangels, G. 1989b. Difenzoquat (AC 84,777): Photodegradation in water. Laboratory Project No. E-89-6. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41325404)

Mangels, G. 1989c. Difenzoquat (AC 84,777): Photolysis on soil. Laboratory Project No. E-89-24. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41325405)

Mangels, G.D. 1988a. Difenzoquat (AC 84,777): Aerobic soil metabolism. Laboratory Report No. PD-M 25-58. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41903701)

Mangels, G.D. 1988b. Difenzoquat (AC 84,777): Anaerobic soil metabolism. Laboratory Report No. PD-M 25-50. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41903702)

Mangels, G. 1987. Difenzoquat (AC 84,777): Adsorption/desorption on soil. Laboratory Report No. PD-M 24-1. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41703401)