7-31-96

Date Out:

20 JUL 1996

Chemical Code: 128810
DPBarcode: D218292

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Cynthia Giles-Parker, PMT #22
Registration Division (7508W)

From: Henry Jacoby, Chief and Paul J. Mastradone, Ph.D., Section Head
Environmental Fate & Ground Water Branch/EFED (7507C)

Henry Jacoby 7/30/96

Attached, please find the EFGWB review of...

Common Name:	Azoxystrobin	**Trade name:**	
Company Name:	Zeneca AG Products		
ID #:			
Purpose:	Review of environmental fate data to support first food use (grapes) and terrestrial non-food (turf)		

Type Product:	**Action Code:**	**Review Time:**
Fungicide	10, 230	50 days

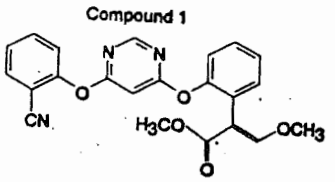
STATUS OF DATA REQUIREMENTS[1]:

Data Requirement	
161-1	S
161-2	N
161-3	S
162-1	N
162-2	S
162-3	S
162-4	N
163-1	S
164-1	N

[1]Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved W=Waived R=Reserved.

1.0 CHEMICAL:

chemical name:methyl (E)-2-{2-[6-(6-2-cyanophenoxy)pyrimidin-4-yloxy]pheny}-3-methoxyacrylate
trade name: Azoxystrobin (ICIA5504)
structure:



CAS #:N/A
Shaughnessy #: 128810

2.0 TEST MATERIAL: N/A

3.0 STUDY/ACTION TYPE: Review of laboratory environmental fate data to support the use of azoxystrobin on grapes and turf.

4.0 STUDY IDENTIFICATION:

Earl M., R.I. Johnson, B. Wilson, and N. Pengelly. 1995. ICIA5504, R230310,R234886, R401553, and R402173: Method and Validation of a Method for the Determination of Residues in Soil using a Zymark Robot. MRID 43678192.

Earl M., S.D. Jones, and A.J. Campbell. 1995. ICIA5504, R230310, and R234886: Validation of Methods for the Determination of Residues in Soil. MRID 43678188.

Ferguson R.E., K. Muller,and M.C.G. Lane. 1995. ICIA5504: Adsorption and Desorption Properties of R234886, a Major Soil Metabolite. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678179.

Fergusan R.E, K. Muller, and M.C.G. Lane. 1995. ICIA5504: Adsorption and Desorption in Soil. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678178.

Hamer, M.J. 1995. Waiver Justification for Fish Bioaccumulation Study. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. (No MRID).

Harvey B.R.. 1995. ICIA5504: Overview of Soil Behavior. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678171.

Johnson R.I., O.J. Tummon, and M. Earl. 1995. ICIA5504, R230310,R234886, R401553, and R402173: Method and Validation of a Method for the Determination of Residues in Soil using a Zymark Robot. MRID 43678192.

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Kuet S.F. and S.T. Hadfield. 1994. ICIA5504: Aqueous Photolysis at pH 7. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678173.

Lane M. 1995. ICIA5504: Adsorption and Desorption Properties in Soil of R401553, a Soil Degradate. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678177.

Lane M. 1995. Soil Classification According to USDA 'Soil Taxonomy' for Various Soils Used in Regulatory Studies at Jealott's Hill Research Station. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678182.

Mason G., A. Prevett, A.R. Tarry. 1994 ICIA5504: Study on Microbiological Activities in Soil. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678176.

Mason R., M.S. Weissler, and C.A. Butler. 1995. ICIA5504: Fate of Radiolabelled Material Applied in the Field to Bare Soil. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678187.

Muller K. and M.K. Jeavans. 1995. ICIA5504: Adsorption and Desorption Properties of Two USA Soils. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678181.

Robbins A.J. 1995. ICIA5504: Independent Lab Confirmation of SOP RAM/257/01 for the Determination of 234886, R230310 and ICIA5504 in Soil. MRID 43678190.

Rowe D. and M.C.G. Lane. 1995. ICIA5504: Adsorption and Desorption Properties in Soil of R402173, a Major Soil Metabolite. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678180.

Runnalls J.K., N. Pengelly, E.M. Roper, and M. Earl. 1995. ICIA5504: Field Dissipation Trial Following Treatment to Turf Carried Out in Florida, USA during 1993/1994. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678186.

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Ryan J. and D. Clarke. 1993. ICIA5504: Validation of a Method for the Determination in Drinking Water. MRID 43676189.

Steel T.K. and R.S. Joseph. 1994. ICIA5504: Aqueous Hydrolysis at pH 5, 7, and 9 at 25 and 50°C. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678172.

Tummons O.J., N. Pegelly, S.L. Hargreaves, L. Reed, I.P. Allen, E.M. Roper, and M. Earl. 1995. ICIA5504: Field Dissipation Trial Following Treatment to Turf Carried Out in California, USA during 1993/1994. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678184.

Tummons O.J., S.L. Hargreaves, L. Reed. I.P. Allen, E.M. Roper, and M. Earl. 1995. ICIA5504: Field Dissipation Trial Carried Out in California, USA during 1993/1994. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678185.

Tummons O.J. 1995. ICIA5504, R230310, and R234886: Storage Stability of ICIA5504, R230310, and R234886 in Soil Stored Deep Frozen at < 15°C. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678183.

Warinton J.S., I. Chalofti, and B.R. Harvey. 1995. ICIA5504: Degradation of ^{14}C-Labelled Compound in Soil Under Laboratory Conditions. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678175.

Winter L. and R.S.I. Joseph. 1995. ICIA5504: Soil Surface Photolysis. Performed by Zeneca Agrochemicals (Zeneca Limited), Berkshire, U.K. Submitted by Zeneca Agricultural Products (Zeneca Inc.), Wilmington, Delaware. MRID 43678174.

5.0 REVIEWED BY:

James A. Hetrick, Ph.D.
Chemist, ECRS # 1
EFGWB/EFED/OPP

Signature: James A. Hetrick
Date: 30 JUL 1996

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6.0 APPROVED BY:

Name: Paul Mastradone, Ph.D.
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7.0 CONCLUSIONS:

Environmental Fate Assessment

Based on acceptable and supplemental environmental fate data, the dissipation of ICIA5504 appears to be predominately dependent on photodegradation[1] and to a lesser extent microbial-mediated degradation, and possible mobility in ground and surface waters. Although field dissipation studies did not confirm a high mobility and persistence of ICIA5504, ICIA5504 exhibited relatively low soil water partitioning coefficients (K_d = 1.5 to 23) and moderate persistence ($t_{1/2}$ = 54 to 164 days) in laboratory studies. Transformation products of ICIA5504, Compounds 2, 28, and 30), exhibited low soil/binding affinity (or high mobility) and some persistence in laboratory and field studies. These data suggest ICIA5504 and its degradates may be transported to surface and ground waters under some use conditions (*e.g.* overspray or foliar wash-off on bare ground or soil incorporation in sandy soils). However, these conditions are expected to be controlled by foliar interception and photodegradative processes.

7.1 The study (MRID 43678172) provides acceptable data on the hydrolysis of ICIA5504 in pH 5, 7, and 9 buffer solutions. No additional data are needed this time.

Radiolabeled ICIA5504, at a nominal concentration of 2.8 µg/ml, was stable in pH 5, 7, and 9 buffer solutions at 25°C and pH 5 and 7 buffer solutions at 50°C. Radiolabeled ICIA5504 degraded slowly ($t_{1/2}$=209 hours; 8.7 days) in pH 9 buffer solution at 50°C. Transformation products of ICIA5504 were identified a Compound 2 and 5504/20.

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[1] Although the laboratory fate data indicate ICIA5504degradation appears to be predominately dependent on photodegradation, EFGWB notes a clear degradation pattern of azoxystrobin in terrestrial and aquatic environments cannot be established because the base structure of ICIA5504 (i.e. cyanophenyl-pyrimidine-phenyl rings) was not readily degraded by abiotic and microbial-mediated processes. The degradation of ICIA5504 involved relatively minor molecular transformations of functional groups on the base structure.

The reported data indicate ICIA5504 will not hydrolyze in aquatic environments.

7.2 The study (MRID 43678173) provides upgradable, supplemental data on the photodegradation of ICIA5504 in pH 7 buffer solution. The data may be upgraded with the submission of additional information to substantiate the presence of multiple unidentified compounds (<7.6% per compound of applied radioactivity) in TLC chromatograms.

Radiolabeled ICIA5504 had first-order photodegradation half-lives of 11.1 to 17.1 Florida equivalent summer days (k=-0.0418 to -0.0624 $days^{-1}$) in pH 7 buffer solution under a Xenon lamp. Phototransformation products were identified as Compound 9 (15 % of applied), Compound 13 (1.7% of applied), Compound 21 (<5.6% of applied), Compound 24 (<2.6% of applied), Compound 28 (<8.9% of applied), and Compound 30 (<2.4% of applied).

The reported data indicate ICIA5504 should photodegrade in aquatic environments.

7.3 The study (MRID 43678174) provides acceptable data on the photodegradation of ICIA5504 on a sandy loam soil. No additional information is needed at this time.

Radiolabeled ICIA5504, at 1.0 lbs ai/A, had an average 50% degradation time (DT_{50}) of 11 days. The first order photodegradation half-lives of ICIA5504 ranged from 17.6 to 28.4 days. There was minimal degradation of ICIA5504 in dark control treatments. Phototransformation products were identified as Compound 3 (0.7% of applied), Compound 9 (9.0% of applied), Compound 13 (< 3.5% of applied), Compound 19 (< 6.0% of applied), Compound 24 (<3.2% of applied), Compound 28 (<6.5% of applied), Compound 30 (<5.0% of applied), and U13 (<5.2% of applied). Unidentified transformation products (individually < 3.0% of applied) were also detected in soil extracts.

The reported data indicate ICIA5504 will photodegrade on mineral soils.

7.4 The study (MRID 43678175) provides upgradable supplemental data on the metabolism of ICIA5504 in aerobic mineral soils. The data are deemed supplemental because the study was not conducted for 365 days. The data may be upgraded with the submission of additional information on soil concentrations of ICIA5504 and it transformation products from 120 to 365 days.

Radiolabeled ICIA5504, at 0.57 μg/g, had a DT_{50} of 7.7 weeks (53.9 days) in the Hyde Farm soil, 12.2 weeks (85.4 days) in the 18 Acre soil, and 23.4 weeks (163.8 days) in the Visalia soil. The first-order degradation half-life of ICIA5504 was 72 days in the Hyde Farm soil, 85 days in the 18 Acre soil, and 163.8 days in the Visalia soil. Transformation products were identified as Compound 2 (12 to 20% applied), Compound 3 (< 3% of applied), Compound 28 (3.1% of applied), and Compound 36 (< 2.8% of applied). Unidentified bands/spots were also detected (cumulative 0.8 to 11.6% of applied) on the TLC plates. Unextractable radiolabeled soil residues ranged from 16 to 22% at 120 days posttreatment. The cumulative concentration of $^{14}CO_2$ ranged from 2% to 27% of applied radioactivity.

The reported data indicate ICIA5504 should be moderately persistent to persistent in aerobic mineral soils.

7.5 The study (MRID 43678175) provides acceptable data on the metabolism of ICIA5504 in anaerobic soil-water systems. No additional data are needed at this time.

Radiolabeled ICIA5504, at 0.57 μg/g, had a range of DT_{50} of 7 to 8 weeks in flooded Hyde Farm and 18 Acre soil. The DT_{50} for radiolabeled ICIA5504 was < 2.1 days in the test water and 8.6 to 9.2 weeks in anaerobic sediments. The first-order degradation half-life of ICIA5504 ranged from 50 to 56 days in anaerobic soil-water systems, 16 to 21 days in anaerobic flood waters, and 60 to 65 days in anaerobic soil/sediment. Transformation products were identified as Compound 2 (58 % of applied), Compound 3 (0.2 % applied), Compound 28 (< 4.2% of applied), and Compound 36 (< 2.8% of applied). Unidentified bands/spots were also detected (cumulative < 8.0 of applied) on the TLC plates. The concentration of unextractable radiolabeled soil residues ranged from 5 to 10% of applied at 120 days posttreatment. The cumulative concentration of $^{14}CO_2$ was < 5% of applied radioactivity.

The reported data indicate ICIA5504 should be moderately persistent in anaerobic mineral soils.

7.6 The study provides ancillary data on the soil microbial effects of ICIA5504. The data are deemed as ancillary because the soil microbial effects study is not a Subdivision N guideline study.

United Kingdom soils amended with ICIA5504, at 0.25 and 2.50 kg ai/ha, had an increase of 6 to 12% in KCl extractable soil nitrate (NO_3^-) over control treatments. There were small or no differences in KCl extractable ammonium (NH_4^+) between ICIA5504 amended and control treatments. Nitrite (NO_2^-) was not detected in the ICIA5504 amended and control treatments. Test soils amended with ICIA5504 did not significantly affect microbial respiration. The registrant claims that ICIA5504 amendment to soils did not affect the microbial activity associated with N mineralization and respiration.

7.7 The study (MRID 43678178) provides acceptable data on partitioning of ICIA5504 in mineral soils. These data in conjunction with batch equilibrium data (MRID 43678181) fulfill the unaged portion of the 163-1 data requirement. No additional data are needed at this time.

Radiolabeled ICIA5504 had Freundlich adsorption coefficients of 6.2 ml/g (K_{oc}=210; 1/n=0.85) in the Kenny Hill sandy loam soil, 4.0 ml/g (K_{oc}=240; 1/n=0.82) in the East Anglia loamy sand soil, 1.5 ml/g (K_{oc}=540; 1/n=0.90) in the Lilly Field sand soil, 9.5 ml/g (K_{oc}=580;1/n=0.90) in the Nebo silty clay loam soil, and 15 ml/g (K_{oc}= 540; 1/n=0.90) in the Pickett Piece clay loam soil.

The reported data indicate ICIA5504 should be mobile to relatively immobile in terrestrial and aquatic environments.

7.8 The study (MRID 43678181) provides acceptable data on partitioning of ICIA5504 in mineral soils. These data in conjunction with batch equilibrium data (MRID 43678178) fulfill the unaged portion of the 163-1 data requirement. No additional data are needed at this time.

Radiolabeled ICIA5504 had Freundlich adsorption coefficients of 2.9 ml/g (K_{oc}=1490; 1/n=0.85) in the ERTC soil and 23 ml/g (K_{oc}=1690; 1/n=0.90) in the NRTC soil.

The reported data suggest ICIA5504 is expected to be to mobile to relatively immobile in terrestrial and aquatic environments.

7.9 The study (MRID 43678179) provides acceptable data the partitioning of Compound 2 in mineral soils. These data in conjunction with the batch equilibrium data (MRIDs 43678180 and 43678177) fulfill the aged portion of the 163-1 data requirement. No additional data are needed at this time.

Radiolabeled Compound 2 had Freundlich adsorption coefficients of 0.82 ml/g (K_{oc}=28; 1/n=0.90) in the Kenny Hill sandy loam soil, 0.35 ml/g (K_{oc}=21; 1/n=0.76) in the East Anglia soil, 1.4 ml/g (K_{oc}=490;1/n=0.79) in the Lilly Field sand, 6.8 ml/g (K_{oc}=420;1/n=.90) in a Nebo silty clay soil, 0.85 ml/g (K_{oc}=49;1/n=0.85) in the Hyde Farm sandy clay loam soil, and 10 ml/g (K_{oc}=360;1/n=0.89) in the Pickett Piece clay loam soil.

The reported data suggest Compound 2 is expected to be mobile to be very mobile in terrestrial and aquatic environments.

7.10 The study (MRID 43678180) provides acceptable data on the partitioning of Compound 30 in mineral soils. These data in conjunction with the batch equilibrium data (MRIDs 43678179 and 43678177) fulfill the aged portion of the 163-1 data requirement. No additional data are needed at this time.

Radiolabeled Compound 30, at 0.03 to 2.0 µg/ml, had Freundlich adsorption partitioning coefficients of 0.74 ml/g (K_{oc}=25) in a Kenny sandy loam soil, 2.0 ml/g (K_{oc}=86) in a Wisborough Green silty clay loam soil, 0.27 ml/g (K_{oc}=93) in a ERTC loamy sand soil, 4.2 ml/g (K_{oc}=200) in a NRTC silty clay loam soil, 0.65 ml/g (K_{oc}=37) in the Hyde Farm sandy clay loam soil, and 2.9 ml/g (K_{oc}=110) in the Pickett Piece clay loam soil.

The reported data suggest Compound 30 is expected to be mobile to very mobile in terrestrial and aquatic environments.

7.11 The study (MRID 43678177) provides marginally acceptable the partitioning of Compound 28 in mineral soils. The data are deemed marginally acceptable because the registrant did not provide a complete description of the study design. EFGWB believes the absence of a complete description of the study design does not affect acceptance of the data because Compound 28 is expected to be mobile to very mobile in terrestrial and aquatic environments. These data in conjunction with the batch equilibrium data (MRIDs 43678179 and 43678180) fulfill the aged portion of the 163-1 data requirement. No additional data are needed at this time.

Radiolabeled Compound 28 had Freundlich adsorption coefficients 2.4 ml/g (K_{oc}=81; 1/n=0.84) in the Kenny Hill sandy loam soil, 1.6 ml/g (K_{oc}=66; 1/n=0.85) in the Wisborough Green silty clay loam soil, 0.76 ml/g (K_{oc}=93;1/n=0.81) in the ERTC loamy sand soil, 11 ml/g (K_{oc}=500;1/n=0.89) in the NRTC silty clay loam soil, 1.90 ml/g (K_{oc}=110;1/n=0.0.96) in the Hyde Farm sandy clay loam soil, and 2.9 ml/g (K_{oc}=110;1/n=0.96) in the Pickett Piece clay loam soil.

The reported data indicate Compound 28 is expected to be mobile to very mobile in terrestrial and aquatic environments.

7.12 The study (MRID 43678184) provides upgradable supplemental data on the field dissipation of ICIA5504 and its transformation products on a California turf site. The data are deemed supplemental because storage stability data were inadequate to support a 24 month storage period and hydrology of the study site was not clearly described. The data may be upgraded with the submission of storage stability data to support a 24 month storage period and a complete description of the hydrology on the study site.

Azoxystrobin, applied as five applications of 1.0 lbs a.i./A at 14 day intervals, had DT_{50}s of 8 to 24 days. The first-order dissipation half-life of ICIA5504 was 65 days. Major transformation products were Compound 28 (R401553), Compound 9 (R230310), and Compound 2 (R234886). Azoxystrobin and Compound 2 were detected in surface soil samples at 371 days after the last treatment. Compound 2 was detected in deep soil layers (6 to 18 inches) at 30, 62, 97, and 196 and 377 days after the last ICIA5504 application. ICIA5504, Compound 28, and Compound 9 were not detected in deep soil samples (> 6 inches).

7.13 The study (MRID 43678185) provides upgradable supplemental data on the field dissipation of ICIA5504 and its transformation products on a bare ground in California. The data are deemed supplemental because storage stability data were inadequate to support a 22 month sample storage period and the hydrology of the study site was not clearly described. The data can be upgraded with submission of storage stability data to support a 22 month sample storage period and a complete description of the hydrology on the study site.

Azoxystrobin, applied as five applications of 0.4 lbs a.i./A at 14 day intervals, had DT_{50}s of 12 to 13 days. The first-order dissipation half-life of ICIA5504 was 85 days. Transformation products were identified as Compound 30 (R402173) and Compound 28 (R401553). These compounds were detected at 96 to 182 days after the last ICIA5504 application. Azoxystrobin and its transformation products were not detected in deep soil samples (> 6 inches).

7.14 The study (MRID 43678187) provides upgradable supplemental data on the field dissipation of radiolabeled ICIA5504) and its transformation products on bare ground plots in California. The data are deemed supplemental because the hydrology of the study site was not clearly described. The data may be upgraded with a complete description of the hydrology on the study site.

Radiolabeled ICIA5504, at 0.5 lbs a.i/A, had a DT_{50} of 14 days. The first-order dissipation half-life of ICIA5504 ranged from 28 to 34 days. Transformation products were identified as (Compound 28) and Compound 30. Compound 28 had a maximum concentration of 8% applied at 2 month posttreatment and then declined < 3% at 4 months posttreatment. Compound 30 had a maximum concentration of 5.3% at 1 month posttreatment and then declined to < 2% at 4 months posttreatment. Unidentified radiolabeled residues were detected (<5% of applied) in the 5 to 15 cm soil layer from immediately posttreatment to 120 days posttreatment.

7.15 The study (MRID 43678186) provides upgradable supplemental data on the field dissipation of ICIA5504 and its transformation products on turf in Florida. The data are deemed supplemental because storage stability data were inadequate to support a 19 month sample storage period and the hydrology of the study site was not clearly described. The data can be upgraded with

submission of storage stability data to support a 19 month sample storage period and a complete descripion on the hydrology of the study site.

Azoxystrobin, applied at five applications of 1.0 lbs a.i./A at 14 day intervals, had DT_{50}s of 8 to 23 days. The first-order dissipation half-life of ICIA5504 was 60 days. Transformation products were identified as Compound 9 (R230310) and Compound 2 (R234886). These compounds were detected 14 days after the last ICIA5504 treatment to 176 days after the last ICIA5504 application. Azoxystrobin, Compound 9, and Compound 2 were not detected in deep soil samples (> 6 inches).

7.7 Environmental Fate Summary

Radiolabeled ICIA5504 was stable in pH 5, 7, and 9 buffer solution (MRID 43678172). Radiolabeled ICIA5504 was degraded ($t_{1/2}$ = 8.7 to 28.4 Florida equivalent days) in irradiated soil and water (MRID 43678173 and 43678174). Phototransformation products were identified as methyl(Z)-2-{2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]-3-methoxyacrylate (Compound 9), 28, 2-hydroxybenzonitrile (Compound 13),U13, methyl 2-{2-[2-6-(2-cyanophenoxy)pyrimidin-4yloxy]phenyl}oxoacetate (Compound 19), methyl{2-[6-(2-cyanophenoxy)pyrimidin-4-yloxy]phenyl}acetate (Compound 21), methyl 2-{2-[6-(2-cyanophenixy)pyrimidin-4-yloxy]phenyl}glycolate (Compound 24),4-(2-cyanophenoxy)-6-hydroxypyrimidine (Compound 28) and 2-[6-(2-cyanophenoxy) pyrimidin-4-yloxy]phenyl}acetate (Compound 30). Radiolabeled ICIA5504 was moderately persistent (DT_{50}= 53.9 to 163.8 days; $t_{1/2}$= 49 to 163.5 days) in non-irradiated aerobic and anaerobic mineral soils (MRID 43678175). Microbial-mediated transformation products were identified as (E)-2-(2-[6-(2-cyano-phenyoxy)-pyrimidin-4-yloxy]pheny}-3-methoxyacrylic acid (Compound 2), methyl (E)-2-{2-(6-hydroxypyrimidin-4-yloxy)phenyl}-3-methoxyacrylate (Compound 3), Compound 28, (E)-2-{2-[6-(2-carbamoylphenoxy)pyrimidin-4-yloxy]phenyl}-methyoxyacrylic acid (Compound 36), and CO_2. The reported laboratory data indicate ICIA5504 is expected to be moderately persistent to persistent in terrestrial and aquatic environments.

Freundlich adsorption coefficients of radiolabeled ICIA5504 ranged from 1.5 ml/μg (K_{oc}=540) to 23 ml/μg (K_{oc}=1690)(MRID 43678181 and 43678178). Transformation products of ICIA5504 (Compounds 2, 28, and 30) had low Freundlich adsorption coefficients of K_d= 0.35 to 11 ml/μg (MRID 43678179, 43678180 43678177). Azoxystrobin may be mobile in coarse-textured soils (*e.g.*, sands and loamy sands). Transformation products are expected to be mobile to very mobile in terrestrial and aquatic environments.

Azoxystrobin was not persistent (DT_{50}=8 to 24 days; $t_{1/2}$= 28 to 85 days) in surface soils of bare ground and turf field sites (MRID 43678186, 43678185, 43678184 and 43678187). The field dissipation of ICIA5504 appears to be dependent on a combination

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of photolytic and microbial-mediated degradation because ICIA5504 was not detected in deep soil samples (> 15 cm) in field studies and volatilization should not be a major route of dissipation (vapor pressure= 8.2×10^{-13} mm Hg at 20°C). Compounds 2, 9, 28, and 30 appear to be moderately persistent in field dissipation studies. Compound 2 was detected in deep soil samples (6 to 18 inches) on an irrigated turf site in California.

8.0 RECOMMENDATIONS:

8.1 Status of Data Requirements for ICIA5504

Data Requirement #	Study Descriptor	Use Group[1]	ICIA5504
161-1	Hydrolysis	All use groups	S-43678172
161-2	Photodegradation in Water	A,B,C,D,E,F,G,I	USP-43678173[3]
161-3	Photodegradation on Soil	A,B,I	S-43678174
161-4	Photodegradation in Air	A,B,G,H,I,J	Waived[4]
162-1	Aerobic Soil Metabolism	A,B,C,D,G,H,I,J	USP-43678175[5] A-43678176
162-2	Anaerobic Soil Metabolism	A,B	S-43678175
162-3	Anaerobic Aquatic Metabolism	A,B,C,D,E,F,I	S-43678175
162-4	Aerobic Aquatic Metabolism	C,D,E,F,I	Not Required[6]
163-1	Leaching/Adsorption-Desorption	All use groups	S-43678181 S-43678187 S-43678185 S-43678184
163-2	Laboratory Volatility	A,B,G,H	Waived[4]
163-3	Field Volatility	A,B,G,H	Waived[4]
164-1	Terrestrial Field Dissipation	A,B,C,D,E,I	USP-43678186[7] USP-43678187 USP-43678185 USP-43678184
164-2	Aquatic Field Dissipation	C,D,E,F	Not Required[6]
164-3	Forest Field Dissipation	I	Not Required[6]
164-5	Long-term, Soil Dissipation	A,B,C,D,E,I	Not Required
165-4	Accumulation in Fish	A,B,C,D,E,F,I	Waived[8]
165-5	Accumulation in Non-Target Organsims	A,B,C,D,E,F,I	Waived[8]
201-1	Droplet Size Spectrum	A,B,C,D	Reserved[9]
201-2	Drift Field Evaluation	A,B,C,D	Reserved[9]

Footnotes:

1. **Use Group Categories**
A-Terrestrial food/feed crop
B-Terrestrial nonfood crop
C-Aquatic food crop
D-Aquatic nonfood outdoor
E-Aquatic nonfood industrial
F-Aquatic nonfood residential
G-Greenhouse food crop
H-Greenhouse nonfood crop
I-Forestry
J-Residential Outdoor
K-Indoor -no environmental fate data requirements are required for indoor use groups.

2. Status of Data Requirements
S-Acceptable Data
USP-Upgradable Supplemental Data
A-Ancillary Data

3- The photodegradation in water study (MRID 43678173) provides upgradable supplemental data because unidentified radioactive compounds were detected (cumulative concentration of > 10% of applied ICIA5504) in pH 7 buffer solution. The data may be upgraded with submission of a additional information to substantiate the presence of multiple compounds at low concentrations (< 10% of applied).

4- The data requirement is waived because ICIA5504 has a low vapor pressure (8.2×10^{-13} mm Hg at 20°C).

5. The aerobic soil metabolism study (MRID 43678175) provides upgradable supplemental data because the study was not conducted for 365 days. The data may be upgraded with submission of additional data on the soil concentration of ICIA5504 and its transfromation products from 120 to 365 days posttreatment.

6. The data are not needed to support terrestrial food (*eg* grapes) and terrestrial nonfood (*eg* turf) use patterns. The data may be required to support additional use patterns.

7. The field dissipation studies (MRID 43678186, 43678187, 43678185, 43678184) provide upgradable supplemental data because the storage stability data are inadequate and/or a complete description of the test site hydrology is needed.

8. The accumulation in fish (165-4) and accumulation in non-target organisms (165-5) data requirements are waived because ICIA5504 has a low octanol-water partitioning coefficient (K_{ow}= 316.22).

9. The Droplet Size Spectrum (201-1) and Drift Field Evaluation (201-2) data requirements are reserved because the label for ICIA5504 is unclear regarding aerial application. These data are needed to support aerial application of ICIA5504.

8.2 Inform the registrant the hydrolysis (161-1), photodegradation on soil (161-3), anaerobic soil metabolism (162-2), aerobic aquatic metabolism (162-3), and adsorption-desorption (163-1) data requirements are fulfilled.

The photodegradation in water study (MRID 43678173) provides upgradable supplemental data because unidentified radioactive compounds were detected (cumulative concentration of > 10% of applied ICIA5504). Submission of addition data on characterization of unidentified phototransformation products are needed to substantiate the presence of multiple compounds at low concentrations (< 10% of applied). The aerobic soil metabolism study (MRID 43678175) provides upgradable supplemental data because the study was not conducted for 365 days. Submission of additional aerobic soil metabolism data are needed to assess the formation and decline patterns of ICIA5504 and its transformation products from 120 to 365 days posttreatment. Field dissipation studies (MRID 43678186, 43678187, 43678185, 43678184) provide upgradable supplemental data because of inadequate storage stability data and/or an incomplete description of hydrology on the test site. Field dissipation data may be upgraded with the submission of storage stability data and a complete description of the hydrology of the test site.

The accumulation in fish (165-4) and accumulation in non-target organisms (165-5) data requirements are waived because ICIA5504 has a low octanol-water partitioning coefficient (K_{ow}= 316.22). The photodegradation in air (161-4), laboratory volatility (163-2), and field volatility (163-3) data requirements are waived because ICIA5504 has a low vapor pressure (8.2×10^{-13} mm Hg at 20°C). The Droplet Size Spectrum (201-1) and Drift Field Evaluation (201-2) data requirements are reserved because the label for ICIA5504 is unclear regarding aerial application. These data are needed to support aerial application of ICIA5504.

8.4 Ground Water Assessment

The EFGWB believes that azoxystrobin should not leach under most field conditions because azoxystrobin is foliar-applied and foliar photodegradation is expected to be a major route of dissipation. Azoxystrobin leaching may be possible in situations of soil incorporation immediately posttreatment or soil conditions with little exposure to sunlight such as under a plant canopy in conjunction with coarse-textured soils. Refer to attached memorandum from the GWTS for additional details.

Transformation products of azoxystrobin (Compounds 2, 28, and 30) exhibit mobility properties of pesticides found in ground water. In particular, compound 2 exhibited some persistent and mobility in laboratory and field studies. More importantly, the leaching potential of Compound 2 is expected to be pH-dependent because of H ion dissociation from the carboxylic acid functional group. The theoretical K_{oc} of Compound 2 would be 561 ml/g at pH 5, 68 at pH 7, and 8 ml/g at pH 9.

EFGWB recommends the following:

A ground-water label advisory that reads as follows:

" The active ingredient, azoxystrobin, in this product can be persistent for several months or longer. Azoxystrobin has degradation products which have properties similar to chemicals which are known to leach through soil to ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination."

Reevaluation of the leaching potential of azoxystrobin and its transformation products once the environmental fate data package is complete, toxicological conclusions are available from the Toxicology Branch in the Health Effects Division, and the levels of concern are determined for ecological effects.

8.5 Surface Water Assessment

The EFGWB believes azoxystrobin and its transformation products can potentially contaminate surface waters through spray drift or surface water runoff. Since photodegradation is expected to be a major route of dissipation for foliar applied azoxystrobin, wash-off or direct over spray of azoxystrobin onto the soil surface will be required for transport in surface waters. Substantial fractions of azoxystrobin are expected to be available for runoff for several months ($t_{1/2}$= 49 to 164 days). It is moderately mobile (K_d= 1.5 to 23 ml/g) in most soil environments so runoff is expected primarily via dissolution in runoff water as opposed to adsorption on eroding soil. Since azoxystrobin is spray applied to turf and grapes, it also may be directly deposited into surface waters through spray drift. EFGWB assumes for ground spray that 1% of the application rate may be directly desposited into surface water. Transformation products of azoxystrobin (Compounds 2, 28, 30) are expected to be mobile in soil environments. In particular, Compound 2 exhibited relatively low soil/water partitioning coefficients (K_d=0.3 to 2.9 ml/g) and persistence in laboratory and field studies. Substantial fractions of Compound 2 are expected to be available for runoff via dissolution in runoff water for shorter time periods than parent azoxystrobin. The environmental fate data and usage data indicates azoxystrobin and it transformation products (specifically Compound 2) may move into surface waters.

The dissipation of azoxytstrobin in the surface waters should be predominately dependent on photodegradation ($t_{1/2}$= 11.1 to 17 days) and to a lesser extent microbial-mediated degradation ($t_{1/2}$= 54 to 164 days). Since photodegradation is a major route of degradation for azoxystrobin, the dissipation of azoxystrobin is expected to be dependent on physical components of the water (eg, sediment loading, etc.) effecting sunlight penetration. For example, azoxystrobin should not persist in clear shallow water bodies, but will probably be more persistent in unclear and/or deeper waters, particularly those with long hydrological residence times. The soil-water partitioning values indicate concentrations on suspended or bottom sediments should be higher then sediment pore water and water column. Sediment bound azoxystrobin can potentially desorb (assuming equilibrium conditions where Kd_{ads}=Kd_{des}) into the dissolved the water column. Dissolved azoxystrobin is not expected to bioaccumlate (K_{ow}= 316.22) in fish tissues. Sediment bound azoxystrobin is expected to be moderately persistent ($t_{1/2}$= 54 to 164 days) as suggested by persistence in aerobic and anaerobic soils.

Uncertainies[2] in the surface water assessment for azoxystrobin are the extent of foliar interception for azoxystrobin, rates of foliar dissipation for azoxystrobin, the extent of azoxystrobin dissipation from spray drift, adequacy of the K_{oc} model to describe azoxystrobin partitioning in mineral soils, degradation rate of azoxystrobin and its transformation products in aquatic environments. These uncertainties could be partially addressed with additional data on foliar dissipation and aquatic metabolism for azoxystrobin.

The Branch needs a toxicological assessment of azoxystrobin and its transformation products from the Health Effects Division (HED) in order to complete a surface water assessment. Therefore, recommendations on surface water label advisories should be reserved pending consideration of HED's assessment.

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[2] The branch has not assessed foliar interception and dissipation of azoxystrobin because these data are not part of the Subdivision N environmental fate testing strategy. The surface water is assumed to receive a constant deposition (1% of applied for ground sprays) of azoxystrobin. The K_{oc} model is assumed to describe azoxystrobin partitioning in mineral soils. However, batch equilibrium data for azoxystrobin suggests azoxystrobin partitioning in mineral soils, as described by Freundlich partitioning coefficients, is not significantly correlated with soil organic matter content. No metabolism data are available to assess persistence of azoxystrobin in aquatic environments. The persistence of azoxystrobin and its transformation products in soil, buffer solutions, and hydrosoils is assume to be representative of persistence in aquatic environments.

9.0 BACKGROUND:

Azoxystrobin is a broad spectrum, systemic fungicide to control Powdery Mildew, Black Rot, and Leaf Spot on grapes and Brown Patch, Fusarium Patch, Leafspot, Pythium Blight, Snow Mold, Spring Dead Spot, Summer patch, and Take-all Patch on turf. The label recommends azoxystrobin should be spray applied at 0.16 to 0.20 lbs a.i./A/application at 12 to 16 day spray intervals for grapes and 0.25 to 0.55 lbs a.i./A/application at 10 to 28 day spray for turf. The maximum annual application rate should not exceed 1.5 lbs a.i./A.

10.0 DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

10.1 The registrant submitted a list of USDA soil taxonomy classifications for test soils. This information was provided in a separate data submission (MRID 43678182). EFGWB appreciates the registrant's effort to provide USDA soil taxonomic classifications for test soils.

10.2 The registrant provided storage stability data for ICIA5504, Compound 2 and Compound 9 (MRID 43678183). These data were submitted to support a 380 day storage period.

Two United Kingdom soils, Hyde Farm sandy clay loam and Wisborough silty clay loam, were each fortified with ICIA5504, Compound 9, and Compound 2 at a fortification rate of 0.10 mg/kg. The fortified soils were stored frozen (<15°C) for 91, 125, 175, 188, 363, and 380 days.

At each sampling interval, the soil samples were extracted with methanol:water (75:25). ICIA5504, Compound 9, and Compound 2 in soil extracts were separated using liquid-liquid partitioning with acidified sodium chloride and dichloromethane and then further separated using HPLC with a UV detector.

Azoxystrobin, Compound 2, and Compound 9 were stable in frozen soils during a 380 day storage period.

10.3 The registrant submitted an environmental fate assessment for ICIA5504 and it transformation products (MRID 43678171). EFGWB reviewed the environmental fate assessment to evaluate the registrant's interpretation of the environmental fate and transport data.

Azoxystrobin dissipation in soil is dependent predominately on photodegradation (DT_{50}=11 days) and to a lesser extent on microbial-mediated degradation (DT_{50}=7 to 23 weeks). The mobility of ICIA5504 was classified from low to medium according to McCall's Mobility Classification. The cumulative photolytic and microbial-mediated degradation of ICIA5504 was the reason for rapid field dissipation of ICIA5504 in field dissipation studies

on bare ground and turf sites in California and Florida. The dissipation of ICIA5504 was not dependent on leaching because ICIA5504 was not detected in deep soil samples (> 15 cm).

Ten transformation products of ICIA5504 were identified in laboratory studies. The registrant stated "None of the photolytic transformation products are themselves stable in soil, and rapidly degrade". The registrant's assessment of persistence is based on the dissipation rate ($t_{1/2}$ < 2 weeks) of Compounds 2, 9, 28, and 30 in field studies and soil concentrations (<4% of applied during 120 days) in aerobic soil metabolism studies. The registrant believes the transformation products of ICIA5504 should not be mobile because of rapid degradation in soil.

11.0 COMPLETION OF ONE-LINER:
12.0 CBI APPENDIX: N/A