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SCIENTIFIC DATA REVIEWS
EPA SERIES 361



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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

Date: 20/July/2000

SUBJECT: Disodium Methanearsonate (DSMA) Reregistration. GLN#'s: 860.1500:
Magnitude of the Residue in Cottonseed.

Reregistration Case No.: 2395.

PC Codes: 013802.

DP Barcode Nos.: D220374.

MRID Nos.: 43817101.

FROM: Sherrie L. Kinard, Chemist
Reregistration Branch II
Health Effects Division [7509C]

Sherrie L. Kinard

THROUGH: Alan Nielsen, Branch Senior Scientist
Reregistration Branch II
Health Effects Division [7509C]

Alan Nielsen 7/26/2000

TO: Tom Myers, Chemical Review Manager
Accelerated Reregistration Branch
Special Review and Reregistration Division [7508W]

Attached is a review of a study submitted for the magnitude of the residue of DSMA in/on cottonseed commodities. This information has undergone secondary review in Reregistration Branch 2 and is consistent with Agency policies.

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EXECUTIVE SUMMARY

1. 860.1500 - DSMA Magnitude of the Residue in Cottonseed (MRID No.:43817101):

The submitted residue data for DSMA on cotton are adequate; however, data depicting residues of MSMA and CA in/on cotton gin byproducts following applications of registered formulations according to the maximum use patterns the Task Force wishes to support are required. The number of field trials, geographic locations of trial sites, and the types of harvesting equipment should be in compliance with the current guidance.

Analytical Method:

The analytical method, used for determining residues of DSMA (calculated as MSMA) and CA in/on ginned cottonseed, was a gas chromatography method with electron capture detection (GC/ECD). The reported limit of quantification (LOQ) was 0.05 ppm for each analyte. Based on acceptable concurrent method recoveries, the GC/ECD method is considered adequate for data collection purposes.

Residue Data:

The field trial data indicate that the combined residues of DSMA (determined as MSMA) and CA in/on ginned cottonseed did not exceed the established 0.7 ppm tolerance level on cottonseed following side-by-side applications of a representative 81% WP formulation of MSMA. In the first schedule, the test formulation was applied twice as a directed spray application at 2.2 lb ai/A per application. In the second schedule, the test formulation was applied as a topical broadcast application at 2.2 lb ai/A followed by a directed spray application at 2.2 lb ai/A. The retreatment interval was 1-4 weeks, and samples of undelinted cottonseed were harvested and immediately ginned 71-130 days following the last treatment. The Task Force indicated that the above treatment schedules for cotton represent the maximum use patterns they wish to support for reregistration.

The majority of treated ginned cottonseed samples bore nondetectable (<0.05 ppm) residues of DSMA and CA. The ranges of combined residues in/on treated samples were <0.10(nondetectable)-0.28 ppm and <0.10(nondetectable)-0.25 ppm from first and second treatment schedules, respectively. The Agency will reassess the established cottonseed tolerance at the issuance of the MSMA and DSMA Reregistration Eligibility Decision (RED).

Storage Stability:

Samples of ginned cottonseed, collected from the field trials, were stored frozen for a maximum interval of ~20 months prior to residue analysis. Based on storage stability recoveries of 79.9-124.4%, the Agency concludes that residues of DSMA are relatively stable in/on cottonseed under frozen storage conditions for the duration (~20 months) of storage. No supporting storage stability data were submitted for CA; however, the registrant stated that the frozen storage stability of CA for up to one year was demonstrated by data submitted in conjunction with a previously reviewed cottonseed metabolism study.

DEFICIENCIES

1. Deficiencies in 860.1500 - DSMA Magnitude of the Residue in Cotton (MRID No.:43817101):

Analytical Method:

There are no deficiencies that would seriously compromise the interpretation of these data. The GC/ECD method is considered adequate for data collection purposes.

Residue Data:

There are no deficiencies that would seriously compromise the interpretation of these data; **however, following harvest of undelinted cottonseed, cottonseeds were ginned, and residues were reported on ginned cottonseed. According to Table 1 of OPPTS 860.1000, the RAC is undelinted seed, not ginned cottonseed; therefore, the Agency is requesting confirmatory data for undelinted cottonseed.**

When the requested data for cotton gin byproducts have been submitted and evaluated, the registrants will be required to revise labels for all MSMA formulations with use claims on cotton to specify a PHI. The interim data suggest that a PHI of 71 to 130 days will be appropriate for cottonseed.

Storage Stability:

The Agency concludes that residues of DSMA are relatively stable in/on cottonseed under frozen storage conditions for the duration (~20 months) of storage. There are no deficiencies that would seriously compromise the interpretation of these data; **however, no supporting storage stability data were submitted for CA. The registrant has stated that the frozen storage stability of CA (up to 12 months) was demonstrated by data submitted in conjunction with a previously reviewed cottonseed metabolism study.**

cc: Sherrie L. Kinard (RRB2), MSMA/DSMA List B File, MSMA/DSMA Subject File, RF, LAN. RD/I: RRB2 Res. Chem. Team (3/29/00).

7509C: RRB2: S. Kinard: CM#2: Rm 722B: 703-305-0563: 7/20/00.

DISODIUM METHANEARSONATE (DSMA)

(PC Code 013802; Case 2395)

(DP Barcode D220374)

REGISTRANT'S RESPONSE TO RESIDUE CHEMISTRY DATA REQUIREMENTS

BACKGROUND

In response to the Phase 4 Reviews for DSMA (C. Olinger, 3/26/91), the MAA Research Task Force Three submitted the results of a study (1995; MRID 43817101) pertaining to the magnitude of residue on cottonseed. The submitted cotton field trial data are evaluated in this document for adequacy in fulfilling residue chemistry data requirements for the reregistration of MSMA and DSMA.

The qualitative nature of the residue in plants is adequately understood. In a 12/19/94 meeting of the HED Metabolism Committee, it was determined that the residues of concern (i.e., those that should be included in the tolerance expression and are of toxicological concern) associated with the use of MSMA and DSMA are MSMA and CA. This conclusion is based on the low rate or lack of demethylation, and on the inability to distinguish between background arsenic and arsenic resulting from pesticidal use. The molecular structures of MSMA, DSMA, and CA are depicted below.

Figure 1. Chemical structures of MSMA, DSMA, and CA.

$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C}-\text{As}-\text{OH} \\ \\ \text{ONa} \end{array}$ MSMA	$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C}-\text{As}-\text{ONa} \\ \\ \text{ONa} \end{array}$ DSMA	$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C}-\text{As}-\text{OH} \\ \\ \text{CH}_3 \end{array}$ CA
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Tolerances are currently established for the selective postemergence herbicide methanearsonic acid (calculated as As_2O_3) resulting from application of the disodium and monosodium salts of methanearsonic acid [40 CFR §180.289].

The Task Force has provided method validation as well as concurrent method recovery data for a GC/ECD method (MRID No.: 43630101 and 43802501). Since the enforcement methods listed in PAM Volume II are colorimetric methods, the Agency recommends that this GC/ECD method be proposed as an enforcement method. The registrant is referred to OPPTS 860.1340 for specific requirements concerning regulatory methods. OPPTS 860.1340 requires that any

proposed enforcement method be subjected to an independent laboratory validation (ILV) as per PR Notice 96-1. If the Agency determines that the registrant has submitted the results of a successful ILV trial, then the method will be validated by Agency chemists.

CONCLUSIONS AND RECOMMENDATIONS

1. The analytical method, used for determining residues of DSMA (calculated as MSMA) and CA in/on ginned cottonseed, was a GC/ECD method. The reported limits of quantification (LOQ) were 0.05 ppm for each analyte. Based on acceptable concurrent method recoveries, the GC/ECD method is adequate for data collection purposes. The Agency recommends that this GC/ECD method be proposed as an enforcement method.
2. Samples of ginned cottonseed, collected from the field trials, were stored frozen for a maximum interval of ~20 months prior to residue analysis. The storage stability of DSMA was established by fortification of untreated ginned cottonseed samples after harvest at each test site with MSMA and concurrent analyses of fortified and treated samples at the end of storage periods. Based on storage stability recoveries of 79.9-124.4%, the Agency concludes that residues of both MSMA and DSMA are relatively stable in/on cottonseed under frozen storage conditions for the duration (~20 months) of storage. No supporting storage stability data were submitted for CA; however, the registrant has stated that the frozen storage stability of CA for up to one year was demonstrated by data submitted in conjunction with a previously reviewed cottonseed metabolism study.
- 3a. The field trial data indicate that the combined residues of DSMA (determined as MSMA) and CA in/on ginned cottonseed did not exceed the established 0.7 ppm tolerance level on cottonseed following side-by-side applications of a representative 81% WP formulation of MSMA. In the first schedule, the test formulation was applied twice as a directed spray application at 2.2 lb ai/A per application. In the second schedule, the test formulation was applied as a topical broadcast application at 2.2 lb ai/A followed by a directed spray application at 2.2 lb ai/A. The retreatment interval was 1-4 weeks, and samples of undelinted cottonseed were harvested and immediately ginned 71-130 days following the last treatment. The Task Force has indicated that the above treatment schedules for cotton represent the maximum use patterns they wish to support for reregistration.
- 3b. The majority of treated ginned cottonseed samples bore nondetectable (<0.05 ppm) residues of DSMA and CA. The ranges of combined residues in/on treated samples were <0.10(nondetectable)-0.28 ppm and <0.10(nondetectable)-0.25 ppm from first and second treatment schedules, respectively. The Agency will reassess the established cottonseed tolerance at the issuance of MSMA and DSMA RED.
- 3c. Table 1 of OPPTS GLN 860.1000 recognizes cotton gin byproducts (commonly called gin trash) as a RAC of cotton; therefore, data depicting residues of MSMA and CA in/on

cotton gin byproducts following applications of registered formulations according to the maximum use patterns the Task Force wishes to support are required. The number of field trials, geographic locations of trial sites, and the types of harvesting equipment should be in compliance with the current guidance.

- 3d. When the requested data for cotton gin byproducts have been submitted and evaluated, the registrants will be required to revise labels for all MSMA and DSMA formulations with use claims on cotton to reflect maximum seasonal rates of either (i) 4 lb ai/A when uses include two directed spray applications at 2 lb ai/A/application or (ii) 3 lb ai/A when uses include a single topical application at 1 lb ai/A followed by a directed spray application at 2 lb ai/A and to specify a PHI. The interim data suggest that a PHI of 71 to 130 days will be appropriate for cottonseed.

DETAILED CONSIDERATIONS

Residue Analytical Methods

Samples of delinted cotton commodities from the submitted study were analyzed for residues of DSMA and CA by PTRL East, Inc. (Richmond, KY) using a gas chromatography method with electron capture detection (GC/ECD). Using this method, DSMA residues dissociate to methanearsonic acid in solution; consequently, samples are analyzed for residues of MSMA and CA.

Briefly, samples of delinted cottonseed were extracted with water using a Polytron homogenizer, centrifuged, and filtered. The filtered extract was acidified, treated with hexane and diethyl ether to enhance extractability, made basic with 10% NaOH, and concentrated by rotary evaporation. The concentrated extract was then acidified with HCl and refluxed for 16-18 hours. The extract was further purified by C-18 solid phase extraction (SPE). Residues were derivatized with methylthioglycolate (MTG). The derivatized residues of MSMA and CA were partitioned into hexane. The hexane phase was analyzed for residues of MSMA and CA by GC/ECD. The reported limits of quantification (LOQ) were 0.05 ppm for cottonseed samples.

Concurrent method recovery data were submitted for cottonseed. Untreated samples of cottonseed were fortified with DSMA and CA at various levels, and analyzed using the GC/ECD method described above. The results of concurrent method analyses of fortified untreated samples are presented in Table 1. Based on acceptable method recoveries, the GC/ECD method is adequate for determining residues of MSMA and CA in/on cottonseed.

Table 1. Concurrent method recoveries of DSMA and CA from fortified untreated samples of cottonseed.

Fortification Levels (ppm)	% Recoveries	
	DSMA (Determined as MSMA Equivalents)	CA
0.05	94.2, 118.4	78.7, 113.5
0.10	68.7, 77.7, 81.0, 96.0, 96.8, 109.4, 118.0, 118.2, 121.1, 121.8	74.6, 81.4, 83.0, 84.0, 86.9, 90.2, 90.8, 99.1, 109.5, 113.9
Statistics (Mean±SD)	101.9 ± 18.8; n=12	92.1 ± 13.7; n=12

Storage Stability Data

Samples of cottonseed, collected from the field trials, were ginned after harvest. The ginned cottonseed samples were bagged, frozen (-30 C) and then boxed and shipped via freezer truck or overnight delivery on dry-ice to PTRL East (Richmond, KY) for analysis. All samples were stored frozen at PTRL East until residue analysis. The maximum storage interval between harvest and analysis (of treated and concurrent fortified samples) was ~20 months.

The storage stability of DSMA on cotton was established by fortification of untreated ginned cottonseed samples at each test site with MSMA. Fortified samples were shipped and stored with treated samples and analyzed following analysis of the RAC to determine the stability of MSMA and thus DSMA in cottonseed. Recoveries ranged from 79.9-124.4%. No supporting storage stability data were submitted for CA; however, the registrant stated that the frozen storage stability of CA for up to one year was demonstrated by data submitted in conjunction with a previously reviewed cottonseed metabolism study.

Magnitude of the Residue in Plants

Cotton

Established tolerance: A tolerance has been established for residues of methanearsonic acid (calculated as As_2O_3) in/on cottonseed at 0.7 ppm resulting from application of the disodium and monosodium salts of methanearsonic acid in/on cotton [40 CFR §180.289]. No tolerance has been established for cotton gin byproducts.

Registered use patterns: Approved label copies of end-use products containing DSMA as the active ingredient which are registered to MAA Task Force Three members are not available to the study reviewer. However, the Task Force described the use patterns they are willing to support for use of DSMA on cotton for the purposes of reregistration. The use directions listed below were taken from the "Introduction" section of the submission; the registrant indicated that they represent the currently registered uses of DSMA on cotton. The Agency will verify the proposed/registered uses of DSMA on cotton when the Residue Chemistry Chapter for MSMA and DSMA RED is initiated.

The 81% DSMA WP formulation may be applied on cotton plants using a combination of treatment regimes such as directed spray or topical broadcast application. Two directed spray applications may be made at 2.2 lb ai/A/application or one topical application at 2.2 lb ai/A followed by a direct spray at 2.2 lb ai/A. The type of equipment application along with spray volumes was not specified. The implied maximum seasonal rate is 4.4 lb ai/A. No PHI has been established.

Discussion of data: The MAA Research Task Force Three has submitted data (1995; MRID 43817101) pertaining to the magnitude of residues of DSMA and CA in/on cottonseed. Twenty-three trials were conducted during the 1993 growing season in AL(1 trial), AR(2), AZ(2), CA(3), GA(1), LA(4), MS(4), TN(1), and TX(5). Two side-by-side treatment schedules were employed in each trial site using the 81% WP formulation of DSMA (EPA Reg. No. 42519-7). In the first treatment schedule, the test formulation was applied twice as a directed spray application at 2.2 lb ai/A per application. In the second treatment schedule, the test formulation was applied as a topical broadcast application at 2.2 lb ai/A followed by a directed spray application at 2.2 lb ai/A. The treatment rates represent 1x the application rates described above in "Directions for Use" section. All treatments were made onto established growing cotton plants using ground equipment (CO₂ backpack or tractor mounted CO₂ sprayer) in approximately 20-40 GPA of water. The retreatment interval was 1-4 weeks. Samples of cottonseed were harvested 71-130 days following the last treatment. After harvest, cottonseed samples were ginned, stored frozen and shipped via freezer truck or overnight delivery on dry-ice to the analytical laboratory (PTRL East). Samples were analyzed for residues of DSMA and CA by PTRL East, Inc. (Richmond, KY) using a GC/ECD method. Apparent residues of DSMA in/on untreated ginned cottonseed (n = 9 samples) were each below the method's LOQ (<0.05 ppm) except for three samples which bore detectable DSMA residues of 0.051, 0.073, and 0.077 ppm; apparent residues of CA in/on ginned cottonseed (n = 11 samples) were also below the method's LOQ except for one sample which bore detectable DSMA residues of 0.065 ppm. The results of the field study are presented in Table 2.

Geographic representation of data is adequate. Table 1 of OPPTS 860.1500 specifies that for the establishment of a pesticide tolerance on cotton with no regional restrictions, a minimum of 12 trials should be conducted on major growing regions of the country and a minimum of 24 treated samples should be collected. In this field study, 23 cottonseed trials were conducted.

Table 2. Residues of DSMA and CA in/on ginned cottonseed harvested 71-130-days following applications of the 81% WP DSMA formulation.

County, State (EPA Region)	PHI (Days)	Uncorrected Residues (ppm)		
		DSMA *	CA	Combined
Two directed spray application at 2.2 lb ai/A per application				
Grangeburg, AL (2)	92	<0.05	<0.05	<0.10
West Memphis AR (4)	105	<0.05	<0.05	<0.10
Dermott, AR (4)	77	0.09	<0.05	<0.14
Somerton, AZ (10)	105	<0.05	<0.05	<0.10
Buckeye, AZ (10)	147	0.05	<0.05	<0.10
Westmorland, CA (10)	105	0.10	<0.05	<0.15
Kerman, CA (10)	114	0.08	0.06	0.14
Bakersfield, CA (10)	130	<0.05	<0.05	<0.10
Meigs, GA (2)	99	0.23	<0.05	<0.28
Bunkie, LA (4)	98	<0.05	<0.05	<0.10
St. Joseph, LA (4)	99	<0.05	<0.05	<0.10
Washington, LA (4)	81	0.11	<0.05	<0.15
Morganza, LA (4)	98	<0.05	<0.05	<0.10
Friars Point, MS (4)	90	0.10	<0.05	<0.15
Walls, MS (4)	71	0.06	<0.05	<0.11
Leland, MS (4)	85	0.14	<0.05	<0.19
Tutwiler, MS (4)	72	0.07	<0.05	<0.12
Hickory Withe, TN (4)	93	<0.05	<0.05	<0.10
Raymondville, TX (6)	71	<0.05	<0.05	<0.10
La Villa, TX (6)	71	<0.05	<0.05	<0.10
Orchard, TX (6)	80	0.14	<0.05	<0.19
Uvalde, TX (6)	90	0.06	<0.05	<0.11
Lubbock, TX (6)	93	0.08	<0.05	<0.13
One topical application at 2.2 lb ai/A followed by one directed spray application at 2.2 lb ai/A				
Grangeburg, AL (2)	92	<0.05	<0.05	<0.10
West Memphis AR (4)	105	0.07	<0.05	<0.12
Dermott, AR (4)	77	0.06	<0.05	<0.11
Somerton, AZ (10)	105	<0.05	<0.05	<0.10
Buckeye, AZ (10)	147	<0.05	<0.05	<0.10
Westmorland, CA (10)	105	0.07	<0.05	<0.12

County, State (EPA Region)	PHI (Days)	Uncorrected Residues (ppm)		
		DSMA ^a	CA	Combined
Kerman, CA (10)	114	0.09	<0.05	<0.14
Bakersfield, CA (10)	130	<0.05	0.05	<0.10
Meigs, GA (2)	99	<0.05	<0.05	<0.10
Bunkie, LA (4)	98	<0.05	0.16	<0.21
St. Joseph, LA (4)	99	<0.05	<0.05	<0.10
Washington, LA (4)	81	0.20	<0.05	<0.25
Morganza, LA (4)	98	0.16	<0.05	<0.21
Friars Point, MS (4)	90	0.17	<0.05	<0.22
Walls, MS (4)	71	0.10	<0.05	<0.15
Leland, MS (4)	85	0.10	<0.05	<0.15
Tutwiler, MS (4)	72	<0.05	<0.05	<0.10
Hickory Withe, TN (4)	93	<0.05	<0.05	<0.10
Raymondville, TX (6)	71	<0.05	<0.05	<0.10
La Villa, TX (6)	71	<0.05	<0.05	<0.10
Orchard, TX (6)	80	0.08	<0.05	<0.13
Uvalde, TX (6)	90	0.07	<0.05	<0.12
Lubbock, TX (6)	93	0.08	<0.05	<0.13

^a DSMA residues were determined as MSMA.

Study summary: The field trial data indicate that the combined residues of DSMA (determined as MSMA) and CA in/on ginned cottonseed did not exceed the established 0.7 ppm tolerance level on cottonseed following side-by-side applications of a representative 81% WP formulation of MSMA. In the first schedule, the test formulation was applied twice as a directed spray application at 2.2 lb ai/A per application. In the second schedule, the test formulation was applied as a topical broadcast application at 2.2 lb ai/A followed by a directed spray application at 2.2 lb ai/A. The retreatment interval was 1-4 weeks, and samples of undelinted cottonseed were harvested and immediately ginned 71-130 days following the last treatment. The Task Force indicated that the above treatment schedules for cotton represent the maximum use patterns they wish to support for reregistration; however, the RAC that was harvested was undelinted cottonseed. Following harvest, cottonseeds were ginned, and residues were reported on ginned cottonseed. According to Table 1 of OPPTS 860.1000, the RAC is undelinted seed.

The majority of treated ginned cottonseed samples bore nondetectable (<0.05 ppm) residues of DSMA and CA. The ranges of combined residues in/on treated samples were <0.10(nondetectable)-0.28 ppm and <0.10(nondetectable)-0.25 ppm from first and second treatment schedules, respectively. The Agency will reassess the established cottonseed tolerance at the issuance of MSMA RED.

Table 1 of OPPTS GLN 860.1000 recognizes cotton gin byproducts (commonly called gin trash) as a RAC-of cotton; therefore, data depicting residues of MSMA and CA in/on cotton gin byproducts following applications of registered formulations according to the maximum use patterns the Task Force wishes to support are required. The number of field trials, geographic locations of trial sites, and the types of harvesting equipment should be in compliance with the current guidance.

When the requested data for cotton gin byproducts have been evaluated, the registrants will be required to revise labels for all MSMA formulations with use claims on cotton to specify a PHI. The interim data suggest that a PHI of 71 to 130 days will be appropriate for cottonseed.

MASTER RECORD IDENTIFICATION NUMBERS

The citation for the MRID document referred to in this review is presented below.

43817101 Johnson, T. (1995) Disodium Methanearsonate: Field Crop Residue Trials for DSMA on Cotton (Raw Agricultural Commodities): Final Report: Lab Project Number: 768: 1838. Unpublished study prepared by PTRL East, Inc. 522 p.