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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

DATE: March 13, 2001

MEMORANDUM

SUBJECT: ID#113501. Metalaxyl/Mefenoxam Storage Stability in Plants.

DP Barcode:	D257302	PRAT Case:	819456
Submission No.:	S564452	Caswell No.:	None
PC Code:	113501 and 113502	Class:	Fungicide
Trade Name:	Not Applicable	EPA Reg. No.:	Not Applicable
40 CFR:	180.408 and 180.546		
MRID Nos.:	44316101 and 44850301		

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03/15/2001

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INTRODUCTION

Syngenta (formerly Novartis Crop Protection, Inc. and formerly Ciba Crop Protection) submitted storage stability data for the fungicide mefenoxam [(R)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester; CGA-329351] on plants. The storage stability data were requested under the metalaxyl reregistration process [D197066, S. Hummel,

2/17/94; and the Product and Residue Chemistry Chapters for the Metalaxyl Reregistration Eligibility Decision (RED) Document (DP Barcodes D197037 and D197066, CBRS #12906 and 12907, issued on 6/16/94)]. Mefenoxam is the R isomer; metalaxyl (CGA-48988) is a mixture of the R and S isomers.

A time-limited tolerance (to expire on December 31, 2001) for mefenoxam and its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)-alanine methyl ester, each expressed as mefenoxam equivalents, in/on canola at 0.05 ppm has been established [*FR Vol. 65, 57550-57557*; 40 CFR § 180.546 (b)] in connection with a Section 18 emergency exemption for use of mefenoxam as a seed treatment on canola in ND. A permanent tolerance is pending for the combined residues of (R)- and (S)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester, its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester, each expressed as mefenoxam equivalents, on canola at 0.05 ppm (D254225, N. Dodd, 11/13/00). No other tolerances have been established for mefenoxam.

Permanent tolerances have been established for the combined residues of metalaxyl [*N*-(2,6-dimethylphenyl)-*N*-(methoxyacetyl) alanine methyl ester] and its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)-alanine methyl ester, each expressed as metalaxyl equivalents, in/on a number of plant and animal commodities [40 CFR §180.408 (a, c, and d)]. Tolerances have been established on plant commodities at levels ranging from 0.1 ppm in/on beets (sugar and garden), *Brassica* leafy vegetables, cereal grains, cottonseed, pineapples, sunflowers, and papaya to 25 ppm in/on grass hay. Tolerances have been established for animal commodities at 0.4 ppm in the fat, kidney, and liver of cattle, goats, hogs, horses, poultry, and sheep; 0.05 ppm in meat and meat byproducts (except kidney and liver) of cattle, goats, hogs, horses, poultry, and sheep; 0.02 ppm in milk, and 0.05 ppm in eggs.

Tolerances for residues of metalaxyl in/on raw and processed plant commodities and animal commodities are currently expressed in the CFR in terms of the combined residues of metalaxyl [*N*-(2,6-dimethylphenyl)-*N*-(methoxyacetyl) alanine methyl ester] and its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)-alanine methyl ester, each expressed as metalaxyl equivalents. However, the HED Metabolism Committee (now called Metabolism Assessment Review Committee) determined in a meeting on 9/8/93 that the residues to be regulated in animals are metalaxyl, metabolites that can be converted to 2,6-dimethylaniline (2,6-DMA), and those metabolites containing the 2-hydroxymethyl-6-methylaniline (HMMA) moiety (S. Hummel, 9/10/93).

The Metabolism Assessment Review Committee (D269910, N. Dodd, 10/27/00) discussed mefenoxam on 10/24/00 and concluded that the residues to be regulated for the tolerance expression and for dietary risk assessments would be the following:

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Plants

(R)- and (S)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester, its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester*, each expressed as mefenoxam equivalents

[* *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester is CGA-94689.]

Animals

(R)- and (S)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester, its metabolites containing the 2,6-dimethylaniline moiety, and its metabolites containing the 2-hydroxymethyl-6-methylaniline moiety, each expressed as parent equivalents

Rotational Crops

(R)- and (S)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester, its metabolites containing the 2,6-dimethylaniline moiety, and *N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester, each expressed as parent equivalents, except that 2-[(methoxyacetyl)(2-methoxy-1-methyl-2-oxoethyl)amino]-3-methylbenzoic acid (CGA-108905) and *N*-(3-hydroxy-2,6-dimethylphenyl)-*N*-(methoxyacetyl)alanine methyl ester (CGA-100255) will be considered in risk assessments involving the foliar use of mefenoxam.

Metalaxyl is a List A chemical. A Metalaxyl Reregistration Standard and Guidance Document was issued on 12/81. Product and Residue Chemistry Chapters of the Metalaxyl Registration Standard were issued on 6/22/87. The Metalaxyl Final Reregistration Standard and Tolerance Reassessment (FRSTR) Guidance Document was dated 9/88. The Metalaxyl Product Chemistry and Residue Chemistry Reregistration Standard Updates were issued on 3/13/91. There is a Metalaxyl Product Chemistry and Residue Chemistry Registration Standard Update dated 4/92. The Product and Residue Chemistry Chapters for the Metalaxyl Reregistration Eligibility Decision Document (DP Barcodes D197037 and D197066, CBRS #12906 and 12907) were issued on 6/16/94.

The structure of metalaxyl/mefenoxam is shown in Figure 1 below.

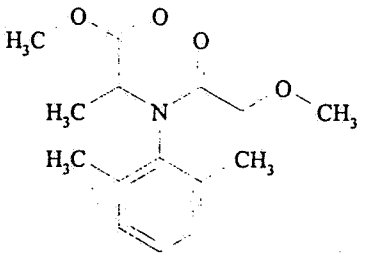


Figure 1. Metalaxyl/Mefenoxam

CONCLUSIONS

OPPTS GLN 860.1380: STORAGE STABILITY DATA- PLANTS

1. Residues of CGA-329351 are stable in soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste stored frozen (-20 °C) for at least 32 months. Residues of CGA-62826 and CGA-94689 are stable in soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste stored frozen (-20 °C) for at least 34 months. (HED notes that the recoveries for CGA-94689 for both fresh fortifications and stored samples in all matrices tested in this submission are low. The conclusions regarding the storage stability are based on the measure of stability as defined in OPPTS 860.1380 for the storage stability tables: "The values in the second column from the right represent the apparent recovery in the stored samples. These can be divided by the recoveries obtained in the freshly fortified samples to determine the corrected recovery, the measure of the stability of the residue in storage....".) Also, the ChemSAC determined in a meeting on 2/28/01 that the storage stability data for CGA-94689 are acceptable despite the low fresh fortification recoveries since 1) parent and the other metabolites are stable; 2) there was a high degree of consistency in recoveries; and 3) CGA-94689 is not of particularly high toxicological concern.

2. Metalaxyl/mefenoxam residues of concern [as represented by weathered residues of metalaxyl or by mefenoxam (CGA-329351), CGA-62826, and CGA-94689] are stable in all raw agricultural commodities at -20 °C for at least 24 months. This conclusion is based on storage stability studies in five diverse crops [i.e., potatoes (root crop), peppers (fruiting vegetable), spinach (leafy vegetable) for 24 months, and corn (nonoily grain) and soybeans (oilseed) for 32 months]. [A final report reflecting 38-39 months storage of weathered residues of metalaxyl on cranberries, potatoes, peppers, and spinach (MRID 43446901) is under concurrent review.]

3. Metalaxyl/mefenoxam residues of concern [as represented by mefenoxam (CGA-329351), CGA-62826, and CGA-94689] are stable in all processed commodities at -20 °C for 32 months.

This conclusion is based on storage stability studies in the processed commodities of three diverse crops [i.e., soybeans (oilseed), corn (nonoily grain), and tomato (fruiting vegetable) for 32 months].

RECOMMENDATION

The registrant/petitioner should be informed of the status of the plant storage stability data as stated in Conclusions 1, 2, and 3 above.

DETAILED CONSIDERATIONS

See Attachment 1 for the chemical names and structures of mefenoxam and its metabolites which are discussed in this review.

OPPTS GLN 860.1380: STORAGE STABILITY DATA

PLANTS (MRID 44316101and MRID 44850301)

Previously reviewed storage stability data for metalaxyl are summarized below:

Residues of metalaxyl *per se* (CGA-48988) are stable in tobacco and potatoes for up to 12 months when stored in glass jars at -15 °C, and combined residues of metalaxyl and its metabolites containing the 2,6-dimethylaniline moiety are stable in tobacco and potatoes for up to 18 months when stored in plastic bags at -15 °C (MRID 40534802; Metalaxyl Registration Standard, 6/22/87 and D223261, L. Kutney, 4/23/96). Residues of metalaxyl *per se* and five metabolites (CGA-62826, CGA-67869, CGA-107955, CGA-37734, and CGA-94689) individually fortified in strawberries, apples, cabbage, lettuce, and potatoes were found to be stable while frozen (-15 °C) for up to12 months (D197066, S. Hummel, 2/17/94; MRID 40106601, Study ABR-86044, PP#3F2848, 7/6/83). An interim storage stability study on cranberries, potatoes, peppers, and spinach indicated that weathered residues of metalaxyl determined as 2,6-DMA are stable in samples stored frozen (-20 °C) for 18 months (cranberries) or 24 months (potatoes, peppers, and spinach) (MRID 42919401, D197066, S. Hummel, 2/17/94). A final report reflecting 38-39 months storage of cranberries, potatoes, peppers, and spinach (MRID 43446901) is under concurrent review.

In the Product and Residue Chemistry Chapters for the Metalaxyl Reregistration Eligibility Decision (RED) Document (DP Barcodes D197037 and D197066, CBRS #12906 and 12907, issued on 6/16/94), HED concluded that adequate storage stability data are available to support residue studies on raw agricultural commodities stored less than 24 months at temperatures of -20 °C or less, with the exception of oilseed and grain crops; storage stability data for metalaxyl and representative metabolites in a representative oilseed (e.g., soybean or nut) and grain (e.g., wheat) were required. As stated in D197066 (S. Hummel, 2/17/94), storage stability data would normally be required for all of the raw agricultural commodities associated with oilseeds and grains; however, in the case of metalaxyl/mefenoxam, HED will translate from leafy greens to

the forages and hays. [As stated in OPPTS 860.1380, storage stability can be assumed for all raw agricultural commodities provided that storage stability has been demonstrated in at least five diverse crops. If the pesticide is to be applied to all crops, the suggested crops to be used in the storage stability studies are an oilseed (or soybean or nut), a nonoily grain, a leafy vegetable, a root crop, and a fruit or fruiting vegetable. The fruit/fruiting vegetable should be an acidic crop such as citrus or tomatoes. Field corn grain is considered to be a nonoily grain as opposed to an oilseed.]

In the Product and Residue Chemistry Chapters for the Metalaxyl Reregistration Eligibility Decision (RED) Document (DP Barcodes D197037 and D197066, CBRS #12906 and 12907, issued on 6/16/94), HED also concluded that storage stability data for metalaxyl and representative metabolites were required from all processed commodities of an oilseed, a grain, and a fruit or fruiting vegetable. [As stated in OPPTS 860.1380, additional storage stability data on other processed commodities (for the same storage conditions and storage time) will not be required provided that the residues are stable in the processed commodities from one of each of these three types of crops (i.e., oilseed, grain, and fruit/fruiting vegetable (mainly citrus, apples, or tomatoes).]

Subsequently to the RED, storage stability studies (MRID 44316101, interim report; and MRID 44850301, final report) on CGA-329351, CGA-62826, and CGA-94689 in soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste were submitted. The studies are cited below. The performing laboratory was Novartis Crop Protection, Inc., Greensboro, NC. No other storage stability data are available on processed commodities. [Note: The data on soybeans, corn, and their processed commodities were reviewed in connection with a petition for mefenoxam on canola (D254225, N. Dodd, 11/13/00). That data is repeated below along with the data on tomato paste.]

MRID 44316101 Eudy, L.W. (1997) Stability of CGA-329351, CGA-62826, and CGA-94689 in Crops and Processed Fractions under Freezer Storage Conditions, Laboratory Project Identification No. (Report No.) ABR-97047, Study Number 119-96, unpublished study sponsored by Novartis Crop Protection, Inc., 118 pp.

MRID 44850301 Grunenwald, M.C. (1999) Stability of CGA-329351, CGA-62826, and CGA-94689 in Crops and Processed Fractions under Freezer Storage Conditions, Novartis Number 119-96, unpublished study sponsored by Novartis Crop Protection, Inc., 130 pp.

Samples of soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste were fortified with mefenoxam (CGA-329351), CGA-62826, or CGA-94689 and stored frozen (at -20 °C) in polyethylene bags. Samples were extracted at 0-day and at 3, 6, 12, 24, and 32 or 34 months. Analytical Method AG-395 was used to determine residues as 2,6-dimethylaniline (2,6-DMA), which values were then converted to CGA-329351, CGA-62826, or CGA-94689 equivalents using the factors 2.305, 2.189, or 2.437, respectively. Several modifications to Method AG-395 were the following: 1) refluxing with 80% (v/v) methanol/water for two hours as described in Section 5.4 for dry crops instead of the Polytron

extraction described in Section 5.3 of AG-395; 2) doubling the water and sodium hydroxide volumes in Section 5.5.4; and 3) omitting the trifluoroacetic acid addition step for the formation of DMA-TFA in Sections 5.7.6 and 5.7.7 as unnecessary.

Table 1. Storage Stability Fortification Recovery Data for CGA-329351 in Soybean Seeds								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean seeds	CGA-329351	2.00	0.0	7	1.399, 1.130, 1.219 (av 1.249)	70, 62, 51 (av 61)	62	102
			3.2	7	1.670, 1.570 (av 1.620)	88, 83 (av 86)	81	94
			6.1	16	1.558, 1.522 (av 1.540)	66, 86 (av 76)	77	101
			11.9	3	1.470, 1.707 (av 1.588)	78, 78 (av 78)	79	101
			24.4	4	1.652, 1.499 (av 1.576)	85, 77 (av 81)	79	98
			32.5	16	1.837, 1.962 (av 1.900)	97, 94 (av 96)	95	99

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 2. Storage Stability Fortification Recovery Data for CGA-329351 in Soybean Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean meal	CGA-329351	2.00	0.0	2	1.344, 1.504, 1.522 (av 1.457)	60, 61, 65 (av 62)	73	118
			3.1	7	1.477, 1.583 (av 1.530)	87, 80 (av 84)	76	90
			6.0	13	1.373, 1.287 (av 1.330)	70, 72 (av 71)	66	93
			12.5	7	1.626, 1.549 (av 1.588)	78, 94 (av 86)	79	92
			24.1	3	1.622, 1.473 (av 1.548)	88, 78 (av 83)	77	93
			32.4	8	1.348, 1.679 (av 1.514)	73, 86 (av 80)	76	95

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 2.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 3. Storage Stability Fortification Recovery Data for CGA-329351 in Soybean Hulls								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean hulls	CGA-329351	2.00	0.0	13	1.644, 1.572, 1.552 (av 1.589)	86, 85, 82 (av 84)	79	94
			3.2	5	1.667, 1.624 (av 1.646)	90, 87 (av 88)	82	93
			6.1	10	1.627, 1.534 (av 1.580)	84, 86 (av 85)	79	93
			12.6	8	1.789, 1.732 (av 1.760)	85, 102 (av 94)	88	94
			24.3	2	1.320, 1.174 (av 1.247)	81, 84 (av 82)	62	76
			32.4	12	1.803, 2.026 (av 1.914)	75, 93 (av 84)	96	114

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 4. Storage Stability Fortification Recovery Data for CGA-329351 in Corn Grain								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn grain	CGA-329351	2.00	0.0	8	1.834, 1.599, 1.567 (av 1.667)	78, 78, 80 (av 79)	83	105
			3.0	6	1.880, 1.534 (av 1.707)	84, 74 (av 79)	85	108
			6.2	8	1.688, 1.680 (av 1.684)	86, 88 (av 87)	84	97
			11.7	8	1.722, 1.739 (av 1.730)	87, 82 (av 84)	86	102
			24.2	8	1.561, 1.416 (av 1.488)	76, 76 (av 76)	74	97
			32.5	17	1.705, 1.846 (av 1.776)	94, 100 (av 97)	89	92

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 2.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 5. Storage Stability Fortification Recovery Data for CGA-329351 in Corn Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn meal	CGA-329351	2.00	0.0	2	1.657, 1.698, 1.480 (av 1.612)	87, 87, 77 (av 84)	81	96
			3.1	6	1.769, 1.915 (av 1.842)	90, 85 (av 88)	92	105
			6.2	7	1.726, 1.624 (av 1.675)	88, 90 (av 89)	84	94
			11.7	9	1.617, 1.665 (av 1.641)	85, 82 (av 84)	82	98
			24.3	7	1.453, 1.568 (av 1.510)	84, 79 (av 82)	76	93
			32.5	17	1.727, 1.683 (av 1.705)	62, 89 (av 76)	85	112

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 2.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 6. Storage Stability Fortification Recovery Data for CGA-329351 in Corn Oil								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn oil	CGA-329351	2.00	0.0	19	1.367, 1.212, 1.484 (av 1.354)	72, 78, 61 (av 70)	68	97
			3.2	16	1.866, 1.947 (av 1.906)	93, 97 (av 95)	95	100
			6.0	14	1.549, 1.525 (av 1.537)	84, 82 (av 83)	77	93
			12.7	7	1.657, 1.578 (av 1.618)	85, 81 (av 83)	81	98
			24.1	3	1.834, 1.975 (av 1.904)	87, 82 (av 84)	95	113
			32.4	9	1.593, 1.563 (av 1.578)	91, 88 (av 90)	79	88

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 7. Storage Stability Fortification Recovery Data for CGA-329351 in Tomato Paste								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
tomato paste	CGA-329351	2.00	0.0	22	1.518, 1.638, 1.226 (av 1.461)	74, 79, 68 (av 74)	73	99
			3.1	8	1.522, 1.295 (av 1.408)	86, 92 (av 89)	70	79
			6.0	8	1.335, 1.503 (av 1.419)	76, 73 (av 74)	71	96
			11.8	6	1.456, 1.661 (av 1.558)	74, 85 (av 80)	78	98
			24.3	5	1.709, 1.441 (av 1.575)	84, 76 (av 80)	79	99
			32.5	15	1.745, 1.640 (av 1.692)	69, 84 (av 76)	85	112

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 8. Storage Stability Fortification Recovery Data for CGA-62826 in Soybean Seeds								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean seeds	CGA-62826	2.0	0.0	6	1.638, 1.700, 1.216 (av 1.518)	85, 87, 94 (av 89)	76	85
			3.2	8	0.740, 0.950 (av 0.845)	79, 81 (av 80)	42	52
			6.2	10	1.628, 1.577 (av 1.602)	79, 76 (av 78)	80	103
			11.9	9	1.658, 1.668 (av 1.663)	83, 79 (av 81)	83	102
			23.9	7	1.769, 1.456 (av 1.612)	80, 85 (av 82)	81	99
			34.5	5	1.566, 1.707 (av 1.636)	98, 84 (av 91)	82	90

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 9. Storage Stability Fortification Recovery Data for CGA-62826 in Soybean Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean meal	CGA-62826	2.00	0.0	7	1.297, 1.404, 1.167 (av 1.289)	78, 64, 68 (av 70)	64	91
			3.5	6	1.368, 1.066 (av 1.217)	64	61	95
			6.4	16	1.546, 1.674 (av 1.610)	70, 71 (av 70)	80	114
			12.2	8	1.580, 1.444 (av 1.512)	55, 87 (av 71)	76	107
			25.0	2	1.702, 1.514 (av 1.608)	84, 80 (av 82)	80	98
			34.5	3	1.627, 1.814 (av 1.720)	93, 92 (av 92)	86	93

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 10. Storage Stability Fortification Recovery Data for CGA-62826 in Soybean Hulls								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean hulls	CGA-62826	2.00	0.0	12	1.693, 1.723, 1.327 (av 1.581)	98, 89, 78 (av 88)	79	90
			3.4	9	1.426, 1.316 (av 1.371)	79, 79 (av 79)	69	87
			6.3	10	1.704, 1.719 (av 1.712)	90, 81 (av 86)	86	100
			12.1	8	1.684, 1.721 (av 1.702)	88, 76 (av 82)	85	104
			24.0	8	1.800, 1.493 (av 1.646)	81, 81 (av 81)	82	101
			34.4	8	1.722, 1.780 (av 1.751)	69, 100 (av 84)	88	105

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 11. Storage Stability Fortification Recovery Data for CGA-62826 in Corn Grain								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn grain	CGA-62826	2.00	0.0	5	1.614, 1.751, 1.769 (av 1.711)	70, 76, 82 (av 76)	86	113
			3.0	2	1.507, 1.493 (av 1.500)	73, 73 (av 73)	75	103
			6.2	8	1.325, 1.547 (av 1.436)	69, 64 (av 66)	72	109
			11.9	9	1.599, 1.669 (av 1.634)	86, 85 (av 86)	82	95
			24.0	7	1.784, 1.673 (av 1.728)	89, 90 (av 90)	86	96
			34.7	2	1.640, 1.462 (av 1.551)	94, 88 (av 91)	78	86

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 2.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 12. Storage Stability Fortification Recovery Data for CGA-62826 in Corn Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn meal	CGA-62826	2.00	0.0	9	1.468, 1.405, 1.410 (av 1.428)	76, 78, 75 (av 76)	71	93
			3.0	6	1.400, 1.302 (av 1.351)	79, 66 (av 72)	68	94
			6.1	7	1.733, 1.553 (av 1.643)	82, 76 (av 79)	82	104
			11.9	6	1.490, 1.384 (av 1.437)	79, 72 (av 76)	72	95
			24.1	3	1.923, 1.555 (av 1.739)	92, 90 (av 91)	87	96
			34.7	4	1.811, 1.744 (av 1.778)	97, 90 (av 94)	89	95

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 13. Storage Stability Fortification Recovery Data for CGA-62826 in Corn Oil								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn oil	CGA-62826	2.00	0.0	8	1.517, 2.366, 1.625 (av 1.836)	88, 86, 85 (av 86)	92	107
			3.0	7	1.529, 1.314 (av 1.422)	70, 82 (av 76)	71	93
			6.1	13	1.450, 1.589 (av 1.520)	80, 87 (av 84)	76	90
			11.9	11	1.682, 1.595 (av 1.638)	77, 89 (av 83)	82	99
			24.6	7	1.549, 1.640 (av 1.594)	90, 89 (av 90)	80	89
			34.0	8	1.822, 1.688 (av 1.755)	94, 87 (av 90)	88	98

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 2.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 14. Storage Stability Fortification Recovery Data for CGA-62826 in Tomato Paste								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
tomato paste	CGA-62826	2.00	0.0	7	1.267, 1.013, 1.387 (av 1.222)	57, 56, 57 (av 57)	61	107
			3.4	9	1.449, 1.268 (av 1.358)	67, 56 (av 62)	68	110
			6.2	15	1.656, 1.666 (av 1.661)	74, 88 (av 81)	83	102
			11.9	6	1.216, 1.307 (av 1.262)	67, 70 (av 68)	63	93
			23.9	6	1.683, 1.743 (av 1.713)	84, 88 (av 86)	86	100
			34.3	5	1.061, 1.498 (av 1.280)	68, 62 (av 65)	64	98

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 2.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 15. Storage Stability Fortification Recovery Data for CGA-94689 in Soybean Seeds								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean seeds	CGA-94689	5.00	0.0	7	0.418, 0.423, 0.430 (av 0.424)	8, 7, 11 (av 9)	8	89
			3.2	9	0.640, 0.596 (av 0.618)	11, 10 (av 10)	12	120
			6.2	10	0.393, 0.421 (av 0.407)	7, 7 (av 7)	8	114
			11.9	10	0.348, 0.423 (av 0.386)	7, 8 (av 8)	8	100
			23.9	7	0.709, 0.692 (av 0.700)	17, 17 (av 17)	14	82
			34.5	6	0.669, 0.651 (av 0.660)	11, 10 (av 10)	13	130

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 5.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 16. Storage Stability Fortification Recovery Data for CGA-94689 in Soybean Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean meal	CGA-94689	5.00	0.0	12	0.331, 0.350 (av 0.340)	5, 7, 6 (av 6)	7	117
			3.5	27	0.349, 0.384 (av 0.366)	8, 9 (av 8)	7	88
			6.4	16	0.414, 0.431 (av 0.422)	9, 10 (av 10)	8	80
			12.2	9	0.479, 0.547 (av 0.513)	11, 9 (av 10)	10	100
			25.0	3	0.473, 0.496 (av 0.484)	12, 11 (av 12)	10	83
			34.5	4	0.594, 0.499 (av 0.546)	12, 11 (av 12)	11	92

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 5.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 17. Storage Stability Fortification Recovery Data for CGA-94689 in Soybean Hulls								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
soybean hulls	CGA-94689	5.00	0.0	14	1.253, 1.263, 1.310 (av 1.275)	25, 24, 23 (av 24)	26	108
			3.4	9	0.809, 0.634 (av 0.722)	17, 17 (av 17)	14	82
			6.3	11	1.249, 1.399 (av 1.324)	26, 27 (av 26)	26	100
			12.1	8	1.170, 1.364 (av 1.267)	25, 25 (av 25)	25	100
			24.0	9	1.025, 0.908 (av 0.966)	13, 15 (av 14)	19	136
			34.5	7	1.528, 1.139 (av 1.334)	30, 29 (av 30)	27	90

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 5.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 18. Storage Stability Fortification Recovery Data for CGA-94689 in Corn Grain								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn grain	CGA-94689	5.00	0.0	6	1.456, 1.286, 1.385 (av 1.376)	30, 31, 27 (av 29)	28	97
			3.0	6	1.342, 1.276 (av 1.309)	27, 25 (av 26)	26	100
			6.2	9	1.113, 1.425 (av 1.269)	25, 32 (av 28)	25	89
			11.9	10	1.305, 1.301 (av 1.303)	28, 22 (av 25)	26	104
			24.0	5	1.371, 1.221 (av 1.296)	25, 30 (av 28)	26	93
			34.7	2	1.165, 1.267 (av 1.216)	28, 31 (av 30)	24	80

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 5.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 19. Storage Stability Fortification Recovery Data for CGA-94689 in Corn Meal								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn meal	CGA-94689	5.00	0.0	8	1.080, 1.013, 0.914 (av 1.002)	24, 22, 21 (av 22)	20	91
			3.0	6	1.066, 1.159 (av 1.112)	20, 26 (av 23)	22	96
			6.1	8	1.210, 1.179 (av 1.194)	25, 25 (av 25)	24	96
			11.9	6	1.038, 1.178 (av 1.108)	25, 24 (av 24)	22	92
			24.1	6	1.355, 1.314 (av 1.334)	30, 28 (av 29)	27	93
			34.8	4	0.998, 0.985 (av 0.992)	23, 21 (av 22)	20	91

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 5.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 20. Storage Stability Fortification Recovery Data for CGA-94689 in Corn Oil								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
corn oil	CGA-94689	5.00	0.0	14	2.560, 2.792, 3.136 (av 2.829)	54, 60, 67 (av 60)	57	95
			3.0	8	2.969, 2.791 (av 2.880)	61, 65 (av 63)	58	92
			6.1	20	2.298, 2.557 (av 2.428)	56, 52 (av 54)	49	91
			11.9	11	2.131, 2.008 (av 2.070)	51, 58 (av 54)	41	76
			24.6	4	2.671, 2.705 (av 2.688)	50, 34 (av 42)	54	129
			34.0	7	2.776, 3.092 (av 2.934)	62, 54 (av 58)	59	102

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.
[2] The fortification level was 5.00 ppm. Results are not corrected for controls.
[3] apparent recoveries ÷ fresh fortification recoveries X 100

Table 21. Storage Stability Fortification Recovery Data for CGA-94689 in Tomato Paste								
Commodity	Analyte	Residue Level Added (ppm)	Storage Period, Fortification to Extraction (months)	Storage Period, Extraction to Analysis (days)	Residue Level Found, Uncorrected[1] (ppm)	Fresh Fortification Recovery[2] (%)	Apparent Recovery in Stored Sample (%)	Corrected Recovery[3] in Stored Sample (%)
tomato paste	CGA-94689	5.00	0.0	14	0.839, 0.728, 0.672 (av 0.746)	15, 17 (av 16)	15	94
			3.3	12	0.562, 0.735 (av 0.648)	16, 13 (av 14)	13	93
			6.2	16	0.832, 0.731 (av 0.782)	16, 16 (av 16)	16	100
			11.9	8	0.759, 0.901 (av 0.830)	18, 17 (av 18)	17	94
			23.9	7	1.087, 0.879 (av 0.983)	27, 29 (av 28)	20	71
			34.3	12	1.191, 0.829 (av 1.01)	25, 19 (av 22)	20	91

[1] Residue levels found were not corrected for controls or fresh fortification recoveries.

[2] The fortification level was 5.00 ppm. Results are not corrected for controls.

[3] apparent recoveries ÷ fresh fortification recoveries X 100

Conclusions

Residues of CGA-329351 are stable in soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste stored frozen (-20 °C) for at least 32 months. Residues of CGA-62826 and CGA-94689 are stable in soybeans, soybean meal, soybean hulls, corn grain, corn meal, corn oil, and tomato paste stored frozen (-20 °C) for at least 34 months. (HED notes that the recoveries for CGA-94689 for both fresh fortifications and stored samples in all matrices tested in this submission are low. The conclusions regarding the storage stability are based on the measure of stability as defined in OPPTS 860.1380 for the storage stability tables: "The values in the second column from the right represent the apparent recovery in the stored samples. These can be divided by the recoveries obtained in the freshly fortified samples to determine the corrected recovery, the measure of the stability of the residue in storage....".) Also, the ChemSAC determined in a meeting on 2/28/01 that the storage stability data for CGA-94689 are acceptable despite the low fresh fortification recoveries since 1) parent and the other metabolites are stable; 2) there was a high degree of consistency in recoveries; and 3) CGA-94689 is not of particularly high toxicological concern.

Metalaxyl/mefenoxam residues of concern [as represented by weathered residues of metalaxyl or by mefenoxam (CGA-329351), CGA-62826, and CGA-94689] are stable in all raw agricultural commodities at -20 °C for at least 24 months. This conclusion is based on storage stability studies in five diverse crops [i.e., potatoes (root crop), peppers (fruiting vegetable), spinach (leafy vegetable) for 24 months, and corn (nonoily grain) and soybeans (oilseed) for 32 months]. [A final report reflecting 38-39 months storage of weathered residues of metalaxyl on cranberries, potatoes, peppers, and spinach (MRID 43446901) is under concurrent review.]

Metalaxyl/mefenoxam residues of concern [as represented by mefenoxam (CGA-329351), CGA-62826, and CGA-94689] are stable in all processed commodities at -20 °C for 32 months. This conclusion is based on storage stability studies in the processed commodities of three diverse crops [i.e., soybeans (oilseed), corn (nonoily grain), and tomato (fruiting vegetable) for 32 months].

Attachment 1: Names and Structures of Mefenoxam and its Metabolites

cc: N. Dodd (810C), PM#21, PM#53, M. Rust (RAB3)
RDI: Chem Team:2/14/01: S. Dapson:3/9/01
7509C:RAB3:CM#2:Rm810C:305-5681:N. Dodd:nd:3/13/01

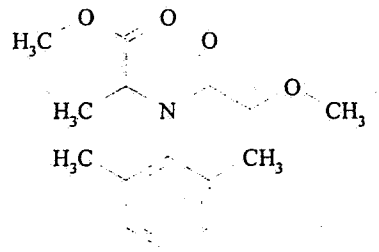
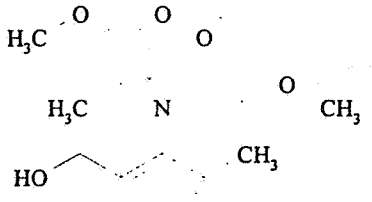
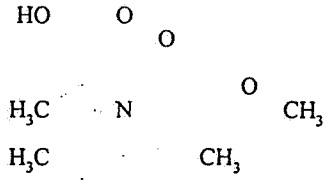
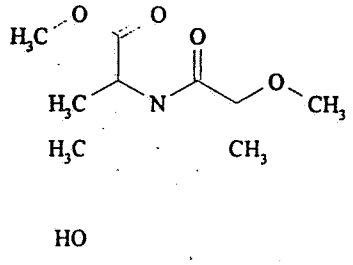
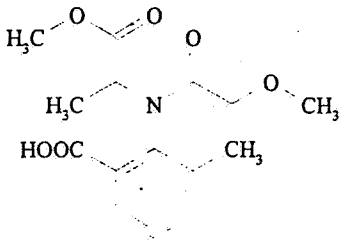
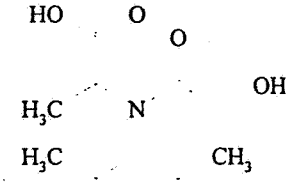
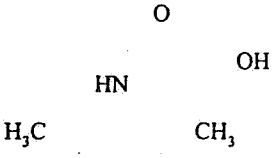
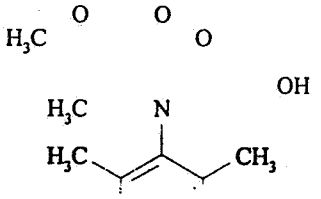
Table 22. Names and Structures of Mefenoxam and its Metabolites	
Structure	Chemical Name Common Name (Company Code)
	(R)-2-[(2,6-dimethylphenyl)-methoxyacetylamino]-propionic acid methyl ester mefenoxam (CGA-329351)
	*N*-(2-hydroxymethyl-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester (CGA-94689)
	*N*-(2,6-dimethylphenyl)-*N*-(methoxyacetyl)alanine (CGA-62826)
	*N*-(3-hydroxy-2,6-dimethylphenyl)-*N*-(methoxyacetyl)alanine methyl ester (CGA-100255)

Table 22. Names and Structures of Mefenoxam and its Metabolites	
Structure	Chemical Name Common Name (Company Code)
	*N*-(2-carboxy-6-methylphenyl)-*N*-(methoxyacetyl)alanine methyl ester 2-[(methoxyacetyl) (2-methoxy-1-methyl-2-oxoethyl)amino]-3-methylbenzoic acid (CGA-108905)
	*N*-(2,6-dimethylphenyl)-*N*-(hydroxyacetyl)alanine (CGA-107955)
	*N*-(2,6-dimethylphenyl)-2-hydroxyacetamide (CGA-37734)
	*N*-(2,6-dimethylphenyl)-*N*-(hydroxyacetyl)alanine methyl ester (CGA-67869)