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

February 21, 1995

MEMORANDUM

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

**SUBJECT:** Ridomil MZ58 (Metalaxyl, Mancozeb) EPA Reg. No. 100-629  
Ridomil Bravo 81W (Metalaxyl, Chlorothalonil) 100-658  
Maneb Plus Zinc F4 (Maneb) EPA Reg. No. 4581-359  
Bravo 720 (Chlorothalonil) EPA Reg. No. 50534-188  
Potential Section 18 use on Turnip, Mustard, and Collards  
CBRS Nos. 15064, 15066, 15067, 15068. DP Barcode No. D211510.  
No. MRID No.

**FROM:** Susan V. Hummel, Chemist, Acting Section Head *Susan V. Hummel*  
Special Review Section II  
Chemistry Branch II - Reregistration Support  
Health Effects Division [7509C]

**TO:** Amy Farrell/Richard Dumas, PM#61  
Special Review Branch  
Special Review and Reregistration Division [7508W]

Special Review Branch has requested that we review the available residue data for potential Section 18 uses on the "Georgia Leafy Greens": Turnip greens, Mustard greens, and Collards. A section 18 for chlorothalonil on these crops has been denied due to lack of progress toward registration and high dietary risk. A cancellation hearing on maneb uses on these crops is in progress. A Georgia Food Processor has requested that the Agency consider a number of alternatives to the requested Section 18 (see W. Wassell, 9/29/94, 94GA0008, CBTS 14355, D207428; see also M. Rodríguez and R. Lascola 3/10/93, 93GA0006, CBTS 11393, D188229, and D. Edwards, 3/30/93).

The products proposed for use are Ridomil MZ58 (a WP formulation containing 10% Metalaxyl and 48% Mancozeb; EPA Reg. No. 100-629); Ridomil Bravo 81W (a WP formulation containing 7% Metalaxyl and 70% Chlorothalonil; EPA Reg. No. 100-658); Maneb Plus Zinc F4 (a Flowable concentrate formulation containing 4 lb/gal Maneb; EPA Reg. No. 4581-359); and Bravo 720 (an EC formulation containing 6 lb/gal Chlorothalonil; EPA Reg. No. 50534-188).

Residue estimates are needed for metalaxyl on these crops. Anticipated residues for carcinogenic dietary exposure assessment are needed for mancozeb, maneb, chlorothalonil, and the HCB impurity in chlorothalonil formulations. Anticipated residues are needed for other chronic effects for chlorothalonil and its regulated metabolite, SDS-3701, along with residue estimates for acute exposure to chlorothalonil, its regulated metabolite, and HCB. Chlorothalonil products have an Agency mandated certified limit for HCB of 0.05% of the Chlorothalonil content in the product. One producer of chlorothalonil products, ISK Biotech has indicated that they are reducing the amount of HCB in their chlorothalonil products, but there are other producers.



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## Conclusions

1. The residue of concern in plants is adequately defined for each of the proposed Section 18 uses. The residue of concern in livestock animals is not an issue, since none of the proposed uses are for livestock feeds. (We will assume that the proposed uses on turnips are for varieties grown for human consumption only.)
  - 1a. The residue of concern for metalaxyl in plants is those residues convertible to 2,6-dimethylaniline (2,6-DMA) moiety, and one metabolite containing the 2-hydroxymethyl-6-methylaniline moiety (HMMA), N-(2-hydroxymethyl-6-methylphenyl)-N-(methoxyacetyl) aniline methyl ester. Metalaxyl residues are regulated in 40 CFR 180.408 (a), (b), and (c). Residues of metalaxyl in turnip greens are covered by a 15 ppm tolerance for leaves of root and tuber vegetables. Residues of metalaxyl in turnip roots are covered by a 0.5 ppm tolerance for residues of metalaxyl in root and tuber vegetables.
  - 1b. The residue of concern for chlorothalonil in plants is chlorothalonil, per se [tetrachloroisophthalonitrile]; its hydroxy metabolite, SDS-3701 [4-hydroxy-2,5,6-trichloroisophthalonitrile]; and hexachlorobenzene (HCB). Only chlorothalonil, per se, and SDS-3701 are currently regulated in 40 CFR 180.275.
  - 1c. The residue of concern for maneb in plants is maneb, per se, and ethylene thiourea (ETU). The maneb enforcement method measures residues convertible to carbon disulfide (CS<sub>2</sub>). Only maneb, per se, is currently regulated in 40 CFR 180.110.
  - 1d. The residue of concern for mancozeb in plants is mancozeb, per se, and ethylenethiourea (ETU). The mancozeb enforcement method measures residues convertible to carbon disulfide (CS<sub>2</sub>). Only mancozeb, per se, is currently regulated in 40 CFR 180.176.
2. Adequate analytical methods are available for enforcement.
  - 2a. Analytical methods for metalaxyl are Methods I and II in PAM II, with modifications. The method determines total residues of metalaxyl and its metabolites containing the 2,6-DMA moiety and N-(2-hydroxymethyl-6-methylphenyl)-N-(methoxyacetyl)-aniline methyl ester as 2,6-DMA by gas chromatography. Results are expressed as metalaxyl equivalents with a limit of detection of 0.05 ppm.
  - 2b. The analytical method for chlorothalonil, SDS-3701, and HCB is PAM II Method I with modifications. The residues are extracted together, cleaned up separately, and quantitated by GC/ECD. HCB is methylated prior to GC/ECD analysis.
  - 2c. Analytical methods for maneb and mancozeb are the Keppel method and the Morse Method. Both methods are based on the conversion of residues to CS<sub>2</sub> by acid reflux with HCl in the presence of stannous chloride. The Keppel uses a colorimetric determinative step. The Morse method uses Head Space GC with a packed column for separation and a Flame Photometric Detector (FPD) in the sulfur mode for the determinative step.
  - 2d. Analytical methods for ETU are available for enforcement. The official ETU method is the AOAC method, which is based on the original method published by Onley (JAOAC 60:1105-

1110), using GC/FPD. An alternative method is the Morse Method. In the Morse method, samples are extracted with water/ethanol, cleaned up on an alumina column, and quantitated by HPLC using UV or electrochemical detection.

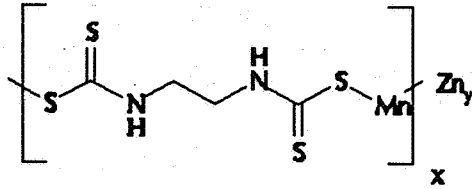
3. Storage stability data have been submitted to support the data used to estimate residues of metalaxyl. Storage stability data on celery stored frozen for about 4 years have been submitted to support data on chlorothalonil, SDS-3701, and HCB. Storage stability data have been submitted to support the residue estimates of maneb and ETU from the use of Maneb + Zinc F4. No storage stability data are available to support the residue estimates of mancozeb or ETU on leafy crops or mancozeb on root crops. Storage stability data are available to support the residue estimate of ETU on root crops.
4. Residue estimates have been made for enforcement levels and for anticipated residues for chronic and carcinogenic dietary exposure assessment where needed. The enforcement level should be used for acute dietary exposure assessment. These acute dietary exposure estimates may be adjusted by using washing and cooking factors. Residue estimates are tabulated below. The basis for the residue estimates is found in the tables following the conclusions. Available washing and cooking data are also summarized below.
5. Where the proposed use pattern does not correspond to available data residues have been adjusted for rate and PHI when sufficient data were available. For chlorothalonil, the residue data were too meager to make such an adjustment. No adjustment could be made for reducing the number of applications. However, it should be noted that the residue level at harvest is most closely related to the application rate used closest to harvest and the PHI. Generally, changing the number of applications has less of an effect on the residue level at harvest than changing the rate or PHI.

#### Recommendation

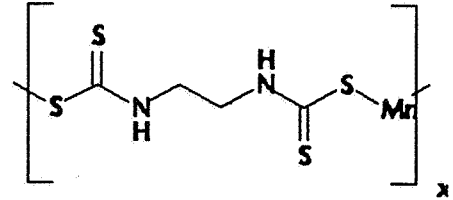
If a Section 18 Exemption were granted for one of the proposed uses, we would recommend that the enforcement level tabulated below by use be used.

<b>Residue Estimates for Enforcement Levels and Anticipated Residues</b>			
<b>Use Pattern</b>	<b>Residue</b>	<b>Enforcement Level</b>	<b>Anticipated Residue</b>
<b>Ridomil MZ58 on Turnips, Mustard Greens, Collards</b>	<b>Metalaxyl</b>	Turnip tops: 15 ppm roots: 0.05 ppm Mustard, collards: 5 ppm	--
	<b>Mancozeb</b>	tops: 50 ppm roots: 0.50 ppm	tops: 19 ppm cooked tops: 0.19 ppm roots: 0.17 ppm roots, cooked: 0.006 ppm
	<b>ETU</b>	tops: 0.3 ppm roots: <0.02 ppm	tops: 0.08 ppm cooked tops: 0.56 ppm roots: <0.01 ppm roots, cooked: 0.01 ppm
<b>Ridomil Bravo 81W on Turnips, Mustard, Collards</b>  <b>And Bravo 720 (without metalaxyl)</b>	<b>Metalaxyl</b>	Turnip tops: 15 ppm roots: 0.05 ppm Mustard, collards: 5 ppm	--
	<b>Chloro-thalonil</b>	tops: 25 ppm roots: 1 ppm	tops: 7.2 ppm cooked tops: 0.79 ppm roots: 1 ppm roots, cooked: <0.01 ppm
	<b>HCB</b>	tops: 0.012 ppm roots: 0.0005 ppm	tops: 0.0036 ppm cooked tops: 0.002 ppm roots: 0.0005 ppm roots, cooked: 0.000005 ppm
<b>Maneb + Zinc F4 on Turnips, Mustard, Collards</b>	<b>Maneb</b>	tops: 5 ppm roots: 2 ppm	tops: 1.7 ppm cooked tops: 0.17 ppm roots: 0.35 ppm roots, cooked: 0.014 ppm
	<b>ETU</b>	tops: 0.25 ppm roots: <0.01 ppm	tops: 0.10 ppm cooked tops: 0.14 ppm roots: <0.01 ppm roots, cooked: 0.002 ppm

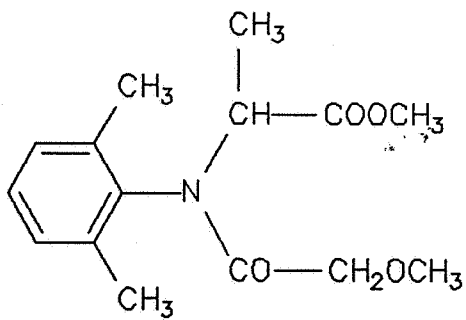
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 Chemical Number: 014504  
 Chemical Name: Mancozeb



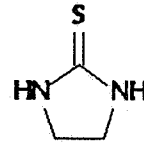
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 Chemical Number: 014505  
 Chemical Name: Maneb



Case No. 0081  
 Chemical No. 113501  
 Chemical Name: metalaxyl

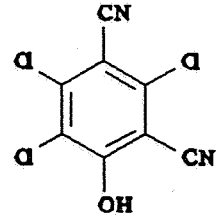
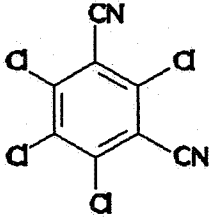


ETU

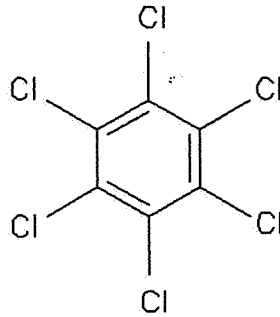


Case Number: 0097  
Chemical Number: 081901  
Chemical Name: Chlorothalonil

Hydroxy metabolite  
SDS-3701



HCB



**Collards/Mustard Greens**  
**A Comparison of Proposed Label and the Residue Data**  
**Parameters Used to Determine Residues of Metalaxyl**

	<u>Proposed Use</u>	<u>Residue Data</u>
Chemical	Metalaxyl	Metalaxyl
Formulation	Ridomil MZ58 Ridomil Bravo 81W	Ridomil 2E/ Bravo 81W
Crop	Collards, Mustard Greens	Mustard Greens
Method of Application	Foliar Spray	P2eplant Broadcast (Incorporated) and Foliar Spray
Number of Applications	2-mustard greens 3-collards	1 preplant and 4 foliar
Timing	assume 14-day intervals	Single preplant incorporated broadcast application followed by 4 foliar applications, the first application ranged from 8 - 30 days after the preplant application. Repeat foliar sprays were made on a 14-day reapplication schedule.
Rate/application	0.15 - 0.20 lbs ai/A	2.0 & 4.0 lbs ai/A preplant 0.18 & 0.36 lbs ai/A foliar
Rate/year or season	0.4 lbs ai/A-mustard greens 0.6 lb ai/A-collards	2.72 - 5.44 lbs ai/A
Maximum Residue	N/A	4.4 ppm
Restrictions	14-day PHI	7-day PHI

Residue data taken from: PP#2F4072 - MRID No. 42159801

Estimated Maximum Residues of Metalaxyl resulting from Proposed Use:

Turnip Tops 15 ppm (current tolerance)

Turnip Roots 0.5 ppm (current tolerance)



**Turnip Tops and Roots**  
**A Comparison of Proposed Label and the Residue Data**  
**Parameters Used to Determine Residue Levels of Metalaxyl**

	<u>Proposed Use</u>	<u>Residue Data</u>
Chemical	Metalaxyl	Metalaxyl
Formulation	Ridomil MZ58 Ridomil Bravo 81W	Ridomil 2E/ Ridomil MZ58
Crop	Turnips	Carrots, Potatoes, Radishes and Sugar Beets
Method of Application	Foliar Spray	At Planting and Foliar Spray
Number of Applications	1	1 preplant and 4 foliar (carrots, potatoes, sugar beets) or 2 foliar (radishes) applications
Timing	N/A	Single at-planting application followed by 4 foliar applications made on a 14- day reapplication schedule.
Rate/application	0.15 - 0.20 lbs ai/A	2.0 lbs ai/A preplant 0.2 lbs ai/A foliar
Rate/year or season	0.15 - 0.20 lbs ai/A	2.8 lbs ai/A (carrots, potatoes, sugar beets) 2.4 lbs ai/A (radishes)
Maximum Residue	N/A	roots: 0.19 (potatoes), 0.22 (carrots), 0.20 (sugar beets), 0.35 (radishes) tops: 7.1 (carrots), 9.9 (radishes), 4.4 (sugar beets)
Restrictions	14-day PHI	7-day PHI

Residue data taken from: PP#9F3698 review (8/3/89, J. Garbus)

Estimated Maximum Residue of Metalaxyl resulting from Proposed Use  
Collards, Mustard Greens 5 ppm

**Collards/Mustard Greens/Turnip Tops and Roots**  
**A Comparison of Proposed Label and the Residue Data Parameters**  
**Used to Determine Residues of Chlorothalonil**

	<u>Proposed Use</u>	<u>Residue Data</u>
chemical	chlorothalonil	chlorothalonil
formulation	Bravo 720 (6 lb/gal EC) Ridomil Bravo 81W (80% WP)	Bravo 6F, Bravo 720
crop	collard greens, mustard greens and turnips	collard greens, mustard greens, turnip greens, kale, escarole, carrots
method of application	not specified	ground
# of applications	1 (turnip) 2 (mustard greens) 3 (collards)	3 to 5 (greens) 5 to 6 (carrots)
timing	interval not specified 14 day PHI	7 to 10 day intervals 7 and 14 day PHI (greens) 13 day PHI (carrots)
rate/application	1.08 to 1.125 lbs ai/A	1.125 to 2.5 lbs ai/A
rate/year or season	1.125 lbs ai/A/season (turnips) 2.25 lb ai/A/season (mustard greens) 3.375 lb ai/A/season (collards)	3.4 to 10.2 lbs ai/A/season
maximum residue	N/A	25 ppm (greens); 1 ppm (carrots)
average residue	N/A	7.2 ppm (greens);

Residue data on chlorothalonil taken from: PP#6E1841, MRID Nos. 00161190 and 00161165 (for the greens). CB (formerly RCB) concluded that a tolerance level of 25 ppm was appropriate for the greens (see our memo of 10/13/76, W.S. Cox). Additional residue data for chlorothalonil in/on mustard and collard greens were included in the 94GA0008 Submission (W. Wassel, 9/29/94, CBTS 14355, D207428). The additional data consisted of two additional trials in the same location (counts as one trial under our updated guidance for conducting field trials, 6/2/94, which was communicated to the State of Georgia in EPA letter of 10/18/93) for collards and mustard greens; and a residue decline study following the collards and mustard greens through the processing procedure. Residue data for chlorothalonil on carrots (MRID Nos. 00074828 (PP#7F0599), 00156523 (PP#1F1024), 40000101, 40183402) were translated to turnip roots.

A reduction of residue study for chlorothalonil, SDS-3701, and HCB is currently under review (W. Smith, CB Nos. 8841, 14503). Carrots were treated with chlorothalonil at 15 lb ai/A (10x rate) for ten treatments at 7 to 10 day intervals. In one trial, carrots harvested had residues of 2.23 ppm chlorothalonil, <0.01 ppm SDS-3701, and <0.003 ppm HCB. After peeling, all residues were non-detectable (<0.01 ppm chlorothalonil). Residues were also non-detectable after pureeing and partial cooking, and in carrot baby food. Based on this study, we can estimate that residues of chlorothalonil

will be <0.01 ppm in peeled turnips, and in cooked turnips. Residues of HCB are estimated to be <0.01 ppm x 0.05% = <0.000005 ppm (0.005 ppb).

Residue data requirements for future Section 18 requests for chlorothalonil on mustard greens, turnips, and collards were specified in EPA letter of 10/18/93 to the State of Georgia. These requirements will be briefly outlined below and would be the same as the requirements for a 24(c) registration for GA only, except that a residue decline study would also be required (residues measured at different PHIs).

1. Three field trials on mustard greens from diverse locations in GA, with 2 samples per trial.
2. Two field trials on turnips from diverse locations in GA, both conducted at 1x and 2x rates, with two samples collected per trial. Collect roots and tops, unless documentation can be provided that it is practical to limit use to varieties grown solely for tops.
3. Follow GLPs. Trials must reflect the proposed use. A set of data is needed for each formulation class to be registered.
4. Submit a copy of the analytical method along with recovery data and analyses of controls. Obtain independent lab validation if method differs significantly from PAM I or PAM II method.
5. Provide reduction of residue data showing residues (a) before and after washing and cooking; (b) during commercial transport to fresh market; and (c) during commercial processing.

As indicated in our review of 94GA0008, these requirements have not been met. Field trials were provided for a single location in GA for collards and mustard greens, and a single formulation class. Part of what appears to be a formal submission from ISK Biotech was submitted, with the analytical method and all raw data missing. Summaries of recovery and control data were included. Part of a report on a reduction in residue study for commercial processing of greens was submitted. The submission was not assigned an MRID No.

The Reduction in Residue in Commercial Processing Study can be used to estimate residues of chlorothalonil, SDS-3701, and HCB in washed and cooked leafy greens. Mustard greens and collards from a single location were treated with Chlorothalonil (BRAVO 720, ac EC formulation containing 6 lb/gal) at a rate of 1.125 lb ai/A. Five or three applications were made at seven day intervals to mustard and collards, respectively. Samples were harvested 14 and 13 days after the last application. Samples were placed in frozen storage within 3-5 hours after collection. Samples were collected at each step in the processing: (1) after tumbling at the first inspection station, (2) after washing before blanching, (3) after blanching, (4) after freezing and packing in 3 lb boxes. The processed samples were stored frozen for one to two weeks before shipping to the analytical laboratory (Ricera, Inc.) for analysis. The results of the study are tabulated below.

Residue Decline Study for Chlorothalonil in Collards					
Commodity	Residues (ppm)			Reduction of Residues	
	Chlorothalonil	SDS-3701	HCB	Chlorothalonil	HCB
Fresh greens	1.51	<0.01	0.00068		
after 1st inspection	1.36	0.01	0.00064	0.90	0.94
after washing	0.94	<0.01	0.00052	0.62	0.76
After blanching	0.22	<0.01	0.00031	0.15	0.46
after freezing/packing	0.19	<0.01	0.00035	0.13	0.51
Residue Decline Study for Chlorothalonil in Mustard Greens					
Commodity	Residues (ppm)			Reduction of Residues	
	Chlorothalonil	SDS-3701	HCB	Chlorothalonil	HCB
Fresh greens	2.50	0.01	0.00094		
after 1st inspection	0.81	<0.01	0.00035	0.32	0.37
after washing	1.36	<0.01	0.00062	0.54	0.66
After blanching	0.34	<0.01	0.00064	0.14	0.68
after freezing/packing	0.26	<0.01	0.00056	0.10	0.60
Average Reduction Factors					
Process	Chlorothalonil	HCB			
Washing	0.58	0.71			
Cooking (freezing)	0.11	0.56			

Results for commercial processing can be used to estimate residues after cooking. Additional cooking of the frozen product will occur. A washing factor of 0.5x has already been determined for chlorothalonil in leafy greens and used to determine anticipated residues in the past. The washing factor for chlorothalonil from this study is in agreement with the factor used in the past.

It should be noted that residues of HCB did not decline as much on washing and cooking as residues of chlorothalonil. Residues of SDS-3701 were generally non-detectable, and therefore, reduction factors cannot be determined, but residues will be estimated to be non-detectable.

We recommend that a residue of 3.6 ppm chlorothalonil be used in dietary exposure analysis for washed collards, mustard, and turnip greens, as estimated in the review of 94GA0008 (W. Wassel, 9/29/94). We recommend that a residue of 0.79 ppm chlorothalonil (7.2 ppm \* 0.11) be used in

dietary exposure analysis for cooked collards, mustard, and turnip greens. These estimates can be used for both chlorothalonil, per se, and for the sum of residues of chlorothalonil and SDS-3701.

We recommend that a residue of 2.5 ppb HCB be used in dietary exposure analysis for washed greens ( $7.2 \text{ ppm} * 0.0005 * 0.71x$ ). We recommend that a residue of 2.1 ppb HCB be used in dietary exposure analysis for cooked greens ( $7.2 \text{ ppm} * 0.0005 * 0.58x$ ).

For acute dietary exposure analysis, we recommend that 12.5 ppm, 2.8 ppm, and 0.01 ppm chlorothalonil be used for washed greens, cooked greens, and peeled turnip roots, respectively (based on the recommended enforcement levels of 25 ppm and 1 ppm). For acute dietary exposure analysis for HCB, we recommend that 0.09 ppm HCB, 0.072 ppm HCB, and 0.0005 ppm be used for washed greens, cooked greens, and peeled turnip roots, respectively.

**Collards/Mustard Greens/Turnip Tops**  
**A Comparison of Proposed Label and the Residue Data**  
**Parameters Used to Determine Residues of Maneb**

	<u>Proposed Use</u>	<u>Residue Data</u>
Chemical	Maneb	Maneb
Formulation	Maneb + Zinc F4	Maneb + Zinc F4
Crop	Collards, Mustard Greens, Turnips	Collards (GA, TN)
Method of Application	Foliar Spray	Foliar Spray
Number of Applications	1-turnips 2-mustard greens 3-collards	5 foliar
Timing	assume 14-day intervals 14 day PHI	7 day intervals 1-17 day PHI (decline study)
Rate/application	1.2 lbs ai/A	1.6 lbs ai/A
Rate/year or season	1.2 lb ai/A-turnips 2.4 lbs ai/A-mustard greens 3.6 lb ai/A-collards	8 lbs ai/A
Maximum Residue	N/A	10 day PHI: 7.2 ppm maneb, 0.3 ppm ETU 17 day PHI: 2.1 ppm maneb, 0.15 ppm ETU
Average Residue	N/A	10 day PHI: 3.4 ppm maneb, 0.19 ppm ETU 17 day PHI: 0.86 ppm maneb 0.062 ppm ETU

Residue data were taken from: MRID No. 43046401, 43046401, S. Hummel review of 1/25/94. The residue data were from a 1992 study, and were supported by storage stability data. Analyses were done by McKenzie Laboratories. The Projected Average Residue, adjusting the application rate from 1.6 lb ai/A to 1.2 lb ai/A (multiply by  $1.2/1.6 = 0.75x$ ), and interpolating to 14 day PHI is:  $2.3 * .75x = 1.7$  ppm maneb; and  $0.14 * .75 = 0.10$  ppm ETU. Washing and cooking factors are available from the EBDC PD4, and were derived in S. Hummel review of 8/7/91.

Commodity	EBDC Washing Factor	EBDC Cooking Factor	Percent Conversion to ETU
Root Crops	<0.04x	<0.04x	0.5%
Leafy Greens	0.30x	0.01x	2.5%

**Turnip Roots**  
**A Comparison of Proposed Label and the Residue Data**  
**Parameters Used to Determine Residue Levels of Maneb**

	<u>Proposed Use</u>	<u>Residue Data</u>
Chemical	Maneb	Maneb
Formulation	Maneb + Zinc F4	Maneb + Zinc F4
Crop	Turnips	Sugar Beets (CA, ID, MN, ND)
Method of Application	Foliar Spray	Foliar Spray
Number of Applications	1	7 foliar applications
Timing	14 day PHI	Interval unknown 14 day PHI
Rate/application	1.2 lbs ai/A	2.0 lbs ai/A preplant 0.2 lbs ai/A foliar
Rate/year or season	1.2 lbs ai/A	11.2 lbs ai/A
Maximum Residue	N/A	roots: 1.8 ppm maneb <0.01 ppm ETU
Average Residue	N/A	0.35 ppm maneb <0.01 ppm ETU

Residue data taken from: S. Hummel review of 6/30/88. Data from CA, ID, MN, ND 1987-1988 Field trials. Analyses by Morse Laboratories. 6 mo. frozen storage prior to analysis. Storage stability data on potatoes at Morse Laboratories showed 50% of ETU remaining after 6 mo of frozen storage prior to analysis.

Projected Average Residue at 1.2 lb ai/A: 0.26 ppm maneb, <0.01 ppm ETU.

**Collards/Mustard Greens/Turnip Tops and Roots**  
**A Comparison of Proposed Label and the Residue Data Parameters**  
**Used to Determine Residues of Mancozeb**

	<u>Proposed Use</u>	<u>Residue Data</u>
chemical	Mancozeb	mancozeb
formulation	Ridomil MZ58	Ridomil 2E/Ridomil MZ-58
crop	collard greens, mustard greens and turnips	Sugar Beets (CA, WA, MN, NE, TX, OH)
method of application	Foliar Spray	Preplant broadcast (incorporated) (metalaxyl) Foliar Spray (metalaxyl/mancozeb)
# of applications	1 (turnip) 2 (mustard greens) 3 (collards)	1 preplant (metalaxyl) 4 foliar (metalaxyl/mancozeb)
timing	interval not specified 14 day PHI	Unknown 7 day PHI
rate/application	0.96 lbs ai/A	0.96 lbs mancozeb ai/A
rate/year or season	0.96 lbs ai/A/season (turnips) 1.92 lb ai/A/season (mustard greens) 2.88 lb ai/A/season (collards)	3.84 lbs mancozeb ai/A/season
maximum residue	N/A	Greens: 32 ppm mancozeb 0.26 ppm ETU Roots: 0.094 ppm mancozeb <0.02 ppm ETU
average residue	N/A	Greens: 19 ppm mancozeb 0.08 ppm ETU Roots: 0.21 ppm mancozeb <0.01 ppm ETU

Residue data taken from: PP#9F3698, MRID 40838301, 1985-6 residue data. Analyses by EnviroBioTech. No decline study available. No concurrent storage stability data. No storage stability data from EnviroBioTech for leafy crops or root crops. Samples stored frozen at -15 C for 13 months before analysis (10/85-11/86). Older data available for mancozeb on sugar beets show higher residues at higher rate and longer PHI.

cc:Circu, RF, Hummel, SF (4), Section 18 File (4)  
 RDI:MSM:02/21/95:FBS:02/21/95  
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