



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

May 23, 2005

OFFICE OF  
PREVENTION, PESTICIDES AND TOXIC  
SUBSTANCES

**MEMORANDUM**

**SUBJECT:** BEAD Deliverables for the EBDC RED  
DP Barcode: D305829

**FROM:** Richard E. Michell, Ph.D., Plant Pathologist

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**THRU:** Arnet Jones, Chief  
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**TO:** Tawanda Spears, Maneb & Metiram CRM

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**Product Review Panel Completed:** April 20, 2005

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**Introduction**

The Agency prepared the deliverables in this document during Phases 2 and 3 of the reregistration process for the ethelenebisdithiocarbamate (EBDC) fungicides (mancozeb, maneb, metiram) to obtain additional information about specific use patterns of concern and to potentially refine risks identified in the risk assessments.

**Summary of Requests, Conclusions and Deliverables**

I] Sod Farm Use: SRRD requested that BEAD explore several different issues associated with EBDC use on sod farm turf. The information was to be used to estimate typical human exposure levels in newly established residential sod lawns. The information requested included: 1)

common post-application practices associated with the harvest, 2) shipment, installation, and establishment of sod in a residential setting, 3) maximum feasible preharvest interval (PHI), typical rates and application practices on sod farms.

A summary of BEAD's Conclusions follows:

1. Common post-application practices in residential destined sod: Given the reentry interval (REI) of one day plus a one to three day planting window, the minimum time that would elapse between treatment and installation of sod in a residential setting would be within the range of two to four days. However, the frequent and long duration of watering of newly installed sod and the need to restrict foot traffic for several weeks after planting should also serve to deter people from using newly installed sod. Additionally, when harvested sod is stacked or rolled for shipment, the moist roots and soil are in contact with the sod foliage and may impact the level of EBDC residue exposure after the sod is installed. Note: Comments submitted by the EBDC Task Force also support these findings.
2. Maximum PHI: Through information obtained from Florida (FL), the maximum PHI acceptable to sod growers would be two days.
3. Typical rates, number of applications and use practices on sod farms: While BEAD was unable to obtain nationwide data on typical application rates for EBDC fungicides used on sod farms, feedback from FL indicate that a maximum use rate of about 15 lbs. ai/A is commonly used when severe pest pressure conditions exist, and lower rates are used when lower disease pressure exists. Since the nationwide typical application rate used on golf courses ranged from 9 to 14 lbs. ai/A and averaged about 10.5 lbs. ai/A (see Appendix B), BEAD suggests that these rates may be somewhat representative of the rates used on sod farms. FL sod farm information also indicated that a maximum of 4 to 5 applications may be applied during the 10- to 14- month crop cycle, however a nationwide survey indicates that on average about 2 fungicide applications are applied per year.

See [Appendix A](#) for BEAD's full assessment and supporting information. *Note* that Appendix A differs from the original version submitted in that it now addresses the dosage rate issue.

II] Recreational Turf Use of EBDC Fungicides: Due to human post application exposure risk concerns, BEAD was asked to characterize the use of EBDC fungicides on golf courses, and other recreational turf, including the average application rates, number of applications per year, and percentage of courses treated in support of the assessment of occupational exposure to mancozeb. Since the data indicate that little if any maneb is used our response only includes information on the predominant EBDC fungicide mancozeb. The available data indicate that about 19 percent of the US golf courses used mancozeb on at least some portion of their turf acreage. The typical application rate used on golf courses ranged from 9 to 14 lbs. ai/A and averaged about 10.5 lbs. ai/A. The average number of fungicide applications is estimated to range from about 5 to 8 times per year. Although no specific information was available, the use of pesticides in general on sports turf is reportedly limited to professional and some college fields and is estimated to involve about 1 percent of the sports turf acreage. A summary of the relevant information available is provided in [Appendix B](#).

III] Home Garden Use: Due to human risk concerns associated with hand harvesting of sweet corn, BEAD was asked to determine the essentiality of foliar treatments to sweet corn in home gardens. BEAD verbally indicated that this was a relatively unimportant use for homeowners due to the general inability of homeowners to predict or recognize the labeled diseases (Puccinia rust, Helminthosporium leaf spot) plus the fact that these diseases seldom cause serious damage in home gardens. Note: USDA also provided a docket comment which stated that home sweet corn production is not a disease management intensive scenario.

IV] Metiram Apple Use: Due to mixer/loader worker exposure risk concerns, determine the incidence of metiram aerial applications; and the timing of ground and aerial applications relative to summer pruning. Aerial application use was investigated in the seven major states using metiram on apples. NY was the only State reportedly using aerial applications. Such use was estimated to occur on ~3 to 5 percent of the metiram treated acreage in New York. Aerial applications typically are used in early spring when the ground is too wet for ground applications and when trees need to be treated quickly before disease infections occur. Eighty-three percent of NY orchards are <50 acres and 97 percent are less than 250 acres.

Growers have two use pattern choices on apples: 1) apply up to 4.8 lbs. ai/acre/application between green tip and petal fall, or use up to 2.4 lbs. ai/acre/application between green tip and 77 days before harvest. The available data indicates that only about one-third of users choose the 77-day preharvest interval (PHI) option. BEAD found that in the major metiram usage states, when the last application occurs at petal fall there is a 5 to 7 week gap between the last application and the beginning of summer pruning. For those growers that choose to use the alternate 77-day PHI application schedule, the gap between the last application and summer pruning narrows to about 1 to 3 weeks.

See [Appendix C](#) for BEAD's official response documents on these two issues.

*Note:* Appendix C differs from the original version submitted by the inclusion of a statement which addresses the 77-day PHI use pattern. Winter pruning was not addressed since it occurs in the dormant season prior to the initial green tip metiram applications.

V] Leatherleaf Fern Use: Due to worker exposure concerns, determine the number of metiram applications per year. Based on the Florida response, metiram use is minimal on Leatherleaf Fern. Therefore, it is BEAD's conclusion that a seasonal maximum of 20 applications per calendar year would be more than sufficient for Leatherleaf Fern growers. See [Appendix D](#) for BEAD's response document.

VI] Wettable Powder (WP) Formulations: Due to worker exposure concerns, determine the need for wettable powder formulations. An analysis conducted by BEAD found that there is no niche market or location within the country where the WP formulations are used. However, the data did show that of all EBDC formulations, the WP formulations constitute ~10% of the market. Overall, BEAD was unable to determine if there is a specific need for the WP formulation. Comments received by the EBDC Task force stated that the dry flowable or flowable formulation allows for greater ease of handling than wettable powders. See [Appendix E](#).

VII] Cut Flower Use: Due to worker exposure concerns, determine the maximum number of EBDC applications likely to be applied per year. After several weeks of searching for information, BEAD determined that none of the existing studies addressed this issue and we would have to contact too many people to encompass the numerous crops and states involved. Based on our preliminary searching it appeared that most users did not apply any one fungicide all year long. In addition, a public comment submitted by Mary Hausbeck of the University of Michigan, stated that field grown cut flowers in this state received five to seven applications of mancozeb annually. After discussing other options with HED, we advised them that an annual use limitation of 20 applications should be proposed as a risk mitigation measure.

VIII] Mancozeb Pear 24(c) use: Although BEAD was not officially requested to conduct an assessment of this use, it was mentioned that this use was a potential concern to HED because it involved a very high application rate. Accordingly, we conducted a cursory inquiry into a docket comment from the Northwest Horticultural Council claiming that a state local need use on pears for control of pear psyllid is important. Our findings were that two State Local Need registrations exist for use in Washington State. 2002 NASS data indicate that the 6.4 lbs. ai/acre rate is applied an average of 1.1 times/year to 16 percent of the acreage grown in Washington. The Council recommended a crop specialist that could be contacted for obtaining economic impact information. See [Appendix F](#) for BEAD's report on this inquiry.

IX] Provide Average Application Rates and Refine EBDC Usage Data: Average EBDC application rates were provided to assist in the dietary and occupational risk assessments. Additionally, more refined pesticide usage data covering the pounds applied and percent crop treated for metiram, mancozeb, and maneb were provided to assist in refinement of the dietary risk assessment. These data were delivered to the SRRD as official BEAD documents on March 22 2005. See [Appendix G](#) for application rates.

X] Public Comments: We have reviewed the public comments and referred to relevant information when completing the above tasks. The information from the public comments received by BEAD from SRRD will be summarized in a future document.

Attachments: Appendices A through G contain BEAD's official response documents.

## APPENDIX A

### Information Relating to Sod Farms and EBDC Use and Usage

Over the past several months the Agency has explored several different issues associated with EBDC use on sod farm turf.

The ultimate concern behind the requests is to determine the typical human exposure scenarios in newly established residential lawns from sod. The various types of information we were asked to provide were common post-application practices in residential destined sod, maximum preharvest interval (PHI), and typical rates and application practices on sod farms.

BEAD collected the requested information from several different sources, as follows: 1998 Sod Farm Use and Usage survey [proprietary data]; Florida Fruit and Vegetable Association [Mr. M. Aerts] feedback collected from anonymous Florida sod farmers; International Sod Producers Association [Mr. D. Fender, Executive Director]; and BEAD expertise accrued from personal experience and previous contacts with sod specialists.

### Summary

The following is a summary of the information arranged by subject that was received from all sources, followed by the individual references in their entirety.

- 1) Identify common post-application practices associated with sod destined for use in residential settings that should impact exposure.
  - a) Pesticide use on sod farms is considered an agricultural use and as such is subject to Worker Protection Standards; therefore a 24 hour REI is in effect for mancozeb use on sod farms.
  - b) Eighty percent of the sod produced is intended for residential use and involves direct purchases by landscape firms that install the sod.
  - c) Sod must generally be planted between 24 and 72 hours after it is cut.
  - d) On 6/9/04 SRRD asked whether there were any sod industry practices that could lower EBDC residue levels on newly planted sod.
    - i) What we know from previous experiences and personal contacts with growers and turf extension specialists is that turf is commonly watered prior to shipment to keep the roots from drying out prior to installation at the final planting site.
    - ii) Secondly, when sod is rolled up, or layered (stacked), for shipment the roots and soil directly contact the foliage. This will typically result in a layer of moist soil being deposited on the turf foliage, which may impact the level of EBDC residue exposure after the sod is installed.
    - iii) Additionally, all newly planted turf is supposed to be watered extensively for at least several weeks. Also a minimal amount of foot traffic needs to be observed during this time in order for the sod to become firmly established. All these common practices are perceived as measures which should significantly lower exposure and levels of the available EBDC and metabolite (ethylenethiourea) residues.

- 2) The maximum preharvest interval (PHI) that sod farmers could utilize.
  - a) The maximum acceptable PHI is considered to be 2 days. This is considered to be necessary by FL growers because they have weather conditions conducive to disease problems virtually all year long and often need to treat two days before harvest due to the extremely disease-favorable microclimate created when the harvested sod is stacked (i.e., soil and roots are in direct contact with the sod foliage until the sod is laid).
  - b) Pesticide use on sod farms is considered an agricultural use and as such is subject to Worker Protection Standards; therefore a 24 hour REI is in effect for mancozeb use on sod farms.
  
- 3) Typical rates of EBDC fungicides and application practices on sod farms.
  - a) The maximum use rate is about 15 lbs. ai/acre and would apply to situations when either severe pest pressure conditions exist, or curative applications are utilized. However, typical application rates are lower.
  - b) A maximum number of 4 to 5 EBDC applications are utilized during the 10 to 14 month crop cycle.
  - c) The major EBDC target pests are gray leaf spot (*Pyricularia grisea*), Pythium blight (*Pythium spp.*), and brown patch (*Rhizoctonia solani*).
  - d) Specific Fungicide Information:
    - i) Chlorothalonil was the predominant fungicide used. A total of 14,000 acre-treatments of chlorothalonil were applied which constituted about 37 percent of the total fungicide usage.
    - ii) Mancozeb and PCNB fungicides were the next most popular fungicides. A total of about 5,000 acre-treatments of each of these two fungicides were applied which constitutes about 13 percent of the total fungicide usage. This means that mancozeb is probably used on about 2,600 acres, which equates to about 0.9 percent of the total turf farm acreage.
    - iii) No information was collected on the actual application rates utilized on sod farms.
    - iv) Based on the label rates associated with the target pests on mancozeb labels, the maximum rate (17.4 lbs ai/A) is the only rate recommended for a third of the pests and 13 to 17.4 lbs ai/A are recommended for another third of the pests. Accordingly, without specific use rate data we can presume that a significant number of users are likely to use these labeled rates.
    - v) Note: Acre-treatments is a figure obtained by multiplying the average number of applications by the base acreage treated. Therefore to estimate the base acreage treated you divide acre treatments by the average number of applications. In this survey, the national average number of applications applied was 1.9.

[Bill Phillips, II, 21 April 2005]

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Below are the accounts of Dr. Richard Michell's conversation with Doug Fender and Michael Aerts, as well as a summation of the 1998 turf farm survey [proprietary data].

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A] Personal Communication between Richard Michell and Doug Fender, Executive Director of Turfgrass Producers International - 5/19/04

- 1) Doug Fender discussed sod farm issues that relate to production practices, fungicide use, and pesticide use. The principal points he made are as follows:
- 2) A 1998 study reported that only about 38,000 acre-treatments of fungicides were applied (Note: acre-treatment totals include multiple treatments to the same areas).
- 3) Pesticide use on sod farms is considered an agricultural use and as such is subject to Worker Protection Standards; therefore a 24 hour REI is in effect for mancozeb use on sod farms.
- 4) Most sod fields are harvested once every 12-18 months and contain blends of different grasses.
- 5) Eighty percent of the sod produced is intended for residential use and involves direct purchases by landscape firms that install the sod.
- 6) Fungicide use is minimal on sod farms and sod typically will not be sold if there is a reasonable risk of a disease problem developing when or soon after the sod is received and observed by the ultimate residential customers; the reason for this is that sod pickup and replacement costs are high and there is a need to maintain repeat business customers (e.g., landscape firms).
- 7) Sod must generally be planted between 24 and 72 hours after it is cut.
- 8) Only a small percentage (<10%) of the farms are totally mechanized; however; this should increase significantly due to the invention of a new highly efficient harvester in 2003 which is in such demand that the manufacturer cannot keep up with the demand.
- 9) Average farm size is about 450 acres (ranges from 50-75 to several thousand acres).
- 10) Growers typically farm about half of the acreage they own each year.
- 11) Most growers select turf varieties that do not require high pesticide use to keep their costs down. Very little fungicide usage occurs with chlorothalonil being by far the predominant fungicide used when one is needed; mancozeb was one of the second most used fungicides.

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B] 6/22/04 Communication with Michael Aerts, Assistant Director of the Environmental & Pest Management Division, FFVA, regarding FL sod grower issues associated with EBDC fungicides.

His major points were:

- 1) The maximum acceptable PHI is considered to be 2 days. This is considered to be necessary by FL growers because they have weather conditions conducive to disease problems virtually all year long and often need to treat two days before harvest due to the extremely disease-favorable microclimate created when the harvested sod is stacked (i.e., soil and roots are in direct contact with the sod foliage until the sod is re-laid).
- 2) The maximum use rate is about 15 lbs. ai/acre and would apply to situations when either severe pest pressure conditions exist, or curative applications are utilized. However, typical application rates are lower.

- 3) A maximum number of 4 to 5 EBDC applications are utilized during the 10 to 14 month crop cycle.
- 4) The major EBDC target pests are gray leaf spot (*Pyricularia grisea*), Pythium blight (*Pythium spp.*), and brown patch (*Rhizoctonia solani*).
- 5) The cost of using one of the newer systemic alternatives, azoxystrobin (Heritage), is about \$350/acre.
- 6) The majority of the EBDC fungicide alternatives are systemic compounds that are vulnerable to pest resistant problems. Accordingly, use of these compounds is typically limited to a maximum of two consecutive applications, after which at least one application of an alternative chemistry must be utilized. Since the EBDC fungicides are inexpensive and relatively effective non-systemic fungicides they are often the fungicide of choice to serve as a rotational partner for the systemic fungicides.

On 6/9/04 SRRD asked whether there were any sod industry practices that could lower EBDC residue levels on newly planted sod. What I know from previous experiences and personal contacts with growers and turf extension specialists is that turf is commonly watered prior to shipment to keep the roots from drying out prior to installation at the final planting site. Secondly, when sod is rolled up, or layered (stacked), for shipment the roots and soil directly contact the foliage. This will typically result in a layer of moist soil being deposited on the turf foliage, which may impact the potential level of EBDC residue exposure after the sod is installed. Additionally, all newly planted turf is supposed to be watered extensively for at least several weeks. Also a minimal amount of foot traffic needs to be observed during this time in order for the sod to become firmly established. All these common practices are perceived as measures which should significantly lower exposure and levels of the available EBDC and metabolite (ethylenethiourea) residues. Additionally we concur with the findings of the EBDC Task Force relative to the post treatment use practices associated with the harvesting, installation, and establishment of sod in residential settings, that were submitted in response to the risk assessments.

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C] Summary of the results of a 1998 turf farm survey [proprietary data], which are relevant to the use of mancozeb and fungicides in general.

- 1) General Information: A survey was based on 175 respondents out of 1,683 farms, which equates to about 10% of the population of farms. The turf (sod) farm information was presented for 4 regions (south, north central, northeast, and west) as well as from a national perspective. Turf farms exist in all states and are usually situated near the perimeter of large metropolitan areas.
- 2) General Sod Production Information: About 303,000 acres of sod are produced each year on 1,683 farms with an average size of about 180 acres/farm. The regional farm size averages ranged from 131 - 219 acres; the northeast and the south had the smallest and largest average farm sizes, respectively. Growers typically take steps to minimize disease problems due to the relatively high cost of fungicide treatments. Measures include selection of turf types and varieties least likely to develop disease problems, blending of several different turf varieties, and proper fertilization and watering practices to induce vigorous plant growth and minimize the creation of disease favorable conditions. When small diseased areas develop, growers



will typically destroy the diseased turf by plowing it under, as a means of halting the spread of the disease. Generally disease infestations occur in limited areas of a farm and when fungicide treatments are used they are only applied to the problem areas. The number of turf farms in the south, north central, west and northeast regions constitutes about 47, 31, 14, and 8 percent of the total number of farms, respectively. The sod production acreage in the south, north central, west and northeast regions constitutes about 57, 25, 12, and 6 percent of the total acreage, respectively.

- 3) General Fungicide Information: The percentage of farms using fungicides in the northeast, south, west and north central regions were 71, 33, 27, and 22, respectively. Although the northeast region had the highest percentage of farms using fungicides, the total acre-treatments are actually significantly greater in the south and north central regions due to the significantly higher volume of production acreages in these two regions. The number of fungicide applications used per year averaged 1.9 nationally. The average number of applications used in the west, northeast, north central and south were 0.6, 1.6, 1.8 and 3.0, respectively. Fungicides are typically applied by turf farm employees. Nationally there were 38,000 acre-treatments of fungicides applied, which equates to about 20,000 acres being treated based on the average number of applications applied per year; this equates to fungicides being used on around 7% of the total acreage grown.
- 4) Specific Fungicide Information: Chlorothalonil was the predominant fungicide used. A total of 14,000 acre-treatments of chlorothalonil were applied which constituted about 37 percent of the total fungicide usage. Mancozeb and PCNB fungicides were the next most popular fungicides. A total of about 5,000 acre-treatments of each of these two fungicides were applied which constitutes about 13 percent of the total fungicide usage. This means that mancozeb is probably used on about 2,600 acres, which equates to about 0.9 percent of the total turf farm acreage. No information was collected on the actual application rates utilized on sod farms. Based on the label rates associated with the target pests on mancozeb labels, the maximum rate (17.4 lbs ai/A) is the only rate recommended for a third of the pests and 13 to 17.4 lbs ai/A are recommended for another third of the pests. Accordingly, without specific use rate data we can presume that a significant number of users are likely to use these labeled rates.

Note: Acre-treatments is a figure obtained by multiplying the average number of applications by the base acreage treated. Therefore to estimate the base acreage treated you divide acre treatments by the average number of applications. In this survey, the national average number of applications applied was 1.9.

## APPENDIX B

### Golf Course Use of Mancozeb

The information below on golf course use of mancozeb is provided in response to inquiries by HED regarding the EBDC chemicals and will be used to refine their occupational risk assessment of the use of mancozeb on golf courses. The information is based on two market research databases available to EPA and survey data taken from the Golf Course Superintendent's Association. This data source coverage spans the years 2001, 2000, 1999, and 1998. Note that mancozeb is the only EBDC fungicide with use on golf courses, according to the available data sources.

#### Percent of golf courses using mancozeb

1. There are approximately 16,000 golf courses in the U.S.
2. The available data indicates that approximately 3,000 of them use mancozeb on an annual basis.
3. Thus, approximately 18.75% of golf courses in the U.S. use mancozeb.

#### Application rate

Use of mancozeb on golf courses averages about 10.5 pounds per acre nationally and over 95% of its use is between 9 and 14 pounds. Mancozeb was used on golf courses in 42 states.

#### Percent of acres treated

1. A total of 3% of the approximately 16 million acres of golf courses are treated with mancozeb.
2. A maximum of 12.5% of tees are treated with mancozeb.
3. A maximum of 51 percent of greens are treated with mancozeb.
4. A maximum of 5% of fairways are treated with mancozeb.

#### Number of applications

Data describing the number of times mancozeb is applied annually is not readily available. However, the below general fungicide use information is useful in setting upper bounds on mancozeb usage.

1. The Golf Course Superintendent's Association report indicates that all fungicides are applied to golf courses an average of 6.1 times.
2. EPA's proprietary data indicates that, on average, greens are treated 8.3 times with a fungicide annually and tees are treated 5.1 times.
3. Given that a variety of fungicides are applied, these numbers serve as a very conservative upper bound to the number of applications.

#### Athletic Field Turf Use

The Sports Turf Managers Association CEO, Kim Heck, reported to us that in 2001 the total US sports turf acreage was estimated to be ~7 million acres. She also referred us to Dr. Dave Minner (Iowa State University, Department of Horticulture for

pesticide usage information. Dr. Minner advised us that pesticides are only used on professional and some college fields which he estimated constitutes ~1 percent of the sports turf acreage. [R. Michell April 2005]

## APPENDIX C

### Survey of the Incidence of Metiram Applications on Apples

#### Aerial

Based on the states identified in the Nov.1, 2002 QUA report, and in recent usage surveys for 2001- 2003 (EPA proprietary information), over 75 percent of the metiram apple usage occurs in seven states (MI, NY, VA, NC, PA, OH, SC). Accordingly, apple fungicide specialists in these states were surveyed to determine the nature and extent of aerial application use.

The responses indicated that aerial applications are only known to exist in New York State, which grows about 44,000 acres of apples. The reported incidence of aerial applications was estimated to range from 3 to 5 percent of the 29,000 metiram-treated acres. It was estimated that both fixed-wing aircraft and helicopters are used in eastern NY, and that only fixed wing aircraft are used in western New York. Commercial applicators are involved in applying all aerial applications.

Aerial applications are primarily used when the ground is too wet to use ground equipment, or when blocks of trees need to be quickly treated before disease infection occurs. Virtually all aerial applications are made in early spring (green tip thru petal fall) because the post bloom cover sprays include insecticides that require the use of ground sprays to insure optimal coverage of foliage and developing fruit. It was reported that farms 50 to 100 acres or more in size would use aerial applications and that trees are typically planted in blocks of 10 to 20 acres. According to the 2002 Census of Agriculture about 17 percent of NY apple farms are larger than 50 acres and 97 percent are less than 250 acres in size.

The fungicide specialists contacted were: Drs. Mark Longstroth & Phil Schwallier (MI); Drs. David Rosenberger & Deborah Breth (NY); Dr. Keith Yoder (VA); Dr. Turner Sutton (NC); Dr. James Travis (PA); Dr. Mike Ellis (OH); and Dr. Guido Schnabel (SC).

[R. Michell 4/7/05]

### Timing

The table below contains the timing for summer pruning and petal fall for apples in the US by region. The states within each region are listed accordingly. The major metiram usage states are MI, NY, VA, NC, PA, OH, and SC and are addressed in the first three regions listed.

Apple petal fall and summer pruning by region and state.

<i>Region</i>	<i>States</i>	<i>Green Tip-Petal Fall**</i>	<i>Summer Pruning</i>
Appalachian Southern	DE, GA, MD, NC, PA, SC, TN, VA, WV	1 <sup>st</sup> of April thru the end of the 2 <sup>nd</sup> week of May	1 <sup>st</sup> of July thru the end of the 2 <sup>nd</sup> week of August
New England	CT, RI, ME, MA, VT, NH, NJ, NY	1 <sup>st</sup> of April thru the end of the 2 <sup>nd</sup> week of May	3 <sup>rd</sup> week of June thru the end of the 2 <sup>nd</sup> week of August
North Central	MI, OH	2 <sup>nd</sup> week if April thru the end of the 2 <sup>nd</sup> week of May	July – August
Pacific Northwest	WA, OR, ID	1 <sup>st</sup> of April thru the end of the 2 <sup>nd</sup> week of May*	3 <sup>rd</sup> week of May – 1 <sup>st</sup> week of July
Pacific South	CA, AZ	1 <sup>st</sup> week of February thru the end of the 2 <sup>nd</sup> week of April	2 <sup>nd</sup> week of April thru the end of the 1 <sup>st</sup> week of September

\*Pink-Petal Fall

\*\* As an alternative to using a maximum rate of 4.8 lbs. ai/acre/application thru petal fall a 77-day PHI use pattern also exists for apples that allows growers the option of applying up to two additional sprays beyond petal fall. These treatments must utilize a lower maximum rate of 2.4 lbs. ai/acre and must be applied at least 77 days before harvest. The available data indicates that only about one-third of users choose to make applications after petal fall.

Source: BEADS's Benefits Assessment

([http://www.epa.gov/oppsrrd1/op/azinphos/bead\\_Apples1.pdf](http://www.epa.gov/oppsrrd1/op/azinphos/bead_Apples1.pdf)) [B. Phillips 4/11/05]

## APPENDIX D

### EBDC use on Leatherleaf Fern

Information on EBDC use on Leatherleaf Fern (LLF) in Florida, where >70% of the U.S. production is located, was obtained from Dr. Robert Stamps, Professor of Environmental Horticulture and Extension Cut Foliage Specialist, University of Florida. Dr. Stamps has indicated that the EBDC mancozeb is applied four times per year. Harvest is approximately once every two to three months and as a result the reentry for workers is not an issue as there is usually plenty of time between spray and harvest. Included below are the questions posed by BEAD and the answers provided by Dr. Stamps.

#### **Characterization of the Metiram Exposure Concerns Associated with the Production of Leatherleaf Ferns**

1. Identify all active ingredient and product names for fungicides applied to leatherleaf fern and their respective target pest(s).

These are the main fungicides used on leatherleaf fern in Florida; however, not all trade names may be listed (especially for the generics):

chloroneb (Terraneb), used only occasionally - Rhizoctonia  
chlorothalonil (Daconil, Echo, Thalonil), occasionally used – Ascochyta,  
Colletotrichum, Cylindrocladium, Rhizoctonia  
fosetyl-aluminum (Aliette), rarely used – Phytophthora, Pythium  
mancozeb (Dithane, Penncozeb, Protect T/O), used regularly – Colletotrichum,  
Rhizoctonia  
mefenoxam (Subdue), rarely used – Phytophthora, Pythium  
metiram (Polyram), rarely used – Colletotrichum  
tebuconazole (Folicur), used fairly regularly during warm weather – Colletotrichum  
thiophanate-methyl (3336, Systec 1998, 6672), used occasionally – Ascochyta,  
Cylindrocladium

2. Fully characterize the metiram fungicide spray timelines for a typical calendar year (e.g., number of applications per year, when applied, repeat application interval).

Maximum of four applications per year (if used at all at a particular farm), usually applied when the incidence of Colletotrichum is highest (June through September).

3. Provide Crop Production Timelines for a typical calendar year. This should include all activities associated with production of the crop (planting, harvesting, pesticide use, irrigation, fertilization, etc.) If individual activities are not likely to result in human exposure explain why.

Dealing with a perennial crop so planting is not an issue. Fronds are harvested year-round (although more intensely during the first six months of the year) at about an average of once every two to three months for any given fernery. Most pesticides are commonly applied using the irrigation systems (chemigation) during the periods when harvesting is not occurring so direct exposure to applicator or workers is minimized. Irrigation/fertigation is done on a more or less weekly basis.

Source: Robert H. Stamps, Ph.D. , Professor of Environmental Horticulture and Extension Cut Foliage Specialist, University of Florida Institute of Food and Agricultural Sciences, Department of Environmental Horticulture Mid-Florida Research and Education Center, 2725 Binion Road, Apopka, FL 32703-8504, Phone: (407) 884-2034 ext. 164; Facsimile: (407) 814-6186

## APPENDIX E

### EBDC Wettable Powder Use Analysis

#### Uses By Product

Overall, the wettable powders constitute ~10% of the total lbs of EBDC product applied in the U.S. The use of this formulation varies among states and crops in such a wide distribution as to demonstrate no pattern, or niche, use.

#### *Products*

##### Maneb

###### Maneb 80 (Wp/D)

- 87% of the pounds (ai) were applied to Peppers, Lettuce, Tomatoes, and Cucumber. (In order of lbs applied)
- No information on the label as to a D usage.
- Chemigation is listed.

###### Aliette/Maneb 2+2

- No longer on the market.

###### Amazin

- Not able to locate information to determine the formulation of this product.

##### Metiram

No use of WP formulations found in available use database.

##### Mancozeb

###### Manzate 80 WP

- 89 % of the pounds (ai) were applied to Potatoes, Apples, Watermelon, Cucumber, and Wine Grapes. (In order of lbs applied)

###### Penncozeb 80 WP

- Penncozeb DF is ~60% of the Penncozeb (WP & DF) market.
- 53% of the WP (ai) was applied to Apples.
- 82% of the pounds (ai) were applied to Apples, Potatoes, and Wine Grapes.

###### Ridomil Gold MZ

- The mancozeb is a WP but the package mix is in a water soluble bag.
- Only 1.5% of the total mancozeb applied was this product.

###### Acrobat MZ

- 83% of the pounds (ai) were applied to Tobacco.

###### Mancozeb WP

- 56% of the pounds (ai) were applied to Apples.
- 83% of the total pounds (ai) were applied to Apples, Wine Grapes, and Potatoes.

###### Manex II

- Not able to locate information to determine the formulation of this product.

###### Manocide



- Not able to locate information to determine the formulation of this product.

#### Percent Use of Product

The following is a list of the agronomic crops that represent the means of the approximate pounds of EBDC's applied between the years 2001 to 2003. In addition, included is the percent of the total pounds of wettable powder product applied base on the total pounds of EBDC products applied. As an example, for maneb there was 220,000 lbs of EBDC product applied to almonds with 0% being wettable powders. Please note that there were no wettable powder metiram products applied during this time frame.

Ridomil Gold MZ was not included in the percent of total wettable powder product applied since the EBDC product is in a mix of other products with all being contained in a water soluble packet.

#### **Application of Maneb in Wettable Powder Formulation, 2001-2003 average**

Crop	Approximate pounds of Maneb Applied	Percent Applied in Wettable Powder Formulation
Almonds	220,000	0%
Apples	10,000	0%
Beans, Snap	<5,000	0%
Broccoli	20,000	1%
Cabbage	60,000	0%
Cantaloupe	<5,000	0%
Carrots	<5,000	0%
Cauliflower	10,000	4%
Cucumber	30,000	46%
Garlic	30,000	0%
Grapes, Table	<5,000	33%
Grapes, Wine	10,000	6%
Lettuce	650,000	7%
Onions	40,000	3%
Peppers	200,000	25%
Potatoes	20,000	5%
Pumpkin	<5,000	3%
Spinach	10,000	37%
Squash	10,000	0%
Sugar Beets	10,000	2%
Sweet Corn	10,000	0%
Tomatoes	120,000	33%
Walnuts	280,000	0%
Watermelon	20,000	35%
Total	1,760,000	9%

Source, EPA proprietary data.

Note, Usage of maneb was observed in the following formulated products: (wettable powders) Aliette/Maneb 2+2, Amazin , Maneb 80, (other) Maneb 75 DF, and Manex.

**Application of Mancozeb in Wettable Powder Formulation, 2001-2003 average**

Crop	Approximate pounds of Maneb Applied	Percent Applied in Wettable Powder Formulation
Almonds	10,000	0%
Apples	1,330,000	31%
Asparagus	30,000	33%
Beans, Lima	<5,000	0%
Beans, Snap	<5,000	0%
Cabbage	10,000	0%
Cantaloupe	40,000	25%
Carrots	<5,000	0%
Cherries	<5,000	0%
Cotton	<5,000	0%
Cucumber	80,000	38%
Garlic	<5,000	0%
Grapes, Raisin	10,000	0%
Grapes, Table	30,000	33%
Grapes, Wine	200,000	30%
Lettuce	<5,000	0%
Onions	500,000	2%
Peanuts	10,000	0%
Pears	130,000	23%
Peppers	40,000	25%
Potatoes	3,140,000	19%
Pumpkin	20,000	0%
Squash	60,000	17%
Sugar Beets	50,000	60%
Sweet Corn	100,000	0%
Tobacco	40,000	75%
Tomatoes	480,000	15%
Walnuts	<5,000	0%
Watermelon	300,000	27%
Wheat, Spring	30,000	67%
Wheat, Winter	30,000	0%
Total	6,660,000	21%

Source, EPA proprietary data.

Note, Usage of mancozeb was observed in the following formulated products: (wettable powders) Acrobat MZ, Dithane M 45, Mancozeb WP, Manzate 80 WP, Penncozeb 80 WP, (other) Penncozeb DF, Ridomil Gold MZ, Dithane DF, Dithane 45, Gavel 75 DF, Mancozeb 4 F, Manex II, Mancocide, Manzate 75 DF, and Manzate Flowable 4L.

Note: Ridomil Gold MZ contains a wettable powder EBDC but was not included in the percent applied because the product is in a water soluble packet.

## APPENDIX F

### The Importance of Mancozeb Use on Pears for Control of Pear Psylla Nymphs in the Pacific Northwest

R. Michell 3/23/05 Telephone Conversation with Dr. Michael Willett, Vice President for Scientific Affairs, Northwest Horticultural Council, Yakima, WA 98901, (509) 453-3193, [willett@nwhort.org](mailto:willett@nwhort.org)

Dr. Willett was called in response to his comments sent to the EBDC docket regarding the importance of mancozeb use on pears for control of pear psylla nymphs in the Pacific Northwest. Below are his comments during our discussion:

- 1) So far WA is the only state with SLN registrations for this pear use [WA030038, WA040003]; the maximum application rate (6.4 lbs ai/A) is higher than the maximum application rate on the Section 3 label for pears (4.8 lbs ai/A).
- 2) WA grows about 24,800 acres of pears.
- 3) About 16% of the crop is treated with mancozeb (2003 NASS).
- 4) Average number of applications = 1.1.
- 5) A number of insecticide alternatives with different chemistries appear to be available for control of pear psylla; he was unsure of the relative economic impact of not having mancozeb for this use.
- 6) For additional information he referred us to Dr. John Dunley, extension entomologist, WSU (509) 663-8181x236, [dunleyj@wsu.edu](mailto:dunleyj@wsu.edu).

## APPENDIX G

Average EBDC application rates are given below to assist in the dietary and occupational risk assessments.

### Average Application Rates for Mancozeb, Maneb, and Metiram

Crop	Mancozeb Average A.I Rate	Maneb Average A.I. Rate	Metiram Average A.I. Rate
Almonds	1.5	3.574	
Apples	2.601	2.741	2.228
Asparagus	1.413		1.6
Beans, Lima	0.4		
Beans, Snap	0.713	0.847	
Broccoli		1.277	
Cabbage	0.897	1.086	
Cantaloupe	1.185	1.15	
Carrots	0.75	0.75	
Cauliflower		1.28	
Cherries	2.12		
Cotton	0.746		
Cucumber	1.303	1.333	
Garlic	1.5	1	
Grapes, Raisin	2.189	1.8	
Grapes, Table	2.063	1.525	
Grapes, Wine	2.136	2.242	
Lettuce	1.259	1.42	
Onions	1.513	1.672	
Peaches			0.8
Peanuts	1.004		
Pears	3.715	6.01	
Peppers	0.951	1.177	
Potatoes	1.214	0.914	1.392
Pumpkin	1.435	0.939	
Spinach		1.251	
Squash	1.41	1.119	2.005
Sugar Beets	1.077	1.388	
Sweet Corn	0.99	0.993	
Tobacco	0.846		
Tomatoes	1.065	1.627	
Walnuts	0.6	1.751	
Watermelon	1.381	1.163	
Wheat, Spring	1.092		
Wheat, Winter	1		

Source: U.S. Department of Agriculture, National Agricultural Statistics Service and EPA proprietary data sources, 2001 – 2003.