May - June 1999

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Comments from the Coordinator

It's your lucky day—two feature articles this issue for the price of one. Feature article #1, Sandy Perry attempts to explain the Michigan drift management regulation, and provides a blank sample drift management plan for your use. Feature article #2, I attempt to explain the *Bt* pollen/monarch butterfly controversy, and provide answers to some of the commonly asked questions about monarchs, milkweed, and corn pollen. Please feel free to copy and distribute both articles to your clientele.

On another note, congratulations to Sandy Perry on her new job. As of June 1, Sandy is the National Outreach Specialist for the federal IR-4 Program. This is a brand new position, funded by IR-4 national headquarters at the New Jersey Ag Experiment Station, but based at Michigan State. Oversight for the position will be provided by Dr. Bob Hollingworth of the Michigan IR-4 Program, and myself in the Pesticide Education Program. The situation is ideal— Sandy gets to move to a position with new challenges and responsibilities, but we retain her pesticide-related expertise at MSU. Incidentally—don't know or care what the federal IR-4 Program is or does? That is exactly what Sandy is supposed to remedy.

Christina DiFonzo
Pesticide Education Coordinator/Field Crops Entomologist

Michigan's Drift Management Plan Regulation: How to Comply for Private Applicators

Sandy Perry, Pesticide Education Program, Michigan State University

Under Michigan law, a drift management plan is required of both commercial and private pesticide applicators when there is the chance of a spray application drifting from the target onto non-target and off-site sensitive areas. Pesticide drift refers to the off-target movement of **spray**, NOT to the off-target movement of a pesticide by means of erosion, volatilization, or wind-blown soil particles.

Highlights of Michigan Regulation 637, Rule 10

- The drift management plan must be in writing.
- Before spraying, the applicator must determine the likelihood and direction of off-target drift and any sensitive areas that may be impacted.
  - "**Sensitive area**" covers a broad range of situations. Some examples are homes, gardens, schools, playgrounds, and livestock. Even a neighbor's field may be considered a sensitive area if your spray can adversely affect his crop (for instance, Round-Up Ready versus non-Round-up Ready crops).
- If drift is anticipated, the plan must include provisions to secure the informed consent of residents in the affected off-target area before making the application. If off-target drift occurs when it's not anticipated, the applicator must notify the residents in the affected area before leaving the site.
  - **Informed consent** begins with a good neighbor policy. Explaining the why, when and how of pesticide spray application(s) to those who may receive drift will indicate care and concern for their comfort and well-being.
- The plan must include drift minimization practices such as:
  - Use of the largest spray droplets that are created by a combination of nozzles, pressures, and particulating agents to accomplish the objectives of the application.
  - Use of specialized equipment that is designed to minimize off-target drift.
  - Use of the closest possible spray release to the target.
  - Use of the lowest effective rates of application of the pesticide.
  - Establishment of a no-spray buffer zone. The buffer zone may be treated with hand-held equipment.
  - Identification of the maximum wind speed and direction under which applications can be made.
  - Use of windshields or windbreaks to contain or deflect spray drift away from sensitive areas.
  - Other specific measures stated in the plan that are effective in minimizing the incidence of off-target drift.
- The drift management plan must be reviewed annually by the person who uses it.
- A record of the sites where the drift management plan was implemented shall be retained for one year for *general use* pesticides and three years for *restricted use* pesticides. *The drift management plan applies to both general use and restricted use pesticides.*

Enforcement

- Enforcement of the drift management plan is complaint driven.
- If a drift complaint is lodged against you, Michigan Department of Agriculture will consider the presence and use of a drift management plan as a factor in your favor when determining appropriate enforcement action.

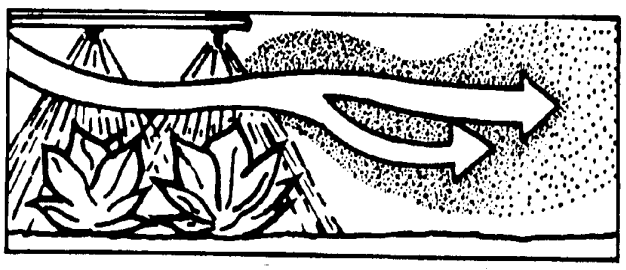
Format of the Drift Management Plan

There is **no required format** for the drift management plan. You can adopt the sample plan and ideas that follow or make up something that better suits your needs.

Drift Management Plan (DMP) for each Pesticide Spray Application (sample provided)

The DMP on page 3 of this newsletter contains all the pertinent information needed if a drift management plan is to be used at each application when there is any likelihood of spray drift moving off-target to a sensitive area. A copy of Regulation 637, Rule 10 is also provided as a reference. If there is likelihood of spray drift moving off-target, informed consent of the affected residents is needed prior to the application (a blanket consent for the season is acceptable and does not need to be in writing).

This plan was designed to be used *each time* sprays are applied to an area where there is the possibility of off-



MICHIGAN DRIFT MANAGEMENT PLAN

(for use at each pesticide application where off-target drift is possible)

List sensitive sites onto which pesticide spray may drift during this application:

_____

_____

_____

Applicator name: _____ Date:_____

Time of day when spray application began _____
Wind speed _____(measured or estimated? Circle one)

Possible direction of off-target drift: N, NE, NW, S, SE, SW, E, W, other ____

If off-target drift is a possibility:

The following practices help retard drift or its impact. Put a check mark before any of the following practices that were used to retard drift. Write in the time of day that the practice was first used.

___ Use larger nozzles to produce larger droplet size. Time:_____
___ Use a different type of nozzle (i.e., raindrop rather than flood). Time:_____
___ Reduce spray pressure or increase spray volume. Time:_____
___ Use spray additives to reduce "fines." Time:_____
___ Reduce the distance from the sprayer to the target. Time:_____
___ Lower application speed. Time:_____
___ Use the lowest effective rates of the pesticide. Time:_____
___ Use a no-spray buffer strip. Time:_____
___ Other practices (specify_____). Time:_____

If off-target drift was not anticipated but does occur, notify affected persons either verbally or in writing before leaving the site.

Who was contacted?_____ Time:_____

Time of day when spray application concluded _____

A record of the sites where the drift management plan was implemented and a copy of the drift management plan must be retained for a period of 1 year for general use pesticides and 3 years for restricted use pesticides.

Sandy Perry 5/99

R 285.637.10 Off-target pesticide drift.

Rule 10. (1) Pesticide applications shall be made in a manner that minimizes off-target drift, unless prior authorization and consent as specified in subrule (3) of this rule is obtained from the owner or resident of the land onto which drift may occur.

(2) Before making a pesticide application, an applicator shall do both of the following:

(a) Determine the likelihood of off-target drift.

(b) Determine the direction of possible off-target drift and any sensitive areas that may be impacted.

(3) When pesticide off-target drift is anticipated due to the nature of the application, a drift management plan shall be utilized by the applicator to minimize the occurrence and adverse effects of off-target drift. The plan shall include provisions to secure the informed consent of residents in the affected area before making the application. If, in the course of making an application when off-target drift is not anticipated, there arises an occurrence of off-target drift, the applicator shall notify the residents in the affected area either verbally or with appropriate signs before leaving the application site. The drift management plan shall include drift minimization practices. Such practices may include any of the following:

(a) The use of the largest spray droplets that are created by a combination of special nozzles, pressures, and particulating agents to accomplish the objectives of the applications.

(b) The use of specialized equipment that is designed to minimize off-target drift.

(c) The use of the closest possible spray release to the target.

(d) The use of the lowest effective rates of application of the pesticide.

(e) The establishment of a no-spray buffer zone. The buffer zone may be treated with non-powered equipment.

(f) The identification of the maximum wind speed and direction under which applications can be made.

(g) The use of windshields or windbreaks to contain spray drift or deflect spray drift away from sensitive areas.

(h) Other specific measures stated in the plan that are effective in minimizing the incidence of off-target drift.

(4) Drift management plans shall be in writing. The plan will state the measures to be used and how those measures will reduce the impact of off-target drift. The drift management plan shall be annually reviewed by the person who utilizes the plan.

(5) A record of the sites where the drift management plan was implemented and a copy of the drift management plan shall be retained for a period of 1 year for general use pesticides and 3 years for restricted use pesticides and shall be made available to the director upon request.

(6) Operating under a drift management plan does not exempt an applicator from complying with appropriate federal or state statutes and regulations. However, the department shall consider the presence and use of a drift management plan as a factor in determining appropriate enforcement action.

(7) Pesticide off-target drift shall not include the off-target movement of a pesticide by means of erosion, volatilization, or windblown soil particles after the application of a pesticide.

History: 1992 MR 10, Eff. Oct. 30, 1992

target drift. Photocopies of the plan can be kept on a clipboard or in a notebook so it will be handy when needed.

Advantages:

a) Weather conditions and timing of sprays are documented for each application.
b) The method of pesticide spraying can be varied depending on the likelihood of drift.
c) Less time is spent devising an overall plan.

Disadvantages

a) More paperwork to keep track of.

Long-term Drift Management Plan (no sample provided)

The main component needed for a long-term plan (a plan that is made one time and only updated as needed) is a diagram of the fields to be sprayed and the areas that may be impacted by off-target drift. For each area, the plan must state the drift minimization measures to be used when spraying pesticide in that area, and how those measures will reduce the impact of off-target drift. The long-term plan must also include provisions to secure the informed consent of residents in the affected area before making the application. If off-target drift arises when not anticipated, the applicator must notify the residents in the affected area before leaving the area. A record of the sites where the plan was implemented and a copy of the plan must be retained for one year for general use pesticides and three years for restricted use pesticides. The plan must also be reviewed minimally once a year or more frequently if there are changes within the off-target areas that may be impacted by pesticide sprays.

Advantages

a) Paper work is only done once.

Disadvantages

a) If there is a chance of drift you must remember to treat each sensitive area exactly as stated in the drift plan, thus there is less flexibility at the time of spraying.
b) You have less specific information recorded about each spray application.
c) Any notes or documentation made about a specific spray application will likely be made on a separate piece of paper and more easily misplaced.

Questions/Answers

Q: I already keep spray records for each application. Can I combine the information needed for the drift management plan with my spray records and keep a farm diagram with sensitive areas highlighted in the back of the record book?

A: That's an excellent plan. Because there is no required format, you can design your record keeping any way you choose as long as the pertinent information is included.

Q: Is there any commercial source of forms to combine pesticide spray records and drift management plans?

A: Not that we're aware of.

Q: Federal record keeping requirements specify that I must keep my restricted use pesticide (RUP) records for two years. Why does the drift management plan require me to keep them for three years?

A: Federal record keeping 2-year retention requirements for RUPs apply nationally but only to private applicators. The Regulation 637 drift management requirements apply to both commercial and private applicators in Michigan. Michigan commercial applicators are required to retain their RUP records for three years, thus the drift management requirements reflect the more stringent state requirement.

Bt Corn Pollen and Monarch Butterflies

Christina Difonzo, Pesticide Education Program, Michigan State University

Research on the effect of *Bt* pollen on monarch butterflies was recently published in the May 20th edition of the journal *Nature* ("Transgenic pollen harms monarch larvae" by J.E. Losey, L.S. Rayor, and M.E. Carter, Cornell University). Reports of this research have since been picked up by news outlets around the country and stories have been printed in many papers, for example, "Corn strain is deadly to monarch butterflies" in the *Detroit Free Press*, May 20, 1999; "Butterfly-killing corn" by the *Associated Press*, May 19, 1999.

Research Summary

The researchers compared feeding, growth, and mortality of monarch larvae fed on milkweed leaves dusted with *Bt* pollen, non-*Bt* pollen, and no pollen. They applied pollen to milkweed leaves misted with water, visually matching density of the pollen to that measured on milkweed leaves collected from cornfields. Five 3-day old (~ 2nd instar) larvae from a monarch butterfly lab colony were placed on each leaf and allowed to feed for four days. They found that larval survival after four days was significantly less on leaves dusted with *Bt* pollen (*Bt* pollen = 56% survival, non-*Bt* pollen and no pollen = 100% survival), that larvae consumed significantly less of the milkweed leaves dusted with pollen, either from *Bt* or non-*Bt* plants, and that larval growth rate (measured as larval weight of survivors) was significantly less for larvae on leaves with *Bt* pollen versus no pollen.

This experiment only lasted four days, used the most susceptible larval stages, and did not follow larvae through development (i.e., pupation to adult butterfly, mating, and egg production). It is therefore not clear what eventually happens to exposed survivors. If they continue to feed on pollen-free milkweed, do they gain weight? Lay the same number of eggs? Live as long? Also, this experiment was NOT a field trial. It was done in the laboratory, and it is not clear if the timing of monarch caterpillar feeding in the field coincides with pollen shed, or what level of pollen on milkweed leaves in the field is enough to harm the caterpillars.

Background Information

The **monarch butterfly** is one of the most recognized, popular insects in the United States. Monarchs overwinter at sites in Mexico, arrive in Michigan (likely not individuals that overwintered in Mexico) in early summer, and lay single eggs on milkweed plants. New butterflies emerge in mid-summer, leading to a second brood of larvae in July/August. Monarchs feed exclusively on some, but not all, of the 108 species of milkweed (*Asclepias)*, particularly on common milkweed. Monarchs are found throughout the United States, but about 50% of the population summers in the Midwest. For further information visit the University of Kansas Monarch Watch web site: http://www.MonarchWatch.org.

***Bacillus thuringiensis* (*Bt*)** is a bacterium used as an insecticide spray for over 50 years. The bacteria contain a protein crystal that, in the stomach of an insect, becomes "activated" and forms a toxin. The toxin binds to the lining of the insect gut, making it leaky and eventually killing the insect. Different subspecies of *Bt* are available commercially for use by home gardeners and farmers to kill beetles, mosquitoes/ blackflies (*Bti*), and caterpillars (*Btk*).

Bt is an important insecticide in production of organic crops, and it is used as a safer alternative in gypsy moth spray programs in many states, including Michigan. *Bt* is highly specific to insects and is listed as practically "non-toxic" to mammals. *Bt* has much less impact on beneficial insects compared to conventional broad-spectrum insecticides. However, as with any pesticide, *Bt* applications are not completely benign. Non-target impacts of *Bt* sprays on insects related to the intended target pest (for example, other caterpillars in the forest besides gypsy moth) have been noted by researchers for years. The negative impact of Dipel, a *Bt* product made up of several caterpillar-killing strains of *Bt*, on monarch larvae feeding on plants in treated vegetable fields was reported in 1986.

Although *Bt* insecticides have reduced mammalian toxicity and greater environmental safety over conventional insecticides, there are some problems that prevent their large-scale use in agriculture. Problems include: rapid breakdown in UV light, requiring frequent applications; *Bt* is a stomach poison, so it must be eaten to have activity, thus spray coverage must be complete; and, although small larvae are very susceptible to *Bt*, large larvae may survive treatment, hence timing of application is critical. Finally, *Bt* generally costs more per acre than conventional OP and carbamate insecticides.

Genetic engineering allowed scientists to find the specific genes in *Bt* bacteria that code for the protein crystal. These genes have been inserted into plants, allowing crops like potato and corn to produce *Bt* toxin directly in their own tissues. In most cases, toxin is produced in all tissues of the plant, including the pollen.

Bt-transgenic crops circumvent the problems of UV breakdown, coverage, and timing by making *Bt* toxin available continuously throughout the season in all tissues.

***Bt* corn** is genetically engineered to control the most important pest of corn, the European corn borer (ECB), which is increasing in acreage in the United States. Advantages of *Bt* corn are:

- Highly effective, with almost 100% control of ECB.
- More consistent control and less cost than insecticide sprays.
- Easy implementation—simply plant the seed.
- Low mammalian toxicity compared to conventional insecticides, and safe for people and livestock to eat.
- Specificity—kills only ECB and few other caterpillars, with little short-term effect on beneficial insects.

There are also several important limitations of *Bt* corn.

- Higher cost than non-genetically engineered seed.
- *Bt* hybrids may not out-yield non-*Bt* hybrids.
- Producers must remember to scout, and may have to spray, for other corn pests.
- Growers must implement a "refuge" strategy to manage potential resistance of corn borer to *Bt* toxin.
- Marketing issues in Europe and Asia about genetically engineered crops.

Q and A: Considerations and Implications of this Research in Michigan

Is this a surprise?

Frankly, no. Other research groups have also been investigating this phenomenon. Iowa State entomologists (L. Hansen and J. Obrycki) did a similar feeding study using milkweed leaves actually taken from *Bt* cornfields. They found that after 2 days, 19% of first-instar monarchs fed on milkweed leaves from *Bt* cornfields died, versus 0% fed on milkweed not exposed to *Bt* pollen and 3% fed on leaves without pollen. Many other groups around the world are conducting lab and field-based experiments to determine the impacts of *Bt* corn, including pollen, on beneficial insects like ladybugs and lacewings. Up to now, most studies show *Bt* corn has little impact on beneficials, although much of this work is not complete. Subtle, long-term impacts still could turn up.

How far does corn pollen travel?

Corn pollen is fairly heavy, and most of the grains produced by a plant settle in the immediate vicinity. However, a single tassel has been estimated to produce 25 million pollen grains, and one would expect that some of this pollen move a greater distance under windy conditions. The *Nature* article sites a distance of "at least 60 meters" (~ 200 ft). Production of inbred corn seed requires separating blocks by 600 feet to prevent cross-pollination. Compared to the amount of pollen which falls in the field, the amount moving 600 feet is very small.

How much Bt corn is in Michigan?

According to the most recent statistics, 2.6 million acres of field corn and 12,500 acres of fresh market sweet corn were planted in Michigan in 1997; only a fraction of this acreage is *Bt* transgenic. Compared to other states in the Midwest, Michigan and Ohio have fewer acres of *Bt* field corn. Depending on the growing region, the amount of *Bt* corn ranges from less than 5% of the acreage up to about 20% in some parts of southeast Michigan. Cornfields in Michigan tend to be smaller, and the cropping pattern more diverse, than in the rest of the Corn Belt. Thus much of Michigan is not within 600 feet of a cornfield, much less a *Bt* cornfield.

What is the status of milkweed (Asclepias spp.*) in Michigan?*

Milkweed plants are found throughout Michigan along roads, in fields, pastures, swamps, and around homes. Some types are available commercially to plant in butterfly gardens. In agricultural fields, milkweed (mostly common milkweed) is considered a weed species and thus is a target for cultivation or herbicide applications. Of the species found in Michigan, common milkweed is the most likely to be located near cornfields, and thus dusted with corn pollen. Jim Kells, MSU weed specialist, reports that milkweed is a "second tier" weed species in Michigan, i.e., found as single plants or groups of plants in a cornfield or on a field margin, but generally not common enough to be the actual target of a weed control program. Milkweed species in Michigan eaten by monarchs are listed below.

- Common (*A. syriaca*)—cultivated fields, pastures, open woods, roadsides.
- Eastern whorled (*A. verticillata*)—meadows, pasture, waste areas. Seldom in cultivated fields.
- Showy (*A. speciosa*)—prairies, sandy soil next to lakes and ponds. Seldom in cultivated fields.
- Swamp (*A. incarnata*)—swamps, ditches, wet prairie. Seldom in cultivated fields.
- Butterfly weed (*A. tuberosa*)—prairies, roadsides, open woodlands. Available commercially.

Why is the number of monarchs declining in the United States?

The number of monarchs has been decreasing over the years, but for reasons not related to transgenic crops. The two most important factors associated with the decline of this butterfly are the loss of overwintering sites and the loss of milkweed habitat in the United States.

Monarchs overwinter in certain areas in the highlands of Mexico. Literally thousands of butterflies gather at each site in the winter. The destruction of a site, or adverse weather conditions (for example, a freeze) at even one site, can lead to loss of a significant part of the population. Back in the United States, most of the prairie and wetland habitats for native milkweed species are gone due to urban development and farming. Also, milkweed

plants in agricultural fields and developed areas can be destroyed by herbicide applications or by mowing roadsides, cultivation, etc. Thus much of the breeding habitat for monarchs (as well as other native butterflies) has been reduced.

Another factor that can negatively impact monarchs is the use of conventional insecticides in agricultural and suburban areas. Most conventional (OP, carbamate, pyrethroid) insecticides used in corn production are broad-spectrum, in other words, they kill most of the insects in the field, pest or not. Pyrethroids in particular are very active against beneficial and non-target species. Ironically, one of the advantages of *Bt* corn for corn borer control is that it replaces the application of broad-spectrum insecticides. *Bt* sprays, such as Dipel, targeted at caterpillar pests have also been shown to affect monarchs (L. Brower, 1986).

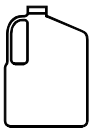
In the whole scheme of things—the big picture—is this something for people to worry about?

Personally, my opinion is "no" short-term, "maybe" long-term. The Cornell findings are interesting. They suggest there could be non-target impacts of *Bt* pollen on monarch butterflies and, by extrapolation, non-target impacts on other caterpillars that live in and around cornfields. These results should prompt further research to, for example, find out if monarchs are actually being harmed in the field, test different levels of *Bt* pollen and different sizes of monarch larvae, examine the timing of corn pollen shed versus the timing of the monarch life cycle, measure actual accumulation of pollen on plants in and around corn fields, and look at other species of caterpillars. Also, this work shows once again that no pest management technique is a "magic bullet;" there are benefits and limitations of transgenic technology.

However, my sense is that with the current level of *Bt* corn in Michigan, most of our milkweed is not within range of *Bt* pollen. This is especially true of milkweed in suburban areas (for example, residents in Detroit identified in a newspaper article were worried about their butterfly gardens). Monarchs in Michigan are currently at more risk from problems at overwintering sites, reduction in milkweed, and the use of insecticides rather than *Bt* pollen shed. Again, in the big picture, *Bt* corn is a safer method of pest management, and has less detrimental impact on all aspects of the environment (monarchs included) than the use of broad-spectrum insecticides.

Chemical Update

The following information provides registration status of particular pesticides and should not be considered as pesticide recommendations by MSU Extension.



Products are listed by trade name with active ingredient name and manufacturer following. Please note that multiple manufactures may make the same product. A change in the registration, formulation, or label of a product from one manufacturer ***may not apply*** *to the same product made by another manufacturer. If you have any doubts about the status of a pesticide, please read a current label and/or check with the manufacturer directly.*

Proposed/Established Tolerances:

Insecticides

- Apollo (clofentezine; AgrEvo)—residue tolerance established on apples at 5 ppm.
- Confirm (tebufenozide; Rohm & Haas)—proposed residue tolerances on fruiting vegetables (except cucurbits) at 1 ppm. Comments were due by 3/22/99.
- Confirm (tebufenozide; Rohm & Haas)—proposed residue tolerances on leafy green vegetables at 10 ppm, stem brassica crops at 2 ppm, and leafy brassica crops at 10 ppm. Comments were due by 3/22/99.
- Confirm (tebufenazide; Rohm & Haas—residue tolerances established on berries at 2 ppm, brassica vegetables (head type) at 5 ppm, brassica vegetables (leafy type) at 10 ppm, cranberries at 1 ppm, fruiting vegetables except cucurbits at 1 ppm, leafy greens at 10 ppm, and mint tops (10 ppm).
- Esteem (pyriproxyfen; Valent)—new residue tolerance established on pome fruits at 0.2 ppm.
- Knack (pyriproxyfen; Valent)—established time-limited residue tolerances to cover a specific exemption on pears at 0.2 ppm and tomatoes at 0.1 ppm (expires 7/31/99), and on stone fruits at 0.1 ppm (expires 8/31/2000).
- Provado (imidacloprid; Bayer)—residue tolerances proposed for cucurbits at 0.05 ppm, and tuberous and corm vegetables at 0.3 ppm.
- Success (spinosad; DowAgroSciences)—residue tolerances proposed for tuberous and corm vegetables at 0.3 ppm.

Herbicides

- Action (fluthiacet-methyl; Novartis)—residue tolerance established on soybean seed at 0.01 ppm.
- Dual (metolachlor; Novartis)—time-limited residue tolerances established to cover a specific exemeption on tomatoes at 0.1 ppm, tomato puree at 0.3 ppm, and tomato paste at 0.6 ppm (expires 4/1/2001).
- Facet (quinclorac; BASF)—residue tolerances established on sorghum grain at 6 ppm), sorghum forage at 3 ppm, wheat grain and hay at 0.5 ppm,

wheat straw at 0.1 ppm, and wheat forage at 1 ppm.
- Prowl (pendimethalin; American Cyanamid)—time-limited residue tolerance on mint extended until 5/31/2000.
- Roundup (glyphosate; Monsanto)—EPA established residue tolerances on barley grain at 20 ppm, canola seed at 10 ppm, legume vegetables (except soybean) at 5 ppm, sugarbeet pulp at 25 ppm, and sugarbeet roots and tops at 10 ppm. The purpose of these tolerances is to allow for spraying of Roundup Ready canola and sugarbeet varieties.
- Touchdown (sulfosate; Zeneca)—residue tolerances proposed on edible pod vegetables at 0.5 ppm, fruiting vegetables at 0.05 ppm, and dried, shelled beans (except soybean) and peas at 6 ppm.

Fungicides

- Abound (azoxystrobin; Zeneca—residue tolerances established on head lettuce at 6 ppm, leaf lettuce at 20 ppm, and spinach at 25 ppm.
- Acrobat (dimethomorph; American Cyanamid)—tolerances proposed on cereal grains at 0.05 ppm and on fodder and straw of cereal grains at 0.1 ppm. Comments were due by 4/9/99.
- Actigard (acibenzolar-s-methyl; Novartis)—tolerances proposed on leafy vegetables (excluding spinach) at 0.25 ppm, spinach at 1 ppm, and fruiting vegetables at 1 ppm. Comments were due by 3/22/99.

- Diphenylamine—established residue tolerances on pears proposed to expire on 12/1/2001. Comments were due by 3/8/99.
- Maxim (fludioxonil; Novartis)—tolerances proposed on grapes at 1 ppm; peanuts, sunflowers, leafy vegetables, brassica leafy vegetables, fruiting vegetables, cucurbits, forage fodder and straw of cereal grains, forage, fodder, hay and non-grass animal feeds, tuber vegetables, roots and leaves, bulb vegetables, cereal grains, herbs and spices at 0.02 ppm; cotton at 0.05 ppm; flax seed at 0.05 ppm; and safflower seed at 0.01 ppm. Comments were due by 3/25/99.
- Sovran (kresoxim-methyl; BASF)—tolerances proposed on pome fruits at 0.3 ppm, grapes at 1 ppm, pecans at 0.15 ppm, and apple pomace at 0.7 ppm. Comments were due by 4/9/99.

New Registrations

Insecticides

- Adage 70WS and 5FS (thiamethoxam; Novartis)—company has proposed registration as a seed treatment to control insects on barley, sorghum, and wheat.
- Aqua-Reslin (permethrin/piperonyl butoxide; AgrEvo)—new formulation recently introduced to control mosquitos in mosquito abatement programs.
- Aza 3% (azadirachtin; Amvac)—new formulation of Neem to control insects on ornamentals.
- Bayer Bee Strips (coumaphos; Bayer)—new insecticide treated strips for use in hives against varroa mite.
- Karate Z (lambda cyhalothrin; Zeneca)—new encapsulated formulation.
- Permethrin Pro (Top Pro/Micro Flo)—new formulation being marketed to control termites in structures and other insects in turf and ornamentals and as a premise spray.
- Veridian (thiamethoxim; Novartis)—company proposed to register new active ingredient for insect control on greenhouse ornamentals, interiorscapes, turf, and sod.
- Vikor XL (cypermethrin;. AgrEvo)—public health insecticide, new formulation.

Herbicides

- Achieve 40DG and 80DG (tralkoxydim; Zeneca)—new active ingredient registered by EPA.
- Distinct (diflufenzopyr/dicamba; BASF)—received registration for post-emergence use on corn to control broadleaf weeds when the corn is 4-24 inches tall. It is fast acting with 6 weeks residual control and formulated as a WDG in 7.5 lb. jugs.
- Drive 75DF (quinclorac; BASF)—received registration for use as a post-emergence and pre-emergence turf herbicide to control broadleaf weeds and grasses. It can be used on both warm and cool season turf and will be marketed by Top Pro Specialties, the joint venture of BASF and Micro Flo Co.

Fungicides

- Agri Tin (TPTH; AgTrol)—new formulation to control *Cercospora* on sugarbeets.
- Cygnus (kresoxim-methyl; BASF)—new active ingredient registered for use on greenhouse ornamentals.
- Elite (tebuconazole; Bayer)—registered for control of powdery mildew and black rot on grapes.
- Folicur (tebuconazole; Bayer)—registered for use on grass seed to control rust and powdery mildew. May be applied within 4 days of harvest.
- Heritage (azoxystrobin; Zeneca)—registered for use on ornamentals, both landscape and production, including nurseries and greenhouses. Injury has been noted on apples, crabapples, and Yoshina flowering cherry. Also can now be used on all turf areas including home lawns.
- Premium Sulfur Dust (mycobutanil + sulfur; Wilbur Ellis)—new dust formulation available to control powdery mildew on grapes.
- SuperTin 80WP (TPTH; Griffin)—received EPA registration for use on potato to control early and late

blight (seven-day PHI).

Other

- Chipco Proxy (ethephon; Rhone Poulenc)—growth regulator received registration for use on turf for suppression of growth to reduce frequency of cutting. Registration does not include residential use.
- Flight Control (9,10-anthraquinone; Env. Bio Control)—EPA registered new product to repel geese at airports, golf courses, dumps, conifer nurseries, and other commercial/municipal sites.

Label Additions/Changes

Insecticides

- Archer (pyriproxyfen; Zeneca)—expanded label includes control of ants, crickets, flies, mosquitoes, ticks, moths, gnats, midges and carpet beetles. Also, it can now be used in aircraft cargo areas, animal research facilities, barns, cargo holds, outdoor pet and animal runs, ships, trains, transport vehicles, unoccupied livestock areas and poultry houses.
- Asana (esfenvalerate; Dupont)—mustard greens added to the label.
- Nylar (pyriproxyfen; MGK Inc)—outdoor use against various insects added to the label.
- Sanmite (pyridaben; BASF)—outdoor use on ornamentals added to the label.

Herbicides

- Pursuit (imazethapyr; AmCy)—aerial application on alfalfa added to the label.

Fungicides

- Elite (tebuconazole; Bayer)—aerial application added to label.
- Quadris (azoxystrobin; Zeneca)—control of *Alternaria* black spot, blackleg, and *Sclerotinia* of canola added to the label.
- Quadris (azoxystrobin; Zeneca)—cucurbits added to the label (cantaloupe, cucumbers, gourds, honeydew, muskmelon, pumpkin, squash, and watermelon).
- Quadris (azoxystrobin; Zeneca)—re-entry interval changed to 4 hours, and pre-harvest interval reduced from 7 days to day of harvest (not clear if this applies to all crops).

Label Deletions/Cancellations

Insecticides

- Ficam/Trucam (bendiocarb; AgrEvo)—requested to delete from the label use on non-bearing nut, citrus and other fruit trees, and use in aircraft and mausoleums.
- Guthion/Azinphis (azinphos-methyl; Bayer and Gowan)—companies requested that the following crops be deleted from the label: apricots, artichoke, barley, dry beans, oats, pasture grass, peas, rye, soybean, vetch, and wheat. Unless withdrawn, this will be effective on 10/12/99.
- Kelthane (dicofol; Robm & Haas)—all residential uses were voluntarily cancelled. Existing stocks must be sold by 2/1/2000.
- Mocap (ethoprop; Rhone-Poulenc)—manufacturer voluntarily canceled uses. EPA has proposed to revoke residue tolerances on mushrooms and soybeans.
- Morestan (oxythioquinox; Bayer)—manufacturer requested permission to cancel all uses of this product. Unless withdrawn, this will be effective on 10/12/99.

Herbicides

- Dalapon, fluchloralin, metobromuron, and sesone—all tolerances revoked by EPA.
- Finale (glufosinate-ammonium). AgrEvo. The company is NOT deleting the following from its label: right-of-way, ornamentals, Christmas tree plantations. The uses are being moved to a different label.
- Paraquat (Zeneca)—EPA proposed to revoke tolerances on rye and oat grain (currently no registered uses).
- Ramrod (propachlor; Monsanto)—dry-flowable formulations for this pre-emergence herbicide were voluntarily cancelled. Production was discontinued in August 1998 and products must be sold by 6/30/2000.
- Vernam (vernolate; Zeneca/Drexel)—The technical and end-user labels for this product have been voluntarily cancelled. Existing stock must be sold by 2/1/2000.

Fungicides

- Chlorothalonil (Zeneca/Sostram)—home lawn use voluntarily cancelled to address concerns about potential post-application exposure to toddlers around the home. Existing stocks must be sold by 2/1/2000.
- Maneb (Elf Atochem)—proposed to delete from the label use on grass due to the high cost of re-registration. Unless withdrawn, this will be effective on 9/7/99.
- Rovral/Chipco 26019 (iprodione; Rhone-Poulenc)—all residential uses for this product including ornamental residential turf and residential use in vegetables and small fruit gardens have been voluntarily cancelled. Existing stocks must be sold by 2/1/2000.
- Spot-Less (*Pseudomonas aureofaciens* strain TX-1; Eco Soil Systems)—a new bio-fungicide registered for control of turfgrass diseases.
- Zinc sulfate, glyoden, and nabam—all tolerances revoked by EPA.

Other

- Paraformaldehyde—tolerance in maple syrup revoked by EPA.
- Thinnex (Dow AgroSciences)—this thinning agent growth regulator will be withdrawn from the market and the registration will be cancelled later in 1999.

Section 18s and Experimental Use Permits

Insecticides

- Avaunt (indoxacarb; DuPont)—experimental use permit issued for use on 100 acres of apples, cole crops, tomatoes and lettuce to control various insects. The treated crops must be destroyed. Michigan is one of the states included in the permit (expires 2/9/2000).

Herbicides

- Finale (glufosinate-ammonium; AgrEvo)—EPA issued experimental use permits (EUPs) for tests on glufosinate-tolerant crops (canola, rice, sugarbeets) in 17 states, including Michigan. The EUPs cover 2543 acres, and the treated crop must be destroyed.

Fungicides

- Acrobat MS (dimethomorph + mancozeb; AmCy)—Section 18 granted for crown rot control on cucurbits in three states, including Michigan.
- Indar (fenbuconazole; Rohm & Haas)—Section 18 granted for use on blueberry in eight states, including Michigan. Expires 12-31-00.

Other

- Mycogen received an EUP for tests of transgenic *Bt* corn expressing a new type of protein, the Cry 1F toxin. The EUP is for 134 acres, and included acreage in Michigan.

Miscellaneous

- **Agrevo** has acquired India's second largest seed company, ProAgro, which specializes in canola, rice, and vegetables. Agrevo also acquired 100% of the Dutch seed company, Biogentic Technologies, which developed hybrid seeds such as corn, rice, and rape.
- **Agrevo**, under an emergency exemption, will be allowed to use the herbicide Liberty on 100,000 acres of Liberty Link canola planted in North Dakota and on 30,000 acres planted in Minnesota. AgrEvo plans to introduce Liberty Link rice as early as 2001 in the U.S.
- **Monsanto** has entered into a research agreement with Great Lakes Hybrids to develop corn rootworm-resistant hybrid corn. Monsanto has also announced a long-term license agreement with Zeneca. Under the agreement, Zeneca can develop and register Touch-down products for use on Roundup Ready soybeans, corn, and cotton in the U.S.
- **Monsanto** is joining with several forestry-related companies, including International Paper, to develop and market genetically engineered trees for fiber and wood production.
- **Pioneer** says it will have corn genetically engineered against corn rootworm ready by 2002.
- In 2000, **Rhone-Poulenc** plans to market herbicide (bromoxynil) resistant canola in Canada.

(Sources: *Ag. Chem News*, 4/15/99 and 5/15/99)

News Extras

World Round-Up of Transgenic News

A "round-up" of some of the latest controversies and decisions about genetically engineered crops.

Australia. A voluntary "GM (genetically modified)-free" label is ready for use sometime this year. The label can be used by farmers, food processors, restaurants, and others in the food business if they can prove their product is free from genetically engineered ingredients. Also, the product must be produced so it is "sustainable" and "humane to animals." Farmers who want to use the logo will have to sign a declaration that their crop is not genetically modified, while processors must also pay a fee.

Meanwhile, applications were due by April 30 to the Australian and New Zealand Food Authority (ANZFA) to keep existing GMO (genetically modified organisms) foods on the market. Over 20 applications were filed by the deadline for such crops as corn, cotton, potato, and sugarbeet. Two GMOs, Roundup Ready Soybean and Ingard Cotton, are already approved by ANZFA. The rest will be assessed shortly for toxicity, nutrition, and allergies. In the mean time, existing GMO foods can remain in the supermarket pending approval. If applications were not filed by April 30th, new food standards effective May 13, 1999 required that the GMO ingredients be declared illegal.

Brazil ended its ban on GMO crops in May. Monsanto is set to sell five types of Roundup Ready seeds in the country. Also, Brazil is beginning the process of deciding whether to label genetically modified foods.

Canada. A world committee met in Ottawa in April to discuss mandatory food labeling. The U.S. and Canada want food labeling to be voluntary, while the EU, Australia, Japan, and New Zealand have or are thinking about mandatory labeling. There was broader support for Canada's proposal to label foods when there has been a substantive change in nutritional value or when a new allergen has been introduced. Also under discussion were standards for organic labeling.

European Parliament. In late May, the Green Party in the Parliament asked for a ban on GM corn, based on the work from Cornell that *Bt* pollen can kill monarch butterflies (see feature article in this P-Notes issue). The European Commission then halted the approval of a *Bt* hybrid from a U.S. company.

Kenya. African papers are reporting on the GMO controversy, and an environmental group from Europe has established an office in Nairobi to begin political action against GMOs.

Portugal. On May 17, demonstrations were held outside the Portuguese Consumer Affairs Ministry to press for labeling of GM foods.

Russia. As of July 1, Russia will carry out its own safety tests of imported GM foods. Monsanto has applied for the first permit under the new Russian system. Currently, Russia relies on certificates from other countries guaranteeing their products are GMO-free.

Switzerland. In April, the Swiss turned down company requests to plant genetically engineered corn and potatoes in test plots in that country. Health and environmental concerns were cited as the reason for the decision. The ruling only affects the planting of GMOs—doesn't affect the import of genetically modified food or food products into the country.

United Kingdom. Government funded research showed that bees carry pollen from genetically engineered plants 2.5 miles. This implies that cross-pollination between genetically modified and conventional crops could occur at distances greater than previously thought.

The British Medical Association—BMA—(similar to the AMA in the United States) issued a statement in mid-May calling for extensive testing and monitoring of transgenic crops. The Association stated GMO food should be labeled, and kept separate from other foods in case there are health effects. The physicians are also worried about allergies or toxicity of food containing GMOs. The U.S. position is that crops are safe because they are equivalent to conventional crops, with the exception of a few genes. The BMA disagreed with this position, stating that unexpected gene interactions may occur, and that there is not enough information to conclude that the risk to the environment and human health is negligible from the production and consumption of GMOs. Finally, the doctors urged much more stringent monitoring of the effects of biotech crops.

USA. Archer Daniels Midland Company (ADM—"Supermarket to the world") announced it would only buy transgenic corn approved for export to Europe. Four corn varieties have been approved by the European Union (EU); approval of many of the others have been held up by consumer protests. ADM said it will purchase and market hybrids as they are approved by Europe. Farmers growing grain not approved by the EU must sell it elsewhere or use it on-farm [info from various sources, including *World Food Chem News* 6(2), 6(3)].

EU Organic Regs Set for June

By June 30th, the European Union will begin enforcing regulations on the production and labeling of organic food. Although the regulations were passed in 1991, the EU will only begin enforcing the laws this month. The United States must also begin complying with the regulations. The USDA held several training programs this spring to update organic certifiers who inspect organic growers importing to Europe (based on *Pest. & Tox. Chem. News,* 4/15/99).

Breast Milk Pesticides Related to Lake Ontario Fish

Women who ate fish from Lake Ontario—the most polluted Great Lake—had 30% higher PCB levels and more pesticides in their breast milk than women eating fish from other sources. Researchers at the University of Buffalo studied 100 breast milk samples from women who lived near Lake Ontario and ate fish from the lake. The milk was tested for 77 different PCBs, the pesticides hexachlorobenzene and Mirex, and DDE, the breakdown product of DDT. Although women who ate Lake Ontario fish had more PCBs and pesticides in breast milk, the levels declined as the women had more children and spent more time breast feeding. Researchers say that breast-feeding may be the primary means that females excrete persistent toxic compounds.

Parasite Linked to Deformities in California Frogs

Recent studies in the April 30 issue of *Science* report that parasitic infections, not pesticides, are the cause of limb deformities in frogs. The studies theorize that flatworm larvae burrow into tadpoles' hind leg regions causing infections that stimulate limb buds to divide and form multiple limbs. In one study, lead by Pieter Johnson at Claremont McKenna College in Southern California, tadpoles of the Pacific tree frog were exposed under controlled conditions to small parasitic flatworms called *Riberoria* trematodes. The study found that the severity of deformities, including missing, partial, and extra legs, was directly related to the concentrations of parasites. A high percentage of the frogs developed multiple legs. The results produced in the lab were consistent with field studies documenting the same type of problem in several ponds in Santa Clara County, California.

The trematode life cycle includes snails, tadpoles and frogs, and birds. After hatching, the trematode is consumed or absorbed by a snail. The worm develops into a

larvae that is deposited in a pond where it hooks onto a tadpole and forms cysts in the leg buds, resulting in leg deformities in the mature frog. The deformed mature frogs are easy prey for birds, which become the next host of the parasite.

Parasites, however, have not been linked to the cause of frog deformities in other states such as Minnesota, Wisconsin, Vermont, and Maine, where the species of frog and the parasite studied are not found. The frogs studied in these states tend to have missing legs, rather than the multiple legs of Johnson's frogs. Canadian researchers also reportedly have not found any connections between parasites and thousands of deformed frogs in the St. Lawrence River Valley of Quebec. Pesticides and other chemicals continue to be suspects in the cause of these deformities (adapted from the *Star Tribune* and the *Pioneer Press*, April 30, 1999).

Food Quality Protection Act Information

For more information, contact a regional MDA office or Dr. Christina DiFonzo, MSU Pesticide Education Program (517) 353-5328.

Pombo Bill Introduced into U.S. House

On April 27th, U.S. Rep Richard Pombo (California) introduced a bill that directs EPA to use sound science in its FQPA decisions. The bill directs EPA to collect information to fill in scientific data gaps before making decisions, and to conduct a *transition analysis* when it revokes or denies a registration or tolerance. The transition analysis would include information on how the decision was made, plus analyze the alternatives, effect on imports, crop damage, and production costs related to the revocation or denial. The Pombo bill also calls for the Agency to form a *Pesticide Advisory Committee* to help with FQPA implementation. The bill had 21 sponsors from both parties, and is now in committee.

April Showers Bring TRAC Sours, Plus the Resignation of Seven Members

TRAC—the Tolerance Reassessment Advisory Committee—the group set up by EPA to advise it on FQPA implementation, is smaller by 7 members. All representatives of public interest groups resigned in protest in a letter dated April 26. The groups were: Consumers Union (CU), Farmworker Justice Fund, Farmworker Support Committee, the National Campaign for Pesticide Reform, the Natural Resources Defense Council (NRDC), the Pesticide Education Center, and the World Wildlife Fund (WWF). Last year, the groups wrote to the Clinton administration expressing their frustration about the time and resources spent on TRAC. The groups felt that the EPA staff time devoted to TRAC was delaying the implementation of FQPA and the protection of children from pesticides. This time, the groups left TRAC for good, saying TRAC "has been marked by an endless, fruitless airing of stakeholder opinion about pesticide science and policy, and continually reopened debates about scientific data and studies." TRAC "ultimately clogged the decision making network to the extent that regulatory action has been brought to a near stand still" which "will only benefit those who profit from the status quo." USDA and EPA expressed their disappointment in the resignations, but said the risk assessments mandated under FQPA were fundamentally different from how things were done in the past, are very complex, and need to be based on good data (info from EPA press release).

Texas A&M Study Looks at Eliminating OPs, Carbamates

Researchers at Texas A&M's Ag and Food Policy Center and Auburn University released a study in May, "Impacts of Eliminating Organophosphates and Carbamates from Crop Production." According to the study, eliminating these two groups of pesticides would lead to (no surprise) increased production costs for farmers, lower crops yields, higher food prices for consumers, more imports from other countries, lower consumption of fruits and vegetables, and regionalization of crop production. It also predicts the following impacts:

- Of all crops, apple production would be impacted the most, with 38% yield reduction and 66% increase in production costs.
- Yield reductions in other crops—carrots (7%), corn (4%), grapes (9%), peaches (2%), potato (3%), sorghum (12%), soybean (5%), tomato (15%), and wheat (1%).
- $17-billion decrease in total U.S. economic output.
- Increased resistance to OP and carbamate alternatives.

Note that the report specifically only looks at a complete ban of all OPs and carbamates, and does not take in consideration elimination of only a few products or uses.

The Link between Worker Protection and FQPA

FQPA now requires that EPA require aggregate exposure when setting tolerances. This means residues from food, drinking water, and residential exposures, such as lawn sprays, structural pest control, and pet products, all go into the risk cup. Aggregate exposure only does not include occupational exposure, in other words, exposures to people manufacturing pesticides, applicators spraying pesticides, or farm workers working in pesticide treated fields. But just because worker exposure data can't be used in FQPA risk assessments, it still could play a role in EPA's decisions under FQPA. For example, say Pesticide X, used on fruits and vegetables, is overflowing its risk cup, i.e., dietary exposure to residue is deemed by EPA to be too great. Which uses of Pesticide X should be revoked or curtailed? To make that recommendation, EPA can use worker exposure data. For example, say EPA has data to show that reported farm worker poisonings due to Pesticide X are greatest in apple and peach production systems. Presto, remove tree fruit from the Pesticide X label, meet both FQPA and WPS standards. Remember, mitigation strategies proposed for FQPA, such as changes in spray rate, frequency, or formulation, link to how that product meets worker protection standards. Such changes influence worker re-entry intervals, PPE requirements, use of certain spray equipment, etc.

Endocrine Disrupter Update

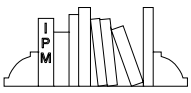
At a scientific meeting in mid-April, researchers reported on studies showing that certain chemicals cause endocrine disruption at both very low and very high levels, but not at middle doses. This research could have implications on the types and levels of testing EPA will eventually require under FQPA. EPA has expanded it endocrine testing program to include not just pesticides, but environmental contaminants, food additives, cosmetics, and nutritional supplements—possibly 90,000 chemicals to be tested. EPA is still deciding on the exact assays to use in its endocrine-screening testing program. One of the problems is that some of the research that has influenced the endocrine debate has not been repeated. Sometimes results vary from lab to lab, and researcher to researcher, and even different strains of mice or different lab conditions (such as the mouse chow fed to the mice) seem to influence the outcome of experiments.

Europeans also Reviewing OPs and Carbamates

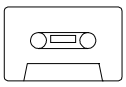
By July, the European Union is expected to target OPs and carbamates for acute dietary reassessment. The discussion surrounding this move sounds oddly familiar—lack of residue data, incomplete food consumption data, exposure estimates based on animal studies, concerns over who will pay to generate needed data, and a special worry about minor crops. Most crops in Europe are considered minor, and to further complicate matters, Europe is divided into two regulatory zones for pesticides: moderate (north) and Mediterranean (south). A registrant has to obtain separate registrations for each region, which further divides crops into smaller units.

As of June 1, 1999…

Only 64 Shopping Days left until August 3rd, 1999, when the first group of pesticide tolerances must be reviewed by EPA! EPA already admitted it will not be able to reach its goal of reassessing all OP, carbamate, and B2 carcinogen tolerances by that date, but the Agency expects to still have 1/3 of the 9,000 tolerances reviewed—just not necessarily the "Worst-First."



Resources



Announcing Web Site for MSU Pesticide Education Program

The MSU Pesticide Education now has a Web site at: http://www.pested.msu.edu/. The site contains information about the Pesticide Education Program and staff, back issues of the *Pesticide Notes* newsletter available in PDF format, information on licensing and certification and on pesticide-related bulletins. Useful links to related sites such as the Michigan Dept. of Ag., Pesticide Impact and Assessment Program (PIAP), and the Center for Integrated Plant Systems (CIPS) are also located at the site.

Training Tutorials Available from the University of Florida

The University of Florida Entomology and Nematology Department announces the release of a new series of computer-verified training tutorials on arthropod pests and beneficials of turfgrass, ornamentals, household and wood and on pesticides.

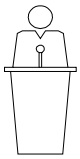
East tutorial takes about 4 MB of hard disk space and requires Windows. The tutorials currently available are:

Core 2: Pesticide Labeling
Core 6: Harmful Effects
Demand CS
Turfgrass Insects #1
Turfgrass Insects #2
Ornamental Insects #1
Pest Ants
Cockroaches
Mulch and Moisture Pests
Eastern Subterranean Termites
Wood-destroying Pests

Each tutorial is authorized by Florida for one (1) CEU for recertification. Details on these tutorials are posted on the UF Buggy Software WWW site at:
http://www.ifas.ufl.edu/~ent1/software/fasulo.htm
A discount of 40% is applied when 10 or more of a single title are ordered.

Recognition and Management of Pesticide Poisonings

The 5th edition of the EPA manual, *Recognition and Management of Pesticide Poisonings* (March 1999) is now in print. Copies of the manual (EPA 735-R-98-003) can be ordered at Telephone No. 703-305-7666 or Fax: 703-308-2962. The manual will also soon be available in electronic format on the Internet at: http://www.epa.gov/pesticides/safety/healthcare



Pesticide Applicator Recertification Seminars

This partial listing of recertification seminars was provided by MDA. Certified applicators and registered technicians may earn recertification credits by attending these programs. For additional information, call the MDA Lansing office at (517) 373-1087.

NOTE: Renewal of pesticide applicator certification credentials can be done by taking the appropriate exam(s) or by obtaining the necessary number of recertification credits by attending approved seminars.

Date	Seminar	Location	Credit	Category	Phone #
6/14	Monday Night Fruit Spray Update	South Haven, MI	1	Priv,1C	(616)657-7745
6/14	Twilight Fruit Mgmnt In-Season Mtg	Ludington, MI	1	Priv,1C	(616)873-2129
6/15	IPM Breakfast Update	Centreville, MI	1	Priv, 1A, 1B	(616)457-5511
6/21	Monday Night Fruit Spray Update	Benton Harbor, MI	1	Priv,1C	(616)657-7745
6/21	Twilight Fruit Mgmnt In-season Mtg	Ludington, MI	1	Priv,1C	(616)873-2129
6/22	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
6/23	IPM Breakfast Meeting	Sparta, MI	1	Priv,1C	(800)767-1345
6/23	Twilight Fruit Mgmnt In-Season Mtg	Manistee, MI	1	Priv,1C	(616)873-2129
6/24	Mid-season IPM Meeting	Ann Arbor, MI	2	Priv,Com Core,1A	(517)264-5300
6/24	Grower Meeting	Belding,MI	1	Priv,1C	(616)887-8333
6/24	Twilight Growers Meeting	Fremont, MI	2	Priv,1C	(800)767-1345
6/25	Mid-season IPM Meeting	Adrian, MI	2	Priv,Com Core,1A	(517)264-5300
6/28	Monday Night Fruit Spray Update	South Haven, MI	1	Priv,1C	(616)657-7745
6/28	Twilight Fruit Mgmnt In-Season Mtg	Ludington, MI	1	Priv,1C	(616)873-2129
6/29	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
6/30	Twilight Fruit Mgmnt In-Season Mtg	Manistee, MI	1	Priv,1C	(616)873-2129
7/5	Monday Night Fruit Spray Update	Benton Harbor, MI	1	Priv,1C	(616)657-7745
7/6	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
7/7	IPM Breakfast Meeting	Sparta, MI	1	Priv,1C	(800)767-1345
7/12	Monday Night Fruit Spray Update	South Haven, MI	1	Priv,1C	(616)657-7745
7/13	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
7/19	Monday Night Fruit Spray Update	Benton Harbor, MI	1	Priv,1C	(616)657-7745

7/20	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
7/26	Monday Night Fruit Spray Update	South Haven, MI	1	Private,1C	(616)657-7745
7/27	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
7/29	Mid To Late Season IPM	Ann Arbor, MI	2	Priv,Com Core,1A	(517)264-5300
7/29	Twilight Growers Meeting	Fremont, MI	2	Priv,1C	(800)767-1345
7/30	Mid To Late Season IPM	Adrian, MI	2	Priv, Com Core,1A	(517)264-5300
8/3	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
8/10	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
8/17	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
8/24	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
8/26	Late Season IPM	Ann Arbor, MI	2	Priv,Com Core,1A	(517)264-5300
8/27	Late Season IPM	Adrian, MI	2	Priv,Com Core,1A	(517)264-5300
8/31	IPM Breakfast Update	Centreville, MI	1	Priv,1A,1B	(616)467-5511
10/12	FC Pesticide Stewardship Sem-Day 1	Houston, TX	4	Com Core,7A,7C,ST,C	(913)782-7600
10/13	FISA Good Manuf. Pract.-Day 2	Houston, TX	2	Com Core,7A,7C	(913)782-7600
11/9	MI Grnhse Grwrs Expo-Root Zone Mg	Lansing, MI	2	Priv	(616)383-8830
11/9	MI Grnhse Grwrs Expo-Disease Mgnt	Lansing, MI	2	Priv	(616)383-8830
11/9	MI Grnhse Grwrs Expo-Insectcde Updt	Lansing, MI	1	Priv	(616)383-8830
11/9	IFC Pestcde Stwrdship Seminar-Day 1	Atlanta, GA	4	Com Core,7A,7C,ST,C	(913)782-7600
11/10	FISA Good Manuf Pract-Day 2	Atlanta, GA	2	Com Core,7A,7C	(913)782-7600
11/10	MI Grnhse Grwrs Expo-Insect Mgnt	Lansing,MI	2	Priv	(616)383-8830
11/10	MI Grnhse Grwrs Expo-Fungicde Updt	Lansing, MI	1	Priv	(616)383-8830
11/12	OPCA Training School	Cincinnati, OH	4	Com Core,7A,7B	(614)789-9020
11/13	OPCA Training School	Cleveland, OH	4	Com Core,7A,7B	(614)789-9020

Instructions for recertification training seminar attendance and training seminar dates are posted at the MDA website:
http://www.mda.state.mi.us/industry/semsked.html

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