Guthion™, Azinphosmethyl (AZM), Talking Point Outline for Comments to USEPA 2006

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Introduction.- It is a fact that the USEPA risk managers have no choice but to make regulatory decisions according to their statutory responsibilities. Surprisingly, this Agency (USEPA) very much wants and needs grower, field scientist and extension inputs. Your comments in their decision making will be considered. Federal law and promulgation of public policy provide for this opportunity. Therefore, each person involved in tree fruit production has both the opportunity and the wherewithal to make comments in the pesticide regulatory process. AZM received a three year, Group 3 Conditional Registration from USEPA in 2003. This Conditional Registration is ending and AZM is again being reviewed by the Agency through a six step process. Every step is tightly regulated by policy. USEPA is asking for your help; more specifically your comments. Regulators want to hear what they term "**the benefits**" as apposed to the impacts and drawbacks of Guthion's use. I've prepared this document in an effort to help you comment with sufficient background to be effective and on-target with your comments.

Note that the first Reference Cited at the end of this document is an outline of the information USEPA would like to receive in your comment submission (1).

How to comment—directions for web-based comment.- The Federal Register Notice published on 12/7, started the 60-day comment period on the ecological risk assessment and potential grower impacts (benefits assessment) is found below in a step by step format. You can also comment by sending a letter in to USEPA and the address and directions for this method of comment is also contained at the web site listed below. Note that the docket number is the key to getting your comments in the right folder so that it will be considered. Remember, at any time during the year, our Government may be taking 100's of different comment dockets for numerous agencies. Therefore, it is essential that you stay identify the correct docket location on the Federal Register (FR) Notice = #45. Hopefully what follows will help you do this without much difficulty.

1. **USEPA Comment Period: Ending February 6th**
2. **Procedure for Submitting Comments to USEPA's Guthion Docket:**
   a. go to: www.regulations.gov
   b. select agency = "**EPA**"
   c. document type select "**all document types**"
   d. keyword type in "**opp-2005-0061**"
   e. select "**any word**" submit
   f. Once the docket comes up, click on the docket number **EPA-HQ-OPP-2005-0061.** The recent submissions start with **#32. Note! This is in the second display window.** The FR Notice is **# 45.** Note also, the numbers are not consecutive. USEPA is still working on this site so be persistent!
3. Below you will find a number of points that will help you address the potential loss of Guthion in tart and sweet cherry crop protection.
4. **Background- A Brief Insecticide Regulatory History:**

Because processed cherries have a zero tolerance for worms in processed product, growers face a daunting task in producing tart and sweet cherries for the processing market. Historically this was only possible through powerful chemistries like Azinphosmethyl (AZM), Guthion™, which is an organophosphate (OP) insecticide. The cherry processing industry in the US evolved during the 'Organophosphate insecticide era' when for 35 years growers experienced outstanding control of fruit pests that would have otherwise infested fruit before harvest depressing the marketing of a wholesome and attractive product. Now the cherry industry has become dependant upon the power of organophosphate chemistry to meet its demanding marketplace quality standards.

The passage of the Food Quality Protection Act (FQPA-1996) resulted in an extended AZM preharvest interval (PHI) to protect against residues in the diets of children and infants even though OP residues were below the limit of detection (LOD) in processed cherries. The Pesticide Reregistration Improvement Act (PRIA-2004) merged and streamlined the reregistration statutes in different pesticide legislation including the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA-1972), FQPA and the Endangered Species Act (ESA-1972) as amended into one process. Together these federal regulations have placed great pressure upon USEPA to mitigate or cancel the uses of organophosphates in specialty crops like cherries. In addition, a number of environmental activists groups have targeted the organophosphate class of insecticides for cancellation.

Yet one of the most significant AZM mitigations came through the application of the Worker Protection statutes in the Federal Insecticide, Fungicide, and Rodenticide Act (1972) where reentry intervals (REI) were extended three years ago allowing Conditional Registration of AZM by USEPA. In addition, the ecological and water statutes in FIFRA, the ESA and Clean Water Act as amended continue to cause USEPA to address these statutory responsibilities which may result in reduction or cancellation in many pesticides that impact the environment.

Guthion has severe ecological impacts.- AZM is arguably the most ecologically destructive pesticide chemistry in use in North America today. A 2001 report on the impact of AZM on ecosystems, fish, invertebrates, birds, etc. led USEPA officials to identify AZM as the pesticide generating over 50% of all aquatic kill incident reports in the US (2). But the issue before you in this comment period is not whether or not AZM really is the most ecologically devastating pesticide in use today, but rather, what are the benefits the cherry industry derives from its use? Additionally, what would happen to the cherry industry if AZM were not available?

Acute vs Chronic Data for Ecological Assessment: To answer the above questions we must look at how USEPA determines ecological impact of an insecticide. The Agency uses two principal types or categories of impact data; 1) acute and 2) chronic toxicity. Foremost in their assessment of ecological impact is acute toxicology data. These data are readily acquired in the laboratory and analyzed unequivocally scientifically. Registrants (pesticide companies) find these data comparatively

inexpensive to acquire and report. From bacteria through mammals, acute toxicity methods are well defined, easily documented and almost without major scientific disagreement in interpretation. These data are therefore part of every USEPA pesticide registration and reregistration process. Acute toxicological data are the backbone of USEPA's ecological assessment process on the way to granting or rejecting registrations.

However, acute toxicity is only part of the story of the impact of any chemistry used in agriculture or the environment. Chronic toxicity effects are all of the non-lethal impacts like reduced reproduction, bioaccumulation from species to species up through the food web of life, behavior changes like altered bird songs, changes in development time or shape or structure.

Mitigation.- With registration companies can legally manufacture, distribute and sell their pesticide with a "LABEL" dictating how the pesticide is to be used. USEPA often controls or reduces the negative impacts of pesticides with changes to the Pesticide's Label. Three years ago (2003) AZM's received a Conditional Registration Because USEPA required certain changes on its use label. USEPA used these changes to reduce AZM's impact by "mitigating" worker exposure by extending legal post application reentry intervals (REI), by mitigating (reducing) AZM residues in food by extending its legal preharvest interval (PHI) and by mitigating (reducing) both its acute (kill) and chronic effects in ecosystems by reducing the total pounds that could be applied in a season. All of these changes came to users through LABEL CHANGES. And this process is known as MITIGATION of the negative effects of AZM.

Ecological Incident Reports.- With sales comes field use, and with field use often incidents of **both acute (kills) and chronic effects (reduced reproduction, failed mating, changed development times, etc.)** are reported. Because AZM has a very bad history of causing fish kills, water problems with sensitive species like mayflies and impacts on birds, butterflies and endangered species it is currently facing a major challenge for reregistration based on its Incident Reports record of negative impacts in the environment.

Measuring or counting killed fish, birds or butterflies is pretty straight forward even if it is alarming publicly. However, understanding and assigning chronic toxicity effects is very tricky. Today, chronic environmental and ecological effects for regulatory purposes remain controversial. Practical and meaningful studies of non-lethal effects take longer and require more subtle information than counting the number dead butterflies at such and such a rate of use. Therefore, many practical and scientific issues and disagreements attend most chronic impact information. Because the science is controversial so too regulation based on chronic effects is controversial.

USEPA has to legally use ecological problem reporting from the field (Incident Reports). Often these reports are more like forensic science where regulators and state scientists try to recapitulate causative agent(s), contributing circumstances and infer

long-term outcomes without really measure chronic impacts in a meaningful way. Thus these incidents are produce anecdotal, expensive, and controversial regulatory data. As a rule then, laboratory and incident related chronic ecological impact assessment is rife with problems. Table 1 below represents a more comprehensive orchard chronic effect analysis of AZM, "OP-alternatives" and "reduced risk" insecticides.

Understanding the acute vs chronic toxicity issue is especially important in commenting on the inferred and reported ecological effects of AZM (3). When we actually think about environmental and ecological effects of pesticides, it is easy to believe that most pesticide exposure in nature is actually chronic (subtle long-term) and not acute (outright killing). This means that our regulatory system is practically and scientifically designed from an acute perspective, but called upon to protect from the most common exposure which is not acute but chronic. Therefore, the USEPA's acute toxicity registration paradigm can miss important subtle long-term effects as occurred with compounds like DDT a chlorinated hydrocarbon. USEPA leaned the chronic toxicity lesson from DDT the hard way, and as a result the Agency is especially sensitive to criticism from chronic effects. However, we can over react using the DDT experience to infer long-term effects with the use of all compounds without data. This latter instance can lead to subverting or replacing one compound for another based upon acute criteria when the chronic effects of a replacement can not be fully know until years after it has been used.

With AZM we have over 30 years of field use to estimate its chronic effects. With many of its replacements, we have very little time; less than 5 years for a few and less than 1 or 2 years for many reduced risk compounds currently favored for registration.

Therefore, by looking primarily at acute toxicity, AZM appears to be a very disruptive chemistry which rapidly kills many different exposed species. Its action is relatively quick and broad spectrum, but its residues break down rather rapidly into various nontoxic carbon molecules. For illustrative purposes, I like to characterize AZM's ecosystem impact as "deep" (broad spectrum), but short (residues break down rapidly). In contrast, something like a neonicotinoid or Insect Growth Regulator (IGR) may have "shallow" but "long" impacts. The comparison of how both may impact the same orchard ecologically is illustrated in Figure 1. The question for all of us is which is better; a short deep impact or a long shallow impact? In this instance, it may be more about trading off effects and your comments/preference about choosing something we know vs. something we do not know can be made just as well as the next persons.

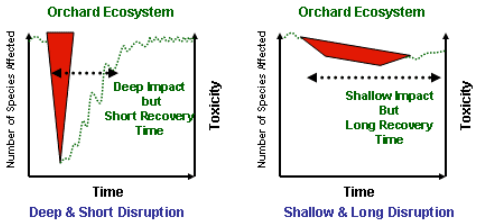

Figure 1. An illustration of different insecticides upon the ecology of an orchard.

Benefits of AZM USE.- One of the "benefits" of AZM is that we do know a lot about how it works in ecosystems. We have learned how to use it effectively, and the cherry industry's current "zero tolerance" was achieved through the "power" of the OP compounds. Since AZM's residues dissipate in the environment fairly rapidly, the long-term impacts are limited in time. This is a significant "benefit" as chronic effects of AZM have a relatively short time impact. Building on residue breakdown as a "benefit", in a very important way, rapid breakdown limits AZM's residue at harvest and keeps pesticide residues below detectable limits in processed products. This is a very real "benefit" from AZM use compared to many of its OP-alternatives and reduced risk replacements.

Further mitigation of AZM Environmental/ecological Effects.- The cherry industry may want to offer additional AZM use changes in order to keep its Conditional Registration for another three years. Essentially, any reduction is use equals an environmental mitigation. But what tactics could really reduce environmental and ecological impacts without reducing the effectiveness of AZM for the cherry industry? Here are a few you may want to consider:

a) Currently, the anti-drift measures on the label for Guthion Solupak 50% WP registered on cherries reads, "for airblast applications, turn off outward pointing nozzles at row ends and when spraying the outer two rows." If this is to be mitigated further, perhaps suggest spraying inward on outer three rows?
b) Consider adding a label distance to water restriction, essentially establishing a specific 'set back' buffer, e.g. "x" number of feet where x = 50, 100 or 150 feet,
c) Restrict airblast spraying to conditions below 8 mph wind velocity, instead of "make aerial and ground applications when the wind velocity favors on-target product deposition. Apply only when the wind speed is less than 10 mph,"

5. Reentry Intervals and Worker Protection: Conclusions from the Bayer 2004 Tree Fruit Orchard Study Oregon and Michigan

a) Exposure to AZM treated crops after REI does not affect plasma or red blood cell (RBC) cholinesterase activity.
b) MOEs (margin of exposures) for all monitored activities do not exceed a reasonable level of concern.
c) Current REIs (reentry intervals) are more than adequate to protect workers.

6. USDA Standards and Market Driven "Zero Tolerance" for Internal Worms in Processed Cherries:

The "zero tolerance" for worms in cherries grew out of evolving market standards dating back to the early part of the 1900's. As early as 1926 Michigan saw legislation enforcing the abandoned cherry orchard removal and other strategies to reduce pesticide pressure and reach for a zero tolerance in processed cherries. Chlorinated hydrocarbon insecticides like DDT paved the way for the cherry processing industry to evolve to a practical "zero tolerance" that came to be the standard with the advent of powerful organophosphate insecticides through both USDA quality standards, and more importantly, the market's demand which is now "zero" worms in processed

product. Essentially, with the development and use of organophosphate insecticides the US cherry processing industry stabilized its global position as suppliers of a worm-free product year after year. This remains the quality standard today.

Now the US cherry processing industry has little choice; people refuse to eat worms in their cherries! What's more, other producers internationally can achieve this standard by using OP's that yield below LOD residues even if the US bans AZM. In this event, the US processing cherry industry would be severely penalized compared to their international competitors. In other words, this would be a severe market disadvantage for US producers and processors, especially in light of the increased production costs and increased risk of infestation from OP-alternatives and so called 'reduced risk' (RR) compounds summarized below.

Cherry Crop Profile.- Essentially, the USDA Cherry Crop Profile and Pest Management Strategic Plan for tart and sweet cherries identify the critical need to achieve the "zero tolerance" by primarily suppressing plum curculio, *Conotrachelus nenuphar* and the cherry fruit fly (*Rhagoletis cingulata* and *R. fausta*) along with a number of other pests that can occur. These documents recognized willingness, but also recognize the difficult "realities" of moving the cherry industry to adopt other strategies, tactics and tools that can not reliably deliver the "zero threshold" standard upon which the whole industry is based. Therefore, the cherry industry has been more than a responsible citizen by making the effort and investing the resources to accomplish a "zero tolerance" without using organophosphate insecticides. To date, these efforts are too premature to force a whole industry to do away with AZM before proven and reliable alternatives are in place.

7. Extensive efforts to find Reduced Risk (RR) and OP-alternatives since 1996
Cherries were identified in the FQPA (1996) federal deliberations as one of the 20 most consumed children's foods. Hence cherries were "under the microscope" by USEPA and USDA especially from crop protection residues that were perceived to be harming children and infants.

But all cherries are not equal. There are cherries and then there are processed cherries. EPA (pre-FQPA) and the National Science Foundation (4) did not understand production practices well enough to know that fresh cherries for the most part are hand harvested and bear insecticide residues to market. Processed cherries however, are harvested by machines into water. In addition, processed cherries are cooled with water washes for at least 3 hours before transport to a processor. Thus organophosphate residues from AZM where hydrolyzed and dramatically mitigated prior to processing.

No Detectable Residues at Processing with AZM.- Michigan State University in cooperation with the Cherry Marketing Institute and Michigan Department of Agriculture did a number of studies from 1998-2001 linking pest management practices in the Michigan processing cherry industry with residues before harvest, after harvest and after processing (5). These studies revealed that Guthion (AZM)

residues on processed cherries were not just below legal tolerances, but below the limit of detection (LOD) by modern analytical methods. The current USDA cherry RAMP grant is conducting similar experiments and these data will be available in March of 2006—too late for the AZM Comment Period, but we fear that they will reveal that RR and OP-replacement compounds; particularly the neonicotinoids (Provado, Actara, & Calypso), Insect Growth Regulators (IGR) (Confirm, Esteem, Intrepid, Rimon) and old OP-replacement compounds like Sevin (carbaryl) will leave residues in processed fruit.

Will USEPA Force the US Processed Cherry Industry to Put Detectable Residues on Fruit by Canceling AZM?- If USEPA driven by FQPA, PRIA, ESA, and FIFRA cancels AZM use on cherries, its decision will almost certainly put reduced risk or OP-replacements residues into US processed cherries. This decision could be the Achilles heal of an industry struggling to remain profitable in the face of increasing foreign competition. This situation would be especially odious since AZM use would still be allowed internationally since AZM residues on imported fruit would remain below the limit of detection just as those here in the US have.

Worker exposure already mitigated.- Since 99.9% of the US cherries that are processed are machine harvested, worker protection issues and reentry (REI) issues are already mitigated very significantly. Processed cherries have almost no in-orchard operations during the short 60-64 day growing season compared to apples and other stone fruits. With the exception of spraying, IPM monitoring and very limited mowing no worker tasks are necessary until harvest. Thus real worker exposure is dramatically reduced compared with other crops that require thinning.

Will OP-Alternatives and Reduced Risk Compounds Achieve the 'Zero Tolerance'?- The upper Midwest cherry industry (MI, NY, WS) has very significant pests with 'zero tolerance" in processed products for worms at harvest. This is not a producer imposed standard, but an industry, consumer and US law imposed standard. The two most significant insect pests include the plum curculio and cherry fruit fly complex. But other pests can also be problematic for growers to achieve the zero infestation standards including the cherry fruitworm (*Grapholitha parckardi*), and various other weevils (go to the web site- www.whalonlab and click on "Curculio Identification" for a tour of other weevils in MI cherries). Only a few of these pests, other than plum curculio, are problematic where organic practices, reduced risk and/or OP-alternative compounds are used.

Scientist in land grant universities like Michigan State University have studied more than 25 reduced risk, OP-alternative, biopesticide, kairomone and natural products to control internal cherry feeders (primarily plum curculio and cherry maggots) in the last 7 years (USDA/Special Grant, PESP, RAMP and CAR; USEPA PESP and AFT grants as well as Gerber Products Co, Cherry Research Committee, cherry processors and crop protection industry support). These efforts will be discussed below by pesticide or management class.

OP-Alternatives: Phosmet (Imidan™) is not as effective as AZM for plum curculio control, but is adequate for cherry fruit fly management (Michigan Fruit Management Guide MSU E-154). Researchers and extension field personnel have also compiled 25 years of field, research plot and anecdotal information across seasons, orchards and observers into a risk matrix using a number of compounds including Imidan (Table 1). Overall phosmet does not yield the same control assurance that AZM does in cherries. If AZM were cancelled, phosmet use would probably increase from 2 x to 3 ½ x in tart cherries but very little in sweet cherries where phytotoxicity is a major concern.

There are several likely candidates for Guthion (AZM) replacement for control of Plum Curculio (PC) that are in various stages of development and testing. These include Avaunt (indoxacarb), Calypso (thiacloprid), and Imidan (phosmet). Phosmet has been used in cherries for many years and is no longer classified by USEPA as an Extremely Hazardous Substance (5).

Table 1.-Reduced Risk, OP-Alternative, Biopesticide, Kairomone and Natural Products Tested

OP Replacement Ratings[a] **Ecological Impact[b]**

For 3 Internal Feeding Pests

EPA Class.	Class. Chem	Cmpd.	PC[c]	CFF[c]	CFW[c]	Bees	Mite Predators	Predators	Functional Ecology
Conditional Registration	OP	Guthion	E	E	E	T	S	M	-20
	OP	Diazinon	P	G	P	T	M	T	-30
	OP	Imidan	Ph	Ph	Ph	T	S	M	-10
	OP	Lorsban	G	G	G	T	T	T	-40
	OP	Malathion	P	G	G	T	M	M	-30
OP-Alt	Carbamate	Sevin	N	G	G	T	T	T	-40
OP-Alt	SP	Asana	Ph	G	G	T	T	T	-60
OP-Alt	Pyrethrum	Pyganic	N	N	N	M	M	M	-5
OP-Alt	Spinosad	Entrust	N	N	N	M	S	M	+10
OP-Alt	SP	Ambush	G	F	G	T	T	T	-40
OP-Alt	SP	Pounce	G	F	G	T	T	T	-40
OP-Alt	Chlorinated Hydrocarbon	Thiodan	N	G	N	M	M	M	-20
OP-Alt	Pipronyl Butoxide + Pyrethrum	Evergreen	N	N	U	M	M	M	-10
OP-Alt	SP	Warrior	G	G	G	T	T	T	-50
RR	IGR	Esteem	U	N	U	S	S	S,MG	+20
RR	IGR Oxadiazine	Avaunt	E	N	U	T	S	S	-10
RR	IGR Diacylhydrosine	Intrepid	N	F	U	S	S	S	+10
RR	Spinosad	GF-120	N	F	N	U	S	U	+10
RR	Spinosad	Entrust	N	F	U	M	S	M	-10
RR	Clay	Surround	G	E	U	N	M	M	-5
RR	Antifeedant	Neem	P	N	U	S	S	S	+5
RR	Neonicotinoid	Actara	G	G	U	T	S	M	-20
RR	Neonicotinoid	Assail	G	G	U	M	S	M	-20
RR	Neonicotinoid	Calypso	E	G	U	M	S	M	-20
RR	Neonicotinoid	Provado	F	G	U	T	S	M	-20
RR	Biopesticide	Mycotrol O	Ph	Ph	Ph	T	T	T	-10
RR	Biopesticide	Nematodes	Ph	Ph	Ph	T	T	T	-10

[a] **Control Ratings** as a Guthion (Azinphosmethyl AZM) replacement given a zero tolerance for internal worms in processed cherries: E= currently rated as yielding Excellent control in the Michigan Fruit Management Guide as Excellent for control of the listed pest, Y = viable AZM replacement, P = possible AZM replacement with more information, Ph = possible AZM replacement with **help** from other pesticides and with increased risks of rejected loads, N = not a possible replacement and U = under investigation or unknown replacement value.
[b] **Ecological Impact Assessments**—HT = highly toxic, M = moderately toxic, S = relatively safe, G = generational effects, MG = Multi-generation effects and U = unknown. **Functional Ecology** rating is from unsustainable to sustainable on a scale from -100 to zero to +100 where zero is an equilibrium neither breaking down the ecosystem nor building it up.
[c] **Cherry internal feeding insect names**: Plum Curculio (PC), Cherry Fruit Fly complex (CFF) and Cherry Fruitworm (CFW).

Imidan is another organophosphate (OP) with a better ecological footprint than AZM. Yet it lacks AZM's field performance and producers are not as confident in this material. It is likely that phosmet users will have to spray more to achieve AZM's success. Whether increased use of phosmet to achieve equivalent control will yield better or worse cherry ecosystems is debatable. One very significant drawback for phosmet as a AZM replacement is that it can not be used on sweet cherries because it causes phytotoxicity. The harvest residue picture for phosmet on processed cherries is similar to that of AZM and would not put residues into processed product.

Indoxacarb (Avaunt), as an AZM replacement has very high potential. But in recent USDA/CSREES Apple and Cherry RAMP studies it did not yield more benign predator impact results than AZM, but it did add substantially greater costs per acre ($24.98) in New York apples. Issues of fruit quality may be to Avaunt's advantage in apples, but this is still unclear in cherries. In the first two years of the cherry USDA/CSREES RAMP study (MI, WS, UT) and in various trials run at Trevor Nichols Research Station (MI), Avaunt certainly has shown excellent PC control, but as in apples, the cost per A will certainly be much higher to achieve the zero threshold performance established through the OPs. The Cherry RAMP preliminary data suggest at least a 2x increase in per acre costs if AZM were cancelled now.

One significant drawback with indoxacarb is that it is toxic to bees. This is particularly troublesome because early spring pesticide application timing in cherry for PC control occurs at petal fall. Therefore, indoxacarb received a reduced functional ecology rating (Table 1) because of its likely impact on native pollinators which tend to forage on pollen in cherry orchards long after petal fall. In addition, indoxacarb introduces uncertainty in cherry production for producers and processors alike because at this time, the industry does not know whether or not its use will result in increased residues on processed product.

Thiacloprid (Calypso) also exhibited excellent control of PC in trials conducted at Trevor Nichols Research Station (MI). In the first two years of the cherry RAMP study, researchers believe that thiacloprid also contributed significantly to PC control in cooperator's blocks. Probably the most troublesome aspect of using neonicotinoid products like Calypso, Assail and Provado is that they exhibit relatively long-lived residues. Almost certainly, their use will result in pesticide residues in processed

product, and the cherry RAMP grant should have data addressing this issue as early as March 2006. Thiacloprid and imidacloprid may also have significant impacts on natural enemies for long periods of the summer in tree fruit systems, therefore neonicotinoids as a group may not be better than AZM based on their low functional ecology scores (-20) Table 1.

Synthetic Pyrethroids and Carbaryl.- Some cherry producers currently attempt to use synthetic pyrethroids (Asana, Pounce, Ambush & Warrior) or a carbamate (carbaryl or Sevin) to control PC. In all of the investigations conducted by the Whalon laboratory (2000 Report to the Cherry Industry) at Michigan State University into infested loads of cherries several factors contributed. First, synthetic pyrethroids and carbaryl yield only poor to good control of key internal feeders like plum curculio in cherries. Second, significant rain (>1/2 inch in < 2 hours) results in loss of residue and failed control. Third, poor timing of the application(s) of these less effective compounds with PC and CFF emergence and activity resulted in infested fruit at harvest. These compounds therefore are not effective for PC or CFF control in some years, and should not be cited as OP-replacements. Further, all of these compounds net a more negative impact on the ecosystem than does AZM because producers have to spray more frequently to achieve control resulting in greater and longer perturbation of the cherry orchard ecosystem (Table 1).

Insect Growth Regulator (IGR) compounds like Esteem (pyriproxifen) and Rimon (novaluron) may also have promise for control of plum curculio. Several experiments in the laboratory and field (2004 & 5 Reports to the MI Cherry Research Committee by Whalon et al.) indicate that pyriproxifen breaks diapause in plum curculio summer generation beetles (6) and this may be used by growers to elicit high overwintering mortalities before spring eggs are deposited in cherry fruit. Yet this work is just testing this hypothesis and much more work will be necessary to confidently deliver this management approach to the industry. In addition, such non-lethal impacts at what are thought to be very low residue levels could have similar effects on critical biological control agents in the cherry ecosystem and these effects are unknown at this time (Table 1).

Novaluron has been shown to be vertically transferred from female plum curculios to their eggs (2005 Report to the MI Cherry Research Committee). In laboratory studies, treated females were unable to lay eggs that emerged as larvae whether they were treated before or after mating. This is a very encouraging result and more work is needed to determine if egg mortality from novaluron would be an effective plum curculio worm control. Again like pyriproxifen, the potential Functional Ecology consequences of using this IGR with such its subtle effects are unknown at this time (Table 1).

Spinosad in either the GF-120 or the Entrust (Table 1) formulations were rated as "fair" alternatives when compared to AZM for cherry fruit fly control in the Michigan Fruit Management Guide (2005 E-154). In either case, spinosad will be a more expensive alternative to fruit fly management, but many cherry growers worry about

their use given the "Zero tolerance" and a few problems with infested cherries at harvest have been reported. On the other hand, a to shift to spinosad for REI and PHI reasons would be desirable perhaps because treatments could be made 7 days closer to harvest than AZM. The Entrust formulation of spinosad is rated with moderate bee and predator toxicity and therefore has a poor Functional Ecology score (Table 1) although both are better than AZM, especially GF-120 which can be used in organic production too. Spinosad is not a control for plum curculio.

8- The Economics of OP-Alternatives and RR compounds.- The Cherry USDA RAMP grant has deployed a reduced risk approach to managing cherry pests in consultation with the tart cherry processing industry over two seasons. Nine growers are comparing this program against the AZM-based current system in paired plots. This project will be completed in 2007. Although it is too early to conclusively assert and too much is at stake to jump to early conclusions, yet it may be "technically" possible to use a reduced risk program based upon indoxacarb, neonicotinoids and spinosad as discussed in 7 above. At this stage of the research, several major issues that have to be addressed before reduced risk compounds could be substituted for AZM in processed cherry production; 1) the specter of 2-3 times the expense per acre when compared to a AZM-based control program (Table 2 & 4 below), 2) residues in processed product, 3) the ecological impact of supposed "reduced risk" compounds compared to current AZM-based systems is largely unknown, but preliminary information demonstrates that there is no net gain in natural enemies in the reduced risk plots and 4) the uncertainty of rebound pests like the Cherry Fruitworm in reduced risk blocks is possible, but more work and time is needed to make any conclusions.

Table 2.- Cherry USDA/RAMP Grant: 2004 Insecticide Cost ($) Comparison.

- **Conventional AZM-based Cherry Pest Management**
  - **$40.52 ($20.55 – $73.88)**
- **RAMP Pest Management (based on the compounds below)**
  - **$91.45 ($31.64 – 154.78)**
- **Average difference**
  - **$51.12 or 2.5x more to produce a cherry crop with Reduced Risk compounds currently registered on cherry**

Table 3.- Cherry USDA/RAMP Grant: 2003-4 Insecticide Program.

Insecticide	Label Rate	Spray Timing	Target Insect
SpinTor™ 2SC	4 - 8 oz/acre	Late bud burst/open cluster	green fruitworm leafrollers
Avaunt®**	5 - 6 oz/acre	Shuck split 350 DD_{50} after bloom	plum curculio
Actara™ 25 WG	4.5 - 5.5 oz/acre	12 mm fruit	cherry fruit fly plum curculio
Provado® 1.6 Flowable	4.0 – 8.0 oz/acre	20 – 22 mm fruit	cherry fruit fly

Given the international competition, the current economics of processed cherries and the likelihood of new production challenges, a 2-3 fold increase in pest management costs could cause significant dislocation and shrinkage of the US cherry processing industry. In turn, this would significantly impact the rural economies of states like Michigan already hard-hit by foreign competition in their manufacturing sectors. Although it is difficult to predict the full extent of this implosion, no doubt small and middle sized growers would be hardest hit and some if not many would be forced to turn to other income alternatives. In addition, the US processed cherry industry is already hard hit by two recent short crops (2001-2) and foreign competition and could stand to loose its prominence globally is production were further impacted.

Table 4.- Preliminary conclusions from the 2003-4 USDA/RAMP Grant for Michigan only. Data from Utah and Wisconsin is still being compiled.

1. The so called "reduced risk" insecticide program (Table 3 above) may yield equal control to the AZM program, but it is too early to conclude this after just two trials.
    a) No worms in harvested fruit were detected in plots using reduced risk insecticides (3 spray application applied alternate row).
2. Emerging issues associated with transitioning to reduced risk compounds that will need addressing in the next 2 years of the RAMP grant:
    a) Reduced risk blocks may need post harvest sprays for high Cherry Fruit Fly pressure or adjacent Plum Curculio populations. Re-emerging or rebounding of formerly managed pests is still an unanswered question and may increase the reduced risk costs to even higher levels.
    b) These results are without doubt, PRELIMINARY, the final performance conclusions of reduced risk insecticides vs AZM will not be available until January 2008 when all of the on-farm trial data from Utah, Wisconsin and Michigan have been compiled, analyzed and reported formally. Michigan State University is reporting this preliminary data here because of the critical need to maintain AZM's Conditional Registration for another 3 years.
    c) A number of new or rebounding insect pests were observed for the first time in 2005 plots and we do not know if these detections represent rebound condition in response stopping the use of organophosphates.

9- Is it time for USEPA to award "credits" to an industry for using pesticide delivery systems that reduce drift and off-target deposition of compounds like AZM?- The processing cherry industry has a employed a number of innovations in spray delivery that USEPA should count as mitigation of off-target deposition. Many producers have purchased and use more efficient sprayer technology than is currently used in USEPA's model for drift simulation. These innovations include:

a. Laminar flow air curtain and tower delivery for directing sprays across or down into trees,
b. Droplet size control exceeding historical airblast models,
c. Optical control of the spray nozzles reduces application and drift,
d. Electrostatics attract droplets to target leaves and reduces drift.

e. In addition, Dr. John Wise's laboratory at MI State University has demonstrated that there is a difference between droplet detection and droplet biological activity downrange which would significantly curtail USEPA's "biologically" active drift profiles.

References Cited:

1. Memorandum to the Azinphos-methyl Docket
From: Diane Isbell, Special Review and Reregistration Division
Date: November 29, 2005
Subject: Questions to Consider While Reviewing the Assessments in the Azinphos-methyl
Docket OPP-2005-0061

On October 19, 2005, EPA will announce availability the Environmental Fate and
Ecological Effects Risk Assessment, dated September 29, 2005, the 2005 Grower Impacts
Assessments for Azinphos-methyl, and the BEAD Assessment of Citations Submitted by
Plaintiffs (Case 2:04-Cv-00099-RSM) in Regard to EPA's 2001 Benefits Assessments for
Azinphos-methyl. These documents will be available for a 90-day public comment period. These assessments pertain to the following crops: almonds; apples and crab apples; blueberries, lowbush and highbush; Brussels sprouts; sweet and tart cherries; nursery stock; parsley; pears; pistachios; and walnuts. While all public comments are welcome, certain types of information are most useful to the Agency for refining these assessments and developing risk management options. The information requested below is intended to guide commenters toward the most pertinent types of information
Generally, comments supported by published literature or data are of greater utility than
expressions of opinion. If you believe, based on your own expertise or experience, that the assumptions used in the assessments are well founded, that is also useful information to provide to EPA.

EPA will make the human health assessment available for public comment in 2006, prior
to or in conjunction with the Agency's proposed decisions on the continued use of Azinphosmethyl for above listed uses. For the current comment period, please confine your comments to the ecological and grower impact assessments made available on October 19, 2005. The following topics are suggested for comment:
1. The Agency is seeking data for pest management scenarios applicable to commercial scale commodity production (that include domestic and export markets) other than those discussed in the azinphos-methyl assessments. Please describe in detail:

a) Whether these alternatives to azinphos-methyl would be likely to be used by a
significant number of growers and if so, why.
b) The cost per acre of these alternatives.
c) The efficacy of these alternatives, focusing on yield and quality effects.
d) The implications of the proposed scenarios on the marketability of the commodity.

2. The Agency invites the submission of data or other relevant information that addresses
economically important pests currently controlled **most effectively** or **only** by AZM, and which were not discussed in the assessments, please submit data that address the following:
a) The proportion of crop acres by region affected by the pest.
b) Details on the life cycle of the pest and nature of damage inflicted.
c) Efficacy studies comparing AZM to potential alternatives for control of the pests,
focusing on yield and quality impacts. If such studies have been done, also provide
copies of the studies, citations, or contact information so that we may obtain the
studies.
3. If available, the Agency is seeking new crop budgets for any crops discussed in these
assessments, please provide copies or citations for these documents.
4. The Agency is seeking any information related to the use patterns (location where the crop is grown (county and state), application rate, lowest effective application rate, number of applications, the timing of each application, or increased buffer zones) that differs from what was relied upon in the assessments.
5. The Agency is interested in information concerning any typical practices, not reflected on current labels, that serve to reduce exposure to non-target species and water resources, for example, special equipment to reduce spray drift.
6. The Agency is seeking information related to any additional measures that could be added to current labels to reduce exposure to non-target species and water resources, for example, larger buffers for some or all crops.

2. **Azinphos-methyl: EFED's Data Request, Risk Characterization, Risk Reduction Options. October 19, 2001.**
3. **Azinphosmethyl Insecticide: Ecological Risk Assessment…Sept. 29, 2005. PC Code: 058001, DP Barcode: D307568**
4. **NAS Pesticides in the Diets of Children**

5. **Phosmet, an Insecticide** - EPA issues a Final Rule which deletes " ... *phosmet from the list of extremely hazardous substances (EHS) issued under the Emergency Planning and Community Right-to-Know Act (EPCRA). Today, EPA is taking final action to delete phosmet from the EHS list. Facilities with phosmet on-site will no longer be required to comply with emergency planning and emergency release notification requirements. In addition, facilities handling phosmet will no longer have to file an emergency and hazardous chemical inventory form and Material Safety Data Sheet (MSDS) for phosmet with their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), and local fire department, for amounts less than 10,000 pounds ...*" - Electronic copies of available documents are available in EPA Docket ID Number SFUND-2003-0007 at http://www.epa.gov/edocket - Effective December 27, 2004 - EPA Contacts: For general information, contact the Emergency Planning and Community Right-to-Know Hotline at 800 424 9346 or in the Washington, DC metropolitan area at 703 412 9810 - The EPA Project Officer for the rule is Kathy Franklin, Office of Emergency Management, Office of Solid Waste and Emergency Response at 202 564 7987; fax: 202 564 8444; e-mail: Franklin.Kathy@EPA.gov - EPA November 26 *Federal Register*:
6. **Hoffmann, E.J., A. B. Coombs and M.E. Whalon. 2004. Reproductive Development of Northern and Southern Strains of Plum Curculio. J. Econ. Entomology 97:**