

Appendix AG: National Collaboration Centre for Environmental Health (2009) Recommendations for Safe Re-occupancy of Marijuana Grow Operations



National Collaborating Centre
for Environmental Health
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Recommendations for Safe Re-occupancy of Marijuana Grow Operations



Introduction

The following guide offers a practical approach to achieving safe re-occupancy of former marijuana grow operations (MGOs) and reviews possible exposures/hazards (tables 1 and 2). It is essential to make a clear distinction between risks associated with an "active" MGO and risks associated with a "shut down" MGO. An "active" MGO is linked to criminal activity, which in itself poses safety risks, while in a "shut down" MGO, this illegal activity is no longer a concern. This guide considers only the potential risks remaining after an MGO is dismantled, criminal activity has stopped, and all related material is removed (i.e., plants and bulk chemicals).

This guide is derived, in part, from the protocol outlined in the New York City Department of Health Guidelines for mould remediation¹ and from discussions with experts involved in mould, pesticide, and MGO investigations and remediation. Most available guidelines on mould remediation mirror the New York City guidelines and are partly based on consensus, survey information of "normal" levels in homes, and personal experience².

Although remediation professionals may use this guide as a basis for their practice, it is only meant to orient public health and municipal staff to the hazards that may need to be addressed to ensure the safety of re-occupants. This guidance document is not intended as a step-by-step procedure for remediation professionals and homeowners.

Potential safety concerns and remediation procedures

Each MGO is different and, as a result, a site assessment is required to determine the presence and extent of any hazards as well as the remediation and cleanup necessary. The assessment usually consists of a walk-through to identify potential safety and health hazards^{3,4} related to structural damage or the presence of biological or chemical contaminants. An investigation by the Canada Mortgage and Housing Corporation (CMHC) included 12 former MGOs and found that safety concerns in MGOs may or may not be directly related to the presence of the grow operation⁵. During the walk-through of a former MGO, the initial assessor should be aware of the following:

- 1) hazards stemming from physical and structural changes to the building that have been made to accommodate the grow operation^{6,7};
- 2) hazards that originate from alterations to wiring and electric power^{8,9};
- 3) the presence of biological hazards such as mould due to excess moisture⁷;

evidence
review

1

4) the presence of chemical hazards³ related to chemical spills and residues from the use of pesticides, fertilizers, and solvents used for the extraction of tetrahydrocannabinol (THC).

Additional information regarding hazards and remediation procedures can be found in tables 1 and 2. Figure 1 provides a summary of the steps involved in the assessment and actions to be taken.

The hazards listed in tables 1 and 2 are not specific to MGOs and may be present in other residential properties as well. Therefore, the approach used in the remediation of these deficiencies in a former MGO is no different than one that would be used in other properties with similar problems. A general cleanup of the house using detergent and water is recommended, regardless of any other remediation actions related to possible biological and chemical hazards.

1) Hazards resulting from possible physical and structural changes to the residence (Table 1)

- Physical and structural changes are often made to buildings that house MGOs to accommodate the installation or may directly result from MGO-related activities. Alterations in the building structure such as cuts in walls and wood framing members can be made to provide larger growing areas or to change the ventilation⁴⁶. Ventilation changes can include alterations to furnace and hot water vents⁴ and gas appliances⁷.

An inspection for possible structural and physical changes should be conducted. Any alterations that have resulted in violation of building or other codes should be corrected.

- Elevated humidity and moisture problems can occur in any building and lead to mould growth and structural damage. In MGOs, elevated humidity/moisture can result from leaks or damage to the building structure and from plant growth, particularly in large-scale grow operations³.

Any moisture or water damage should be identified, the underlying causes corrected, and water-damaged materials repaired or replaced.

2) Hazards resulting from possible electrical alterations (Table 1)

In former MGOs, bypasses and additional wiring^{46,7} necessary to produce the extra light requirements for optimal plant growth can overload the electrical system if not repaired.

The electrical system should be checked and brought into compliance with code.

3) Possible biological hazards (Table 2)

• Mould

The presence of mould/mildew inside homes is not specific to MGOs and can be quite common in non-MGOs homes, as shown by a survey completed in 24 North American communities⁸, with an overall mould/mildew occurrence of 36%. A comparable study has not been done on MGOs specifically. Mould/moisture may be more prevalent in MGOs, not only because of the cultivation of plants but also because older and poorly maintained homes are often used for such installation. However, all houses and buildings have a background concentration of settled spores. These spores result in mould growth if there is suitable temperature, humidity and substrate⁹. As adequate temperatures and the presence of nutrients are usually met in indoor environments, fungal growth usually results from a moisture problem¹⁰.

An inspection for visible mould growth should be performed. Inspected areas should include forced air ducting and hidden cavities/attics where humid air may have vented. Any ongoing sources of humidity and moisture should be identified and corrected. Mould-contaminated materials should be cleaned, or where this cannot be done, materials should be replaced¹.

4) Possible chemical hazards (Table 2)

Chemical use inside homes is also common (e.g., cleaning products, paints, pesticides) and again is not specific to MGOs. Several studies performed in the US indicated the frequent presence of a measurable low-level airborne residue of pesticides, even for urban residences¹¹⁻¹³. Pesticide residues have also been recovered from kitchen floor wipes and living room dust of urban residential apartments (Appendix 1, Table 3) with permethrin and chlorpyrifos being detected in kitchen floor wipes in all homes¹⁴.

Investigators of former MGOs may find signs of chemical spills or residues such as staining, odours, or mineral deposits. These residues may be present near drains, floor areas where water traveled towards drains, or in bathrooms and kitchens that have served as chemical mixing rooms for THC extraction, pesticides, fertilizers, and acids and bases.

In addition to difficulties in obtaining consistent wipe samples, there is no demonstrated relationship between environmental samples and exposure to occupants¹⁵. For this reason, routine wipe sampling for chemicals used in grow operations is not recommended.

Possible chemical hazards may include:

- Pesticides

In regular residential properties, pesticides from domestic indoor treatment have been shown to accumulate inside homes, especially in carpets^{11,12,14}, carpet fibers, and binders¹⁷ as well as other sorbent materials such as textiles¹⁸. Pesticides tracked indoors tend to have a longer half-life than those in an outdoor environment¹⁹, and indoor residues may contribute to the exposure of infants and toddlers through dermal contact or ingestion^{19,20}. Examples of concentrations found in regular homes in kitchen floor and living room wipe samples are presented in Table 3 (Appendix 1).

Although customers prefer organically grown marijuana²¹, pesticides are sometimes used to control insects, powdery mildew, and other pests. In former MGOs, the major areas of concern are bathrooms, tubs, and kitchens where chemicals were mixed. However, based on discussion with experts who investigate MGOs from a health and safety perspective, the amount of residual pesticides found is often minimal or not detectable via wipe sampling. Most of the time, only small amounts of pesticides have been detected on the floor in the grow rooms or where spray water has drained from the grow room to the floor drains. Examples of concentrations found in former MGOs are summarized in Table 4 (Appendix 1). These data cannot be compared to the data obtained from residential homes (Table 3) due to differences in sampling methodologies. Wipe samples were collected at suspected areas of contamination in the MGO, whereas wipe samples were collected from random locations

in residential homes. However, the data still provide an idea of concentrations that may be found in both settings.

- Fertilizers

Fertilizers are often used to promote plant growth or flower production and are typical of those used in vegetable gardens or hydroponic cultures.

- Other Chemicals

Other chemicals that may be found on-site include solvents³ used for THC extraction like isopropyl alcohol, methyl hydrate, naphtha, or ethanol.

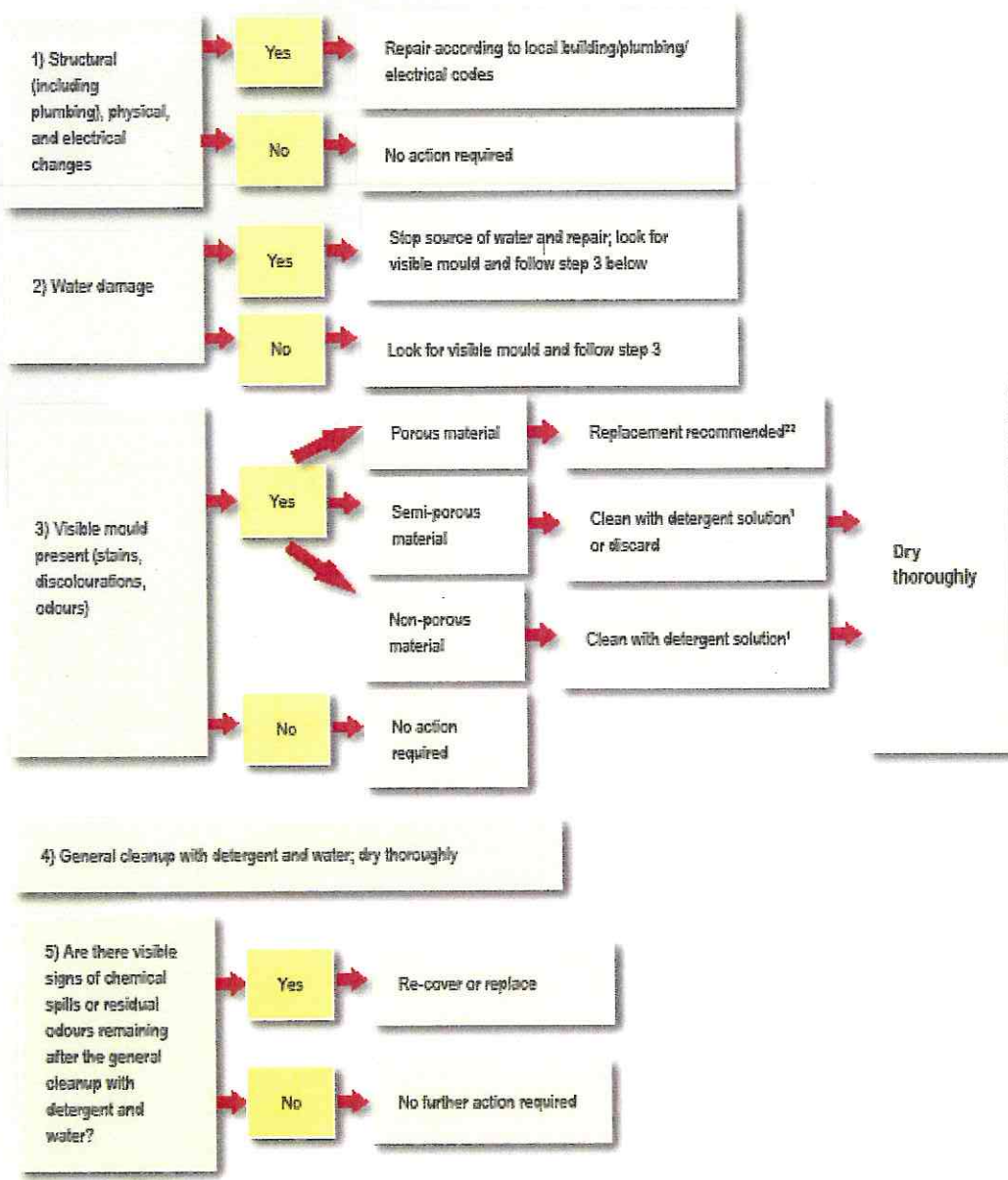
Acids and bases can also be used to change the pH of hydroponic solutions or soil. Grow areas and chemical mixing rooms (i.e., bathrooms and kitchens) are important areas to investigate for signs of contamination.

Any chemicals found in an MGO should be removed and disposed of in accordance with local and provincial regulations. The locations, volumes, and identity of chemicals, where known, should be recorded. If this information is available to professionals performing the cleanup, it may provide a guide to locations in the house where clean-up efforts should be focused. If no information is available on chemicals found on-site, interior surfaces should be cleaned with detergent and water and dried thoroughly. If visible stains, discoloration, or residual odours can be detected on surfaces or articles after cleaning, materials can be re-covered or replaced.

Evidence gaps

This document is based on available evidence and expert opinion. To our knowledge, there are no published MGO remediation protocols based on pre- and post-remediation data, especially regarding pesticides. Additional data to verify the effectiveness of the protocols described in this document would be helpful. If individuals or organizations do have additional information, please contact the National Collaborating Centre for Environmental Health at the following e-mail address: contact@nccosh.ca.

Figure 1. Assessment and actions to be taken (Refer to tables 1 and 2 for further detail)



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Appendix

Table 1. Possible physical and electrical hazards in MGOs and associated remediation procedures

Possible physical and electrical hazards	Description	Associated hazard	Proposed remediation strategy
Structural damage & physical changes			
<ul style="list-style-type: none"> Alterations in the building structure 	<ul style="list-style-type: none"> Holes and cuts in walls and ceilings to accommodate ventilation system^{3,4} Cuts in structural members (i.e., roof trusses, floor joists, and wall studs⁴ Structural damage on wood caused by moulds 	<ul style="list-style-type: none"> Fall hazards 	<ul style="list-style-type: none"> Repair according to current local building code
<ul style="list-style-type: none"> Makeshift to ventilation system 	<ul style="list-style-type: none"> Disconnection of furnace exhaust duct to vent odour from plants⁴ Collection of carbon dioxide from furnace and hot water flues to improve plant growth⁷ 	<ul style="list-style-type: none"> Carbon monoxide poisoning of residents 	<ul style="list-style-type: none"> Repair and clean
<ul style="list-style-type: none"> Plumbing system 	<ul style="list-style-type: none"> Possibility of chemicals, being caught in solids if discarded in the sink⁸ Leaks in the plumbing system 	<ul style="list-style-type: none"> Release of chemical fumes Potential cross-contamination of the water supply Elevated humidity and water damage 	<ul style="list-style-type: none"> Clean Stop leakage immediately and repair according to local plumbing code
<ul style="list-style-type: none"> Natural gas line 	<ul style="list-style-type: none"> Makeshift sometimes added to provide natural gas supply⁷ 	<ul style="list-style-type: none"> Fire and explosion 	<ul style="list-style-type: none"> Repair according to applicable codes
Electrical alterations			
	<ul style="list-style-type: none"> Bypasses and additional wiring^{3,7} 	<ul style="list-style-type: none"> Fires and electrocution 	<ul style="list-style-type: none"> Repair in accordance to Canadian Electrical Code

Table 2. Possible biological and chemical hazards in MGOs and associated remediation procedures

Possible biological and chemical hazards	Description	Location	Proposed remediation strategy
Mould	<p>Moisture/humidity generated by:</p> <ul style="list-style-type: none"> • plant growth or water use • leaks in the plumbing system • leaks stemming from damage to infrastructure 	<ul style="list-style-type: none"> • Mould growth may occur in grow areas, basements², forced air ducts, hidden cavities, and attics where water vapour is frequently vented. In addition mould growth may occur in fertilizer mixing rooms or areas of heavy water usage 	<ul style="list-style-type: none"> • Immediately stop and dry any occurrence of water accumulation/infiltration; Repair building infrastructure so that water damage and moisture buildup does not recur <p>If visible mould present:</p> <ul style="list-style-type: none"> • Porous items (eg., carpets/padding, insulation, wallboards, material which has lost its structural integrity) – replacement recommended²² • Semi-porous items (eg., wood, plaster, concrete) – Clean with detergent solution and dry thoroughly¹ or discard • Non-porous items (eg., metal, glass and hard plastics) – Clean with detergent solution and dry thoroughly¹
<ul style="list-style-type: none"> • Solvents • Unknown chemicals 	<ul style="list-style-type: none"> • Used in tetrahydrocannabinol (THC) extraction (eg., isopropyl alcohol, methyl, naphtha, and ethanol) • Visible residues of spills may be discovered in MGOs, but no information is available to determine the material that was spilled 	<ul style="list-style-type: none"> • Spills, especially near drains due to unsafe disposal, or containers on-site • Chemical mixing rooms (bathrooms, tubs, kitchens) • Near drains, on floor of grow area, chemical mixing rooms (i.e., bathrooms, kitchen) 	<ul style="list-style-type: none"> • Surfaces and articles with any visible residue remaining after general cleaning with detergent and water should be re-covered or replaced • Discard material

Table 2. Possible biological and chemical hazards in MGOs and associated remediation procedures (continued)

Possible biological and chemical hazards	Description	Location	Proposed remediation strategy
• Pesticides	• May be used to control pests such as gnats, aphids, red spider mites, white flies, slugs, and snails or to control powdery mildew on the plants	• Spills or containers left on-site • Residues around marijuana grow areas, drains, or floor areas where water traveled towards drains and chemical mixing rooms (i.e., bathrooms and kitchens)	• Surfaces and articles with any visible residue remaining after general cleaning with detergent and water should be re-covered or replaced
• Fertilizers	• Optimize plant growth and blooming stage	• Containers left on-site, spills, chemical mixing rooms (i.e., bathrooms, tubs, kitchens)	
• Acids/Bases	• Used in pH adjustment of soil or hydroponic solutions	• Spills, especially near drains due to unsafe disposal, or containers left on-site (i.e., in bathrooms, tubs, kitchens)	

Table 3. Summary of pesticide loadings in kitchen and living room floor wipe samples^{a)} from standardized location in selected homes^{b)}

Pesticides	Median ($\mu\text{g}/\text{m}^2$)	Maximum ($\mu\text{g}/\text{m}^2$)	Median ($\mu\text{g}/\text{m}^2$)	Maximum ($\mu\text{g}/\text{m}^2$)
	Kitchen floor wipes (N=42)	Kitchen floor wipes (N=42)	Living room wipes (N=30)	Living room wipes (N=30)
Chlorpyrifos	0.3	19.5	0.49	7.7
Permethrin	8.8	226.5	5.97	74.8
Diazinon	0.4	556.2	0.35	16.3
Cypermethrin	3.7	330.7	3.80	63.2
Esfenvalerate	0.7	16.8	1.00	27.4
Cyfluthrin	1.1	567.1	3.70	56.9
Cyhalothrin	<LOD ^{a)}	4.1	1.87	7.5
Tetramethrin	<LOD	5.9	8.19	8.6
Deltamethrin	<LOD	45.2	3.43	4.5
Bifenthrin	<LOD	0.2	<LOD	0.1
Sumithrin	<LOD	2.3	<LOD	0.4
Resmethrin	<LOD	0.05	<LOD	0.05

^{a)} According to a sampling protocol adapted from the National Human Exposure Assessment Survey in Arizona (NHEXAS-AZ)

^{b)} LOD: limit of detection

Table 4: Example of pesticide types and concentrations detected in samples collected from former marijuana grow operations from suspected areas of contamination (n=131)^(a) (Kindly provided by Pacific Environmental Consulting, Vancouver)

Pesticides	Maximum (µg/m ³)	Mean (µg/m ³)
Permethrin (cis & Trans)	24.3	0.648
Carbaryl	6.4	0.0432
Imidacloprid	27	0.324
Malathion	198.56	2.052
Methoxychlor	10.26	0.108
Propoxur	2.16	0.0216
Dicofol	33.804	0.324
Chlorpyrifos	8.1	0.0648
Fenvalerate	0.54	0.00432
Cypermethrin	3.564	0.0324
Tetramethrin	7.56	0.054
Chlorothalonil	200.88	1.512

^(a) According to EPA method 8081A and EPA method 8141A

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Photo credits: Large indoor marijuana growing operation sprouts up in Youngstown. [Online] 2004 Feb [cited 2008 Jul 3]; Available from: URL: <http://www.usdoj.gov/dea/pubs/states/newsreal/detroit022504.html>

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Appendix AH: Cochrane (2011) High Quality Analysis of Pesticides in Marijuana using QuEChERS, Cartridge SPE Cleanup, and GCxGC-TOFMS

Found at <http://blog.restek.com/?p=2632>

ChromaBLOGraphy

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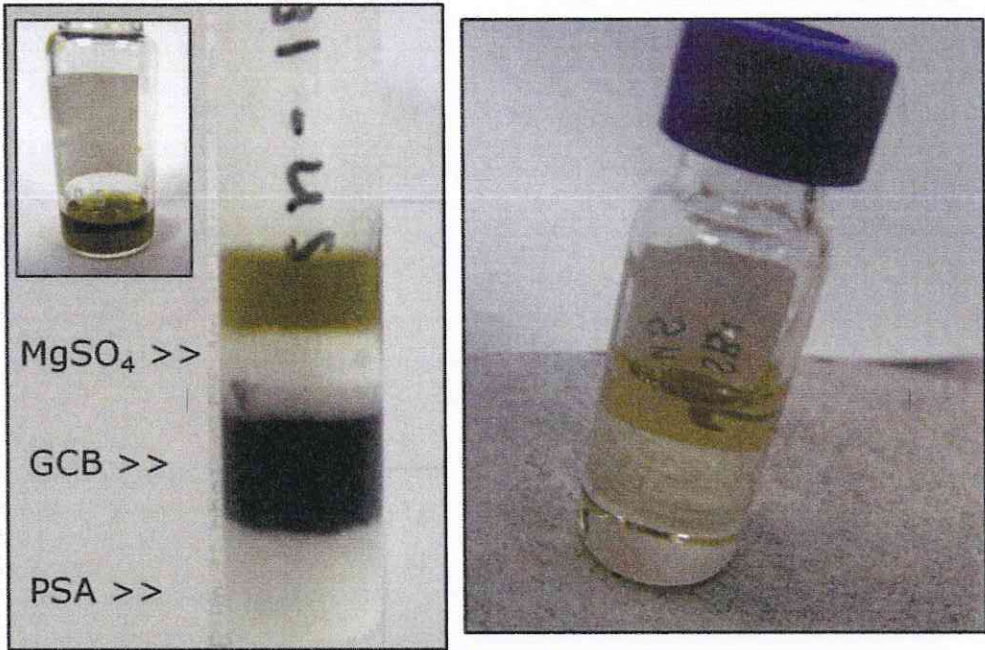
May 22nd, 2011 by [Jack Cochran](#)

Recently we reported on what we believe is the [first application of QuEChERS for marijuana](#), using it for potency analysis with GCxGC-TOFMS. Ultimately, the plan was to determine pesticides via the [QuEChERS](#) approach, combining it with cartridge SPE cleanup as we did for [dietary supplements](#), since sample complexity would defeat the typical dispersive SPE cleanup used with QuEChERS.

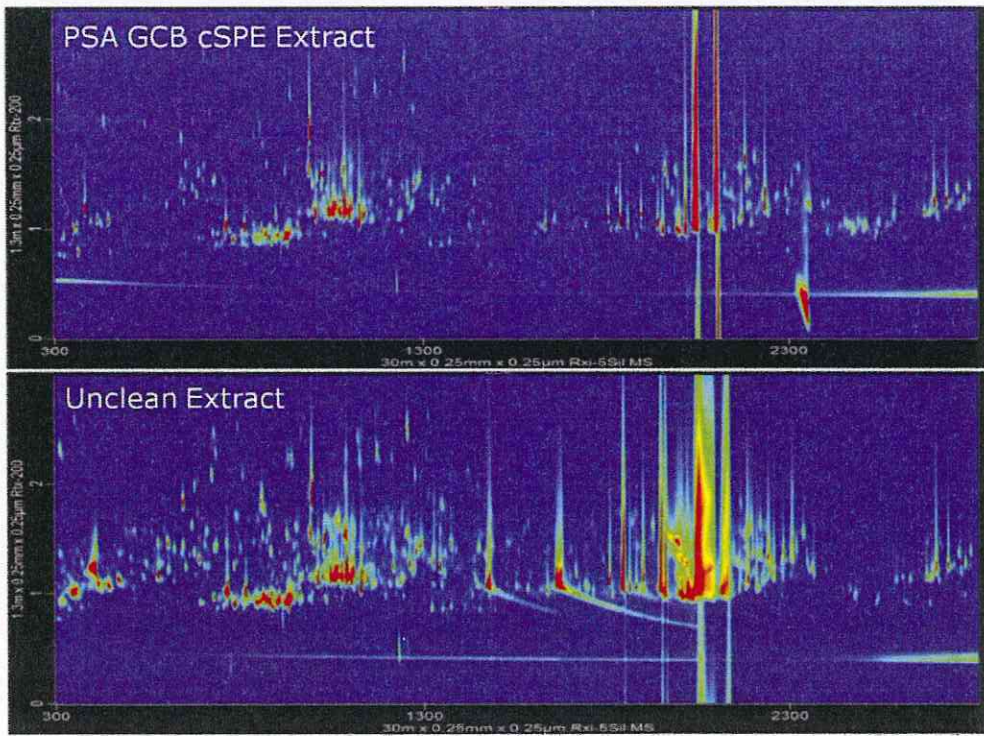
Since [17 States and the District of Columbia now have active medical marijuana programs](#), which includes allowing dispensaries to sell cannabis products for smoking/vaporizing, and in the form of edibles, it won't be long before the FDA has to get involved to evaluate the pesticide content of the medicine. And while many of the cannabis labs currently in existence purport to determine weed killers in weed, it's unlikely they have sophisticated methods in place to look for anything but the highest levels.

We did our method development on illicit marijuana that was scheduled for destruction by the Penn State University police department, with the kind help of Randy Hoffman, a police officer there. Samples were finely ground, weighed from about 0.2 to 2 g into centrifuge tubes, wetted with solvent and water, spiked with [internal standards](#) and pesticides (if needed for recovery determinations), and extracted with a modified [EN QuEChERS method](#). The extract was then cleaned using cartridge SPE ([500 mg GCB and 500 mg PSA](#)), mainly to remove high levels of chlorophyll that degrade GC inlet and column performance, and fatty acids that interfere with pesticides where they elute. We looked at over 80 pesticides, including those reported to be found on marijuana or used in marijuana grow operations. Recoveries overall were very good as determined using GCxGC-TOFMS, with a few exceptions.

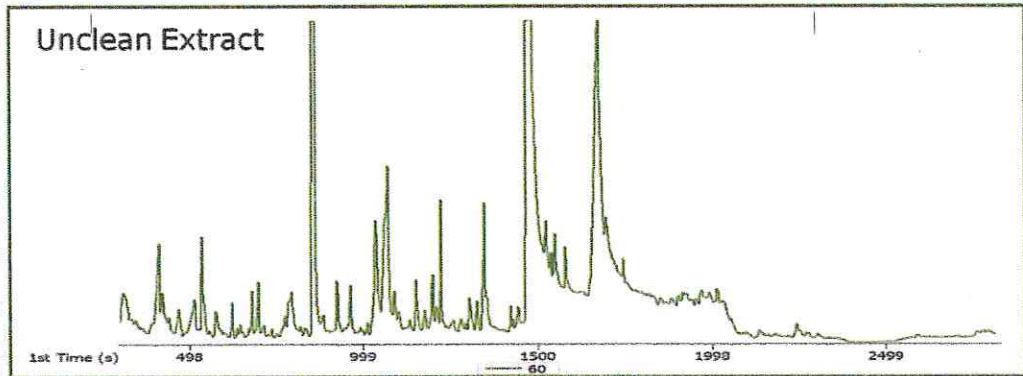
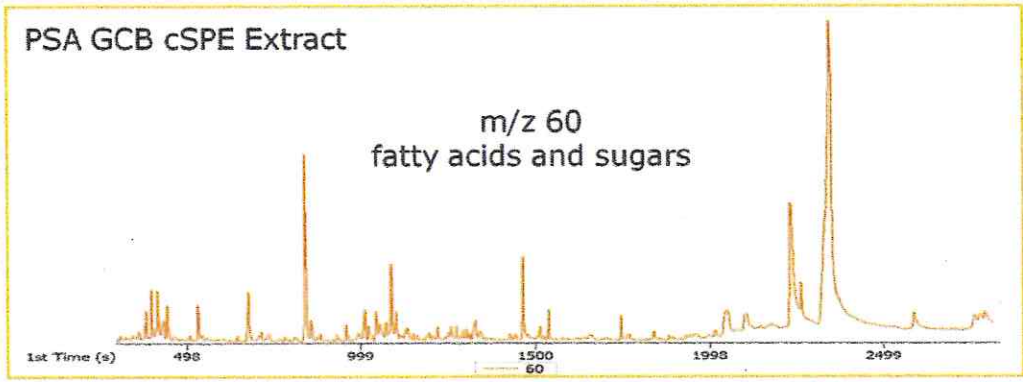
Interestingly, but perhaps not surprisingly, we also found incurred pesticides in the marijuana samples, sometimes at ppm levels (see tables below), highlighting the need for monitoring of medical marijuana. Watch for another blog coming soon on the LC-MS/MS quantification of Bifenazate (Floramite) and Abamectin (Avid), two pesticides commonly used in indoor grow operations.



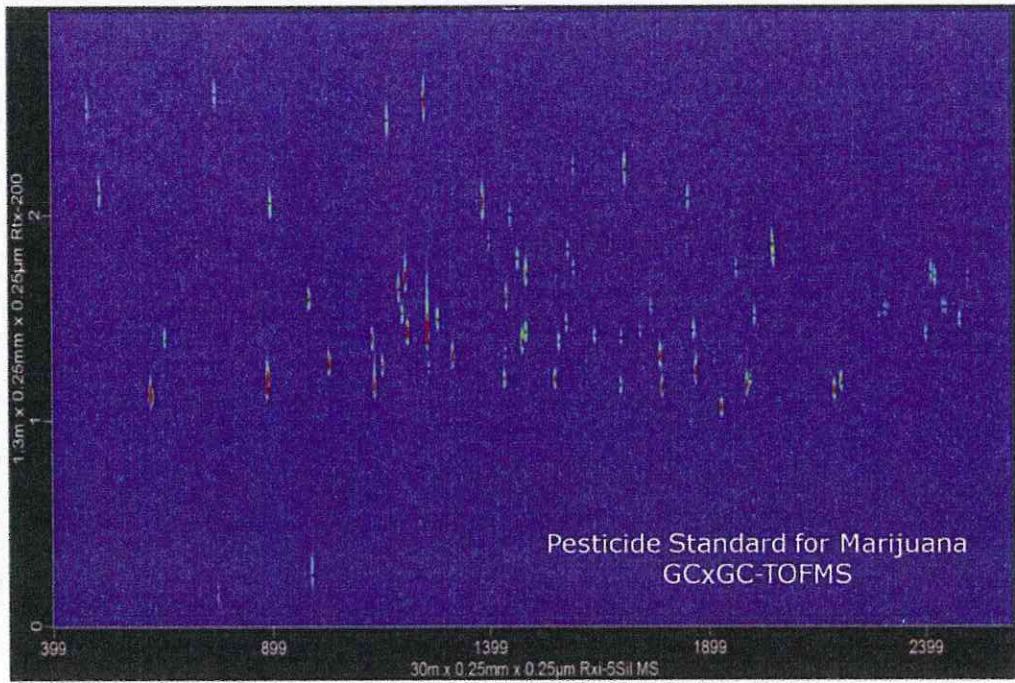
Cartridge SPE cleanup of QuEChERS extract of marijuana. Note chlorophyll removal from cleaned extract on right.



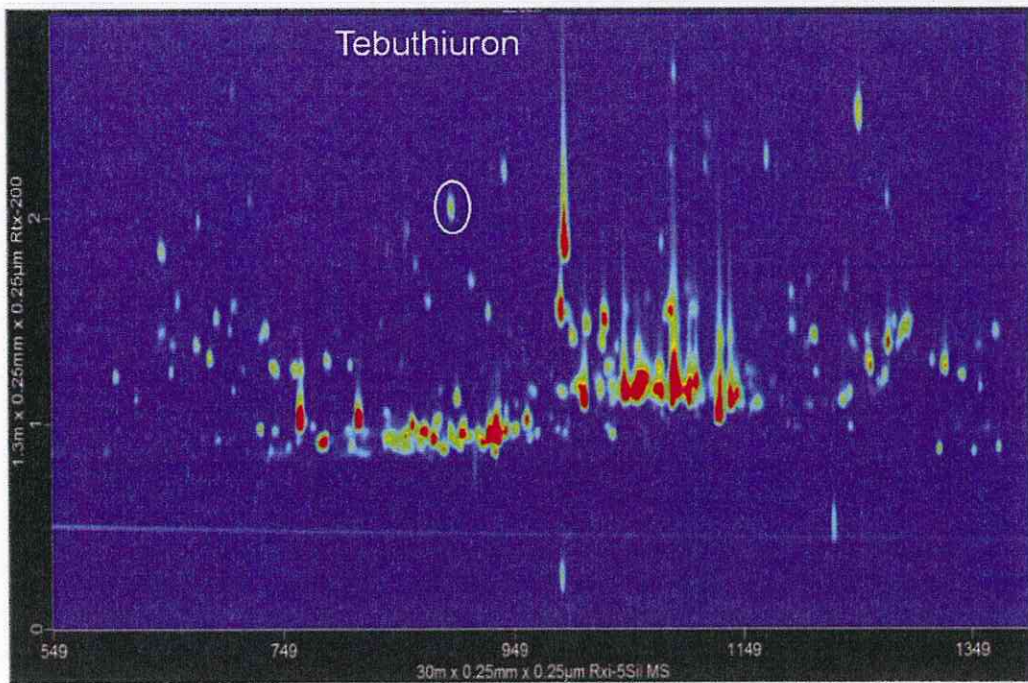
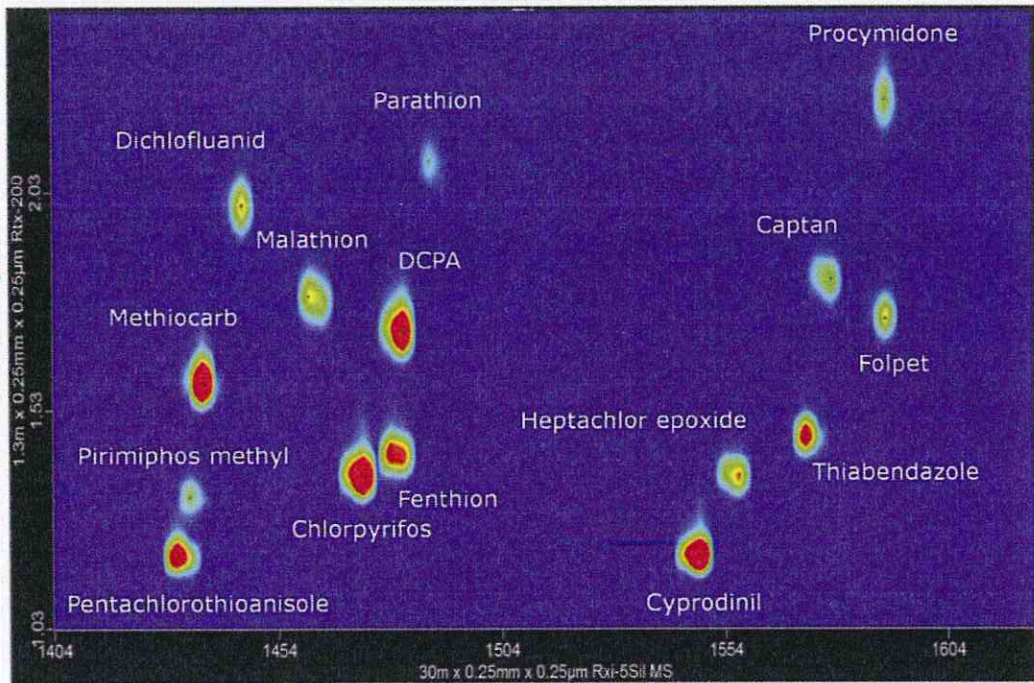
Cartridge cleaned QuEChERS marijuana extract (top) and uncleaned extract (bottom) analyzed with GCxGC-TOFMS (Rxi-5Sil MS x Rtx-200 columns).



Cartridge SPE cleanup (top) of marijuana extract showing removal of fatty acids versus uncleaned extract (bottom) as analyzed with GC-TOFMS.



GCxGC-TOFMS of pesticide standard using an Rxi-5Sil MS x Rtx-200 column combination.



Pesticide Recoveries for Marijuana Spikes

Pesticide	Classification	SB1 cSPE	SB3 Q + cSPE	S3 Q + cSPE
o-Phenylphenol	Unclassified	91	83	97
Tebuthiuron	Organonitrogen	100	104	94
Hexachlorobenzene	Organochlorine	73	44	71
Chlorothalonil	Organochlorine	77	80	81
Anthracene	QC STD	108	105	119
Diazinon	Organophosphorus	86	89	102
Carbaryl	Carbamate	91	103	100
Metalaxyl	Organonitrogen	93	96	90
Malathion	Organophosphorus	98	106	104
Chlorpyrifos	Organophosphorus	87	92	93
Captan	Organochlorine	71	80	91
Endosulfan I	Organochlorine	87	86	102
Imazalil	Organonitrogen	83	77	91
Endosulfan II	Organochlorine	86	80	113
Endosulfan sulfate	Organochlorine	82	88	105
4,4'-DDT	Organochlorine	83	77	99
Bifenthrin	Pyrethroid	82	86	96
Dicofol	Organochlorine	40	84	73
Azinphos methyl	Organophosphorus	92	79	97
cis-Permethrin	Pyrethroid	72	64	91
trans-Permethrin	Pyrethroid	52	68	90
Cypermethrin	Pyrethroid	1	1	89
Deltamethrin	Pyrethroid	77	68	99

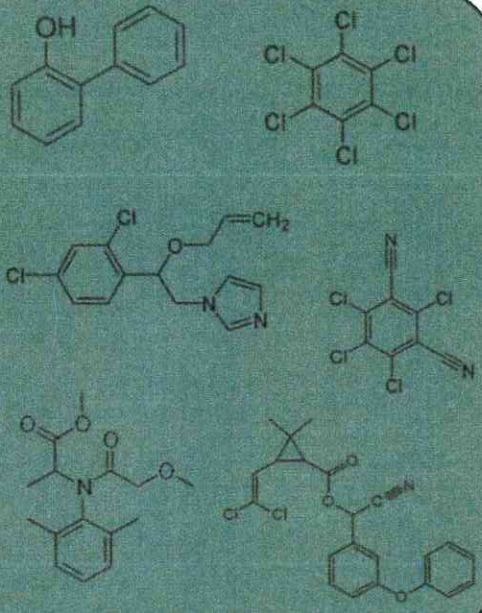
Pesticide recoveries from cartridge cleanup of QuEChERS marijuana extract (spiked immediately before cleanup; column 1), and two samples spiked before QuEChERS extraction and cartridge cleanup (columns 2 and 3). Generally, recoveries are very good. Loss is incurred pesticides.



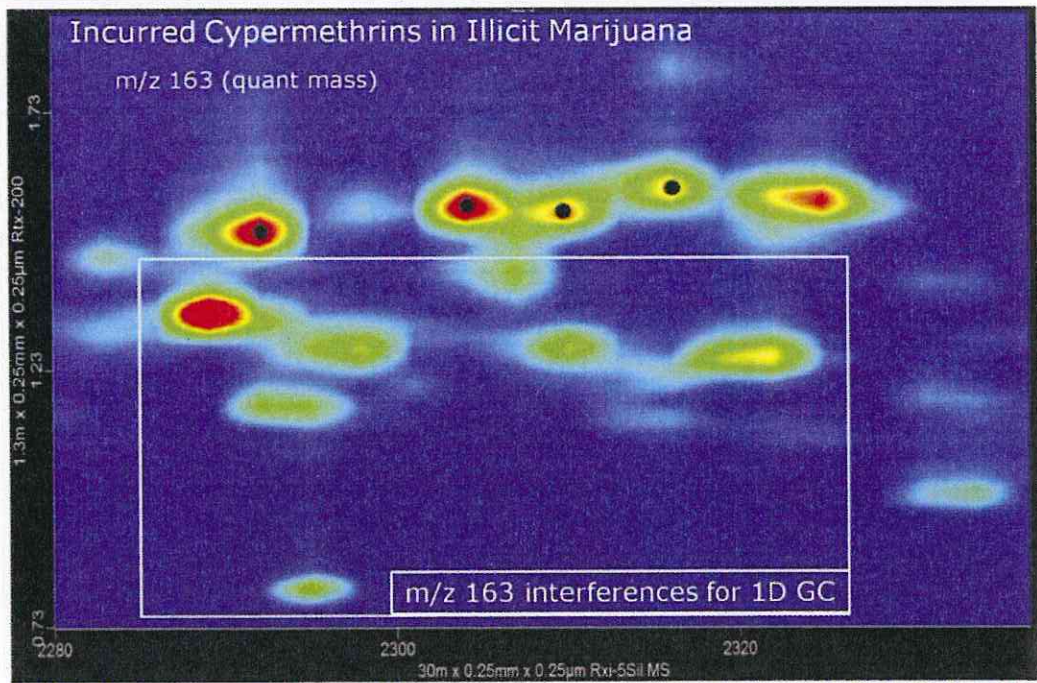
S1	Pesticide	ppb
	o-Phenylphenol	190
	Hexachlorobenzene	23
	Imazalil	1100

S2	Pesticide	ppb
	o-Phenylphenol	190
	Chlorothalonil	330
	Metalaxyl	400

SB1	Pesticide	ppb
	o-Phenylphenol	58
	Chlorothalonil	29
	Cypermethrin	2200



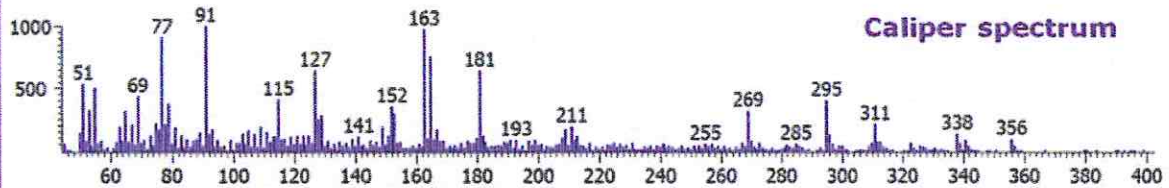
Pesticides, and their concentrations, found in marijuana samples with QuEChERS, cartridge SPE cleanup, and GCxGC-TOFMS.



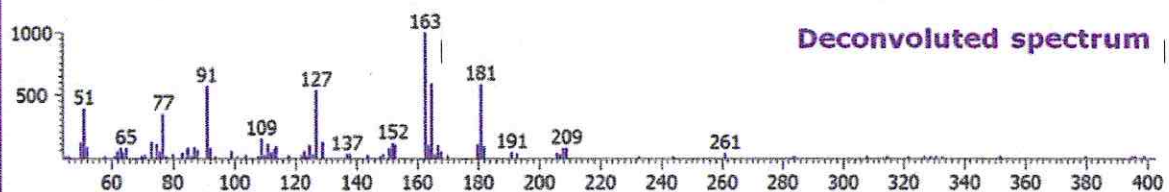
GCxGC-TOFMS chromatogram of cypermethrins (noted by black peak markers) as incurred pesticides in a marijuana extract. The quantification mass 163 is plotted. Note the interferences resolved by using GCxGC.

Incurred Cypermethrin in Illicit Marijuana - QuEChERS GCxGC-TOFMS

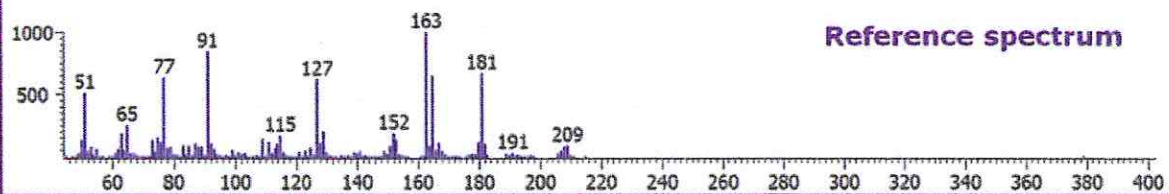
Caliper - sample "SB1 Not spiked:1", 2304, 1.540 sec, sec to 2304, 1.540 sec, sec



Peak True - sample "SB1 Not spiked:1", peak 6598, at 2304, 1.540 sec, sec



Reference Spectrum - Calibration "Pest GCxGC Matrix Matched 100 Std S2", Analyte "Cypermethrin 2"



Cypermethrin mass spectrum (deconvoluted) matches well with a Reference Spectrum, confirming incurred pesticide in QuEChERS marijuana extract.

Appendix A1: Material Data Safety Sheets

Bayer Environmental Science



Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 10200004837
MSDS Version 2.0
Revision Date: 06/15/2006

SECTION 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name SCOURGE® INSECTICIDE WITH RESMETHRIN / PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II
MSDS Number 10200004837
EPA Registration No. 432-716
Product Use A ready to use synthetic pyrethroid for effective adult mosquito (including organophosphate resistant species), midge (biting and non-biting) and black fly control.

Bayer Environmental Science
2 T.W. Alexander Drive
Research Triangle PK, NC 27709
USA

For MEDICAL, TRANSPORTATION or other EMERGENCY call: 1-800-334-7577 (24 hours/day)
For Product Information call: 1-800-331-2867

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Hazardous Component Name</u>	<u>CAS-No.</u>	<u>Average % by Weight</u>
Resmethrin	10453-86-8	4.14
Piperonyl butoxide	51-03-6	12.42
Naphthalene	91-20-3	0.55
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8	

SECTION 3. HAZARDS IDENTIFICATION

NOTE: Please refer to Section 11 for detailed toxicological information.

Emergency Overview Caution! Harmful if swallowed or absorbed through skin. Avoid contact with skin, eyes and clothing. Highly toxic to fish.

Physical State liquid
Odor mild solvent
Appearance yellow to amber
Routes of Exposure Ingestion, Skin Absorption, Inhalation, Eye contact
Immediate Effects
Eye May cause mild irritation to eyes. Avoid contact with eyes.



Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 102000004837
MSDS Version 2.0

Skin	May cause slight irritation. Harmful if absorbed through skin. Avoid contact with skin and clothing.
Ingestion	Harmful if swallowed. Do not take internally.
Inhalation	Avoid breathing spray mist.
Chronic or Delayed Long-Term	This product contains ingredients that are considered to be probable or suspected human carcinogens (see Section 11 - Chronic). This product or its components may have target organ effects.

SECTION 4. FIRST AID MEASURES

General	When possible, have the product container or label with you when calling a poison control center or doctor or going for treatment.
Eye	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a physician or poison control center immediately.
Skin	Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse out mouth and give water in small sips to drink. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person.
Inhalation	Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a physician or poison control center immediately.

**Notes to Physician
Signs and
Symptoms**

Local:
skin and eye paraesthesia which may be severe
The product causes irritation of eyes, skin and mucous membranes.
Inhalation may provoke the following symptoms:
irritation
cough

Systemic:
excitement
gastrointestinal discomfort
tremors
dizziness
headache
apathy



Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 102000004837
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	nausea vomiting abdominal pain muscular fasciculation unconsciousness
Hazards	This product contains a pyrethroid. Must NOT be confused with organophosphorus compounds!
Treatment	Local treatment: Initial treatment should be symptomatic and supportive. After eye contact: Instillation of local anaesthetic drops e.g. 1% Amethocaine Hydrochloride eye drops. Give Analgesics as necessary. Published data indicate Vitamin E acetate can prevent and/or mitigate symptoms of paresthesia (skin irritation) caused by synthetic pyrethroids. Systemic treatment: Endotracheal intubation and gastric lavage, followed by administration of charcoal. Monitoring of respiratory and cardiac functions. ECG - monitoring (Electrocardiogram). Check for pulmonary oedema in event of inhalation. Keep airway clear, administer artificial respiration if necessary. Against convulsions: give diazepam. For adults 5-10 mg intravenously as necessary until fully sedated; for children 2.5 mg i.v. There is no specific antidote. Contraindication: atropine. Contraindication: derivatives of adrenaline. Recovery: spontaneous.

SECTION 5. FIRE FIGHTING MEASURES

Flash Point	> 93.4 °C / > 200.1 °F
Suitable Extinguishing Media	carbon dioxide (CO2), dry chemical, foam, water
Fire Fighting Instructions	Keep out of smoke. Fight fire from upwind position. Cool closed containers exposed to fire with water spray. Dike area to prevent runoff and contamination of water sources. Equipment or materials involved in pesticide fires may become contaminated. Firefighters should wear NIOSH approved self-contained breathing apparatus and full protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Keep unauthorized people away. Isolate hazard area. Avoid contact with spilled product or contaminated surfaces.
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Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 102000004837
MSDS Version 2.0

Methods for Cleaning Up Take up with absorbent material (e.g. sand, diatomaceous earth or a proprietary absorbent material). Keep in suitable, closed containers for disposal. Clean contaminated floors and objects thoroughly, observing environmental regulations.

Additional Advice Use personal protective equipment. Do not allow product to enter streams, sewers or other waterways.

SECTION 7. HANDLING AND STORAGE

- Handling Procedures** Handle and open container in a manner as to prevent spillage.
- Storing Procedures** Do not contaminate water, food, or feed by storage or disposal. Store in original container and out of the reach of children, preferably in a locked storage area.
- Work/Hygienic Procedures**

Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, using the toilet or applying cosmetics.

Take off contaminated clothing and shoes immediately. Then wash thoroughly and put on clean clothing.

Remove Personal Protective Equipment (PPE) immediately after handling this product. Before removing gloves clean them with soap and water. As soon as practical, wash thoroughly and change into clean clothing.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

- General Protection** Follow all label instructions. Train employees in safe use of the product.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and warm/tepid water. Keep and wash PPE separately from other laundry.
- Engineering Controls** Ensure adequate ventilation, especially in confined areas. Maintain exposure levels below the exposure limit through the use of general and local exhaust ventilation.
- Eye/Face Protection** tightly fitting safety goggles
- Hand Protection** Chemical resistant nitrile rubber gloves
- Body Protection** Wear long-sleeved shirt and long pants and shoes plus socks.
- Respiratory Protection** When respiratory protection is necessary under the conditions of use, wear a respirator approved by the National Institute for Occupational Safety and Health (NIOSH).

Bayer Environmental Science



Material Safety Data Sheet

SCOURGE® INSECTICIDE WITH RESMETHRIN / PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II

MSDS Number: 102000004837
MSDS Version 2.0

Exposure Limits

Naphthalene	91-20-3	ACGIH	TWA	10 ppm
		ACGIH	STEL	15 ppm
		NIOSH	REL	10 ppm
		NIOSH	STEL	15 ppm
		OSHA Z1	PEL	10 ppm
		OSHA Z1A	TWA	10 ppm
		OSHA Z1A	STEL	15 ppm
		US CA OEL	TWA PEL	10 ppm
		US CA OEL	STEL	15 ppm
		US CA OEL	TWA	5 ppm
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8	ACGIH	TWA	5 mg/m3

Form of Exposure	Mist.	
ACGIH	STEL	10 mg/m3
Form of Exposure	Mist.	
ACGIH NIC	TWA	0.2 mg/m3
Form of Exposure	Inhalable fraction.	

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	yellow to amber
Physical State	liquid
Odor	mild solvent
Specific Gravity	0.866 at 20 °C
Density	ca. 0.866 g/cm ³ at 20 °C
Bulk Density	7.23 lbs/gal
Water Solubility	insoluble
Viscosity	34.3 mPa.s at 21 °C

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable under normal conditions.
Conditions to Avoid	Exposure to extreme heat. Sources of ignition.
Incompatibility	strong reducing agents strong oxidizing agents

Bayer Environmental Science



Material Safety Data Sheet

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**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

Hazardous Decomposition Products Thermal decomposition
Carbon monoxide
carbon dioxide (CO₂)

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity studies have been bridged from a similar formulation containing a higher percentage of the active ingredients, resmethrin and piperonyl butoxide. The non-acute information pertains to the technical-grade active ingredients.

Acute Oral Toxicity rat: LD50: > 2,700 mg/kg

Acute Dermal Toxicity rabbit: LD50: > 2,000 mg/kg

Acute Inhalation Toxicity male/female rat: LC50: > 2.6 mg/l
Exposure time: 4 h
Determined in the form of liquid aerosol.
(actual)
Maximum attainable concentration.
No deaths

male/female rat: LC50: > 10.4 mg/l
Exposure time: 1 h
Determined in the form of liquid aerosol.
Extrapolated from the 4 hr LC50.
(actual)

Skin Irritation rabbit: Slight irritation.

Eye Irritation rabbit: Minimally irritating.

Sensitization guinea pig: Non-sensitizing.

Chronic Toxicity Resmethrin: In a chronic dietary rat study the primary target organ was the liver with secondary effects observed in the thyroid.

Piperonyl Butoxide: In chronic feeding studies in dogs and rats, effects included decreased body weights and/or increased organ weights (liver, kidney, adrenal).

Assessment Carcinogenicity

Resmethrin: EPA has classified the carcinogenic potential of resmethrin as "likely to be a human carcinogen" due to liver tumors in male mice and female rats.

Piperonyl butoxide: There was no evidence of a carcinogenic potential in a chronic feeding study in rats. In an oncogenicity study in mice, there was an increased incidence of liver tumors. The US EPA has categorized piperonyl butoxide as a group C carcinogen, possible human carcinogen, based on limited evidence of cancer in laboratory animals.



Material Safety Data Sheet

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MSDS Version 2.0

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

ACGIH			
Naphthalene	91-20-3	Group A4	
NTP			
Naphthalene	91-20-3		
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8		
IARC			
Piperonyl butoxide	51-03-6	Overall evaluation: 3	
Naphthalene	91-20-3	Overall evaluation: 2B	
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8	Overall evaluation: 1	
OSHA			
None.			

Reproductive & Developmental Toxicity

DEVELOPMENTAL TOXICITY

Resmethrin: Resmethrin is not a primary developmental toxicant based on developmental toxicity studies in rats and rabbits. Any developmental effects observed were secondary to maternal toxicity.

Piperonyl butoxide: Developmental, embryotoxic or teratogenic effects were not produced in developmental toxicity studies in rats and rabbits.

REPRODUCTION

Resmethrin: In a multi-generation study in rats there was a slight increase in premature stillbirths and a decrease in pup body weights.

Piperonyl Butoxide: There were no reproductive effects observed in a two-generation study in rats.

Neurotoxicity

Resmethrin: Resmethrin was not neurotoxic in acute and subchronic studies in rats.

Piperonyl Butoxide: Data not available.

Mutagenicity

Resmethrin: Resmethrin was not mutagenic in a test performed with the bacterium, *Salmonella typhimurium*.

Piperonyl Butoxide: Sufficient evidence exists indicating piperonyl butoxide does not have significant potential for mutagenicity.

SECTION 12. ECOLOGICAL INFORMATION

Toxicity to Fish

Oncorhynchus mykiss (rainbow trout)
LC50: 0.00240 mg/l
Exposure time: 96 h

Bluegill sunfish
LC50: 0.013 mg/l



Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 102000004837
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Exposure time: 96 h

Cyprinodon variegatus (sheepshead minnow)
LC50: 0.0088 mg/l
Exposure time: 96 h

Toxicity to other organisms

Acute Oral
California Quail
LD50: > 2,000 mg/kg
The value mentioned relates to the active ingredient resmethrin.

Japanese quail
LC50: > 5,000 ppm
The value mentioned relates to the active ingredient resmethrin.

Mallard duck
LC50: > 5,000 ppm
The value mentioned relates to the active ingredient resmethrin.

Environmental Precautions

Highly toxic to fish. For terrestrial uses, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below mean high water mark. Drift and runoff from treated areas may be hazardous to fish/aquatic organisms in adjacent sites. Consult your State's Fish and Wildlife Agency before treating water areas. Do not contaminate surface or ground water by cleaning equipment or disposal of wastes, including equipment wash water. Apply this product as specified on the label.

SECTION 13. DISPOSAL CONSIDERATIONS

General Disposal Guidance

Pesticide, spray mixture or rinse water that cannot be used according to label instructions may be disposed of at an approved waste facility.

Container Disposal

Triple rinse containers. Then offer for recycling or reconditioning or puncture and dispose of in a sanitary landfill or incineration, or if allowed by State and Local authorities, by burning. If burned, stay out of smoke.

RCRA Classification:

The RCRA Classifications may be on the individual component(s) and not necessarily on the product as a whole.

91-20-3

Naphthalene
US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261): U165

91-20-3

Naphthalene
US. EPA Resource Conservation and Recovery Act (RCRA) U List of Hazardous Wastes (40 CFR 261.33(f) and 40 CFR 302 [CERCLA]): U165

Bayer Environmental Science



Material Safety Data Sheet

**SCOURGE® INSECTICIDE WITH RESMETHRIN /
PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II**

MSDS Number: 102000004837
MSDS Version 2.0

SECTION 14. TRANSPORT INFORMATION

DOT CLASSIFICATION:

Non-Bulk Packages:

Not regulated for Domestic Surface Transportation

FREIGHT CLASSIFICATION:

Insecticides or Fungicides, N.O.I., other than poison

SECTION 15. REGULATORY INFORMATION

EPA Registration No. 432-716

US Federal Regulations

TSCA list

Piperonyl butoxide	51-03-6
Naphthalene	91-20-3
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8

US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)

Naphthalene	91-20-3
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SARA Title III - Section 302 - Notification and Information

None.

SARA Title III - Section 313 - Toxic Chemical Release Reporting

Resmethrin	10453-86-8	1.0%
Piperonyl butoxide	51-03-6	1.0%
Naphthalene	91-20-3	0.1%

US States Regulatory Reporting

CA Prop65

This product contains a chemical known to the State of California to cause cancer.

Naphthalene	91-20-3
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This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Resmethrin	10453-86-8	Developmental toxin.
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US State Right-To-Know Ingredients

Resmethrin	10453-86-8	NJ
Piperonyl butoxide	51-03-6	NJ
Naphthalene	91-20-3	CA, CT, IL, MN, NJ, PA, RI
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8	CA, MA

Canadian Regulations

Canadian Domestic Substance List

Resmethrin	10453-86-8
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Material Safety Data Sheet

SCOURGE® INSECTICIDE WITH RESMETHRIN / PIPERONYL BUTOXIDE 4% + 12% MF FORMULA II

MSDS Number: 102000004837
MSDS Version 2.0

Piperonyl butoxide	51-03-6
Naphthalene	91-20-3
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8

Environmental

CERCLA

Naphthalene 91-20-3

100 lbs

Clean Water Section 307 Priority Pollutants

None.

Safe Drinking Water Act Maximum Contaminant Levels

None.

International Regulations

European Inventory of Existing Commercial Substances (EINECS)

Resmethrin	10453-86-8
Piperonyl butoxide	51-03-6
Naphthalene	91-20-3
Distillates (petroleum), hydrotreated light paraffinic	64742-55-8

SECTION 16. OTHER INFORMATION

NFPA 704 (National Fire Protection Association):

Health - 1 Flammability - 1 Reactivity - 1 Others - none

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard

Reason to Revise: Re-numbered due to system update; Updated sections as needed.

Revision Date: 06/15/2006

This information is provided in good faith but without express or implied warranty. The customer assumes all responsibility for safety and use not in accordance with label instructions. The product names are registered trademarks of Bayer.

MATERIAL SAFETY DATA SHEET**DIAZINON AG600 WBC****FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION****FORMULATED FOR:**LOVELAND PRODUCTS, INC.
P.O. Box 1286 • Greeley, CO 80632-1286

24-Hour Emergency Phone: 1-800-424-9300

Medical Emergencies: 1-800-301-7976

U.S. Coast Guard National Response Center: 1-800-424-8802

PRODUCT NAME: DIAZINON AG600 WATER-BASED CONCENTRATE INSECTICIDE
CHEMICAL NAME: Diazinon; (O-O-diethyl O- (2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate)
CHEMICAL FAMILY: Organophosphate Insecticide
EPA REG. NO.: 66222-103-34704
MSDS Number: 66222103-07-LPI **MSDS Revisions:** Section 16 **Date Of Issue:** 10/15/07 **Supersedes:** 09/03/04

2. HAZARDS IDENTIFICATION SUMMARY

KEEP OUT OF REACH OF CHILDREN – CAUTION – Harmful if swallowed, inhaled or absorbed through skin. Causes eye irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing vapor or spray mist. Avoid contamination of food and feed. Food utensils such as tablespoons and measuring cups should not be used for food purposes after use in measuring pesticides. Keep out of reach of domestic animals. Do not use on humans, household pets or livestock. Do not contaminate ornamental fishponds.

This product is an off-white liquid with slight sulfur-like odor.

Warning Statements:

NOTE TO PHYSICIAN: This product is an organophosphate (cholinesterase-inhibiting) insecticide. Atropine is antidotal and should be given in multiple doses as necessary until the patient is atropinized. 2-PAM is also antidotal, but should be administered only in conjunction with Atropine. Monitor serum and RBC cholinesterase. Morphine, theophylline, aminophylline, phenothiazines, reserpine, furosemide, or ethacrynic acid are contraindicated in organophosphate poisonings. Administer intravenous fluids cautiously, if needed, to correct dehydration. Symptoms of cholinesterase inhibition can include headache, dizziness, blurred vision, weakness, nausea, cramps, diarrhea, discomfort in the chest, nervousness, sweating, miosis, tearing, salivation, pulmonary edema, uncontrollable twitches, convulsions, coma, and loss of reflexes and sphincter control.

3. COMPOSITION, INFORMATION ON INGREDIENTS

Chemical Ingredients:	Percentage by Weight:	CAS No.	TLV (Units)
Diazinon	56.00	333-41-5	0.01 mg/m ³ (Skin)
Inert Ingredients	44.00		

This product is hazardous according to the OSHA Hazard Communication Standard (29 CFR 1910.1200)

4. FIRST AID MEASURES

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious or convulsing person.

If in eyes: Hold eye open and rinse slowly and gently with water 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth. Call a poison control center or doctor for further treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: 1-800-301-7976. Have the product container or label with you when calling a poison control center or doctor or going for treatment.

5. FIRE FIGHTING MEASURES

FLASH POINT (*F/Test Method): 220°F/104.5°C (PMCC)

FLAMMABLE LIMITS (LFL & UFL): None established

EXTINGUISHING MEDIA: This product is water-based; use medium appropriate to surrounding fire. Dry chemical, carbon dioxide, foam, water spray or fog.

HAZARDOUS COMBUSTION PRODUCTS: Thermal decomposition products include, but are not limited to, various aliphatic organophosphates, substituted pyrimidines, and hydrogen cyanide.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus with full protective clothing. Fight fire from upwind and keep all non-essential personnel out of area.

UNUSUAL FIRE AND EXPLOSION HAZARDS: If water is used to fight fire or cool containers, dike to prevent runoff contamination of municipal sewers and waterways.

MATERIAL SAFETY DATA SHEET

DIAZINON AG600 WBC

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Wear chemical safety glasses with side shields or chemical goggles, rubber gloves, rubber boots, long-sleeved shirt, long pants, head covering, and a NIOSH-approved pesticide respirator or air-supplied respirator.
 For small spills, absorb with an absorbent material such as pet litter. Sweep up and place in an approved chemical container for proper disposal. Check local, state and federal regulations for proper disposal. For large spills, contain liquid by diking the area, keep product out of water supplies. If possible use a pump to pick up liquid, then use absorbent material to absorb any residual liquid. Place both in an approved container. Flush the area with a household bleach and water mixture (1:1) and then absorb the liquid as described in small spills.
CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

7. HANDLING AND STORAGE

HANDLING: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. Do not use, pour, spill or store near heat or open flame.
STORAGE: If freezing occurs, place the product in a warm room (68°F/20°C or above) and allow to thaw. Roll or shake container frequently until thawing is complete. Do not contaminate water, food or feed by storage or disposal.

Personal Protective Equipment: Mixers, loaders, applicators and other handlers using engineering controls must wear: long sleeved shirt and long pants, shoes plus socks, chemical resistant gloves if mixing or loading, and chemical resistant apron if mixing or loading. Handlers performing tasks, such as cleaning equipment or spill clean-up for which engineering controls are not feasible must wear: coveralls over long sleeved shirts and long pants, chemical resistant gloves, chemical resistant footwear plus socks, chemical resistant apron if exposed to concentrate, and a NIOSH-approved respirator with an organic vapor (OV) cartridge or canister with any R, P, or HE prefilter. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that has been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets with requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.
RESPIRATORY PROTECTION: Not normally required, if vapors or mists exceed acceptable levels, wear a NIOSH approved pesticide respirator.
EYE PROTECTION: Chemical goggles or shielded safety glasses.
SKIN PROTECTION: Wear protective clothing: long-sleeved shirts and pants, shoes with socks. Wear chemical-resistant gloves.

Diazinon	OSHA PEL 8 hr TWA not listed	ACGIH TLV-TWA 0.01 mg/m ³ (Skin)
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9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Off-white liquid with slight sulfur-like odor. **SOLUBILITY:** Slight
SPECIFIC GRAVITY (Water = 1): 1.07 g/ml **BULK DENSITY:** 8.93 lbs/gal. **pH:** 7-8 (1% solution)
VAPOR PRESSURE: <0.1 mm Hg @ 25°C **BOILING POINT:** Not established
PERCENT VOLATILE (by volume): > 30% **EVAPORATION RATE:** Not established
 Note: These physical data are typical values based on material tested but may vary from sample to sample.
 Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

STABILITY: Stable **CONDITIONS TO AVOID:** Excessive heat and ignition sources.
INCOMPATIBILITY: Strong bases, acids, and oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition – aliphatic organophosphates, substituted pyrimidines, and hydrogen cyanide.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Oral LD₅₀ (rat): 1600 mg/kg **Acute Dermal LD₅₀ (rabbit):** > 2020 mg/kg
Eye Irritation (rabbit): Causes irritation **Skin Irritation (rabbit):** Non-irritating
Inhalation LC₅₀ (rat): >2.5 mg/L (4 hr) **Skin Sensitization (Guinea Pig):** Not a sensitizer
Carcinogenic Potential: None listed in OSHA, NTP, IARC or ACGIH

12. ECOLOGICAL INFORMATION

Summary of Effects: Diazinon is highly toxic to birds, fish, and other wildlife. Avoid exposure to waterfowl. Keep out of lakes, streams, ponds, tidal marches, and estuaries. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Shrimp and crab may be killed at application rates on the product label. Do not apply this product where fish, shrimp, crab, and other aquatic life are important resources. Do not contaminate water by cleaning of equipment or disposal of equipment wash waters. Highly toxic to bees exposed to direct treatment or to residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

MATERIAL SAFETY DATA SHEET

DIAZINON AG600 WBC

Eco-Acute Toxicity

96 HR LC₅₀
 Rainbow Trout 1.8 mg A.I./L
 Bluegill Sunfish 0.21 mg A.I./L
 Bobwhite Oral LD₅₀: 5.2 mg/kg
 Mallard Oral LD₅₀: 1.44 mg/kg
 Bobwhite 8-day Dietary LC₅₀: 235 ppm
 Mallard 8-day Dietary LC₅₀: 33 ppm A.I.

48 HR LC₅₀
 Daphnia Magna 0.0011 mg A.I./L

Eco-Chronic Toxicity

Diazinon: Fish (Fathead minnow) Early Life Stage MATC >0.092 and <0.17 mg/L
 Invertebrate (Daphnia Magna) Life Cycle MATC >0.00017 and <0.00032 mg/L
 Mallard Reproduction NOEC 10 ppm (ChE inhibition <5 ppm)
 Bobwhite Reproduction NOEC 40 ppm (ChE inhibition < 10 ppm)

13. DISPOSAL CONSIDERATIONS

Do not reuse product container. Plastic: Triple rinse (or equivalent), then offer for recycling at an ACRC site (go to <http://www.acrecycle.org/> for locations) or by reconditioning, or puncture and dispose of in a sanitary landfill, or, incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. Do not contaminate water, food or feed by storage or disposal.

14. TRANSPORT INFORMATION

DOT Shipping Description: RQ ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, UN3082, III (DIAZINON) MARINE POLLUTANT ERG GUIDE 171
 U.S. Surface Freight Classification: INSECTICIDES, INSECT REPELLENTS, NOI, OTHER THAN POISON (NMFC 102120, CLASS: 60)
 Consult appropriate ICAO/IATA and IMDG regulations for shipment requirements in the Air and Maritime shipping modes.

15. REGULATORY INFORMATION

NFPA & HMIS Hazard Ratings:		NFPA		HMIS
1	Health	0	Least	1 Health
1	Flammability	1	Slight	1 Flammability
0	Instability	2	Moderate	0 Reactivity
		3	High	H PPE
		4	Severe	

SARA Hazard Notification/Reporting
 SARA Title III Hazard Category: Immediate Y Fire N Sudden Release of Pressure N
 Delayed Y Reactive N

Reportable Quantity (RQ) under U.S. CERCLA: Diazinon (CAS: 333-41-5): 1 pound
 SARA, Title III, Section 313: Diazinon (CAS: 333-41-5) 56.0%
 RCRA Waste Code: Not listed
 CA Proposition 65: Not listed.

16. OTHER INFORMATION

MSDS STATUS: Section 16 revised
 PREPARED BY: Registrations and Regulatory Affairs
 REVIEWED BY: Environmental/ Regulatory Services
 This product is a RESTRICTED USE PESTICIDE due to Avian and Aquatic Toxicity

Disclaimer and Limitation of Liability: This data sheet was developed from information on the constituent materials identified herein and does not relate to the use of such materials in combination with any other material or process. No warranty is expressed or implied with respect to the completeness or ongoing accuracy of the information contained in this data sheet, and LOVELAND PRODUCTS, Inc. disclaims all liability for reliance on such information. This data sheet is not a guarantee of safety. Users are responsible for ensuring that they have all current information necessary to safely use the product described by this data sheet for their specific purpose.



Bayer CropScience

MATERIAL SAFETY DATA SHEET

BAYER ENVIRONMENTAL SCIENCE
A Business Group of BAYER CROPSCIENCE, LP
2 T.W. Alexander Drive
Research Triangle Park, NC 27709

For MEDICAL, TRANSPORTATION or Other EMERGENCY call 1-800-334-7577 (24 hours/day)

For Product Information call 1-800-331-2867

1. CHEMICAL PRODUCT IDENTIFICATION:

PRODUCT NAME.....: TEMPO SC Ultra Insecticide
EPA REG. No.....: 432-1363
CHEMICAL FAMILY.....: Pyrethroid Insecticide
CHEMICAL NAME.....: Cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2
-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate
SYNONYMS.....: beta-cyfluthrin
FORMULA.....: C22 H18 Cl2 F N O3

2. COMPOSITION/INFORMATION ON INGREDIENTS:

INGREDIENT NAME /CAS NUMBER EXPOSURE LIMITS CONCENTRATION (%)

***** HAZARDOUS INGREDIENTS *****

FCR 4545 Technical (beta-cyfluthrin)
68359-37-5 OSHA : Not Established 11.8 %
ACGIH: Not Established

Specific chemical identity is withheld as a trade secret.
OSHA : Not Established 1-3 %
ACGIH: Not Established

Approval date: 07/29/2005

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Continued on next page

3. HAZARDS IDENTIFICATION:

* EMERGENCY OVERVIEW *
* *
* CAUTION! Color: Beige; Form: Liquid; Off-white to beige *
* viscous liquid suspension; Odor: Chalky; Harmful if *
* inhaled; Harmful if absorbed through skin; Causes eye *
* irritation. *

POTENTIAL HEALTH EFFECTS:

ROUTE(S) OF ENTRY.....: Inhalation; Skin Contact; Skin Absorption;
Eye Contact

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE EFFECTS OF EXPOSURE.....: Skin and mucous membrane irritation may occur from contact with the product and produce symptoms such as itching, stinging, skin reddening or rash. Paresthesia (a tingling or burning sensation on the surface of the skin) may also result from skin contact. These are frequently reported symptoms associated with sufficient dermal exposure to alpha-cyano (Type II) synthetic pyrethroids and normally subside without treatment within 24 hours. The onset of these symptoms usually occurs 2-12 hours after exposure. The effects are temporary and are reversible. Based on the EPA Toxicity Category criteria, this material is mildly toxic by the oral and dermal routes of exposure. In addition, animal studies have shown that it can cause mild irritation to the conjunctiva of the eye with all irritation resolving within 7 days.

CHRONIC EFFECTS OF EXPOSURE...: Based on animal studies, no adverse effects or symptoms would be expected from chronic exposure to this material.

CARCINOGENICITY.....: This product is not listed by NTP, IARC or regulated as a carcinogen by OSHA.

MEDICAL CONDITIONS

AGGRAVATED BY EXPOSURE.....: No specific medical conditions are known which may be aggravated by exposure to this product. As with all materials which can cause upper respiratory tract irritation, persons with a history of asthma, emphysema, or hyperreactive airways disease may be more susceptible to overexposure.

4. FIRST AID MEASURES:

FIRST AID FOR EYES.....: Hold eyelids open and flush with copious amounts of water for 15 minutes. Call a physician if irritation develops or persists

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4. FIRST AID MEASURES (Continued)

after flushing.

FIRST AID FOR SKIN.....: Remove contaminated clothing immediately. Wash skin with soap and water, preferably preceded by a waterless hand cleaner. Get medical attention if irritation develops or persists. If signs of intoxication (poisoning) occur, get medical attention immediately.

FIRST AID FOR INHALATION: If a person is overcome by excessive exposures to aerosols or vapors of this material, remove to fresh air or uncontaminated area. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention as soon as possible.

FIRST AID FOR INGESTION.: If ingestion is suspected, call a physician or poison control center. Drink one or two glasses of water and induce vomiting by touching back of throat with finger, or, if available, by administering syrup of ipecac. If syrup of ipecac is available, administer 1 tablespoonful (15 mL) of syrup of ipecac followed by 1 to 2 glasses of water. If vomiting does not occur within 20 minutes, repeat the dose once. Do not induce vomiting or give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN.....: ANTIDOTE: No specific antidote is available. Treat victim symptomatically. Published data indicate vitamin E acetate can prevent and/or mitigate symptoms of paresthesia caused by synthetic pyrethroids. In case of poisoning, call the number on page 1.

5. FIRE FIGHTING MEASURES:

FLASH POINT.....: Greater than 200 F (93 C)

EXTINGUISHING MEDIA.....: Water; Foam; Dry Chemical

SPECIAL FIRE FIGHTING PROCEDURES: Keep out of smoke. Cool exposed containers with water spray. Fight fire from upwind position. Use self-contained breathing equipment. Contain runoff to prevent entry into sewers or waterways. Equipment or materials involved in pesticide fires may become contaminated.

6. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES.....: Isolate area and keep unauthorized people away. Do not walk through spilled material. Avoid breathing vapors and skin contact. Remove sources of ignition if combustible or flammable vapors may be present and ventilate area. Wear proper protective equipment. Dike contaminated area with absorbent granules, soil, sand, etc. If large spill, material should be recovered. Small spills can be absorbed with absorbent granules, spill control pads, or any absorbent material. Carefully sweep up absorbed spilled material. Place in covered container for reuse or disposal. Scrub contaminated area with soap and water. Use dry absorbent materials such as clay granules to absorb and

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Continued on next page

6. ACCIDENTAL RELEASE MEASURES (Continued)

collect wash solution for proper disposal. Contaminated soil may have to be removed and disposed. Do not allow material to enter streams, sewers, or other waterways or contact vegetation.

7. HANDLING AND STORAGE:

STORAGE TEMPERATURE(MIN/MAX): 0 F/30 day avg. not to exceed 100 F
SHELF LIFE.....: Time/temperature-dependent. Contact Bayer for specific information.
SPECIAL SENSITIVITY.....: Not established
HANDLING/STORAGE PRECAUTIONS: Store in a cool, dry area designated specifically for pesticides.

8. PERSONAL PROTECTION:

EYE PROTECTION REQUIREMENTS.....: Goggles should be used to prevent liquid from getting into eyes.
SKIN PROTECTION REQUIREMENTS.....: Avoid skin contact. Wear long sleeves and trousers.
HAND PROTECTION REQUIREMENTS.....: Chemical-resistant gloves such as neoprene
VENTILATION REQUIREMENTS.....: Control exposure levels through the use of general and local exhaust ventilation.
RESPIRATOR REQUIREMENTS.....: When respiratory protection is necessary under the conditions of use, wear a NIOSH-approved organic vapor respirator with dust and mist filter.
ADDITIONAL PROTECTIVE MEASURES.....: Clean water and soap should be available for washing in case of eye or skin contamination. Waterless hand cleaner use is often more effective than soap and water. Sensitive areas of the skin and mucous membranes can become contaminated indirectly. Educate and train employees in safe use of the product. Follow all label instructions. Launder clothing separately after use. Wash thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES:

PHYSICAL FORM.....: Liquid
APPEARANCE.....: Off-white to beige viscous liquid suspension
COLOR.....: Beige
ODOR.....: Chalky
MOLECULAR WEIGHT.....: 434.3 (for beta-cyfluthrin)
pH: 7-8
BOILING POINT.....: Not established
MELTING/FREEZING POINT.....: Approx. 20 F

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9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

VISCOSITY.....: 1060 cps @ 23 C
SOLUBILITY IN WATER: Not established
SPECIFIC GRAVITY: 1.06 @ 20 C/20 C
BULK DENSITY.....: Not established
VAPOR PRESSURE: 7.2 x 10⁻⁹ mm Hg @ 20 C (for beta-cyfluthrin)

10. STABILITY AND REACTIVITY:

STABILITY.....: This is a stable material.
HAZARDOUS POLYMERIZATION...: Will not occur.
INCOMPATIBILITIES.....: Alkaline media; reacts with methanol; incompatible
with many disinfectants.
INSTABILITY CONDITIONS.....: Not established
DECOMPOSITION PRODUCTS.....: Not established

11. TOXICOLOGICAL INFORMATION:

Only acute studies have been performed on this product as formulated. The non-acute information pertains to the active ingredient, cyfluthrin technical, and its enriched isomer mixture, BAY FCR 4545 technical.

ACUTE TOXICITY

ORAL LD50.....: Male rat: 960 mg/kg -- Female rat: 1150 mg/kg
DERMAL LD50.....: Male and Female Rat: >2000 mg/kg
INHALATION LC50.....: 4 hr exposure to Liquid Aerosol: Male and Female Rat:
>1.72 mg/L (analytical) -- 1 hr exposure to Liquid Aerosol (extrapolated from
4 hr): Male and Female Rat: >6.88 mg/L (analytical)
EYE EFFECTS.....: Rabbit: Mild irritation to the conjunctiva was
observed with all irritation cleared within 7 days post-treatment.
SKIN EFFECTS.....: Rabbit: Not a dermal irritant
SENSITIZATION.....: Guinea pig: Not a dermal sensitizer
SUBCHRONIC TOXICITY...: FCR 4545: In a 13 week dog study, FCR 4545 was
administered at dietary concentrations of 10, 60 or 360 ppm. Effects included
vomiting and diarrhea after feeding, decreased body weight gain, and motor
disturbances in the hind limbs. The no-observed effect-level (NOEL) was 60
ppm. In a 13 week study using rats, FCR 4545 was administered at dietary
concentrations of 30, 125 or 500 ppm. Effects included reduced body weight
gains and feed consumption, uncoordinated gait, and skin injuries of the neck
and head from excessive preening due to the local irritant effect of the test
material. The NOEL was 125 ppm. In a 4 week inhalation study, rats were
exposed to FCR 4545 at liquid aerosol concentrations of 0.2, 2.7 or 23.5
mg/m³. Effects observed included ungroomed fur, piloerection, hyper- and
hypoactivity, reduced body weight gains, reduced organ weights (thymus and
spleen), and hematological changes. The NOEL was 0.2 mg/m³ based on decreased
body weight gains. CYFLUTHRIN: In a 3 week dermal toxicity study, cyfluthrin

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11. TOXICOLOGICAL INFORMATION (Continued)

was administered to rats for 6 hours/day at dose levels of 100, 340 or 1000 mg/kg. Animals received a total of 17-18 applications in a period of 22-23 days. An additional control and high-dose group were treated and maintained for 14-15 days following treatment so as to ascertain the extent of recovery. Effects observed included reduced feed consumption, red nasal discharge, urine stains, and findings at the dose site (scabbing, crusty, discolored and raised zones). Histologically, epidermal and dermal alterations in treated skin were observed in animals of the mid- and high-dose groups. Similar, but slightly less severe microscopic alterations were also observed in the high-dose recovery group. The overall NOEL was 100 mg/kg. In a 13 week inhalation study, rats were exposed to cyfluthrin at aerosol concentrations of 0.09, 0.71 or 4.51 mg/m³ for 6 hours/day, 5 days/week. The NOEL was 0.09 mg/m³ based on reduced body weight gains.

CHRONIC TOXICITY.....: Cyfluthrin has been investigated in chronic feeding studies using two different strains of rats. In each study, cyfluthrin was administered for 2 years at dietary concentrations ranging from 50 to 450 ppm. Body weight gains were decreased at concentrations of 150 ppm and greater. Changes in clinical chemistries occurred at 450 ppm. In one of the studies, histopathology revealed a numerical increase in mammary gland adenocarcinomas at 450 ppm. This finding was not statistically significant when compared to the controls and is not considered to be compound-related. In each study, the overall NOEL was 50 ppm based on decreased body weight gains. In a 1 year feeding study, dogs were administered cyfluthrin at dietary concentrations of 50, 100, 360 or 650 ppm. Beginning on week 8, the high dose was reduced to 500 ppm for the remainder of the study due to severe clinical neurological symptoms. Body weights were decreased for animals of the high-dose. Neurological findings (gait abnormalities and postural reaction deficits) were observed at doses of 360 and greater. The NOEL was 100 ppm.

CARCINOGENICITY.....: Cyfluthrin was investigated for carcinogenicity in chronic studies using rats and mice at maximum levels of 450 and 800 ppm, respectively. There was no evidence of a carcinogenic potential observed in either species.

MUTAGENICITY.....: In vitro and in vivo mutagenicity studies have been conducted on BAY FCR 4545 technical, all of which are negative. Numerous in vitro and in vivo mutagenicity studies have been conducted on cyfluthrin, all of which are negative.

DEVELOPMENTAL TOXICITY: FCR 4545: In a developmental toxicity study, Bay FCR 4545 technical was administered orally to rats during gestation at doses of 3, 10 or 40 mg/kg. At the lethal and maternally toxic dose of 40 mg/kg, there was a decrease in fetal body weights and an increased incidence of skeletal findings. The NOELs for maternal and developmental toxicity were 3 and 10 mg/kg, respectively. **Cyfluthrin:** In developmental toxicity studies using rats, cyfluthrin was administered during gestation by oral gavage at doses ranging from 1 to 30 mg/kg. The overall NOEL from these studies for maternal toxicity was 3 mg/kg. No developmental effects were observed at any of the doses tested. In each study, the NOEL for developmental toxicity was equivalent to the highest dose tested. The NOELs for developmental toxicity for the initial study and the subsequent study were 30 and 10 mg/kg, respectively. Rabbits were administered cyfluthrin during gestation by oral gavage at doses ranging from 5 to 180 mg/kg. At maternally toxic levels, there was an increased incidence of post-implantation losses. The overall

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11. TOXICOLOGICAL INFORMATION (Continued)

NOEL derived from these studies for both maternal and developmental toxicity was 20 mg/kg. In an inhalation study, rats were exposed during gestation to cyfluthrin at aerosol concentrations of 0.46, 2.55 or 11.9 mg/m³ for 6 hours/day. NOELs for maternal and developmental toxicity were less than 0.46 and 0.46 mg/m³, respectively.

REPRODUCTION.....: In a reproduction study, cyfluthrin was administered to rats for 3 generations at dietary concentrations of 50, 150 and 450 ppm. Reproductive effects observed at parentally toxic levels included reductions in viability, lactation, litter size, feed consumption, and pup birth weights and body weight gains. Coarse tremors were observed in some offspring at 450 ppm. The NOEL for both parental and reproductive effects was 50 ppm. In another reproduction study, cyfluthrin was administered to rats for 2 generations at dietary concentrations of 50, 125 or 400 ppm. Coarse tremors occurring in conjunction with parental toxicity were observed in the offspring in the mid- and high-dose groups. Based on this finding, the neonatal NOEL was 50 ppm. The NOELs for parental and reproductive toxicity were 50 and 400 ppm, respectively.

NEUROTOXICITY: Numerous neurotoxicity studies have been conducted on cyfluthrin. Oral gavage studies using hens have indicated that at extremely high dose levels (5000 mg/kg), minimal nerve damage occurs. When rats were administered cyfluthrin daily at oral doses of 40 to 80 mg/kg for 14 days, minimal nerve effects were seen. These effects were completely reversible within a 3 month recovery period. In dermal and inhalation studies which are relevant to field exposure, there was no evidence of delayed neurotoxicity in hens. In a special investigative study, litters of neonatal mice (10 days of age) and their mothers were exposed to aerosol concentrations of 5, 15, or 50 mg/m³ for 6.3 hours/day for 7 successive days. Motor activity was measured in the offspring at 4 months of age (approximately 3.5 months post-exposure). At 50 mg/m³, all of the offsprings died or were sacrificed in a moribund state following the first exposure. Mortalities were not observed at any of the other levels. Clinical symptoms were observed immediately after exposure in young mice at 15 mg/m³, and included decreased motility, temporary scratching, and tonic convulsions. There was an increase in motor activity in mice at 15 mg/m³. Histopathological investigations did not reveal any treatment-related findings in mice at the age of 4 months.

12. ECOLOGICAL INFORMATION:

This product is extremely toxic to fish and aquatic invertebrates, and is highly toxic to bees. Bayer will provide a summary of specific data upon written request. As with any pesticide, this product should be used according to label directions and should be kept out of streams, lakes and other aquatic habitats of concern. In event of a spill emergency the number on page 1.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD.....: Follow container label instructions for disposal of wastes generated during use in compliance with the FIFRA product label. In other situations, bury in an EPA approved landfill or burn in an incinerator approved for pesticide destruction.

EMPTY CONTAINER PRECAUTIONS.: Do not reuse container without written permission and instructions from Bayer. Empty, clean and dispose in accordance with state and local laws.

14. TRANSPORTATION INFORMATION:

TECHNICAL SHIPPING NAME.....: beta-Cyfluthrin
FREIGHT CLASS PACKAGE.....: Insecticides, NOI, NMFC 102100
PRODUCT LABEL.....: Not noted

DOT (DOMESTIC SURFACE)

HAZARD CLASS OR DIVISION: Non-Regulated

It is not expected that a mist or vapor hazard would exist from the normal transportation of this liquid substance.

IMO / IMDG CODE (OCEAN)

HAZARD CLASS DIVISION NUMBER...: Non-Regulated

ICAO / IATA (AIR)

HAZARD CLASS DIVISION NUMBER...: Non-Regulated

15. REGULATORY INFORMATION:

OSHA STATUS.....: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

TSCA STATUS.....: This product is exempt from TSCA Regulation under FIFRA Section 3 (2) (B) (ii) when used as a pesticide.

CERCLA REPORTABLE QUANTITY...: No components listed.

Approval date: 07/29/2005

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MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Chlorpyrifos 38.7% EC
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1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND COMPANY:

Product Name	Chlorpyrifos 38.7% EC
Company Name	NUFARM MALAYSIA SDN BHD (207731-P)
Company Address	L2.03 Wisma BUB, No. 11, Lebuhr Bandar Utama, Bandar Utama, 47800, Petaling Jaya, Selangor D.E., Malaysia
Tel/Fax Number	Tel: (+60 3) 7629 7233 Fax: (+60 3) 7629 7229
Email	sales.my@my.nufarm.com
Emergency Contact	National Poison Centre 1800 88 8099 (Normal Hour) (+60 12) 430 9499 (After Hour)
Product Type	Insecticide
Product Use	Non-systemic insecticide with contact, stomach, and respiratory action. Control of insect pests in chili, paddy, cocoa, oil palm, rubber, tobacco, broccoli and cover crops.
Other Information	This MSDS describes, to the best of our knowledge, the properties of the concentrated product. The physical properties and some of the assessments do not apply to the properties of the product once it has been diluted for application. Acute health effects of the diluted product are likely to be much less severe.

2. HAZARDS IDENTIFICATION:

Emergency Overview: Appearance and Odour Warning Statements	Pale yellow to amber colour liquid with mild odour. Keep out of reach of children. CAUTION. Cause skin irritation and moderate eye irritation. Harmful if swallowed. Avoid contact with eyes, skin and clothing
Potential Health Effects: Ingestion	Possible symptoms of exposure include: nausea, vomiting and central nervous system depression. If aspirated into the lung, e.g. from vomiting, the presence of solvent may result in chemical pneumonitis or pulmonary oedema.
Eye Contact Skin Contact	The concentrate may cause the irritation of the eyes. The rate of absorption for chlorpyrifos is low; hence, the product is moderately toxic by this route. Prolonged contact with the concentrate can cause defatting of the skin and may result in dermatitis.
Inhalation	When applying the product as a spray, avoid breathing in spray mists. Breathing in high concentrations of vapour can produce central nervous system depression, which can lead to loss of coordination, impaired judgment and if exposure is prolonged, unconsciousness.
Potential Environment Effects	This product is toxic to fish, aquatic invertebrates, small mammals and bees, and birds.

3. COMPOSITION / INFORMATION ON INGREDIENTS:

Type of Formulation	Emulsifiable Concentrate, (EC)		
Ingredients	Name	CAS	Proportion
	Chlorpyrifos	2921-88-2	38.7%, w/w
	Inert Ingredients		61.3%, w/w

4. FIRST AID MEASURES:

Ingestion	Contact the doctor or National Poison Centre immediately. Do NOT induce vomiting unless told to do so by doctor or National Poison Centre. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.
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MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Chlorpyrifos 38.7% EC
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These instructions are suitable for ingestion of spray solution and small amounts of concentrate; however, if SUBSTANTIAL AMOUNTS of the concentrate have been swallowed (more than about one teaspoon) AND if medical assistance is more than 30 minutes away, the induction of vomiting should be CONSIDERED, preferably based on MEDICAL ADVICE if a physician can be contacted by phone. All care must be taken to prevent vomit from being inhaled. Do not give anything by mouth to a semi-conscious or unconscious person.

If product had been swallowed and symptoms are evidence and medical assistant is not immediately available, give one atropine tablet (0.6 mg) every five minutes until dryness of the mouth occurs. Preferably, carry out treatment under the direction of medical advice obtained by phone.

Eye	Hold eyelids open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call National Poison Centre or doctor for treatment advice.
Skin	If poisoned by skin absorption, remove contaminated clothing, wash skin thoroughly with soap and water and give one atropine tablet every five minutes until dryness of the mouth occurs. Seek medical advice, but only after the exposed skin has been thoroughly washed.
Inhalation	Remove patient to fresh air and if required, give one atropine tablet every five minutes until dryness of the mouth occurs.
First Aid Facilities	If chlorpyrifos is regularly used, it may be wise to keep a supply of atropine tablet (0.6 mg). If poisoning occurs, contact a doctor or National Poison Centre on 1800 88 8099 (Malaysia).
Advice to Doctor	An anticholinesterase compound. If the material is dissolved in solvent, e.g., petroleum solvent, vomiting may cause pulmonary aspiration. Instead, the stomach should be emptied as soon as possible by careful gastric lavage (Using a cuffed endotracheal tube already in place). Artificial respiration should be started at the first sign of respiratory failure. Cautious administration of fluids is advised, as well as general supportive and symptomatic pharmacological treatment and absolute rest. As early as possible, administer 2 mg of atropine sulfate i.v. and 1000-2000 mg of pralidoxime chloride or 250 mg of obidoxime chloride (adult dose) i.v. to patients suffering from severe respiratory difficulties, convulsions, and unconsciousness. Repeated doses of 2 mg of atropine sulfate should be given, as required, based on the respiration, blood pressure, pulse frequency, salivation, and convulsion conditions. The dose and the frequency of atropine vary with each patient, but the patients remain fully atropinised (signs include dilated pupils, dry mouth, skin flushing). Diazepam should be given in all but the mildest cases in doses of 10 mg, s.c. or i.v., which may be repeated as required. For children, the doses are 0.04-0.08 mg of atropine/kg body weight, 250 mg of pralidoxime chloride per child, or 4-8 mg of obidoxime chloride/kg body weight. Morphine, barbiturates, phenothiazine derivatives, tranquilizers, and all kind of central stimulants are contraindicated.

5. FIRE FIGHTING MEASURES:

Extinguishing Media	Water fog, foam, carbon dioxide or dry chemical.
Special Fire Fighting Procedures	Fire-fighters should wear NIOSH/MHSA approved self-contained breathing apparatus and full fire-fighting turn out gear. Dike area to prevent runoff and contamination of water sources. Dispose of fire control water later.
Hazardous Combustion Products	May emit toxic fumes of hydrogen chloride or phosgene if involved in fires or exposed to extreme heat.



MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Chlorpyrifos 38.7% EC
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6. ACCIDENTAL RELEASE MEASURES:

Personal Protection	For appropriate personal protective equipment (PPE), refer Section 8.
Spills and Disposal	Contain spill and absorb with sand, soil or proprietary absorbent (such as vermiculite). Collect spilled material and waste in sealed open-top type containers for disposal. Dispose of at a landfill in accordance with local regulations. Final clean up with degreasing agent or detergent is advised.
Environmental Precaution	Prevent material from entering public sewer systems or any waterways. Do not flush to drains.

7. HANDLING AND STORAGE:

Handling	Avoid skin and eye contact and inhalation of spray mist. Do not use product container for any other purpose. Wash out the container and dispose of it in an approved manner.
Storage	For personal protective equipment (PPE) and hygiene advice, refer Section 8. Store in the closed, original container in a dry, cool, well ventilated area out of direct sunlight. Store in a safe place away from foodstuffs, seeds or fertilizers. Store out of the reach of children. Do not contaminate water, food, or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:

Engineering Controls	Handle in well ventilated area, generally natural ventilation is adequate.
Personal Protective Equipment	
Eye/ Face Protection	To avoid contact with eyes, wear chemical goggles or shielded safety glasses. An emergency eyewash or water supply should be readily accessible to the work area.
Skin Protection	To avoid contact with skin, wear coveralls over with long- or short-sleeved shirt and long or short pants, chemical-resistant footwear plus socks and chemical resistant gloves. Wear chemical-resistant apron when cleaning equipment, mixing or loading. For overhead exposure, wear chemical-resistant headgear. An emergency eyewash or water supply should be readily accessible to the work area.
Respiratory Protection	Not normally required except for all mixers, loaders, other applicator and other handler who must wear a NIOSH-approved dust mist filtering respirator with MSHA/NIOSH approved prefix TC-21C or a NIOSH-approved respirator with any N, R, P, or HE filter. In other situations, if vapours or mists exceed acceptable levels, wear NIOSH approved air-purifying respirator with cartridges/canisters approved for use against pesticides.
General Hygiene Considerations	Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials: 1) do not store, use and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored; 2) wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics or using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Physical State	Liquid
Appearance	Pale yellow to amber colour liquid free from sediment and suspended matter.
Boiling Point	Not determined
Vapour Pressure	2.7 mPa @ 25°C for chlorpyrifos
Volatile Density	N/A
Volatile Component	N/A
Surface Tension	N/A
Solubility in water	Forms an emulsion in water



MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Chlorpyrifos 38.7% EC
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Specific Gravity 1.057 @ 25°C
Flammability Combustible liquid. The spray mixture is not combustible.

10. STABILITY AND REACTIVITY:

Stability Stable under normal handling and storage conditions.
Condition to avoid Avoid contact of the concentrate with strong alkalis materials such as lime.
Avoid contact of the concentrate with strong acids.
Hazardous Reaction Keep away from strong oxidizing agents, may react violently.
Hazardous Polymerization Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION:

Toxicology Information No harmful effects are expected if the precautions on the label and this MSDS are followed.
Acute Toxicity - Oral LD₅₀ (rat): 135 - 163 mg/kg for chlorpyrifos.
LD₅₀ (guinea pig): 504 mg/kg for chlorpyrifos.
LD₅₀ (rabbit): 1000 - 2000 mg/kg for chlorpyrifos.
Acute Toxicity - Dermal LD₅₀ (rat): > 2000 mg/kg for chlorpyrifos.
LD₅₀ (rabbit): > 5000 mg/kg for chlorpyrifos.
Acute Toxicity - Inhalation LC₅₀ (rat) (4hr): > 0.2 mg/l for chlorpyrifos.
Eye Irritation Moderate eye irritant
Skin Irritation Mild skin irritant
Skin Sensitization Product is not a skin sensitizer.
Chronic Effects Regular exposure may result in lowering of cholinesterase activity, which will recover within a few days after exposure cases.
Reproductive Toxicity Data indicates no reproductive effects.
Data indicates no teratogenic effects.
Carcinogenicity Data indicates no carcinogenic effects.

12. ECOLOGICAL INFORMATION:

Acute Toxicity - Fish The following is data for the active ingredient, chlorpyrifos.
LC₅₀ (96 hr) (bluegill sunfish): 0.002 - 0.010 mg/L
LC₅₀ (96 hr) (rainbow trout): 0.007 - 0.051 mg/L
Very toxic to fish.
Acute Toxicity - Daphnia LC₅₀ (48 hr): 0.0017 mg/L for chlorpyrifos.
Acute Toxicity - Other Organism Moderately toxic to birds.
LD₅₀ (mallard ducks): 490 mg/kg.
Bees: Toxic to Bees.
LD₅₀: 0.07 µg/bee (contact)
0.36 µg/bee (oral)
Other Precautions DO NOT spray on vegetation where honeybees are foraging.
DO NOT contaminate dams, rivers or streams with pesticide or used containers.
Environmental Protection Persistence / Degradability Spray drift should be avoided, read the label for more information.
Average field half-life of chlorpyrifos is 33 - 56 days.

13. DISPOSAL CONSIDERATIONS:

Product Disposal Ideally the product should be used for its intended purpose. If there's a need to dispose of the product, approach local authorities who hold periodic collection of unwanted chemical.
On site disposal of the product is not acceptable.



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Issue Date: 1 August 2011

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Product Name:	Chlorpyrifos 38.7% EC
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Container Disposal

Do not use this container for any other purpose.
Triple rinse containers, add rinsate to the spray tank, then offer for recycling / reconditioning or puncture top, sides and bottom and dispose of in landfill in accordance with local regulations.
If no landfill is available, bury the containers below 500mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots.
Empty containers and product should not be burnt.

14. TRANSPORT INFORMATION:

Transport Information	It is a good practice to separate this product from food, food related materials, animal feedstuffs, seed or fertilizers during transport.
Storage and Transport UN Number (Sea Transport)	Follow the precautions indicated in this MSDS, Section 7: HANDLING AND STORAGE. 3018
IMO Class/Packing Group	Class 6.1, Packing Group III
IMO Marine Pollutant	Marine pollutant
IMO Proper Shipping Name	ORGANOPHOSPHORUS PESTICIDE, LIQUID, TOXIC - (CHLORPYRIFOS)

15. REGULATORY INFORMATION:

Risk Phrase:	N/A
Safety Phrase:	N/A
Poisons Schedule	No data
Hazard Category	Class III (Malaysia Regulation)
Packaging and Labelling	HARMFUL KEEP AWAY FROM FOODSTUFF AND CHILDREN READ THE LABEL BEFORE USE

16. OTHER INFORMATION:

Contact Person / Point	Nufarm Malaysia Sdn Bhd Mr. PMG Pitchai Phone: (+60 3) 31761888 Ext 217 Position: Safety & Health Officer DOSH Reg No: JKKP IS 127/438/2/2294 Email: pmg.pitchai@my.nufarm.com
Date of preparation or last version of MSDS	Revised: 1 August 2011 Supersedes: 5 May 2010

... END OF MSDS ...

Note: While the information given herein is, to the best of our knowledge, correct and is given in good faith, we make no warranty, with respect hereto and disclaim all liability from reliance thereon. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular purpose.

MATERIAL SAFETY DATA SHEET
 CHLORPYRIFOS 4E AG
 Page 1 of 6

1. IDENTIFICATION

Product name: CHLORPYRIFOS 4E AG
 Chemical name of active ingredient(s): Chlorpyrifos: O,O-diethyl-O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate
 Manufacturer: Makhteshim Agan of North America, Inc.
 4515 Falls of Neuse Road, Suite 300
 Raleigh, NC 27609
 Phone: 919-256-9300
 Phone: 1-800-535-5053
 For fire, spill, and/or leak emergencies, contact Infotrac:
 For medical emergencies and health and safety inquiries, contact Prosar: Phone: 1-877-250-9291

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS NUMBER	%	ACGIH/TLV	OSHA/PEL	OTHER	NTP/IARC/OSHA (Carcinogen)
Chlorpyrifos	2921-88-2	42.5	0.1 mg/m ³ (TWA)	NA	NA	NA
Heavy aromatic petroleum hydrocarbons	64742-94-5	48.7	525 mg/m ³ (TWA)	NA	NA	NA
Contains Naphthalene (% of total)	91-20-3	6.8	52 mg/m ³ (TWA)	50 mg/m ³ (TWA)	NA	NTP - 2* IARC -2B**

* Substances that may reasonably be anticipated to be carcinogens.

** Substance is possibly carcinogenic to humans.

3. HAZARDS IDENTIFICATIONS

PHYSICAL PROPERTIES

Appearance: Red liquid
 Odor: Solvent-type odor

EMERGENCY OVERVIEW: WARNING. May be fatal if swallowed. Causes substantial but temporary eye injury. Causes skin irritation. Harmful if absorbed through skin. Do not get in eyes, on skin, or on clothing.

SYMPTOMS OF OVER EXPOSURE: Headaches, nausea, vomiting, cramps, weakness, blurred vision, pinpoint pupils, tightness in chest, labored breathing, nervousness, sweating, watering of eyes, drooling, muscle spasms and coma

POTENTIAL HEALTH EFFECTS:

Eye: Irritating, and may injure eye tissue if not removed promptly.
 Skin: Harmful if absorbed through the skin. Large exposures could be fatal.
 Inhalation: Vapor or mist concentrations may be harmful if inhaled. High concentrations could be fatal.
 Ingestion: May be fatal if swallowed.

POTENTIAL PHYSICAL HAZARDS: Combustible liquid and vapor.

4. FIRST AID MEASURES

FIRST AID Organophosphate	
IF SWALLOWED:	<ul style="list-style-type: none"> Call a poison control center or doctor immediately for treatment advice. Do not give any liquid to a person. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
IF IN EYES:	<ul style="list-style-type: none"> Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
IF ON SKIN OR CLOTHING:	<ul style="list-style-type: none"> Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes.

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MATERIAL SAFETY DATA SHEET
CHLORPYRIFOS 4E AG
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IF INHALED:	<ul style="list-style-type: none">• Call a poison control center or doctor for treatment advice.• Move person to fresh air.• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.• Call a poison control center or doctor for further treatment advice.
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Have the product container or label with you when calling a poison control center or doctor or going for treatment. **Note to Physician:** This product contains an organophosphate that inhibits cholinesterase. Treat symptomatically. If exposed, plasma and red blood cell cholinesterase tests may indicate significance of exposure (baseline data are useful). Atropine, only by injection, is the preferable antidote. Oximes, such as 2-PAM/protopam, may be therapeutic if used early; however, use only in conjunction with atropine. In case of severe acute poisoning, use antidote immediately after establishing an open airway and respiration. Contains petroleum distillate. Vomiting may induce aspiration pneumonia.

5. FIRE FIGHTING MEASURES

FLASH POINT: 184° F (84.4° C)

METHOD USED: TCC

FLAMMABLE LIMITS

LFL: 1%

UFL: 6% (xylene range aromatic solvent)

EXTINGUISHING MEDIA: Foam, CO₂, dry chemical

FIRE & EXPLOSION HAZARDS: Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Toxic, irritating gases may be formed under fire conditions. Rapid decomposition above 320-392° F (160-200° C) can occur. Violent rupture due to over-pressurization may occur at temperatures generated during a fire.

FIRE-FIGHTING EQUIPMENT: Use positive-pressure self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES

ACTION TO TAKE FOR SPILLS/LEAKS: Clean up spills immediately, using precautions described in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering.

Small Spill: Absorb spill with inert material such as dry sand, vermiculite or fuller's earth, then place in a chemical waste container. Rinse area with dilute soda ash and place rinsate into chemical waste container.

Large Spill: Same as for small spills; may neutralize with dilute alkaline solutions of soda and ash and place into chemical waste container. Do not allow material to run off into soil, drainage systems, or bodies of water. Notify and consult with proper regulatory authorities.

7. HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING: Keep container closed when not in use. Handle and open container in a manner as to prevent spillage. Do not contaminate water, food or feed by storage, disposal or by cleaning equipment. Do not reuse empty container. If container is damaged or spill occurs, use product immediately or dispose of product and damaged container as indicated in Section 13.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store in original container in secured dry storage area. Prevent cross-contamination with other pesticides and fertilizers. Do not contaminate water, food or feed by storage or disposal.

STORAGE TEMPERATURE (MIN/MAX): Do not store above 100° F for extended periods of time. Storage below 20° F may result in the formation of crystals. If product crystallizes, store at 50-70° F and agitate to re-dissolve crystals.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

THE FOLLOWING RECOMMENDATIONS FOR EXPOSURE CONTROLS/PERSONAL PROTECTION ARE INTENDED FOR THE MANUFACTURE, FORMULATION, PACKAGING AND USE OF THIS PRODUCT.

FOR COMMERCIAL APPLICATIONS AND/OR ON-FARM APPLICATIONS CONSULT THE PRODUCT LABEL.

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CHLORPYRIFOS 4E AG
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EYE PROTECTION: Use chemical goggles. If vapor exposure causes eye discomfort, use a NIOSH approved full-face respirator.

SKIN PROTECTION: Wear coveralls over long-sleeved shirt and long pants, chemical-resistant footwear plus socks, chemical-resistant apron when mixing or loading or exposed to the concentrate, and chemical-resistant headgear for overhead exposure.

HAND PROTECTION: Chemical-resistant gloves, such as barrier laminate or butyl rubber ≥ 14 mils.

RESPIRATOR REQUIREMENTS: Atmospheric levels should be maintained below the exposure guidelines. When respiratory protection is required, use a NIOSH approved respirator with any R, P, or HE filter.

ENGINEERING CONTROLS: Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

ADDITIONAL PROTECTIVE MEASURES: Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS:

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove clothing immediately after handling this product. Wash outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

EXPOSURE GUIDELINES: Refer to Section 2.

ENGINEERING CONTROLS: Refer to product label.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Red liquid

ODOR: Solvent-type odor

FLASH POINT: 184° F (84.4° C)

MOLECULAR WEIGHT: 350.5

MOLECULAR FORMULA: C₉H₁₁Cl₃NO₃PS

BOILING POINT: 290° F (143° C) (solvent)

pH: 3.8

VAPOR PRESSURE: <10 mmHg @ 25° C

SOLUBILITY IN WATER: Emulsifiable

SPECIFIC GRAVITY: 1.079

DENSITY: 9.4 lbs/gallon

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Avoid heating above 60° C (100° F). Chlorpyrifos undergoes exothermic decomposition at approximately 130° C (266° F), which can lead to higher temperatures and violent decomposition if generated heat is not removed. Contains petroleum derivative solvent-will burn.

SPECIFIC MATERIALS TO AVOID: Strong alkalis, amines and oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Under fire conditions, hydrogen chloride, ethyl sulfide, diethyl sulfide and nitrogen oxides can be formed.

HAZARDOUS POLYMERIZATION: Not known to occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY/IRRITATION STUDIES

Acute Oral LD50 (Rat): 776 mg/kg (males); 300 mg/kg (females)

Acute Dermal LD50 (Rat): >5,000 mg/kg

Acute Inhalation LC50 (Rat): 2.7 mg/L (4-hr)

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Eye Irritation (Rabbit):	Moderately irritating.
Dermal Irritation (Rabbit):	Moderately irritating.
Dermal Sensitization (Guinea Pig):	Not a skin sensitizer

EYE: May cause moderate eye irritation and/or corneal injury. Vapors may irritate the eyes.

SKIN: A test in guinea pigs indicated that this product may have weak skin sensitization potential. However, experience in the manufacture and use of this product has not provided evidence for skin sensitizing properties. The product did not sensitize human subjects when tasted at an end-use dilution. A single prolonged exposure, is not likely to result in the material being absorbed through the skin in harmful amounts.

INGESTION: Single dose oral toxicity is moderate. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause lung damage or death due to chemical pneumonia.

INHALATION: Excessive exposure may produce organophosphate-type cholinesterase inhibition. Excessive vapor concentrations are attainable and could be hazardous on single exposure. Excessive exposure to solvent may cause respiratory irritation and central nervous system depression. Signs and symptoms of central nervous system depression are in order of increasing exposure, headache, dizziness, drowsiness, and incoordination.

SYSTEMIC (OTHER TARGET ORGAN EFFECTS): Excessive exposure may produce organophosphate-type cholinesterase inhibition. Signs and symptoms of excessive exposure to chlorpyrifos may be headache, dizziness, incoordination, muscle twitching, tremors, nausea, abdominal cramps, diarrhea, sweating, pinpoint pupils, blurred vision, salivation, tearing, tightness in chest, excessive urination, convulsions. Chlorpyrifos produced mild adrenal effects when fed to rats, but only at doses that greatly exceeded any exposures that would be received during normal use of this product. Solvent has been reported to cause liver, kidney, and blood effects at high exposure levels.

CANCER INFORMATION: Chlorpyrifos did not cause cancer in laboratory animals.

TERATOLOGY (BIRTH DEFECTS): Chlorpyrifos did not cause birth defects in laboratory animals. Solvent was toxic to the fetus in laboratory animal tests, but only at doses that were toxic to the mothers. Very high concentrations of solvent (producing severe toxicity to adult animals induced an increase in cleft palate in mice, which is a common developmental abnormality in mice and is associated with stress to the maternal animals. No malformations were induced at exposures less than those causing severe toxicity to the adult animals.

REPRODUCTIVE EFFECTS: Chlorpyrifos did not interfere with fertility in reproduction studies in laboratory animals.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): Results of in-vitro ("test tube") and animal mutagenicity tests on the aromatic solvent have been negative. Based on a majority of negative data and some equivocal or marginally positive results, chlorpyrifos is considered to have minimal mutagenic potential.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL HAZARDS: This pesticide is toxic to fish, aquatic invertebrates, small mammals, and birds. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwater or rinsate. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Based on information for chlorpyrifos and components of aromatic hydrocarbons. Bioconcentration potential is moderate (BCF is between 100 and 3000 or Log Pow between 3 and 5).

DEGRADATION & PERSISTENCE: Based on information for chlorpyrifos.

The photolysis half-life in water is 3-4 weeks.

Tropospheric half-life is estimated to be 1.4 hours.

Degradation is expected in the soil environment within days to weeks.

Under aerobic soil conditions the half-life is generally 30-60 days.

Based on information for components of aromatic hydrocarbons.

Biodegradation under aerobic static laboratory conditions is high (BOD 20 or BOD28.ThOD is >40%).

ECOTOXICOLOGY:

Chlorpyrifos:

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CHLORPYRIFOS 4E AG
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Material is very highly toxic to aquatic organisms on an acute basis ($LC_{50}/EC_{50} < 0.1$ MG/L in most sensitive species).

Material is highly toxic to birds on a dietary basis (LC_{50} between 50 and 5000ppm).

Material is moderately toxic to birds on an acute basis (LD_{50} is between 51 and 5000 mg/kg).

Heavy aromatic petroleum hydrocarbons:

Material is moderately toxic to aquatic organisms on an acute basis (LC_{50}/EC_{50} is between 1 and 10 mg/L in most sensitive species).

Material is practically non-toxic to birds on a dietary basis (LD_{50} is >5000ppm).

Material is practically non-toxic to birds on an acute basis (LD_{50} is >2000mg/kg).

13. DISPOSAL CONSIDERATIONS

PESTICIDE DISPOSAL: Open dumping is prohibited. Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency or the hazardous waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Dispose of product containers, waste containers, and residues according to label instructions and local, state, and federal health and environmental regulations.

14. TRANSPORT INFORMATION

DOT CLASSIFICATION:

UN3018, RQ, Organophosphorus pesticide, liquid, toxic (chlorpyrifos 42.5%), 6.1, PG III
(Add "Marine Pollutant" for bulk or vessel shipments.)

INTERNATIONAL TRANSPORTATION

IMO (vessel): UN3018, RQ, Organophosphorus pesticide, liquid, toxic (chlorpyrifos 42.5%), 6.1, PG III,
Marine pollutant

IATA (air): UN3018, RQ, Organophosphorus pesticide, liquid, toxic (chlorpyrifos 42.5%), 6.1, PG III

15. REGULATORY INFORMATION

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state, or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state, or provincial, and local laws and regulations.

SARA TITLE III CLASSIFICATION:

Section 302: Not applicable.

Section 311/312: Acute health hazard (immediate)
Chronic health hazard (delayed)
Fire hazard

Section 313: Naphthalene (6.8%) CAS#: 91-20-3

CA PROPOSITION 65: This product contains a material (naphthalene) known to the State of California to cause cancer.

CERCLA RQ: Chlorpyrifos RQ=1 lbs.

RCRA CLASSIFICATION: Under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

TSCA STATUS: The ingredients of this product are listed on the TSCA inventory or are exempt.

16. OTHER INFORMATION

NFPA HAZARD RATINGS	NFPA		
HEALTH:	2	0	MINIMAL
FLAMMABILITY:	2	1	SLIGHT
REACTIVITY:	1	2	MODERATE
		3	HIGH

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4 SEVERE

MSDS DATE 5-28-09. Supercedes versions dated 11-17-08, 5-31-06, 3-21-06, 3-12-04. Changes made to Section 13.

The information herein is given in good faith, but no warrant, express or implied, is made. Consult Makhteshim Agan of North America, Inc. for further information.



MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Abamectin 1.9% EC
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1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND COMPANY:

Product Name	Abamectin 1.9% EC
Company Name	NUFARM MALAYSIA SDN BHD (207731-P)
Company Address	L2.03 Wisma BU8, No. 11, Lebuhr Bandar Utama, Bandar Utama, 47800, Petaling Jaya, Selangor D.E., Malaysia.
Tel/Fax Number	Tel: (+60 3) 7629 7233 Fax: (+60 3) 7629 7229
Email	sales.my@my.nufarm.com
Emergency Contact	National Poison Centre 1800 88 8099 (Normal Hour) (+60 12) 430 9499 (After Hour)
Product Type	Insecticide
Product Use	Insecticide, acaricide and nematocide with contact and stomach action. Control of insect pests in cabbage, chili and chrysanthemum.
Other Information	This MSDS describes, to the best of our knowledge, the properties of the concentrated product. The physical properties and some of the assessments do not apply to the properties of the product once it has been diluted for application. Acute health effects of the diluted product are likely to be much less severe.

2. HAZARDS IDENTIFICATION:

Emergency Overview:

Appearance and Odour
Warning Statements

Pale yellow to amber colour liquid with slight alcoholic odour
Keep out of reach of children. WARNING. Hazards to humans and domestic animals. May be fatal if swallowed. Causes substantial but temporary eye injury. Do not get in the eyes. Harmful if inhaled or absorbed through skin. Avoid breathing spray mist. Avoid contact with eyes, skin and clothing.

Potential Health Effects:

Ingestion
Eye Contact
Skin Contact
Inhalation

Moderately toxic based on toxicity studies.
Moderately irritating based on toxicity studies. Vapour and mist can cause irritation.
A sensitization (allergic) reaction may occur in some individuals.
Breathing of mists and vapors should be avoided.

Potential Environment Effect

This product is toxic to fish and wild life. This product is toxic to bees exposed to direct treatment or residues on blooming crops or weeds.

3. COMPOSITION / INFORMATION ON INGREDIENTS:

Type of Formulation	Emulsifiable Concentrate, (EC)		
Ingredients	Name	CAS	Proportion
	Abamectin	71751-41-2	1.9%, w/w
	Inert Ingredients		98.1%, w/w

4. FIRST AID MEASURES:

Ingestion	Contact the doctor or National Poison Centre immediately. Do not give any liquid to the person. Do NOT induce vomiting unless told to do so by doctor or National Poison Centre. DO not give anything by mouth to an unconscious person.
Eye	Hold eyelids open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call National Poison Centre or doctor for treatment advice.



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Product Name:	Abamectin 1.9% EC
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Skin	Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Wash affected area with soap and water. Call National Poison Centre or doctor for treatment advice.
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Inhalation	Remove affected person to fresh air until recovered. If the person is not breathing, call 999 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call National Poison Centre or doctor for further treatment advice.
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Advice to Doctor Symptom	Early sign of intoxication include dilation of pupils, muscular in-coordination and muscular tremors. Toxicity following accidental ingestion of this product can be minimized by early administration of chemical adsorbents (e.g. activated charcoal). If toxicity from exposure has progressed to cause severe vomiting, the extent of resultant fluid and electrolyte imbalance should be gauged. Appropriate supportive parental fluid replacement therapy should be given, along with other required supportive clinical signs, symptoms and measurements.
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In severe cases, observations should continue for at least several days until clinical condition is stable and normal. Since abamectin is believed to enhance GABA activity in animals, it is probably wise to avoid drugs that enhance GABA activity (barbiturates, benzodiazepines, valproic acid) in patients with potentially toxic abamectin exposure.

Treatment	There is no specific antidote if this product ingested. Treat symptomatically. Product contains petroleum distillate – vomiting may cause aspiration pneumonia. Person suffering a temporary allergic reaction may respond to treatment with antihistamines or steroid creams and /or systemic steroids.
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5. FIRE FIGHTING MEASURES:

Extinguishing Media	Foam, carbon dioxide or dry chemical. Do not use high volume water jet.
Special Fire Fighting Procedures	Fire-fighters should wear NIOSH/MHSA approved self-contained breathing apparatus and full fire-fighting turn out gear. Dike area to prevent runoff and contamination of water sources. Dispose of fire control water later.
Hazardous Decomposition Products	May produce oxides of carbon, hydrogen and nitrogen.

6. ACCIDENTAL RELEASE MEASURES:

Spills and Disposal	Clean up small spills immediately, use proper personal protection. Absorb spill with absorbent material such as earth, sand or clay. After removal, flush contaminated area thoroughly with water containing strong detergent. Sweep up and place in a chemical container. Seal the container and handle in an approved manner. Keep spills out of streams and domestic water supplies. Dike to prevent contamination of local water sources. Take special care to avoid contamination of equipment and facilities during cleanup procedures and disposal of waters. Dispose of waste and rinsate in the appropriate manner.
Environmental Precaution	Prevent material from entering public sewer systems or any waterways.

7. HANDLING AND STORAGE:

Handling	Do not get in eyes. Avoid contact with skin or clothing. Avoid breathing vapour or spray mist. Users should wash hands before eating, chewing gum, using tobacco, or using the toilet. Remove Personal Protective Equipment (PPE) immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.
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MATERIAL SAFETY DATA SHEET

Issue Date: 1 August 2011

Issued by: NUFARM MALAYSIA SDN BHD

Product Name:	Abamectin 1.9% EC
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Storage	Store in the closed, original container in a well ventilated area out of direct sunlight. Store in a safe place away from foodstuffs, seeds or fertilizers. Store out of the reach of children. Do not contaminate water, food, or feed by storage or disposal.
Other Information	Always read the label and any attached leaflet before use.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:

Engineering Controls	Where engineering controls are indicated by specific use conditions or a potential for excessive exposure, use local exhaust ventilation at the point of generation.
Personal Protective Equipment	
Eye/ Face Protection	To avoid contact with eyes, wear chemical goggles or shielded safety glasses. An emergency eyewash or water supply should be readily accessible to the work area.
Skin Protection	To avoid contact with skin, wear coveralls over with long- or short-sleeved shirt and long or short pants, chemical-resistant footwear plus socks and chemical resistant gloves. Wear chemical-resistant apron when cleaning equipment, mixing or loading. For overhead exposure, wear chemical-resistant headgear. An emergency eyewash or water supply should be readily accessible to the work area.
Respiratory Protection	Not normally required. If vapours or mists exceed acceptable levels, wear NIOSH approved air-purifying respirator with cartridges/canisters approved for use against pesticides.
General Hygiene Considerations	Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials: 1) do not store, use and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored; 2) wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics or using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Physical State	Liquid
Appearance	Pale yellow to amber colour clear liquid
Odour	Slight alcoholic odour
Specific Gravity	0.919 (20°C)
Boiling Point	N/A
Vapour Pressure	N/A
Solubility in Water	Form an emulsion in the water

10. STABILITY AND REACTIVITY:

Storage Stability	This material is stable under normal handling and storage conditions.
Condition to Avoid	Excessive heat, sparks and open flame
Hazardous Decomposition	Under fire conditions may produce oxides of carbon, hydrogen and nitrogen.
Hazardous Polymerization	Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION:

Toxicology Information	No harmful effects are expected if the precautions on the label and this MSDS are followed.	
Acute Toxicity - Oral	LD ₅₀ (rat)	: 1046.13 mg/kg (male) 883.74 mg/kg (female)
Acute Toxicity - Dermal	LD ₅₀ (rabbit)	: > 5000 mg/kg
Acute Toxicity - Inhalation	LC ₅₀ (rat)	: > 3.5 mg/l air – 4 hours



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Eye Irritation	Moderately irritant (rabbit).
Skin Irritation	Slightly irritant (rabbit).
Skin Sensitization	Not a sensitizer (guinea pig).

12. ECOLOGICAL INFORMATION:

Acute Toxicity - Fish	The following data is for the active ingredient, abamectin: LC ₅₀ (96 hr) (rainbow trout) : 3.2 ug/L LC ₅₀ (96 hr) (bluegill sunfish) : 9.6 ug/L
Acute Toxicity - Daphnia	EC ₅₀ (48 hr) (<i>Daphnia magna</i>) : 0.34 ppb
Acute Toxicity - Other Organisms	LD ₅₀ (Oral) (mallard ducks) : 84.6 mg/kg LD ₅₀ (Oral) (bobwhite quail) : > 2000 mg/kg Toxic to bees. LC ₅₀ (28d) (earthworms) : 28 mg/kg soil
Environmental Fate	Abamectin binds tightly to soil, with rapid degradation by soil microorganisms. No bioaccumulation.

13. DISPOSAL CONSIDERATIONS:

Product Disposal	Ideally the product should be used for its intended purpose. If there's a need to dispose of the product, approach local authorities who hold periodic collection of unwanted chemical. On site disposal of the product is not acceptable.
Container Disposal	Do not use this container for any other purpose. Triple rinse containers, add rinsate to the spray tank, then offer for recycling / reconditioning or puncture top, sides and bottom and dispose of in landfill in accordance with local regulations. If no landfill is available, bury the containers below 500mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots. Empty containers and product should not be burnt.

14. TRANSPORT INFORMATION:

Transport Information	It is a good practice to separate this product from food, food related materials, animal feedstuffs, seed or fertilizers during transport.
Storage and Transport UN Number (Sea Transport)	Follow the precautions indicated in this MSDS, Section 7: HANDLING AND STORAGE. UN 2902
IMO Class/Packing Group	Class 6.1; Packing Group III
IMO Marine Pollutant	Marine Pollutant
IMO Proper Shipping Name	Pesticide, liquid, toxic, N.O.S (Abamectin) 6.1 PG III

15. REGULATORY INFORMATION:

Risk Phrase:	N/A
Safety Phrase:	N/A
Poisons Schedule	No data
Hazard Category	Class II (Malaysia Regulation)
Packaging and Labeling	POISONOUS KEEP AWAY FROM FOODSTUFF AND CHILDREN READ THE LABEL BEFORE USE.



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16. OTHER INFORMATION:

Contact Person / Point	Nufarm Malaysia Sdn Bhd Mr. PMG Pitchai Phone: (+60 3) 31761888 Ext 217 Position: Safety & Health Officer DOSH Reg No: JKPP IS 127/438/2/2294 Email: pmg.pitchai@my.nufarm.com
Date of preparation or last version of MSDS	Issue Date: 1 August 2011 Supersedes: November 2009

END OF MSDS ...

Note: While the information given herein is, to the best of our knowledge, correct and is given in good faith, we make no warranty, with respect hereto and disclaim all liability from reliance thereon. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular purpose.



MATERIAL SAFETY DATA SHEET

Syngenta Crop Protection, Inc.
Post Office Box 18300
Greensboro, NC 27419

In Case of Emergency, Call
1-800-888-8372

1. PRODUCT IDENTIFICATION

Product Name:	AGRI-MEK 0.15 EC MITICIDE/INSECTICIDE	Product No.:	A8612A
EPA Signal Word:	Warning		
Active Ingredient(s):	Abamectin (2.0%)	CAS No.:	65195-56-4 & 65195-55-3
Chemical Name:	A mixture of avermectins containing primarily Avermectin B1a and Avermectin B1b		
Chemical Class:	Glycoside Insecticide		
EPA Registration Number(s):	100-898	Section(s) Revised:	3, 4, 8, 14

2. COMPOSITION/INFORMATION ON INGREDIENTS

Material	OSHA PEL	ACGIH TLV	Other	NIPIARC/OSHA Carcinogen
Mineral Oil	5 mg/m ³ (mist)	5 mg/m ³ (mist); 10 mg/m ³ (STEL)	5 mg/m ³ (mist); 10 mg/m ³ (STEL) **	No
Butylated Hydroxytoluene (BHT)	Not Established	2 mg/m ³ TWA (inhalable)	10 mg/m ³ TWA **	IARC Group 3
n-Methylpyrrolidone (<= 30%)	Not Established	Not Established	10 ppm TWA****	No
Abamectin (2.0%)	Not Established	Not Established	0.02 mg/m ³ TWA***	No

** recommended by NIOSH

*** Syngenta Occupational Exposure Limit (OEL)

**** Recommended by AIHA (American Industrial Hygiene Association)

Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.
Syngenta Hazard Category: C, S

3. HAZARDS IDENTIFICATION

Symptoms of Acute Exposure

Causes eye and skin irritation. Harmful if swallowed or absorbed through the skin. Allergic skin reactions are possible.

Hazardous Decomposition Products

Can decompose at high temperatures forming toxic gases.

Physical Properties

Appearance: Yellow to red brown liquid

Odor: Not determined

Unusual Fire, Explosion and Reactivity Hazards

Combustible liquid. Can release vapors that form explosive mixtures at temperatures at or above the flash point. Heavy vapors can flow along surfaces to distant ignition sources and flash back.

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

4. FIRST AID MEASURES

Have the product container, label or Material Safety Data Sheet with you when calling Syngenta (800-888-8372), a poison

Product Name: **AGRI-MEK 0.15 EC MITICIDE/INSECTICIDE**

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