



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

DEC 23 1999

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Mr. Richard Henrich
Great Lakes Chemical Corporation
P.O. Box 2200
West Lafayette, IN 47996-2200

SUBJECT: Review of Labeling Amendment
Brom-O-Gas EPA Reg. No. 5785-4
Terr-O-Gas 98 EPA Reg. No. 5785-22
✓ Brom-O-Gas 2% EPA Reg. No. 5785-42
Your Letters Dated September 30, 1999

Dear Mr. Henrich:

For Terr-O-Gas 98 (EPA Reg. No. 5785-22), the labeling referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended, is acceptable. A stamped accepted copy is enclosed for your records. Please submit one (1) copy of your final printed labeling before you release the product for shipment.

For Brom-O-Gas (EPA Reg. No. 5785-4) and Brom-O-Gas 2% (EPA Reg. No. 5785-42), the labeling referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended, are acceptable subject to the following conditions:

Brom-O-Gas (EPA Reg. No. 5785-4) Label

1. On front panel, change "INERT" to "OTHER" to be consistent with change on the Brom-O-Gas 2% label amendment.
2. Add the box from the Brom-O-Gas 2% label that contains the statement "Observe all Worker Safety Requirements and User Safety Recommendations as set forth in the supplemental labeling, GLK 374C." to be consistent with the Brom-O-Gas 2% label.

Brom-O-Gas 2% (EPA Reg. No. 5785-42) Label

The Terr-O-Gas 98 label contains language regarding the acceptable air concentration level for chloropicrin. Please add this language to this label to be consistent with the Terr-O-Gas 98 label or justify its omission

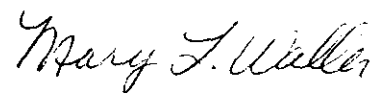
Brom-O-Gas/Brom-O-Gas 2% Supplemental Labeling GLK 374C

The Terr-O-Gas 98 label contains language regarding the acceptable air concentration level for chloropicrin. Please add this language to the supplemental label GLK 374C to be consistent with the Terr-O-Gas 98 label or justify its omission.

Stamped copies are enclosed for your records. Please submit one (1) copy of each of your final printed labeling before you release the products for shipment. Your release for shipment of the subject products constitutes acceptance of the above conditions. If these conditions are not complied with, the registrations will be subject to cancellation in accordance with FIFRA Section 6(e).

If you have any questions, please contact Terri Stowe of my staff at (703) 305-6117.

Sincerely,



Mary L. Waller
Product Manager (21)
Fungicide Branch
Registration Division (7505C)

Enclosures

3 4 2 4

**RESTRICTED USE PESTICIDE
DUE TO ACUTE TOXICITY**

For retail sale to and use only by Certified Applicators or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification.

ACCEPTED
w/ comments
DEC 23 1999
Under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, for the pesticide registered under EPA Reg. No. 5785-42

BROM-O-GAS® 2%

SOIL FUMIGANT
Contains 2% Chloropicrin

ACTIVE INGREDIENTS:	By Wt.
Methyl bromide	98%
OTHER INGREDIENTS:	
Chloropicrin	2%
TOTAL	100%

This product weighs 14.4 pounds per gallon.

KEEP OUT OF REACH OF CHILDREN



DANGER • PELIGRO • POISON



Si Usted no entiende la etiqueta, busque a alguien para que se la explique a Usted en detalle. (If you do not understand the label, find someone to explain it to you in detail).

STATEMENT OF PRACTICAL TREATMENT.

In all cases of overexposure, get medical attention immediately. Take person to a doctor or emergency treatment facility.

IF INHALED: Remove exposed person from contaminated area. Keep warm. Make sure person can breathe freely. If breathing has stopped, give artificial respiration. If not unconscious, rinse mouth out with water. Do not give anything by mouth to an unconscious person.

IF ON SKIN: Immediately remove contaminated clothing, shoes and any other item on skin. Wash contaminated skin area thoroughly with soap and water.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes.

SEE SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

NET WEIGHT _____ LBS.
LOT NUMBER _____

EPA REG. NO. 5785-42
EPA EST. NO. 5785-AR-01

GREAT LAKES CHEMICAL CORPORATION
P. O. BOX 2200
WEST LAFAYETTE, INDIANA 47996-2200 U. S. A.

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**PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER**

Extremely hazardous liquid and vapor under pressure. Do not breathe vapor. Inhalation may be fatal or cause serious acute illness or delayed lung or nervous system injury. Liquid or vapor can cause serious skin or eye injury which may have a delayed onset. Do not get liquid on skin, in eyes or on clothing.

This product contains chloropicrin as a warning agent. Chloropicrin may be irritating to the upper respiratory tract, and even at low levels can cause painful irritation to the eyes, producing watering. If these symptoms occur, leave the fumigation area immediately.

AIR CONCENTRATION LEVEL

The acceptable air concentration level for persons exposed to methyl bromide is 5 ppm (20 mg/m³). The air concentration level is measured by a direct reading detection device, such as a Matheson-Kitagawa, Draeger, or Sensidyne.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

Loose-fitting or well ventilated long-sleeved shirt and long pants.
Shoes and socks.

Full-face shield or safety glasses with brow and temple shields when handling the liquid product (Do NOT wear goggles).

When the air concentration level is above 5 ppm and a respirator is required, protect the eyes by wearing a full-face respirator.

No respirator is required if the air concentration level of methyl bromide in the working area is measured to be less than 5 ppm.

A respirator is required if the acceptable air concentration level of 5 ppm is exceeded at any time. The respirator must be one of the following types: (a) a supplied-air respirator (MSHA/NIOSH approval number prefix TC-19C) OR (b) a self-contained breathing apparatus (SCBA) (MSHA/NIOSH approval number prefix TC-13F).

Observe all Worker Safety Requirements and User Safety Recommendations as set forth in the supplemental labeling, GLK 374C.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to wildlife. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge this product into sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

Contents under pressure. Do not use or store near heat or open flame. In fires fueled by other materials, Brom-O-Gas® 2% may liberate hazardous gases. The use of Brom-O-Gas® 2% with aluminum, magnesium, zinc and alkali metals will result in the liberation of toxic gases, and possible fire and explosion. In addition, severe corrosion of containers and equipment made of these metals will occur.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR 170. Refer to supplemental labeling under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

STORAGE, HANDLING, AND DISPOSAL

Storage and Handling. Store in a secure manner either outdoors under ambient conditions or indoors in a well ventilated area. Post as a pesticide storage area. Do not contaminate water, food, or feed by storage. Store cylinders upright, secured to a rack or wall to prevent tipping. Containers should not be subjected to rough handling or mechanical shock such as dropping, bumping, dragging, or sliding. Do not use rope slings, hooks, tongs or similar devices to unload cylinders. Transport cylinders using hand truck, fork truck or other device to which the cylinder can be firmly secured. Do not remove valve protection bonnet and safety cap until immediately before reuse. Replace safety cap and valve protection bonnet when cylinder is not in use. When cylinder is empty, close valve, screw safety cap on to valve outlet, and replace protection bonnet before returning to shipper. Only the registrant, or his designee, is authorized to refill cylinders. Do not use cylinders for any other purpose.

Disposal. Pesticide wastes are toxic. Improper disposal of excess pesticide is a violation of Federal law. If these wastes can not 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 of guidance. Return empty cylinders freight collect to the Great Lakes Chemical Corporation location from which shipment was made. Return partial cylinders only after consulting Great Lakes Chemical Corporation for proper shipping instructions. In either case, use delivering carrier when possible.

SPILL AND LEAK PROCEDURES FOR SOIL FUMIGATION.

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In case of a rupture of hose or fitting while applying fumigant, immediately stop tractor and motor. Evacuate everyone from the immediate area of the spill or leak. Wear personal protective equipment (including prescribed respirators) specified in the Hazards to Humans section of this labeling for entry into affected area to correct problem. Approach from upwind to make necessary repairs. Do not enter area without the required PPE until the spill has evaporated or the leak has been fixed.

Contaminated soil, water and other cleanup debris is a toxic hazardous waste. Report spill to the National Response Center (800-424-8802) if the reportable quantity of 1000 pounds is exceeded.

Brom-O-Gas® 2% may be used for Soil Fumigation. This fumigant is a highly hazardous material and must be used only by individuals trained in its proper use. You must carefully read and understand GLK 374C. in order to use Brom-O-Gas® 2%. Observe all safety and precautionary instructions as set forth in GLK 374C. All fumigation directions, including dosage rates, exposure times and aeration periods, are given in GLK 374C.

STATEMENT OF WARRANTY AND LIABILITY

Seller warrants that this product complies with the specifications expressed in this label and GLK 374C. SELLER MAKES NO OTHER WARRANTIES; AND DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR THE INTENDED PURPOSE. Seller's liability for default, breach, or failure under this label shall be limited to the amount of the purchase price. Seller shall have no liability for consequential damages.

Many pesticidal chemicals are poisonous and may leave a toxic residue on the plants to which they are applied. The U.S. Environmental Protection Agency has established maximum amounts of such pesticidal chemicals that may remain on raw agricultural products at harvest, and it is the user's responsibility to see that there is no residue on such crops at harvest in excess of these amounts. The "Directions for Use" are based on the best available information, and if followed carefully should not leave excessive residues at harvest. However, Great Lakes Chemical Corporation assumes no responsibility as to their accuracy nor for any loss due to excessive residues.

BOG2-2 REV.AR-42-V



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**RESTRICTED USE PESTICIDE
DUE TO ACUTE TOXICITY**

For retail sale to and use only by Certified Applicators or persons under their direct supervision, and only for those uses covered by the Certified Applicator's certification.

**DIRECTIONS FOR USE OF THE
SOIL FUMIGANTS**

**BROM-O-GAS®
BROM-O-GAS 2%®**

**ACCEPTED
with COMMENTS
In EPA Letter Dated**

DEC 23 1999

**Under the Federal Insecticide,
Fungicide, and Rodenticide Act
as amended, for the pesticide
registered under EPA Reg. No.**

5785-4 AND 5785-42
5785-4 or 5785-42

EPA REGISTRATION NUMBERS

5785-4 and 5785-42, respectively

DANGER PELIGRO

Si Usted no entiende la etiqueta, busque a alguien para que se la explique a Usted en detalle. (If you do not understand the label, find someone to explain it to you in detail).

**READ THIS BOOKLET AND ENTIRE LABEL CAREFULLY PRIOR TO
USE. USE THESE PRODUCTS ACCORDING TO LABEL INSTRUCTIONS.**

**GREAT LAKES CHEMICAL CORPORATION
P.O. BOX 2200
WEST LAFAYETTE, INDIANA 47996-2200 U. S. A.**

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GLK 374C



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PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

Loose-fitting or well ventilated long-sleeved shirt and long pants.

Shoes and socks.

Full-face shield or safety glasses with brow and temple shields when handling the liquid product (Do NOT wear goggles).

When the air concentration level is above **5 ppm** and a respirator is required, protect the eyes by wearing a full-face respirator.

No respirator is required if the air concentration level of methyl bromide in the working area is measured to be less than **5 ppm**.

A respirator is required if the acceptable air concentration level of **5 ppm** is exceeded at any time. The respirator must be one of the following types: (a) a supplied-air respirator (MSHA/NIOSH approval number prefix TC-19C) OR (b) a self-contained breathing apparatus (SCBA) (MSHA/NIOSH approval number prefix TC-13F).

WORK SAFETY REQUIREMENTS

1. Do not wear jewelry, gloves, goggles, tight clothing, rubber protective clothing, or rubber boots when handling. Methyl bromide and chloropicrin are heavier than air and can be trapped inside clothing and cause skin injury.
2. If liquid fumigant splashes or spills on clothing, remove them at once, as fumes will be an intolerable source of irritation.
3. Immediately after contamination remove outer clothing, shoes, and socks and do not reuse until thoroughly aerated or ventilated. Keep such clothing and shoes outdoors until thoroughly aerated. Then follow the PPE manufacturers instructions for cleaning/maintaining PPE. If there are no such instructions for washables, use detergent and hot water. Keep and wash PPE and work clothing separately from other laundry.
4. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product. Do not reuse them.
5. Follow PPE manufacturer's instructions for cleaning/maintaining protective eyewear and respirators.



USER SAFETY RECOMMENDATIONS

Users should:

- * 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 immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

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STATEMENT OF PRACTICAL TREATMENT

In all cases of overexposure, get medical attention immediately. Take person to a doctor or emergency treatment facility.

IF INHALED: Remove exposed person from contaminated area. Keep warm. Make sure person can breathe freely. If breathing has stopped, apply artificial respiration. Do not give anything by mouth to an unconscious person. If not unconscious, rinse mouth out with water.

ON SKIN: Immediately remove contaminated clothing, shoes and any other item on skin. Wash contaminated skin area thoroughly with soap and water.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes.

Note to Physician. Early symptoms of overexposure are dizziness, headache, nausea and vomiting, weakness and collapse. Lung edema may develop in 2 to 48 hours after exposure, accompanied by cardiac irregularities; these effects are the usual cause of death. Repeated overexposures can result in blurred vision, staggering gait and mental imbalance, with probable recovery after a period of no exposure. Blood bromide levels suggest the occurrence, but not the degree, of exposure. Treatment is symptomatic.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to wildlife. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or public water unless this product is specifically identified and addressed in an NPDES permit. Do not discharge this product into sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

4

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

This fumigant is a highly hazardous material and must be used only by individuals trained in its proper use. Before using, read and obey all label precautions and directions.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

All persons working with this fumigant must be knowledgeable about the hazards, and trained in the use of required respiratory equipment and detector devices, emergency procedures, and proper use of the fumigant.

STORAGE, HANDLING AND DISPOSAL

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Storage. Store in a secure manner either outdoors under ambient conditions or indoors in a well ventilated area. Post as a pesticide storage area. Do not contaminate water, food or feed by storage. Store cylinders upright, secured to a rack or wall to prevent tipping.

Cylinders. Cylinders should not be subjected to rough handling or mechanical shock such as dropping, bumping, dragging or sliding. Do not use rope slings, hooks, tongs or similar devices to unload cylinders. Transport cylinders using hand truck, fork truck or other device to which the cylinder can be firmly secured. Do not remove valve protection bonnet and safety cap until immediately before use. Replace safety cap and valve protection bonnet when cylinder is not in use.

When cylinder is empty, close valve, screw safety cap on to valve outlet, and replace protection bonnet before returning to shipper. Only the registrant, or his designee, is authorized to refill cylinders. Do not use cylinders for any other purpose.

Cans. Store 1 and 1 1/2 pound cans in same manner as cylinders.

Disposal. Pesticide wastes are toxic. Improper disposal of excess pesticide 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.

Return empty cylinders freight collect to the Great Lakes Chemical Corporation location from which shipment was made. Return partial cylinders only after consulting Great Lakes Chemical Corporation for proper shipping instructions. In either case, use delivering carrier when possible. Dispose of empty cans in a sanitary landfill, or by other procedures approved by state and local authorities.

SPILL AND LEAK PROCEDURES FOR SOIL FUMIGATION.

6

In case of a rupture of hose or fitting while applying fumigant, immediately stop tractor and motor. Evacuate everyone from the immediate area of the spill or leak. Wear personal protective equipment (including prescribed respirators) specified in the Hazards to Humans section of this labeling for entry into affected area to correct problem. Approach from upwind to make necessary repairs. Do not enter area without the required PPE until the spill has evaporated or the leak has been fixed.

Contaminated soil, water and other cleanup debris is a toxic hazardous waste. Report spill to the National Response Center (800-424-8802) if the reportable quantity of 1000 pounds is exceeded.

PLACARDING OF FUMIGATED AREAS

The applicator (or supervisor of the application) must placard all entrances to the fumigated area with signs bearing:

- * skull and crossbones symbol
- * "DANGER/PELIGRO,"
- * "Area under fumigation, DO NOT ENTER/NO ENTRE,"
- * "Methyl Bromide Fumigant in use,"
- * the date and time of fumigation, and
- * name, address, and telephone number of the applicator.

Do not allow entry by unprotected persons into the fumigated area until the signs are removed. Such signs must only be removed when the air concentration level of methyl bromide is measured to be less than **5 ppm**. Signs must remain legible during entire posting period.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements in this labeling about personal protective equipment, restricted-entry intervals, and notification to workers. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard (WPS).

No instructions elsewhere on this labeling relieve users from complying with the requirements of the WPS.

ENTRY RESTRICTIONS:

Greenhouse Soil Fumigation: Entry (including early entry that would otherwise be permitted under the WPS) by any person -- other than a correctly trained and equipped handler who is performing a handling task permitted by the WPS -- is **PROHIBITED** in the entire greenhouse (entire enclosed structure/building) from the start of application until 48 hours after application **AND** until the air concentration level of methyl bromide in the working area is measured to be less than **5 ppm**. Until the **aeration of the soil** is complete (usually 10-14 days), non-handlers are permitted in the greenhouse **ONLY** while the air concentration level of methyl bromide in their working area remains less than **5 ppm**. If tarps are used for the application, non-handler entry is prohibited during tarp removal and until the air level is measured to be less than **5 ppm**.

Outdoor Soil Fumigation: Entry (including early entry that would otherwise be permitted under the WPS) by any person -- other than a correctly trained and equipped handler who is performing a handling task permitted on this labeling -- is **PROHIBITED** from the start of application until 48 hours after application. **In addition**, if tarps are used for the application, non-handler entry is prohibited while tarps are being removed.

NOTIFICATION: Notify workers of the application by warning them orally and by posting fumigant warning signs, as described in the "Placarding of Fumigated Areas" section of this labeling. Post the fumigant warning sign instead of the WPS sign for this application, but follow all WPS requirements pertaining to location, legibility, size, and timing of posting and removal.

Greenhouses -- Soil Fumigation: Post the fumigant warning signs outside all entrances to the entire greenhouse (entire enclosed structure/building).

Outdoor Soil Fumigation: Post the fumigant warning signs at entrances to treated areas.

PPE FOR ENTRY DURING THE ENTRY-RESTRICTED PERIOD:

PPE for entry that is permitted by this labeling is listed in the "Hazards to Humans and Domestic Animals" section of this labeling.

SOIL FUMIGATION DIRECTIONS

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BROM-O-GAS® AND BROM-O-GAS 2%® ARE NOT APPROVED FOR USE AS A SOIL FUMIGANT IN ARIZONA.

This product may be used only for soil fumigation. The following precautionary procedures must be followed.

PRECAUTIONARY STATEMENTS

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The following precautions must be followed PRIOR to soil fumigation.

- A) Comply with all local regulations and ordinances. Obtain an application permit from agricultural regulatory agencies as required.
- B) Never fumigate alone. It is imperative to always have an assistant present and proper protective equipment available in case of accidents.
- C) Persons in charge of all operations must advise other workers of all safety precautions and procedures. In addition, they must instruct their helpers in the mechanical operation of the equipment.
- D) Handle this fumigant in the open, with operator "upwind" from the container where there is good ventilation.
- E) Check fumigant delivery system for leaks before beginning operation. Two trained persons must be present during introduction of the fumigant.
- F) During soil fumigation, at least 10 gallons of water must be readily accessible at the site of application. This water must be potable and in containers marked "Decontamination water not to be used for drinking".
- G) All trash should be cleaned from the field before starting fumigation.
- H) Post all treated areas with warning signs.

The following precautions must be followed DURING the soil fumigation operation.

- A) Two trained persons must be present during introduction of the fumigant.
- B) Do not make application of this fumigant when there is little or no air movement or there is an atmospheric inversion.

- C) Do not lift injection shanks to turn at the end of a pass until fumigant has been purged or drained from system following closure of shutoff valve.
- D) If trash is inadvertently pulled up by the shanks when fumigating, it must be covered with polyethylene film.
- E) When changing the cylinders, be certain they are turned off and fumigant system is not under pressure.

The following precautions must be followed AFTER soil fumigation.

- A) Keep pets, livestock, and other domestic animals out of the treated area during application, during the exposure period as specified for applications in Directions for Use, and during removal of tarpaulin.
- B) Two trained persons must be present during removal of the tarpaulin.

APPLICATION METHODS. This product is to be used only as a preplant treatment when used for soil fumigation.

A. Tarpaulin Methods for Field, Nursery, Turf, Greenhouse and Seed or Transplanted Bed Soils.

Pests controlled when present in soil at time of treatment:

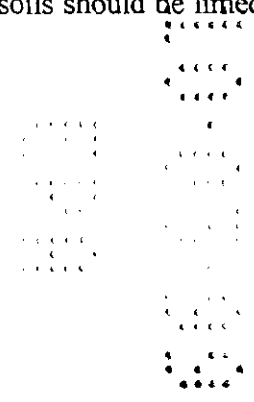
Plant-parasitic nematodes, including root-knot, root lesion (meadow), cyst, citrus, burrowing, false root-knot, lance, spiral, ring, sting, stubby root, dagger, awl, sheath and stunt (stylet).

Soil-borne disease causing organisms, including the fungi *Pythium*, *Rhizoctonia*, *Phytophthora*, *Pyrenochaeta*, *Sclerotinia*, *Sclerotium* and *Fusarium* and the clubroot organism *Plasmodiophora*.

Weeds, including witchweed, broadleaf weeds such as broomrape and lambsquarters and grasses such as bermudagrass, annual bluegrass, torpedograss and quackgrass. Not effective against hard seed weeds, such as mallow, dodder, morningglory, and certain leguminous weeds.

Insects, including wireworms, cutworms, grubs, rootworms, ants and garden symphylans.

NOTE: Fumigation may temporarily reduce nitrification in the soil, thus increasing levels of ammonium nitrogen and soluble ammonium salts to potentially phytotoxic levels. Accumulation of ammonium is most likely to occur when maximum rates of fumigant and fertilizer are applied to soils that are acidic, wet, cold, or high in organic matter. Apply only fertilizer containing at least 30% nitrate until the crop is well established and soil temperature is above 65°F., then fertilize as indicated by soil test. Acid soils should be limed before fumigation to stimulate nitrification and to reduce possible ammonium toxicity.



Pretreatment Soil Preparation.

Plow or rip or otherwise till the soil to the depth to which effective treatment is required. The soil should be worked until free of clods or large lumps. Residue from previous crops should be worked into the soil to allow for decomposition prior to fumigation. Soil moisture should be adequate for seed germination. Coarse textured soils can be fumigated with higher moisture content than fine textured soils. For best results, soil should be kept moist for at least four days prior to treatment. Do not fumigate if the soil temperature is below 50°F. For best results, fumigate when soil temperature is 60°F. to 80°F. at the depth of 6 inches.

1. Overall Application.

Inject this product with a chisel type applicator having the chisels spaced no more than 12 inches apart and injecting the fumigant to a depth of 6-8 inches below the soil surface. The soil surface must be covered with polyethylene film immediately after treatment with simultaneous film laying equipment or by sealing with a roller or cultipacker and covered within 20 minutes with polyethylene film or other suitable cover. Consult dosage rate table for proper rates of application and exposure periods. At the end of exposure period, remove tarpaulins and aerate for 3 days before seeding and 5 to 7 days before introducing transplants or vegetative plant parts.

2. Row or Bed Application.

Apply the broadcast rate to the area actually treated, i.e., the area delimited by the film mulch. Consult dosage rate table for treatment rates.

Use one or more shanks per bed spaced not more than 12 inches apart, depending on the area to be treated. Inject the fumigant 6-8 inches below the surface of the bed and simultaneously cover with polyethylene film or other suitable cover. At the end of the exposure period, remove tarpaulins and aerate for 3 days before seeding and 5-7 days before introducing transplants or vegetative plant parts. Where polyethylene film is to be utilized as a mulch, aeration is accomplished by making holes in the film on spacings appropriate for the crop to be planted.

3. Raised Tarp Fumigation Method for Plant Beds and Other Small Areas.

- A. Dig a trench around the perimeter of area to be treated, throwing soil to the outside so it can be used to bury tarpaulin edges after covering.
- B. Place items such as inflated plastic bags, crumpled fertilizer bags, burlap bags stuffed lightly with hay or straw, inverted baskets, flowerpots or bottles on the soil surface of the area to be treated to support the cover and provide a small gas dome to facilitate fumigant distribution.
- C. Evaporating pans are essential for the volatilization and uniform dispersion of fumigant, except where a vaporizer is used as described in step I below. Shallow pans or basins made of plastic or metal, except aluminum, are satisfactory for this purpose. Use one evaporator pan for each 300 to 400 square feet of area. Special units are available for use of 1 and 1 1/2 pound cans that combine opener and evaporative pan functions, and are designed to be used with all parts under the tarp.

- D. For delivery of this product from outside the tarp, polyethylene tubing is required. Anchor one end of each polyethylene tube into an evaporating pan with tape or a suitable weight. This ensures that the liquid will be directed into the evaporating pan.
- E. Extend the free ends of the polyethylene tubes outside of the area to be covered.
- F. After the supports and tubing are in place, cover the area to be fumigated with polyethylene film or other suitable material.
- G. Seal by placing the outside edges of tarpaulin in the trench and covering with soil. Tamp soil down so edges will not pull loose.
- H. Attach a polyethylene tube to the can applicator or cylinder valve outlet and release fumigant. Use a cylinder dispenser or scale to meter small amounts from cylinders. Consult Dosage Rate Table for proper rates of application and exposure periods.
- I. Fumigant may be vaporized before introduction by means of a commercially manufactured heat exchanger, by using a copper coil immersed in a vessel of hot water or by immersing a can in hot water. CAUTION: Puncture can with applicator before immersing in hot water; keeping outlet up to allow only vapor to enter polyethylene tube.

4. Special Instructions for Tree Site Replants.

Use practices as described above in method for plant beds, etc. except for the following:

1. Confine the treatment to an area not exceeding 10 feet by 10 feet.
2. The center of the treated zone must be at least 5 feet from the dripline of the nearest existing tree.

5. Special Instructions for Florida Citrus.

Preplant or replant fumigation of citrus soil for control of *Phyophthora* and citrus nematodes in Florida sandy soils. Trees which are planted in this treated soil will not bear harvestable fruit for a period of at least 24 months. Apply with chisels spaced 12 inches apart to a depth of 6-8 inches. Seal fumigant with a drag or cultipacker following immediately behind chisels. Apply this product at the rate of 1 pound per 100 square feet. Immediately cover with a 4 mil tarp and expose to fumigation for 96 hours. This treatment will control disease to a depth of 4 feet. Remove cover and aerate 2 weeks before setting transplants in treated area.

B. Non-Tarp Nematode Control.

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All precautionary procedures as outlined immediately below SOIL FUMIGATION DIRECTIONS, must be followed.

This is a preplant or replant treatment for citrus, vineyards and deciduous fruits and nuts. Do not apply to soil where trees or vines will bear harvestable fruit within 24 months. A waiting period of at least 14 days should be observed between application and planting.

This method controls plant parasitic nematodes when present in soil at the time of treatment.

Pretreatment Soil Preparation.

Plow or rip the soil to the depth to which effective treatment is required. The soil should be worked until free of clods or large lumps and residue from previous crops should be worked into the soil to allow for decomposition prior to fumigation. To ensure maximum fumigant penetration the soil at the point of injection should not contain more than 5 to 15% moisture depending on soil type. However, to improve sealing, the soil surface may be moistened by means of a sprinkler application of 1/4 to 1/2 inch of water prior to final preparation and application. Avoid treatment of soils that contain more than 30% clay or those with high organic content. For best results, fumigate when the soil temperature is 60° to 80°F. at the depth of 6 inches. Do not fumigate when soil temperature is below 50°F.

Methods of Application.

1. Chisel Application. After the soil has been properly prepared, inject 400-870 pounds of this product per acre by chisel application with chisels spaced up to 66 inches apart to a depth of 24-30 inches. In the row, strip treatments may be made by using a single shank. Chisels should have a wing welded on the back 2-4 inches above the chemical outlet to partially break the chisel mark. To fill in the chisel mark and seal the surface, disc and cultipack immediately after fumigant injection. Be sure that the disc and cultipacker cover an area at least 33 inches beyond the chisel lines. Refer to the dosage rate table for dosage rates and exposure times.
2. Deep Injection Auger-Probe Treatment. Use one pound of this product per injection site in lighter soils; two pounds in fine textured soils, to a depth of 24-36 inches. Use one injection site per 100 square feet (on a 10 ft.x 10 ft. grid pattern) with the injection in the center of the area to be treated. Tamp or compact the soil at the point of injection. For replant applications in orchards and vineyards, do not locate center of injection site less than 5 feet from the dripline of the nearest tree or vine. Refer to Dosage Rate Table for dosage rates and exposure times.

C. Special Instructions for the control of *Armillaria mellea* (Oak Root Fungus) on Citrus, Vineyards, and Deciduous Fruits and Nuts.

Pretreatment Soil Preparation

To obtain the maximum control of *Armillaria mellea* with this product, soil must be dry to a depth requiring treatment. This can be accomplished by: a) planting sudangrass in the spring, irrigating until the grass has established itself, then withholding further irrigation; b) naturally, by allowing plants to grow without

irrigation. When soil is dry, cut and remove grass, plants and debris. Rip soil to a depth of 36 inches and disc to smoothness.

Dosage and Method of Application

This is a preplant or replant treatment. Crops which are planted in this treated soil will not bear harvestable fruit for a period of at least 24 months. Methods and rate of application are as follows.

1. Non-tarp Chisel Application (Not for use in California). After the soil has been properly prepared, inject 400-870 pounds of this product per acre by chisel application with chisels spaced up to 66 inches apart to a depth of 24-30 inches. In the row strip, treatments may be made by using a single shank. Chisels should have a wing welded on the back 2-4 inches above the chemical outlet to partially break the chisel mark. To fill in the chisel mark and seal the surface, disc and cultipack immediately after fumigant injection. Be sure that the disc and cultipacker cover an area at least 33 inches beyond the chisel lines.
2. Tarp Chisel Application. After the soil has been properly prepared, apply 400-870 pounds of fumigant per acre by chisels spaced up to 66 inches apart, as described above, and cover with polyethylene film.
3. Deep Injection Auger-Probe Treatment. Use one pound of this product in light soils (two pounds in fine-textured soils) to a depth of 36 inches or more below the soil surface. Assume one injection site per 100 square feet (on a 10 ft. x 10 ft. grid pattern) with the injection in the center of the area to be treated.

Exposure and Aeration Period

To ensure the proper time-concentration relationship to control oak root fungus, observe a seven day exposure period before removing the polyethylene film cover. Allow a 14-day aeration period after removal of tarp or application by non-tarp methods before planting trees or vines.

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D. Special Instructions for Control of Ants (including Texas leaf-cutting ant and red imported fire ant).

Do not fumigate near or under homes or other structures. Plant injury may result if used within the dripline of trees or adjacent to desired shrubs and ornamental plantings.

To control ants, use at least one pound of this product per 100 square feet of colony. Apply fumigant with a can opener designed for methyl bromide cans and with at least eight feet of plastic tubing or other equipment designed specifically for this purpose. When either tubing or a probe at the end of the tubing is used, a few holes or notches near the tip will help prevent plugging. Insert tubing or probe into an active feeder hole near the center of the main cavity. The main cavity is marked by numerous crater-shaped mounds where a considerable amount of soil has been brought to the surface. Seal or pack other mound openings with soil. Secure tubing so it will not whip loose. Stand upwind to release fumigant. Do not remove tubing or probe

from soil for 10 minutes. After removal of tubing or probe, pack treated mound opening with soil to better seal fumigant in ant galleries. Fumigation is more effective when soil moisture is high. A plastic tarp may also be used to improve sealing.

E. Special Instructions for Greenhouse Soil Fumigation.

The use of methyl bromide in confined spaces presents a potential hazard to humans and plant life. Special precautions must be taken in order that these potential hazards be minimized. It is the responsibility of the individual supervising the fumigation operation to see that all safety precautions are strictly observed. Before the fumigation operation commences, the supervisor of the fumigation job shall have conducted proper training of all personnel involved in the fumigation (includes use of safety equipment), removed all persons from the area not directly involved in the fumigation, and inspected the equipment to ensure proper application.

Two persons trained in the use of this product must be present during introduction of the fumigant, initiation of aeration, and after aeration when testing for reentry. Two persons do not need to be present if monitoring is conducted remotely (outside the area being fumigated).

Fumigation of greenhouse soils may be done by any of the tarpaulin methods described in Sections A.1 and A.2 above, depending on the greenhouse size and accessibility to equipment. Consult the dosage rate table for proper rates of application and exposure periods. If a wind is blowing, all injection should be made upwind from a previous injection site. Immediately after injection of the fumigant and tarping, a qualified person, wearing protective equipment, should monitor the tarped area with a halide detector. If excessive leaks are found, the source of the leak should be resealed immediately.

On-Site Protective Equipment: Although this fumigant contains chloropicrin, the absence of chloropicrin does not always indicate the absence of methyl bromide. Do not allow any person to enter the fumigated structure without the appropriate protective equipment from the time of injection of the fumigant until acceptable air concentration level readings are obtained using an approved detector. To maintain adequate safety standards, the following equipment must be present and accessible on the site during the entire fumigation operation: (1) one or more self-contained breathing apparatus; (2) one or more replacement air bottles per breathing apparatus; and (3) one or more halide leak detectors.

During Fumigation: The exposure time should be as specified in the application's directions for use.

After Fumigation: At the end of the exposure period, remove all seals and open all doors and windows that are operational. Allow for complete ventilation. Use ventilation fans whenever possible to remove fumigant from dead air pockets. Follow exactly the instructions in the entry restriction section of the Agricultural-Use Requirements box.

F. Potting Mix Fumigation Directions.

Potting mixes including decomposed compost, soil mixes, and manure can be fumigated with this product. Fumigation should take place outdoors or in a well ventilated area away from desirable plants or occupied buildings. The material to be treated should have a temperature of 60°F. or above, be loose, and moist enough

for good seed germination. To ensure a good seal, pile the material on a concrete floor or on wet ground. Pile to a depth of 18 inches. Piles two to three feet high can also be treated provided perforations are made in the pile surface at one foot intervals to assist penetration. Once the pile has been made, install supports to hold the cover a few inches above the pile surface to aid in proper fumigant diffusion. Evaporating pans are essential for the volatilization and uniform dispersion of fumigant except where a vaporizer is used. Shallow pans or basins made of plastic or metal (except aluminum) are satisfactory for this purpose. For delivery of this product from outside the tarpaulin, polyethylene tubing is required. Anchor one end of each polyethylene tube into an evaporating pan with tape or a suitable weight. This ensures that the liquid will be directed into the evaporating pan. Place evaporating pan(s) with anchored applicator tubing about 30 feet apart on the pile surface. Extend the free ends of the polyethylene tubes outside the area to be covered. Cover with a polyethylene sheeting or other gas confining material of 4 mil or greater thickness. Seal the edges by burying, covering with moist sand or soil or by means of sand snakes. Attach applicator tube to the can or cylinder valve outlet and release fumigant. Use a cylinder dispenser or scale to meter small amounts from cylinders. Special units are available for use of 1 and 1 1/2 pound cans that combine opener and evaporating pan functions, and are designed to be used with all parts under the tarpaulin. Consult Dosage Rate Table for proper rates of application and exposure periods. At the end of the exposure period, unseal opposite ends of the tarpaulin and allow to aerate for at least 30 minutes before completely removing the tarp. To avoid phytotoxicity, aerate for 24-72 hours before planting.

Potting mixes in flats may also be treated. Arrange the flats in loose criss-cross stacks no more than 5 feet high, then cover and seal as described above. Introduce the fumigant at the top and in the center of the stack. Use one injection point for each 100 cubic feet. Aerate for 24 hours.



Dosage Rate Table

SOIL FUMIGATION USES

NOT FOR USE IN ARIZONA

TREATMENT SITE	RATE ^a & METHOD ^b	EXPOSURE TIME
Field Soils to be Planted to:		
asparagus, broccoli, cauliflower, eggplants, lettuce, muskmelons, onions (dry bulb), peppers, pineapples, strawberries, tomatoes	180-240 lb/A (IT) 0.4-0.55 lb/100 ft ² (RT)	24-48 hours 24-48 hours
Florida citrus ^c	1.0 lb/100 ft ² (IT) ^d	96 hr. ^d
Citrus, vineyards and deciduous fruits and nuts	400-870lb/A (NTC) ^e (IT) 1-2 lb/100 ft ² (NTP)	7 days ^f 7 days ^f
Nursery and Greenhouse Soils, Seed and Transplant Beds and Turf:		
Non-food crops	180-435 lb/A (IT)	24-48 hours
Non-food crops	0.4-1.0 lb/100 ft ² (RT)	24-48 hours
Tobacco	872 lb/A (IT)	24-48 hours
Tobacco	2 lb/100 ft ² (RT)	24-48 hours
Tomato (Greenhouse Crop)	180-240 lb/A (IT)	24-48 hours
Potting Mix	1 lb/cu.yd. (RT)	24-48 hours
FOR QUARANTINE/REGULATORY USE ONLY ^g		
Fallow fields and small plots for the control of the quarantine pest witchweed, only	436 lb/A (RT) 1 lb/100 ft ² (RT)	48 hr

^a Use higher rates indicated for muck and heavy clay soils.

^b Methods of application: IT = Injected with chisels plus covered with tarpaulin.
RT = Raised tarp with topical (surface) application.
NTC = Non-tarp chisel injection 24-30 inches deep.
NTP = Non-tarp deep injection, auger-probe.

^c May not bear harvestable fruit within 24 months.

^d Also requires 4 mil tarp.

^e Not for use in California for *Armillaria* control.

^f For control of *Armillaria*; must use tarpaulin.

^g This use is limited for quarantine/regulatory purposes and is to be used by or under the supervision of a State or Federal agency. Additional requirements may be imposed by the USDA/APHIS Manual, official government correspondence or documents, or the supervision regulatory agent at the fumigation.

