



Armed Forces Pest Management Board

Technical Information Memorandum No. 5

LAND SNAILS

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DISCLAIMER

Mention of specific pesticides for the control of snails contained herein is necessary to discuss their use. The Armed Forces Pest Management Board does not endorse specific pesticide products. References to pesticides represent unbiased views published in technical literature and are intended to be generic in nature.

INTRODUCTION

The necessity of worldwide Department of Defense operations exposes military hardware and supplies to foreign pest populations. Some of these are known to be serious problems which at the present time do not occur in the United States. Infestation and contamination of supplies, support equipment, and components of weapon systems are likely to occur and have been found to exist on numerous occasions. Under the present concepts of logistics management, military equipment is returned to the United States for modification, repair or disposal. If these components arrive (at ports of entry into the United States) infested or contaminated with pests of agricultural significance, the cargoes are placed under quarantine by the Animal and Plant Health Inspection Service (APHIS), U. S. Department of Agriculture, until cleaning and pest removal have been accomplished by acceptable procedures. Present foreign plant quarantine regulations and their enforcement by APHIS and the Military Customs Inspection program are designed to prevent the introduction and dissemination of new plant pests into the United States. These regulations are in the best interest of the welfare and agricultural economy of this country.

Agricultural pests native to each foreign country where the Department of Defense conducts operations or maintains installations may differ greatly and may include many undesirable species of vertebrates, invertebrates and weeds. In addition, native packing materials utilized in protecting cargoes during shipment and soil adhering to cargoes may contain pests and diseases which, if

introduced into the United States, would be very detrimental to the agricultural industry of this country. Retrograde cargoes, equipment, vehicles, and household effects shipped from DoD installations in the Mediterranean areas of Europe, Africa, and the Middle East, have been found contaminated with several species of land snails which do not occur in the United States. The snails are plant pests, and if introduced into this country, would be harmful to agricultural crops and pastures. The association of the snails with military supplies is purely coincidental. Contamination occurs when the snails are seeking a place of shelter to survive periods of hot, dry weather in a process known as aestivation. They climb and adhere to any object above ground to escape the lethal temperature of the soil, and in so doing may be concealed in unprotected supplies and equipment in outside storage. While Mediterranean land snails pose the greatest quarantine threat Pacific land snails can also pose a problem.

Purpose of memorandum

The purpose of this memorandum is to outline methods and procedures to be utilized by Department of Defense personnel located in overseas areas to prevent the contamination of materials with land snails. In addition, this memorandum provides guidelines for the decontamination of cargoes both prior to shipment and after arrival

Prevention of snail entry and establishment

- Supplies and retrograde cargoes which have not received adequate inspection and clearance and are subsequently shipped to U. S. ports of entry for handling, may give rise to a number of serious problems, if applicable quarantine procedures are not rigidly observed. Some examples are given below:
- A few contaminated items, intermixed with snail-free shipments in cargo loaded on a vessel, may require fumigation of the vessel and entire cargo even if some portions were fumigated prior to landing. This intermixing has been particularly troublesome when shipments originate at different locations, and it may be impossible to establish responsibility for the contamination and to prorate decontamination costs among the shippers on an equitable basis
- Preliminary inspection of cargo prior to loading aboard ships or aircraft may not always disclose the presence of snails. If contamination is discovered after cargo is discharged, it may have to be reloaded aboard ship for fumigation if adequate facilities are not available ashore, or if adverse weather conditions preclude an effective treatment on an exposed dock area.
- The danger of pest introduction is ever present when contaminated cargo is discharged on docks or at military installations in the United States. Such installations are not generally staffed or equipped to decontaminate snail-infested cargo, and the risk of introduction is magnified with delays in arranging for fumigation by commercial pest control operators. Snails, which became established in Florida and California, have presented a very serious threat to the agricultural industry in those states in addition to the expense of the control/eradication measures taken.
- Decontamination at ports of entry, particularly of surface-borne cargo, has been expensive. Fumigation charges may exceed \$40,000 per ship. In addition, there has been considerable delay in the movement of high priority cargo resulting from requirements for fumigation.

- Current directives prohibit the fumigation of ammunition aboard ship at CONUS- ports. Therefore, special precautions must be observed through arrangements between the originators and the carrier of the shipment- to-assure that all ammunition shipments are snail-free.
- The shipment of contaminated cargoes to locations in friendly countries where the destructive snails are not known to occur could have serious consequences if the United States were held responsible for introducing the pests and for the costs of their eradication. The spread of these snails to other areas would compound the present problems which for the most part have been confined to cargo from the Mediterranean area.

General military operational considerations

- The problem of agricultural pests associated with retrograde military cargoes is not an entirely new one in the history of Department of Defense overseas support operations. However, the present snail problem encountered in the Mediterranean and Pacific areas has been compounded by recently implemented logistic concepts, such as the use of CONEX containers. There will be no relief from the risks of pest introduction, and the expense and delay of decontamination, as long as this country has military forces in these areas, unless proper attention is devoted to implementing preventive control procedures at the source.
- In order to prevent the dissemination of pest snails it is necessary to use three control phases simultaneously as follows:
 - Prevention Phase - to protect supplies from becoming infested while in storage or awaiting shipment. This protection should include thorough and complete surveillance by appropriate personnel prior to loading the carrier.
 - Correction Phase - designed and implemented by engineer-entomologist services to reduce and/or eliminate local snail populations by chemical and physical means.
 - Decontamination Phase - to decontaminate infested materials that are to be returned to the United States or shipped to other military bases and locations in overseas areas.
- As preventive and corrective control programs are implemented, and their effectiveness increases, the need for decontamination should be reduced.
- The snail control and decontamination procedures presented in this memorandum are based upon experience and research, in both field and laboratory studies. Therefore, the methods and procedures outlined in this memorandum should not be deviated from unless prior approval has been obtained from the area, district, or command entomologist and appropriate U. S Department of Agriculture APHIS representative.

Supply storage

General: The most important phase in the movement of snail-free cargoes is that of utilizing good storage practices and techniques to prevent the supplies from becoming infested. The following procedures should be incorporated into a preventive control program:

- Store supplies awaiting shipment in warehouses Land snails do not normally enter buildings to

aestivate, therefore, enclosed structures provide the greatest protection against infestation

- If warehouses are not available, use paved open storage, protected by a sound, aggressive, and continuous snail control program. Areas covered with asphalt or concrete provide the most suitable and lasting types of ground cover for storage areas, and less maintenance will be required. However, in the event neither warehousing nor paved areas are available for supply storage, it will be necessary to construct an area of suitable storage. A layer of well-compacted, crushed stone about 6 inches deep should be laid on the soil, the depth depending on the soil conditions. Placing such an impermeable barrier over the soil in the storage area will eliminate the food and break an important link in the reproductive cycle of the snail. Remove the vegetation and top soil from a strip, 20 to 25 feet wide, around the perimeter of this area and apply a soil sterilant to prevent growth of vegetation. This type of site can also be used for decontamination prior to shipment back to the United States or other snail-free military locations.
- Permit only snail-free supplies in warehouses or snail-free storage areas. Do not mix infested cargo with snail-free cargo in storage or in transit.
- Store transport containers when not in use, in snail-free areas to prevent infestation. CONEX containers have been a major source of snail interceptions at the ports of entry in the past. Shipping containers, including those for household goods, must not be stored or allowed to remain on the open ground. Cargoes or household effects infested with snails should never be packed in containers for shipment.

Cargo movement and transportation of supplies

General: Snail-free retrograde cargoes and household effects can be satisfactorily moved from snail-infested areas to the United States and to other overseas locations, provided good judgment is followed in selection of storage, meticulous preinspections are performed and when necessary, effective snail control and fumigation are conducted. These factors must be strictly observed and enforced at the points of origin and embarkation.

Inspection for Snails: It is vital to prohibit the movement of snail containing cargo into any area unless that species of snail is already established in that area. This is particularly applicable in movement of cargo from country-to-country, between non-contiguous land masses, and from off-shore island(s) to mainland port cities. A thorough inspection should be made of all military materials and personal household effects of military and civilian personnel prior to movement from a known snail area to any snail-free destination. Because of the tendency of snails to hide in crevices or to crawl into holes or other openings, it will be necessary to inspect the interior, as well as the exterior of containers, when potential snail entry holes are noted. The smaller snails resemble ordinary pebbles in color and markings as well as size; therefore, a significant infestation could be overlooked during a superficial inspection of contaminated articles. Occasionally, the presence of snails may be indicated by a faint slime trail. Shipping containers boxes, particularly when they have been in contact with the soil, offer a number of havens for snails -- the bottom runners (some of which are hollow), the lift hook slots, and the occasional rust holes in the more weathered boxes. All sides of each likely item must be closely examined, noting in particular any cracks, crevices, or other areas not readily observable. Fork lifts will frequently be required for inspection of bottoms of boxes, crates, and the heavier articles. Steel cylinders present good hiding places - under the screw cap and adhering to the pallets to which cylinders are often fastened Pipes of all types are especially attractive to snails

since caps or plugs are seldom feasible. In the case of half-tracks, cranes, and other heavy equipment, with so many crevices in which snails can hide, steam or water-jet cleaning is recommended in lieu of or in addition to examination. To prevent the contamination of military or commercial cargo carriers during the movement of supplies from one location to another, only snail-free cargo should be shipped. In the examination of ships before loading, attention should be given to the bottoms of holds and ledges around the sides. Hold bulkheads near the engine room, being warmer, are favored snail sites. Snail-free cargo should never be loaded until holds have been thoroughly inspected and found or made snail free.

U.S. port of entry inspection by Plant Protection and Quarantine

At the U.S. Port of Entry, items which could harbor snails will be subject to inspection by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) Standard documents such as vessel or aircraft manifests, general declarations or cargo load plans should be presented to PPQ upon arrival at the first U.S. Port of Arrival. These documents will be used by PPQ to determine if inspection is required for military cargo or containers transporting military cargo. Generally, PPQ examines containers and military cargo originating from certain high risk snail areas of the world such as the Mediterranean and Pacific basin. If quarantine significant snails are found, PPQ may refuse entry to the cargo or require the item be fumigated to kill the snail pests.

Other factors involving cargo movement:

- Equipment (forklifts, tractor-trailers, trucks, and railcars) and materials (pallets, dunnage, and tarpaulins) utilized in the storage and transportation of non-infested supplies must be snail-free. This equipment, when not in use, should be returned to snail-free areas. Equipment that is utilized to handle or transport snail-infested supplies should not be reused unless the equipment has been decontaminated
- It is important that adequate procedures be established to prevent snail "stowaways" in personal household effects of military personnel. Shipment boxes used for household goods should not be placed on the ground. Lawn furniture, garden hoses and tools, sporting goods (boats, motors, etc.) bicycles, motor scooters, utility trailers, tires, and other items that are allowed to remain outdoors must be decontaminated before packing for shipment from snail-infested areas
- Household furniture and packing materials should never be placed on the ground or lawn while being prepared or packed for shipment.

Snail control

General: Military installations and deployments in the Mediterranean region and other high risk areas should establish snail control programs to reduce snail populations on the installations, to control the snails in the vicinity of transportation terminals and to eliminate snails from storage areas. The control of land snails can be accomplished prior to infestation of materials by establishing sound and aggressive physical and chemical control programs. In most instances, both programs should be utilized when practical.

- Physical control: Physical control measures are of definite value in reducing snail populations where chemical control is too hazardous or expensive. During the summer months when the

Mediterranean snails are aestivating, their metabolism is greatly reduced, therefore, chemical control is not effective, and physical control is the only method that can be satisfactorily used. Physical control has been found to be of value in reducing populations of *Theba pisana* in open fields bordering open storage areas in North Africa. Specific physical control measures which would routinely apply as preventive measures in countries with highly endemic snail populations are described as follows:

- Burning-over - Burning vegetation on which aestivating snails attach will reduce snail populations. Burning is most effective during the dry season when the vegetation is dry and the majority of snails are aestivating on the vegetation above ground. The systematic use of flame throwers or commercial weed-burners is effective in reducing snail populations along fence rows, and in areas where other measures may not be practical.
 - Plowing - In open fields, adjacent to outside storage and on-base housing areas, plowing the soil twice a year has been found to reduce both *Theba* and *Cochicella* populations. Cultivating the soil in late autumn destroys many of the immature and adult snails, as well as the eggs that have been deposited in the soil.
 - Disking and culti-packing - This is helpful in reducing land snail populations in areas where plowing may not be practical because of thin top soil or where erosion may be a serious problem. The mechanical action of the disc and culti-packer will eliminate many adult snails, while stirring the soil will destroy many eggs.
 - Equipment utilized in grounds maintenance work should not be parked, stored, or allowed to remain in snail-infested areas. This equipment should be cleaned and returned to the equipment storage area at the end of each work day. The care of equipment prevents infestation and spread into storage areas.
 - Chemical control: Chemical control of exotic snails typically employs metaldehyde, methiocarb (Mesurol), salt, or combinations of these chemicals with other molluscicides in a myriad of bait formulations or foliar sprays.
 - Metaldehyde treatments applied during dry climatic conditions are usually more successful than the degree of control achieved during damp, high humidity conditions at which time snails are likely to be more active. The principal toxic effect of metaldehyde is through stimulation of the mucous glands which cause excessive sliming, leading to death by dehydration. Metaldehyde is toxic to slugs and snails both by ingestion and absorption by the "foot" of the mollusc.
 - The pesticidal properties of methiocarb are similar to the toxic action of other carbamates which prevent effective nerve transmission by inhibiting the enzyme acetylcholinesterase.
 - In addition to these molluscicides, sodium chloride, common table salt, is an effective dehydrating agent. It may be applied as a 12-inch barrier application on the perimeter of known/suspected snail-infested areas. During periods of rain or high relative humidity, salt barriers should be renewed frequently. Molluscicides are ineffective during periods when snails are aestivating.
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TAXONOMY BIOLOGY AND ECOLOGY OF TERRESTRIAL SNAILS

Members of the class Gastropoda, the largest and most varied group of the phylum Mollusca, includes snails, slugs, and limpets. They are found in marine, fresh-water, and terrestrial habitats. Gastropods have retained the primitive, flat, ventral foot for crawling, but in many other ways have evolved significantly from the ancestral stock. They have all undergone torsion in the general body plan so that the digestive tract is no longer a straight tube, but the anus has coiled to lie on the side and usually near the head. Most gastropods have a coiled shell which corresponds to the coiled visceral mass.

The terrestrial, pulmonate snail *Helix pomatia* Linne typifies the biology and habits of this group. The pulmonate snail is hermaphroditic, and each gravid snail deposits batches of gelatinous-covered eggs in damp places or shallow burrows. Development is direct, the young emerging as minute snails. Movement is by waves of muscular action on the ventral side of the "foot" over a slime trail of mucus secreted by a gland below the mouth. The type of food varies, but snails prefer tender, young green plants. Food is held in the "law" and rasped off in small bits by the feeding apparatus or radula. Snails tend to hide during the day, though they often feed on cloudy days. Terrestrial snails are mainly nocturnal, but following a rain may come out of hiding during the day. Temperature and moisture, rather than light, are the main factors to account for their nocturnal habits. Native snails may be found everywhere but prefer habitats offering shelter, adequate moisture, an abundant food supply and an available source of lime. Forested river valleys generally provide such habitats, and those with outcrops of limestone usually show the most abundant and varied mollusk faunas. Snails are very adaptable to times of drought and adverse climatic conditions. During these periods, the snail closes the shell aperture with a mucus flap (epiphragm) which hardens and prevents desiccation. Snails can remain in this dormant state (aestivation) for years, breaking dormancy when climatic conditions are favorable again.

Families of terrestrial snails of agriculture and quarantine significance intercepted in military cargo

Family Achatinidae

The giant African snail, *Achatina fulica*, Bowdich is the largest (shell length 125 mm or more), most voracious and reproductively prolific snail to have been introduced into this country. Its origin is south of the Sahara in East Africa and is established in Asia and the Indo-Pacific Islands, including Hawaii. The giant African snail was inadvertently released in California after World War II and in North Miami in the 1970s. In each instance, eradication efforts were successful, but very expensive.

Family Bradybaenidae

The most well-known member of this family, *Bradybaena similaris*, is a snail of medium size (approximately 12-16 mm in diameter). The shell is wider than high, thin, narrow with a rather depressed spire. The shell is white to greenish yellow, often with a single, spiral, chestnut band.

It probably originated somewhere in China but is now widely distributed over the world. *B. similaris* is a severe pest of coffee trees and is found wherever this crop is grown.

Family Helicidae

This family is the most prevalent and contains the largest European snails, including *T. pisana*, the white garden snail. Distribution of this group is from the countries bordering the Mediterranean Sea.

The shells of the Helicidae are usually medium to very large in size, thick, and often brightly colored, but there is an immense range of size, shape and coloring between and sometimes within species. Members of the family are found in a very wide range of habitats, but there are within the family, groups of species which share similar features of habitat, size, and way of life. Recently, the white garden snail, *T. pisana*, has become established in San Diego County, California.

Family Succinidae

Succinea horticola Reinhart is the most important species of this family and is found mainly in the Orient, i.e., China, Japan and Okinawa. *S. horticola* is also found in Greece and Italy. This snail is a very severe pest of greenhouse plants and grasses.

Table 1. The twenty snails most commonly intercepted on retrograde military cargo or household effects and countries of origin

<u>Scientific Name</u>	<u>No. Of Interceptions</u>	<u>Countries Producing Greatest Number of Interceptions</u>
1. <i>Theba pisana</i>	376	Spain-Israel-Portugal
2. <i>Helicella</i> spp.	307	Italy-Israel-Greece
3. <i>Helix aspera</i>	192	Italy-Mexico-Spain
4. <i>Succinea horticola</i>	146	Italy-Japan-Greece
5. <i>Helicella conspurcata</i>	119	Italy-Spain-Greece
6. <i>Cochlicella barbara</i>	109	Italy-Spain-Greece
7. <i>Cochlicella</i> spp.	108	Israel-Portugal-Italy
8. <i>Monacha</i> spp.	54	Israel-Italy-Greece
9. <i>Helicella maritima</i>	53	Italy-Spain-France
10. <i>Monacha syrlaca</i>	48	Israel-Italy-Turkey
11. <i>Helicella cretica</i>	48	Greece-Italy-Turkey
12. <i>Helicella virgata</i>	47	Italy-Spain-France
13. <i>Monacha carthusiana</i>	47	Italy-France-Israel
14. <i>Helicella gigaxii</i>	46	Italy-Spain-Greece
15. <i>Otala</i> spp.	45	Italy-Greece-Spain
16. <i>Cepaea</i> spp.	42	Hawaii-Brazil-France
17. <i>Cochlicella conoidea</i>	35	Italy-West Germany-Spain
18. <i>Helicella protea</i>	31	Turkey-Italy-Israel
19. <i>Achatina fulica</i>	31	Hawaii-Taiwan-Hong Kong
20. <i>Helicella derbentina</i>	28	Turkey-Italy-Greece

Source: Interception records (1974-1987) APHIS - U.S.D.A.

POST-EXPOSURE PROCEDURES FOR RETROGRADE

MILITARY EQUIPMENT

Notification of Infestation - The nearest representative of the APHIS should be notified of a known or suspected snail infestation on any vehicles, weapons, or any other type of military equipment which is being returned to CONUS from a foreign country in which snails declared to be under quarantine by APHIS exist. A list of APHIS inspectors, location of work sites and their telephone numbers should be maintained at every port-of-entry where military equipment would be received. This list should be reviewed and updated at least annually. Contaminated military cargo, equipment, and/or household effects under USDA quarantine should never be moved any further from the point of disembarkation than is essential to effect the necessary decontamination procedures.

Decontamination Procedures of Snail-Infested Cargo

Non-chemical Methods:

Freshwater wash down (high pressure) is the most accepted, effective and inexpensive method if infestation is obvious and snails are superficially attached. Prior to high pressure wash down, all soil plant material and any other debris should be removed by scraping, brushing or any suitable and appropriate method that will remove gross contamination prior to the actual wash down. The military inspector should be aware of the ultimate disposition of all live and dead snails and any plant material/soil which has been removed during the wash down procedures. If this material does not enter a sanitary sewer system where chemical treatment would be routine, other steps should be taken. A suitable option would be to conduct the cleaning procedure(s) on a concrete or asphalt hardstand which would permit collection and proper disposal of material removed during wash down.

Live steam wash down is an effective method, providing equipment and facilities are available. Live steam is highly lethal to molluscs, but extreme safety precautions must be followed both for the safety of the operator and the vehicles or equipment to be cleaned. These would include the use of protective rubberized outer clothing, rubber boots, rubber gloves and protective face and head gear. The peripheral area of the live steam decontamination area should be well marked, and protective barriers should be in place before beginning the cleaning procedures. Extreme care should be exercised when steam is used-to clean metal surfaces because of the burn hazard of the heated metal.

Chemical Methods:

With the development of suitable devices for measuring gas concentrations, fumigation under temporary enclosures has become generally accepted as a reliable method of snail eradication. Its adaptability for use under a variety of circumstances makes it an irreplaceable method in many instances. The use of a temporary enclosure for the fumigation of snail-infested cargo certainly contains elements of risk beyond those of an approved fumigation chamber. However, it can be used effectively against many plant pests and when properly managed should not present any serious safety hazard. Fumigation must be performed only by properly trained and certified applicators.

Fumigation Procedures

Methyl bromide (MB) is one of the principal fumigants used under tarpaulins for shipboard, and/or warehouse fumigations. It is a colorless gas, and usually supplied as a heavy, volatile liquid under pressure. The gas volatilizes when released from containers at ambient temperatures of 400 F(4.4 Co) or above. In the actual fumigation procedure, vaporizers and circulatory fans are used to increase

diffusion and penetration of this fumigant.

Like all effective fumigants, MB is very dangerous to humans and when improperly handled may produce serious consequences. Fumigations should always be under the supervision of a responsible person who is properly certified and thoroughly familiar with the fumigant and the hazards that may prevail. Exposure of personnel to all concentrations is to be avoided. The threshold limit value has been established at 5 ppm in air for repeated exposures, 8 hr per day, 5 days per week. A concentration of 2,000 ppm is considered to be immediately dangerous to life and health. There is also a chronic toxicity hazard from continuous exposures to low concentrations in air. However, MB poisoning, both acute and chronic, can be avoided with appropriate training, reasonable care, good judgment, and proper safety equipment.

Although the commercial fumigator is responsible for producing the desired results, the military entomologist/inspector must assume a functional role during the operation. He must confer with the fumigator and decide upon the best possible method to follow. Only through familiarity with the materials and procedures involved can this be best accomplished.

Before any large fumigations are started, the commercial fumigator should make sure that local ordinances are understood and followed. Police and fire departments should be notified~ if required by law. Public safety must be the utmost consideration; and although the military inspector cannot assume the responsibility of providing complete protection, he should be able to recognize unsafe procedures and offer advice concerning dangerous situations which may arise.

Suggested fumigation schedule for those snail genera most commonly intercepted at U. S. Ports of entry. This schedule reflects different tolerances according to genus and/or species:

Achatina fulica

MB @ NAP

128g/m³ (8 lb/1000 ft³) for 24 hrs at 12.5 C. (55 F.) or above

(65 g (oz) minimum gas concentration at 2-12 hrs.)

(35 g (oz) minimum gas concentration at 12-24 hrs.)

Cochicella, Helicella and Monacha spp.

MB @ NAP

128g/m³ (8 lb/1000 ft³) for 72 hrs at 12.5 C. (55 F.) or above

95 g (oz) minimum concentration @ hr.)

60 g (oz) minimum concentration @ 48 hr.)

40 g (oz) minimum concentration @ 72 hr.)

Theba pisana

MB @ NAP

96g/m³ (6 lb/1000 ft³) for 10 hrs at 26.5 C. (80 F.) or above

96g/m³ (6 lb/1000 ft³) for 16 hrs at 12.5-26 C. (55-79 F.)

(70 g (oz) minimum gas concentration @ hr.)

(40 g (oz) minimum gas concentration @ 10-16 hrs.)

128g/m³ (8 lb/1000 ft³) for 24 hrs at 4.5-12.2 C. (40-54 F.)

(96 g (oz) minimum concentration @ hr.)

(64 g (oz) minimum concentration @ 4 hrs.)

(39 g (oz) minimum concentration @ 24 hrs.)

Helix spp., *Otala* spp., *Succinea horticola*

MB @ NAP

96g/m³ (6 lb/1000 ft³) for 10 hrs at 26.5 C. (80 F.) or above

96g/m³ (6 lb/1000 ft³) for 16 hrs at 12.5-26 C. (55-79 F.)

(70 g (oz) minimum concentration @ hr.)

(40 g (oz) minimum concentration e 10 or 16 hr.)

128g/m³ (8 lb/1000 ft³) for 24 hrs at 4.5-12.2 C. (40-54 F.)

(96 g (oz) minimum concentration at hr.)

(64 g (oz) minimum concentration at 4 hrs.)

(39 g (oz) minimum concentration at 24 hrs.)

Bradybaena spp. and *Succinea horticola*

MB@NAP

96g/m³ (6 lb/1000 ft³) for 16 hrs at 4.5-26 C. (40-79 F.)

(70 g (oz) minimum concentration @ hr.)

(40 g (oz) minimum concentration @ 10-16 hr.)

FOOTNOTES:

MB = methyl bromide (NSN 6840-00-680-0142)

NAP = normal atmospheric pressure

Release procedures for military cargo, equipment and household effects:

Following post-exposure treatment (fumigation, steam, or water wash down), all equipment and materials under treatment should be re-inspected for the presence of any viable snails. Clean, inspected items should then be loaded onto a clean ship, aircraft, or other interim means of transport. If these items are held for subsequent shipment, they must be in a clean, protected snail-free location. Upon completion of a satisfactory inspection, all appropriate release forms should be completed with appropriate copies to the consignor, the shipper, and consignee of the cargo involved.

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