

RESTRICTED USE PESTICIDE

Due to inhalation exposure to humans.

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.

PALADIN[®]

Soil Fumigant

For control or suppression of weeds, soil-borne plant pathogens and nematodes in soils to be planted with vegetables (tomatoes, peppers, eggplants), cucurbit crops (cucumber, squash and melons), strawberries, blueberries, field-grown ornamentals, and forest nursery stock where plastic tarp is used for fumigation. For application via raised bed shank injection and broadcast/flat fume methods only.

ACTIVE INGREDIENT:

Dimethyl disulfide 98.8%

OTHER INGREDIENTS: 1.2%

TOTAL: 100.0%

One gallon weighs 8.85 lbs. at 68° F

Keep Out of Reach of Children WARNING / AVISO

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.)

FIRST AID	
IF SWALLOWED:	<ul style="list-style-type: none"> ▪ 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 person.
IF INHALED:	<ul style="list-style-type: none"> ▪ 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 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. ▪ Call a poison control center or doctor for treatment advice.
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. ▪ Call a poison control center or doctor for treatment advice.
<p>Have the product container or label with you when calling a poison control center or doctor or going for treatment.</p>	
<p>EMERGENCY TELEPHONE NUMBERS: FOR MEDICAL EMERGENCIES: (866) 767-5089 (Rocky Mountain Poison Control Center) FOR SPILLS OR TRANSPORTATION EMERGENCIES: (800) 424-9300 (Chemtrec)</p>	

See inside booklet for additional PRECAUTIONARY STATEMENTS, DIRECTIONS FOR USE, STORAGE AND DISPOSAL, and CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY.

EPA Registration No. 55050-4



Arkema Inc.
 2000 Market Street
 Philadelphia, PA 19103
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PRECAUTIONARY STATEMENTS HAZARD TO HUMANS AND DOMESTIC ANIMALS

WARNING

May be harmful if swallowed. Harmful if inhaled or absorbed through skin. Do not breathe vapor. Causes slight eye irritation. Avoid contact with skin, eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

HANDLERS

The following activities are prohibited from being performed in the application block (i.e., the field or portion of a field treated with a fumigant in any 24-hour period) by anyone other than persons who have been appropriately trained and equipped as handlers in accordance with the requirements in the Worker Protection Standard (WPS) (40 CFR Part 170). This prohibition period begins from the start of the application until the entry restricted period ends 5 days (120 hours) after the application has been completed. The application starts when the fumigant is first introduced into the soil and ends after the fumigant has stopped being delivered/dispensed to the soil. **NOTE:** persons installing, perforating, removing, repairing, and monitoring tarps are considered handlers for the durations listed below which can extend beyond the 5 day initial period.

- Participating in the application as supervisors, loaders, drivers, tractor co-pilots, shovelers, cross ditchers, or as other direct application participants;
 - Cleaning up fumigant spills (this does not include emergency personnel not associated with the fumigation application);
 - Handling and transferring fumigant or disposing of fumigant containers;
 - Cleaning, handling, adjusting, calibrating or repairing the parts of fumigation equipment that may contain fumigant residues;
 - Installing, repairing, operating, or removing irrigation equipment in the fumigant application block;
 - Entering the application site to perform scouting, crop advising, or monitoring tasks;
 - Installing, perforating (cutting, punching, slicing, poking), removing, repairing, or monitoring tarps:
 - until 21 days after application is complete, if tarps are not perforated and not removed for 21 days after application, or
 - until 48 hours after tarp perforation is complete if tarps are perforated less than 21 days after the application is complete and tarps will not be removed prior to planting, or
 - until tarp removal is completed if tarps are removed less than 21 days after the application is complete.
- NOTE:** see **Tarp Perforation and/or Removal** section on this labeling for requirements about when tarps are allowed to be perforated.
- Performing any handling tasks as defined by the WPS.

All Handlers (including applicators) performing the following tasks have a potential for liquid contact with PALADIN®:

- Fumigant transfer with or without dry-disconnect fittings
- Equipment calibration or adjustment
- Equipment clean-up
- Repair of PALADIN®-containing equipment
- Product sampling
- Any activity within 6 feet from an unshielded pressurized hose containing this product
- Spill clean-up
- Rinsate disposal

All Handlers (including applicators) performing any tasks with DMDS liquid contact potential must wear:

- Loose fitting or well ventilated long-sleeved shirt and long pants,
- Chemical-resistant gloves,
- Chemical-resistant footwear,
- Socks,
- Full-face shield or safety glasses with brow, temple and side protection. DO NOT wear goggles, and
- If any handler detects the garlic-like odor of this product, then a half face or full face air-purifying respirator with a pesticide-approved organic vapor cartridge filter or equivalent (NIOSH approved number prefix TC-23C) must be worn. Any handlers not wearing respirators must cease operations and leave the application block and surrounding buffer zone.
- Handlers wearing respirators can remove them or handlers not wearing respirators can resume operations if two consecutive air samples taken at least 15 minutes apart show that the levels of DMDS do not exceed 55 ppb. Samples must be taken where the odor was first detected. If sampling is not done, after one hour and at hourly intervals thereafter, handlers can remove their air-purifying respirators momentarily to determine if the garlic-like odor is still detectable. If detectable, the respirator must be put back on.

All Handlers (including applicators) performing any tasks without DMDS liquid contact potential must wear:

- Loose fitting or well ventilated long-sleeved shirt and long pants.
- Shoes plus socks.
- If any handler detects the garlic-like odor of this product, a half face or full face air-purifying respirator with a pesticide-approved organic-vapor cartridge filter, or equivalent (NIOSH approval number prefix TC-23C) must be worn. Any handlers not wearing respirators must cease operations and leave the application block and surrounding buffer zone.
- Handlers wearing respirators can remove them or handlers not wearing respirators can resume operations if two consecutive air samples taken at least 15 minutes apart show that the levels of DMDS do not exceed 55 ppb. Samples must be taken where the odor was first detected. If sampling is not done, after one hour and at hourly intervals thereafter, handlers can remove their air-purifying respirators momentarily to determine if the garlic-like odor is still detectable. If detectable, the respirator must be put back on.

Tractor drivers and tractor co-pilots in enclosed cabs must wear:

- Loose fitting or well ventilated long-sleeved shirt and long pants.
- Shoes plus socks.
- If the garlic-like odor of this product can be detected, then a half face or full face air-purifying respirator with a pesticide-approved organic-vapor cartridge filter, or equivalent (NIOSH approved number prefix TC-23C) must be worn. Any handlers not wearing respirators must cease operations and leave the application block and surrounding buffer zone.
- Handlers wearing respirators can remove them or handlers not wearing respirators can resume operations if two consecutive air samples taken at least 15 minutes apart show that the levels of DMDS do not exceed 55 ppb. Samples must be taken where the odor was first detected. If sampling is not done, after one hour and at hourly intervals thereafter, handlers can remove their air-purifying respirators momentarily to determine if the garlic-like odor is still detectable. If detectable, the respirator must be put back on.
- Do not store PPE contaminated with this product within the enclosed cab as handlers may be exposed to vapors. The enclosed cab must meet the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides at 40 CFR 170.240(d)(5).
- For tractor drivers and tractor co-pilots in an enclosed cab the following can be used in lieu of an air-purifying respirator:
 - A tractor equipped with a cabin-area air-fan dilution system consisting of a ducted fan/blower which provides air flow to the breathing zone of the tractor driver and co-pilot. The fan/blower must be mounted so that the fan/blower intake is at least 126 inches from the ground, and the fan/blower must be capable of operating at a minimum of 1,600 revolutions per minute and producing a minimum flow rate of 3,000 cubic feet of air per minute.

IMPORTANT: an air-supplying respirator [i.e., a respirator connected directly to a clean air source or a self-contained breathing apparatus (SCBA)] is not permitted for routine handler tasks. Such respirators are only permitted in emergencies such as spill or leak or when corrective action is needed to reduce air levels to acceptable levels.

SUPERVISION OF HANDLERS

For all applications from the start of the application until the fumigant has stopped being delivered/dispensed into the soil, i.e., after the soil is sealed, a trained and state certified applicator with current registration must be at the fumigation site in the line of sight of the application and must directly supervise all persons performing handling activities.

For handling activities that take place after the fumigant has been delivered/dispensed into the soil until the entry period expires, the Certified Applicator does not have to be on-site, but must have communicated, in a manner that can be understood, to the site owner/operator and handlers responsible for carrying out those activities the information necessary to comply with the label and procedures described in the Fumigation Management Plan (FMP), which includes emergency response plans and procedures, etc. Communication activities must be captured in the FMP.

IMPORTANT: This requirement does not override the requirements in the Worker Protection Standard for Agricultural Pesticides for information exchange between owners/operators of agricultural establishments and commercial pesticide applicators.

The certified applicator must provide the **Fumigant Safe Handling Guide® – Paladin (Dimethyl disulfide, DMDS)** to each handler involved in the application or confirm that each handler participating in the application has received the **Fumigant Safe Handling Guide® – Paladin (Dimethyl disulfide, DMDS)** in a manner they can understand within the past twelve months. The **Fumigant Safe Handling Guide® – Paladin (Dimethyl disulfide, DMDS)** will be provided where this product is purchased.

For all handling tasks at least two handlers trained under the provisions of the WPS 40 CFR 170.230 must be present.

RESPIRATOR FIT TESTING, MEDICAL QUALIFICATION, AND TRAINING

Employers must verify that any handler who uses a respirator is:

- Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29 CFR Part 1910.134)
- Trained using a program that conforms to OSHA's requirements (see 29 CFR Part 1910.134)

- Examined by a qualified medical practitioner to ensure physical ability to safely wear the style of respirator to be worn. A qualified medical practitioner is a physician or other licensed health care professional who will evaluate the ability of a worker to wear a respirator. The initial evaluation consists of a questionnaire that asks about medical conditions (such as a heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. Handlers must be reexamined by a qualified medical practitioner if their health status or respirator style or use-conditions change. Upon request by local/state/federal/tribal enforcement personnel, employers must provide documentation demonstrating how they have complied with these requirements.

PROVIDING, CLEANING, AND MAINTAINING PPE

The employer of any handler (as stated in this label) must make sure that all handlers are provided and correctly wear the required PPE. The PPE must be cleaned and maintained as required by the Worker Protection Standard for Agricultural Pesticides.

AIR-PURIFYING RESPIRATOR AVAILABILITY

At a minimum two handlers must have the appropriate air-purifying respirator and cartridges available and these handlers must be fit-tested, trained, and medically examined.

The employer of any handler must confirm that an air-purifying respirator and appropriate cartridges of the type specified in the PPE section of this labeling are immediately available for each handler who must wear one. This must be documented in the FMP.

Cartridges or canisters must be replaced when odor or irritation from this product becomes apparent or after 8 hours of use, whichever occurs first.

AIR-RESCUE DEVICE AVAILABILITY

The employer of any handler must confirm that at least one air-rescue device (e.g., SCBA) is on-site and is ready for use in case of an emergency. This must be documented in the FMP.

EXCLUSION OF NON-HANDLERS FROM APPLICATION BLOCK

The Certified Applicator supervising the application and the owner/operator of the establishment where the fumigation is taking place must make sure that all persons who are not trained and PPE-equipped and who are not performing one of the handling tasks as stated in this labeling are excluded from the application block during the entry restricted period.

ENTRY RESTRICTED PERIOD

Entry (including early entry that would otherwise be permitted under the WPS) by any person, other than a correctly trained and PPE-equipped handler who is performing a handling task listed on this labeling, is PROHIBITED from the start of the application until:

- 5 days after application is complete if tarps are not perforated and not removed for at least 21 days after application is complete, **NOTE:** Persons installing, repairing, or monitoring tarps are considered handlers until 21 days after the application is complete if tarps are not perforated and not removed during those 21 days, or
- 48 hours after tarp perforation is complete if tarps are perforated less than 21 days after the application is complete and tarps will not be removed prior to planting, or tarp removal is completed if tarps are removed less than 21 days after the application is complete.

NOTE: See **Tarp Perforation and/or Removal** section on this labeling for requirements about when tarps are allowed to be perforated.

NOTIFICATION

Notify workers of the application by warning them orally and by posting Fumigant Treated Area signs. The Fumigant Treated Area signs must bear the skull and crossbones symbol and state:

1. "WARNING/AVISO"
2. "Areas under fumigation, DO NOT ENTER/NO ENTRE"
3. Dimethyl Disulfide Fumigant In Use
4. Date and time of fumigation
5. Date and time entry restricted period is over
6. PALADIN[®], and (fill in co-application), and
7. Name, address, and telephone number of the Certified Applicator in charge of the fumigation.

Post the Fumigant Treated Area signs instead of the WPS signs for this application but follow all WPS requirements pertaining to location, legibility, size and timing of posting and removal.

Post the Fumigant Treated Area signs at all entrances to the application block (i.e., the field or portion of a field treated with a fumigant in any 24-hour period.)

TARP PERFORATION AND/OR REMOVAL

IMPORTANT: Persons applying, perforating, repairing, removing, and/or monitoring tarps are defined, within certain time limitations, as handlers (see handlers as stated in this labeling) and must be provided the PPE and other protections for handlers as required on this labeling and in the Worker Protection Standard for Agricultural Pesticides.

- High barrier tarps must not be perforated until a minimum of 12 days have elapsed after the fumigant injection into the soil is complete (e.g., after tarps have been laid), unless an adverse weather condition exists which necessitates the need for early perforation or removal.

- If tarps will be removed before planting, tarp removal must not begin until at least 2 hours after tarp perforation is complete.
- Tarps used for fumigations may be perforated manually ONLY for the following situations:
 - At the beginning of each row when a coultter blade (or other device which performs similarly) is used on a motorized vehicle such as an ATV.
 - In fields that are 1 acre or less.
- In all other instances tarps must be perforated (cut, punched, poked, or sliced) only by mechanical methods.
- Tarps may be removed before the required 12 days if adverse weather conditions have compromised the integrity of the tarp, provided that the compromised tarp poses a safety hazard. Adverse weather includes high winds, hail or storms that blow the tarps off the field or beds and create a hazard.
- If tarps are left intact for a minimum of 21 days after the application has been completed, planting or transplanting may take place while the tarps are being perforated.
- For broadcast fumigations, tarps must not be perforated if rainfall is expected within 12 hours.
- For broadcast fumigations, tarp perforation must be completed before noon.

USER SAFETY REQUIREMENTS

- Do not wear jewelry, goggles, and/or tight clothing that can trap PALADIN® vapors against your skin.
- Remove all clothing that comes in contact with liquid material at once. Aerate all affected clothing thoroughly outdoors prior to washing.
- Discard any clothing or absorbent materials (e.g. leather) that have been drenched or heavily contaminated with this product. Do not reuse them.

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 skin thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwater or rinsate.

Dimethyl disulfide has certain properties and characteristics in common with chemicals that have been detected in groundwater (dimethyl disulfide is highly soluble in water and has low adsorption to soil).

PHYSICAL OR CHEMICAL HAZARDS

This product contains flammable liquid and vapor. Flammable - Store in a well ventilated area away from heat and sources of ignition such as flame, sparks and static electricity. Ensure that all storage and handling equipment is properly rated, grounded and installed to satisfy electrical classification requirements. Static electricity may accumulate and create a fire hazard. All storage containers must be bonded and grounded during filling operations. Store away from oxidizers and reactive materials. Keep container tightly closed. Precautions must be taken to prevent the ignition of flammable vapors when/where present by sources such as open flames, lightning, hot surfaces, radiant heat, smoking, cutting and welding, spontaneous ignition, frictional heat or sparks, static electricity, electrical sparks, stray currents, ovens, furnaces, and heating equipment. Observe all federal, state and local regulations and National Fire Prevention Association (NFPA) Codes which pertain to the specific local conditions of storage and use, including OSHA 29 CFR 1910.106 and NFPA 30, 55, 70, 77 and 497.

Containers, pumps, and other transfer equipment made of aluminum, brass, copper, magnesium or their alloys may corrode when in contact with PALADIN®. Observe the equipment used for obvious corrosion and replace equipment as necessary. Stainless steel is a preferred material.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. Read entire label before using this product.

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

NOTE: This product is not for use in greenhouses.

This product is not for residential use.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 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 on this label about personal protective equipment (PPE), notification to workers, and restricted-entry interval. The requirements in this box apply to uses of this product that are covered by the Worker Protection Standard. Follow all re-entry restrictions listed on this label.

BUFFER ZONE

The area adjacent to the treated area is referred to as the buffer zone. The buffer zone shall extend from the edge of the treated area in all directions. See **Buffer Zone Distance Table**. The minimum buffer zone distance shall be 25 feet. The Certified Applicator supervising the soil fumigation is responsible for the following:

1. Calculating the appropriate size of the buffer zone that must be maintained from the start of the application until 48 hours following the end of the application;
2. Establishing and maintaining the buffer zone from the start of the application until 48 hours following the end of the application. The Certified Applicator must use an appropriate means to manage and maintain the buffer zone such as posting Buffer Zone signs around the perimeter of the buffer zone at potential points of entry, using trained workers to patrol the buffer zone, or other equivalent means. If Buffer Zone signs are used, they must be posted from the start of the application until 48 hours following the end of the application and must be removed within 3 days of the end of the buffer zone period. The Buffer Zone signs must include the same warning symbol and statements required for Fumigant Treated Area signs as stated on this label with the exception that signs will indicate "Fumigant Buffer Zone" at the top of the sign and will delete the statement "areas under fumigation".
3. Ensuring that unprotected workers and bystanders do not enter the buffer zone, from the start of the application until 48 hours following the end of the application. **Exception:** Unprotected workers and bystanders may travel through (but not engage in any activity in) the buffer zone during the application and the 48-hour period following the end of the application, provided their total exposure time in any 24-hour period is 15 minutes or less. However, travel by unprotected workers or bystanders through the fumigated area itself is prohibited during the entire Entry Restricted period. Handlers protected with required Personal Protective Equipment (PPE) may work in buffer zones. See the **PERSONAL PROTECTIVE EQUIPMENT** section.
4. Ensuring application site has a distinctive buffer zone. The buffer zone of the field to be treated cannot overlap the buffer zone of another field treated within the last 12 hours.
5. Ensuring that there are no occupied nursing homes, hospitals, or prisons; and no occupied licensed schools, licensed day care facilities and licensed assisted living facilities (licensed by state or local governments) within 1/4 mile of the fumigated area during the buffer zone period.

Determining Buffer Zone Distances

- Determine the size of the buffer zone using the following Buffer Zone Tables.
- The size of the buffer zone will be dependent on the following three factors:
 - Whether the application method is raised-bed or broadcast/flat fume shank injected
 - The number of field acres that are being treated with PALADIN®.
 - The pounds of PALADIN® that are being applied per treated acre.

Applications are limited to 40 contiguous acres or less on a single site and a maximum rate of 455 pounds (51.3 gallons) of PALADIN® per acre.

To determine the size of the required buffer zone, refer to the **BUFFER ZONE DISTANCE** tables for either Raised Bed Shank Injection or Broadcast/Flat Fume Shank Injection below.

If the actual Application Rate or Block Size does not appear in the Buffer Zone Distance Table, the Buffer for the next higher Rate or Block Size must be used.

BUFFER ZONE DISTANCE TABLE
For Raised Bed, Shank Injected Applications

Broadcast Equivalent Application Rate lbs/A (gal/A)		Application Block Size (acres)								
		1	5	10	15	20	25	30	35	40
		For Raised Bed, Shank Injected Applications (buffers in feet)								
112	(12.6)	25	25	25	25	25	25	25	25	30
118	(13.3)	25	25	25	25	25	25	25	35	45
121	(13.6)	25	25	25	25	25	25	25	35	50
130	(14.7)	25	25	25	25	25	30	35	55	70
133	(15.0)	25	25	25	25	25	35	45	60	75
136	(15.3)	25	25	25	25	25	35	45	65	80
140	(15.8)	25	25	25	25	25	40	55	70	85
143	(16.2)	25	25	25	25	25	45	60	75	90
146	(16.5)	25	25	25	25	30	50	65	80	95
152	(17.2)	25	25	25	25	40	60	75	90	105
155	(17.5)	25	25	25	25	45	70	80	95	110
162	(18.3)	25	25	25	30	55	75	90	105	120
170	(19.2)	25	25	25	35	60	80	95	115	130
180	(20.3)	25	25	25	40	70	90	105	125	140
186	(21.0)	25	25	25	50	75	95	115	135	150
190	(21.4)	25	25	30	55	80	100	120	140	155
200	(22.5)	25	25	35	60	90	110	130	150	170
205	(23.1)	25	25	35	65	95	115	135	155	175
209	(23.6)	25	25	40	65	95	115	135	155	175
212	(23.9)	25	25	40	70	100	120	140	160	180
219	(24.7)	25	25	45	75	105	125	145	165	185
228	(25.7)	25	25	50	80	110	135	155	175	195
238	(26.8)	25	25	60	90	115	140	160	185	205
249	(28.1)	25	25	65	95	120	145	165	190	210
251	(28.3)	25	25	65	95	125	150	170	195	215
260	(29.3)	25	25	70	100	130	155	180	200	220
273	(30.8)	25	25	75	105	135	160	185	210	230
282	(31.8)	25	25	75	110	140	165	190	215	240
285	(32.2)	25	25	80	110	140	165	190	215	240
288	(32.5)	25	25	80	110	140	165	190	215	240
297	(33.6)	25	25	80	115	150	175	200	225	250
300	(34.0)	25	25	80	115	150	175	200	225	250

Note: Minimum allowable buffer zone is 25 feet

BUFFER ZONE DISTANCE TABLE For Broadcast/Flat Fume Shank Injected Applications

Broadcast Application Rate lbs/A (gal/A)		Application Block Size (acres)								
		1	5	10	15	20	25	30	35	40
For Broadcast/Flat Fume Shank Injected Applications (buffers in feet)										
199	(22.4)	25	95	170	225	275	315	355	395	430
230	(25.9)	25	110	175	240	300	345	390	435	475
240	(27.1)	25	115	195	255	315	360	405	450	490
266	(30.1)	25	125	215	280	340	385	430	475	520
290	(32.7)	25	140	230	295	360	410	455	505	550
304	(34.3)	25	145	240	305	370	420	470	520	565
342	(38.6)	30	160	260	330	400	455	505	555	605
380	(42.9)	40	170	275	345	415	470	525	580	635
418	(47.2)	50	180	290	365	435	495	550	610	665
455	(51.3)	55	190	305	380	455	515	575	635	690

GENERAL INFORMATION

PALADIN® is a preplant liquid fumigant for the treatment of soil borne pests on land suitable for the cultivation of crops. PALADIN® can be used in pest management programs (chemical, cultural, biological, varieties) and pest control disciplines (nematology, plant pathology, weed control) in a systematic approach to pest management decisions.

Note: Co-application with chloropicrin will enhance the spectrum of control of weeds and soil-borne pathogens. If chloropicrin, metam-sodium or 1,3-dichloropropene products are co-applied with PALADIN®, follow the most restrictive precautions and directions for use on the labels, regarding reentry, buffer zones, PPE requirements, planting interval, etc., as these intervals may be longer, and/or more restrictive, and may require additional crop testing methods.

Prior to fumigation, it is important to know the history of the field planned for treatment. Soil sampling for the type and number of pests present should be conducted prior to treatment. In fields where soil samples indicate the presence of high populations of nematodes, soil pathogens and weeds, it cannot be expected that entire populations can be eradicated. Therefore, soil sampling and crop modeling after treatment should be done to determine if additional pest management measures are needed.

Consult your agricultural advisor, University contact or Extension Service for recommended pest management practices for your area. Use recommended integrated pest management practices so that you are not solely relying on chemical control in your crop production. Use post-harvest weed control, destruction of crop residues, and other cultural practices that may aid in the reduction of soil borne pests for the next cropping season.

Following Fumigation

The area can be irrigated with overhead sprinklers (with about 0.25 inches of water) within a few hours of completing the fumigation application and again within 12 – 24 hours of the fumigation to aid in chemical retention, reducing volatilization and reducing odor emissions escaping from the untarped row middles.

GENERAL USE PRECAUTIONS

Soil fumigation with PALADIN® must be used in compliance with all directions and use conditions described in this label.

Recontamination

PALADIN® will control or suppress those pests in the fumigation zone at the time of treatment. It will not control pests that are introduced into the soil after treatment. Precautions should be taken to prevent contamination of treated fields with weed seed, plant pathogenic fungi, and plant parasitic nematodes. Farm equipment should be clean before entering treated fields. Equipment should be rinsed free of soil and weed seeds from other fields. Avoid the use of irrigation water, transplants, seed pieces and/or soil, which could carry soil borne pests from infested land.

Equipment Cleaning Procedures

Because PALADIN® is corrosive under certain conditions, flush all application equipment with water and dispose of rinsate by incorporation into a field just treated or by other approved means. To prevent corrosion, where appropriate, lubricate with fuel oil, kerosene or similar type of petroleum solvent immediately after use. Fill pumps and meters with new motor oil or a 50% motor oil/fuel oil mixture before storing. **Do not use water for long-term storage.** Unused PALADIN® or rinsate must never be introduced into surface or ground water.

Chemigation

Do not apply through any type of irrigation system.

Fertility Interactions

Fumigation may temporarily reduce nitrification in the soil, thus increasing levels of ammonium nitrogen and soluble ammonium salts to potentially phytotoxic levels. Accumulation of the ammonium nitrogen and salts 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. Acid soils should be limed before fumigation to stimulate nitrification and to reduce possible ammonium toxicity. To avoid injury to crops grown in high organic soils, fertilizers containing ammonium salts are not recommended.

Mandatory Good Agricultural Practices (GAPs)

The following GAPs must be followed during all fumigant applications. All measurements and other documentation planned to ensure that the mandatory GAPs are achieved must be recorded in the FMP and/or post-application summary.

- PALADIN® must be transferred through connecting hoses, pipes, and/or couplings sufficiently tight to prevent workers or other persons from coming in contact with the liquid.
- All hoses, piping, and tanks used in connection with this product shall be of a type appropriate for use under the pressure and vacuum conditions to be encountered.
- Hoses between any fumigant container and the flow divider must be Teflon® hoses reinforced with stainless steel wire braid or its equivalent.
- External sight gauges, if applicable, shall be equipped with a valve so that pipes to sight gauge can be shut off in case of breakage or leakage.
- The mechanical transfer system must be adequate to make necessary measurements of the pesticide being used.
- Shut-off devices must be installed on the exit end of all cylinder connections and at all disconnect points to prevent leakage of product when the transfer is stopped and hose is removed or disconnected.
- The pressure in hoses used to move the product must not exceed the manufacturer's maximum pressure specifications.
- Check equipment to ensure good condition and integrity prior to each use.

Tarps

One of the following high barrier tarps is required for all PALADIN® applications. These tarps include Olefinas Embossed VIF, Klerks VIF, Pliant Blockade (1.25 mil) black or white, Bromostop (1.38 mil), XL Blockade (0.00125), Canslit Metalized (1.25 mil) high barrier black or white, Mid-South Extrusion VIF, FilmTec VIF (1.25 mil), Ginegar VIF Embossed, Cadillac VIF, Guardian VIF (1.2 mil), Pliant Metalized black VIF.

Tarps must be installed immediately after the fumigant is applied to the soil and must be kept in place a minimum of 12 days.

For broadcast applications, the applicator must ensure that the high barrier tarp can be securely glued.

A written tarp plan must be developed and included in the FMP. The plan must include:

- schedule and procedures for checking tarps for damage, tears, and other problems
- plans for determining when and how repairs to tarps will be made, and by whom
- minimum time following injection that tarp will be repaired
- minimum size of tarp damage that will be repaired
- other factors used to determine how and when tarp repair will be conducted
- schedule, equipment, and methods used to perforate tarps
- aeration plans and procedures following perforation of tarp, but prior to planting/transplanting
- schedule, equipment, and procedures for tarp removal

Weather Conditions

- Prior to fumigation the weather forecast for the day of the application and the 48-hour period following the fumigation must be checked to determine if unfavorable weather conditions exist (see **Identifying Unfavorable Weather Conditions** section) or are predicted and whether fumigation should begin.
- Wind speed at the application site must be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air stagnation advisory issued by the National Weather Service in effect for the area in which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov>, or by contacting your local National Weather Service Forecasting Office.
- **Identifying Unfavorable Weather Conditions** - Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

Soil Preparation

- Soil must be properly prepared and at the surface generally be free of large clods. The area to be fumigated must be tilled to a depth of at least 5 to 8 inches.
- Field trash must be properly managed. Residue from a previous crop must be worked into the soil to allow for decomposition prior to fumigation. Little or no crop residue shall be present on the soil surface. Crop residue that is present must not interfere with the soil seal. Removing the crop residue prior to fumigation is important to limit the natural "chimneys" that occur in the soil when crop residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limit the efficacy of the fumigant. However, crop residue on the field serves to prevent soil erosion from both wind and water and is an important consideration. To accommodate erosion control, fumigant efficacy, and human health protection, clear fields of crop residue as close to the timing of the fumigation as possible to limit the length of time that the soil would be exposed to potentially erosive weather conditions.

Prior to All Applications:

- Ensure that application equipment does not contain components made of natural rubber, aluminum, magnesium or their alloys.

During All Applications:

- Do not change cylinders when the fumigant system is under pressure. Change cylinders with all cylinder valves in the off position.

Following All Applications:

- To minimize the potential for crop injury, allow the fumigant to dissipate before planting a crop. Seeds may be used as a bioassay to determine if PALADIN[®] is present in the soil at concentrations sufficient to cause plant injury. [see **Lettuce Seed Test** and **Tomato Transplant Test** below].
- With the use of any of the high barrier tarps listed on this label, planting shall not occur for at least 21 days after application.
- Subsurface (Seepage) Irrigation - Raising the water table into the injection zone prior to planting will reduce PALADIN[®] efficacy and increase plantback interval.
- **Planting Intervals following application**

The planting interval should be determined based on mean daily low soil temperature at 8" depth.

Soil Temperature	Planting Intervals following application
50 – 54°F	42 days after treatment
55 – 60°F	35 days after treatment
61 – 70°F	28 days after treatment
71°F and higher	21 days after treatment

The length of time may vary for PALADIN[®] to dissipate from the soil before transplanting and seeding safely. Circumstances which do not favor the dissipation of PALADIN[®] can lengthen the plant-back interval. The plant-back interval is lengthened with (1) heavy soil, (2) low soil temperatures, (3) high soil moisture. If in doubt, perform either the lettuce seed test or the tomato transplant test as described below.

Note: If chloropicrin, metam sodium, or 1,3-dichloropropene products are co-applied with PALADIN[®], follow the most restrictive use directions on the label, as these intervals may be longer, and may require additional crop testing methods.

Lettuce Seed Test

1. Dig into the treated soil with a trowel to or just below the depth of planting. Remove 2 to 4 small soil samples (approximately 1 to 2 ounces each), mix lightly, and immediately place each sample into an air-tight jar so that fumes will not escape. Use jars with gas-tight lids. Moisten the soil samples and cap immediately.
2. Uncap the jar, sprinkle lettuce seeds on the moistened surface of the soil and recap immediately. Prepare an additional jar in the same manner using untreated soil (untreated check) for comparison.
3. Store the jars at 65° F to 85° F; do not place in direct sunlight. Direct sunlight may overheat the soil in the jars and kill the seed. Lettuce seed will not germinate in the dark.
4. Inspect the jars in 1 to 3 days to look for germination.
5. The treated soil is acceptable for planting if the seeds in the treated jar germinate the same as the seeds in the untreated (check) jar.

NOTE: Be sure (1) to take soil samples from the field in several areas, particularly low, wet areas; (2) that the jar lids are air-tight and do not have grit under the seal which may prevent proper sealing; and (3) that the jars are placed in indirect sunlight and not in the dark.

Tomato Transplant Test

Transplant 5 to 10 succulent, fast-growing tomato seedlings into fumigated beds approximately 4 to 6 inches deep. Also transplant 5 to 10 tomato seedlings in a non-fumigated area to serve as untreated checks. If there is variation in the field, plant into the wettest, heaviest soil. Inspect the tomato transplants in 2 days for wilting or "root burn." If plants in the fumigated zone look the same as those in the non-fumigated zone, it is acceptable to plant in the treated area.

Which Test Method to Use?

Both the lettuce seed and tomato transplant tests are appropriate and can serve the purpose. The response of tomato seedlings varies somewhat depending on how succulent they are, temperature, soil moisture, relative humidity, and other weather and soil factors. Relative differences between plants in fumigated and non-fumigated areas are key to detecting low-level residue effects. High soil concentrations of fumigant should produce clear-cut symptoms. The lettuce seed test in jars is not subject to the variations in the field that can affect the tomato transplant test. However, the process of collecting a soil samples for the lettuce seed test has the potential to allow some fumigant to escape prior to sealing the jar. In addition, excess soil moisture can inhibit normal lettuce seed germination reducing the sensitivity of the test.

MANDATORY GOOD AGRICULTURAL PRACTICES (GAPS) FOR PALADIN® BEDDED AND BROADCAST SHANK APPLICATIONS

In addition to the GAPS required for all PALADIN® soil fumigation applications, the following GAPS apply for bedded and broadcast shank injection applications:

Soil Preparation

- Allow time for complete voiding of material in the buried shanks following the closure of the shutoff valve and before removing the shanks from the soil.
- In the event that trash is pulled up with the shanks after completing a treatment pass, the trash must be covered with the tarp and the edges of the tarp must be buried under at least 4 inches of compacted soil before making the next pass through the field.

Soil Temperature

- The soil temperature at the depth of injection must not be less than 45° F or exceed 90° F at the beginning of the application.
- If air temperatures have been above 100° F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

Soil Moisture

- It is critical to manage soil moisture properly before fumigation. Plan fumigation for seasons, crop rotations, or irrigation schedules, which leave moisture in the soil. Applications should be made only to fields with appropriate soil moisture conditions.
- The soil moisture must be at least 75% of field capacity from 2 inches below the soil surface to a depth of 9 inches below the surface. Surface soil generally dries rapidly and must not be considered in this determination.
- Soil moisture must be determined by one of the following methods:
 - The USDA Feel and Appearance Method for testing, or
 - An instrument, such as a tensiometer.
- If there is insufficient moisture 9 inches below the surface, the soil moisture must be adjusted. If irrigation is not available and there is adequate soil moisture below 9 inches, soil moisture can be brought to the surface by tillage before fumigant injection. To conserve existing soil moisture, pretreatment irrigation or pretreatment tillage should be done as close to the time of application as possible.
- Measure soil moisture at a depth of 9 inches at either end of the field, no more than 48 hours prior to application.

Soil moisture determination using the USDA Feel and Appearance Method

- For **coarse** textured soils (fine sand and loamy fine sand) there must be enough moisture (75 percent available soil water moisture) so the soil is moist, forms a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers; will not ribbon.
- For **moderately coarse** textured soils (sandy loam and fine sandy loam) there must be enough moisture (75 percent available soil water moisture) so the soil is moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color will not stick.
- For **medium** textured soils (sandy clay loam, loam, and silt loam) there must be enough moisture (75 percent available soil water moisture) so the soil is moist, forms a ball, very light staining on fingers, darkened color, pliable, and forms a weak ribbon between the thumb and forefinger.
- For **fine** textured soils (clay, clay loam, and silty clay loam) there must be enough moisture (75 percent available soil water moisture) so the soil is moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
- For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. Whenever possible, the field should be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service agent, soil conservation service specialist, or pest control advisor (agriculture consultant) should be consulted for assistance.

Application Depth

- **For Tarped-Bedded and Tarp-Broadcast Applications:** The injection point must be a minimum of 8 inches from the nearest final soil/air interface. The application depth in preformed beds must not be below the bed furrow.

Prevention of End Row Spillage

- Do not apply or allow fumigant to spill onto the soil surface. For each injection line either have a check valve located as close as possible to the final injection point, or drain/purge the line of any remaining fumigant prior to lifting injection shanks from the ground.
- Do not lift injection shanks from the soil until the shut-off valve has been closed and the fumigant has been depressurized (passively drained) or purged (actively forced out via air compressor) from the system.

Calibration, Set-up, Repair, and Maintenance for Application Rigs

- Brass, carbon steel or stainless steel fittings must be used throughout. High-density Polyethylene tubing, fluoropolymer (PFA, PTFE or PVDF) tubing or fluoropolymer-lined steel braided tubing must be used for all low pressure lines, drain lines, and compressed gas or air pressure lines. All other tubing must be fluoropolymer (PFA, PTFE or PVDF)-lined steel braided.
- Do not store PALADIN® in polyethylene tubing. Polyethylene tubing may swell or soften over time. Fluoropolymer (PFA, PTFE or PVDF) tubing is preferred for PALADIN® service.
- Galvanized, PVC, nylon or aluminum pipe fittings must not be used.
- All rigs must include a filter to remove any particulates from the fumigant, and for pressurized systems a check valve to prevent backflow of the fumigant into the pressurizing cylinder or the compressed air system
- Rigs must include a flow meter or a constant pressure system with orifice plates or restrictors to insure the proper amount of fumigant is applied.
- To prevent the backflow of fumigant into the compressed gas cylinder (e.g., nitrogen, other inert gas, compressed air), if used, applicators must:
 - When applying PALADIN® from steel cylinders, using compressed gas, ensure that minimum positive pressure of over 140 psi is maintained in the gas cylinder during the entire time it is connected to the application rig, (*This is not required for a compressed air system that is part of the application rig because if the compressor system fails the application rig will not be operable.*)
 - Ensure that application rigs are equipped with properly functioning check valves between the compressed gas cylinder or compressed air system and the fumigant cylinder. The check valve is best placed on the outlet side of the pressure regulator, and is oriented to only allow compressed gas to flow out of the cylinder or compressed air out of the compressed air system.
 - Always pressurize the system with compressed gas or by use of a compressed air system before opening the fumigant cylinder valve.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator must check the following items carefully:
 - Check the filter, and clean or replace the filter element as required.
 - Check all tubes and chisels to make sure they are free of debris and obstructions.
 - Check and clean the orifice plates and screen checks, if installed.
 - Pressurize the system with compressed gas or compressed air, and check all fittings, valves, and connections for leaks using soap solution.
- Install the fumigant cylinder, and connect and secure all tubing. Slowly open the compressed gas or compressed air valve, and increase the pressure to the desired level. Slowly open the fumigant cylinder valve, always watching for leaks.
- When the application is complete, close the fumigant cylinder valve and blow residual fumigant out of the fumigant lines into the soil using compressed gas or compressed air. At the end of the application, disconnect all fumigant cylinders from the application rig. At the end of the season, seal all tubing openings with tape to prevent the entry of insects and dirt.

Application equipment must be calibrated and all control systems must be working properly. Proper calibration is essential for application equipment to deliver the correct amount of fumigant uniformly to the soil. Refer to the manufacturer's instructions on how to calibrate your equipment, usually the equipment manufacturer, fumigant dealer, or Cooperative Extension Service can provide assistance.

- Follow all local government instructions for posting of treated areas and post all treated areas with warning signs.
- Comply with all local ordinances and regulations.
- Do not apply within 1/4 mile of nursing homes, hospitals or prisons; or licensed schools, licensed day care facilities or licensed assisted living facilities (licensed by state or local governments) that will be occupied during the buffer zone period.
- Applications are limited to 40 contiguous acres or less per day.
- Never fumigate alone. A minimum of two persons must be present during handling and application of soil fumigants.
- Additional instructions must be made available to handlers in the mechanical operation of the tractor and how to safely work with the operator while fumigating.
- Always handle this product in the open, with all handlers positioned "upwind" from the container and/or where there is adequate ventilation.

- When fumigating from a tractor, it is required that 5 gallons of water be carried on the tractor and readily available for rinsing and cleaning purposes. An additional 5 gallons of water must be available in the service truck. This water must be potable and in containers marked "Decontamination water not to be used for drinking".
- For raised bed applications, keep all pets, livestock and other domestic animals out of the treated areas for 12 days. Most raised bed applications will not result in tarp removal.
- For broadcast flat-fume applications, keep all pets, livestock and other domestic animals out of the treated areas until tarps have been removed.
- Do not allow entry by unprotected persons into the fumigated area until the Fumigant Treated Area signs are removed.

SPILL AND LEAK PROCEDURES

- Refer to the **Personal Protective Equipment** section for Applicators and other handlers when handling liquid for spills and leaks.
- Cease all operations if any leak develops in the fumigation system.
- Evacuate everyone from the immediate areas of the spill or leak.
- Approach the area from the upwind side. Work upwind to repair leak(s), if possible.
- Only correctly trained and PPE-equipped handlers are permitted to enter. Do not permit entry into the spill or leak area by any other person until the garlic-like odor of this product is no longer detectable or sampling has verified that the DMDS concentration is below 55 ppb.
- Allow spilled fumigant to evaporate or to absorb onto vermiculite, dry sand, earth, or similar absorbent material. Such material should be disposed of on site or at an approved disposal facility.

SITE-SPECIFIC FUMIGATION MANAGEMENT PLAN (FMP)

Prior to the start of fumigation, the Certified Applicator supervising the application must verify that a site-specific FMP exists for each application block (i.e., a field or portion of a field treated with a fumigant in any 24-hour period). In addition, an agricultural operation fumigating multiple application blocks may format the FMP in a manner whereby all of the information that is common to all the application blocks is captured once, and any information unique to a particular application block or blocks is captured in subsequent sections.

The FMP must be prepared by the Certified Applicator, the site owner/operator, registrant or other party.

The Certified Applicator must verify in writing (sign and date) that the site-specific FMP(s) reflects current site conditions before the start of fumigation.

Each site-specific FMP must contain the following elements:

- Applicator information (name, phone number, pesticide applicator license and/or certificate number, employer name, employer address and date of completing registrant training program)
- General site information
 - Application block location (e.g., county, township-range-section quadrant), address, or global positioning system (GPS) coordinates
 - Name, address, and phone number of owner/operator of the application block
 - Diagrams and maps
 - Identify nursing homes, hospitals, prisons, licensed schools, licensed day care facilities, or licensed assisted living facilities (licensed by state or local governments) within 1/4 mile of the fumigated area, and document how it was determined that such sites would be unoccupied during the application period.
- General application information (target application date/window, brand name of fumigant, EPA registration number)
- Tarp information and procedures for repair, and perforation
 - Brand name, lot number, thickness
 - Name and phone number of person responsible for repairing tarps
 - Schedule for checking tarps for damage, tears, and other problems
 - Maximum time following notification of damage that the person(s) responsible for tarp repair will respond
 - Minimum time following application that tarp will be repaired
 - Minimum size of damage that will be repaired
 - Other factors used to determine when tarp repair will be conducted
 - Name and phone number of person responsible for perforating and/or removing tarps (if other than Certified Applicator)
 - Equipment/methods used to perforate tarps
 - Schedule and target dates for perforating tarps
 - Schedule and target dates for removing the tarps (for broadcast applications)
- Soil conditions (description of soil texture in application block, method used to determine soil moisture)
- Weather conditions (summary of forecasted conditions for the day of the application and the 48-hour period following the fumigant application)
 - Wind speed
 - Inversion conditions (e.g., shallow, compressed (low-level) temperature inversion)
 - Air stagnation advisory

- Buffer Zones
 - Application method
 - Application rate (pounds of PALADIN® per acre)
 - Application block size (acres)
 - Buffer zone distance
 - Description of areas in the buffer zone that are not under the control of the owner/operator of the application block and how it was verified that these structures were unoccupied during the buffer zone period.
- Air-purifying respirators, air-rescue devices, and other personal protective equipment (PPE) for handlers (handler task, protective clothing, air-purifying respirator type, respirator cartridge type, respirator cartridge replacement schedule, air-rescue device type, eye protection, gloves, other PPE)
- Air-Fan Dilution System: Verification that the fan/blower intake is at least 126 inches from the ground, and the fan/blower is capable of operating at a minimum of 1,600 revolutions per minute and producing a minimum flow rate of 3,000 cubic feet of air per minute.
- Emergency procedures (evacuation routes, locations of telephones, contact information for first responders, local/state/federal/tribal contacts, key personnel and emergency procedures/responsibilities in case of an incident, equipment/tarp/seal failure or complaints, or other emergencies).
- Fumigant Treated Area posting procedures (person(s) who will post Fumigant Treated Area signs, location of Fumigant Treated Area signs, procedures for Fumigant Treated Area sign removal)
- Plan describing how communication will take place between the applicator, land owner/operator, and other on-site handlers (e.g., tarp perforators/removers, irrigators) for complying with label requirements (e.g., timing of tarp perforation and removal, PPE, buffer zone location).
 - Name and phone number of persons contacted
 - Date contacted
- Authorized on-site personnel
 - Names, addresses and phone numbers of handlers
 - Names, addresses and phone numbers for employers of handlers
 - Tasks that each handler is authorized and trained to perform
 - For handlers designated to wear air-purifying respirators:
 - ◆ date of medical qualification to wear an air-purifying respirator
 - ◆ date of air-purifying respirator training, and
 - ◆ date of fit-testing for the air-purifying respirator.
- Good Agricultural Practices (GAPs)
 - Description of applicable mandatory GAPs
 - Measurements and documentation to ensure GAPs are achieved (e.g., measurement of soil and other site conditions)
- Description of hazard communication. (The application block has been posted in accordance with the label. Non-handlers are excluded from the buffer zone. Pesticide product labels and material safety data sheets are on-site and readily available for employees to review.)
- Record-keeping procedures (the owner/operator of the application block as well as the Certified Applicator must keep a signed copy of the site-specific FMP for 2 years from the date of application).

For situations where an initial FMP is developed and certain elements do not change for multiple fumigation sites (e.g., applicator information, authorized on-site personnel, record-keeping procedures, emergency procedures) only elements that have changed need to be updated, in the site-specific FMP provided the following:

- The Certified Applicator supervising the application has verified that those elements are current and applicable to the application block before it is fumigated.
- Record-keeping requirements are followed for the entire FMP (including elements that do not change).

Once the application begins, the Certified Applicator must make a copy of the FMP available for viewing by handlers involved in the fumigation. The Certified Applicator or the owner operator of the application block must provide a copy of the FMP to any local/state/federal/tribal enforcement personnel who request the FMP. In the case of an emergency, the FMP must be made immediately available when requested by local/state/federal/tribal emergency response and enforcement personnel.

Within 30 days of completing the application portion of the fumigation process, the Certified Applicator supervising the application must complete a post-application summary that describes any deviations from the FMP that have occurred, measurements taken to comply with GAPs, monitoring results as well as any complaints and/or incidents that have been reported to him/her.

The Post-Application Summary must contain the following elements:

- Actual date of the application, application rate, and size of application block fumigated
- Summary of weather conditions on the day of the application and during the 48-hour period following the fumigant application
- Soil temperature measurement (if air temperatures were above 100 degrees F in any of the 3 days prior to the application)

- Tarp damage and repair information (if applicable)
 - Location and size of tarp damage
 - Description of tarp/tarp seal/tarp equipment failure
 - Date and time of tarp repair
- Tarp perforation/removal details (if applicable)
 - Description of tarp removal (if different than in the FMP)
 - Date tarps were perforated
 - Date tarps were removed (for broadcast applications)
- Complaint details (if applicable)
 - Person filing complaint (e.g., on-site handler, person off-site)
 - If off-site person, name, address, and phone number of person filing complaint
 - Description of control measures or emergency procedures followed after complaint.
- Description of incidents, equipment failure, or other emergency and emergency procedures followed (if applicable)
- Details of elevated air concentrations monitored on-site (if applicable)
 - Location of elevated air concentration levels
 - Description of control measures or emergency procedures followed
 - Air monitoring results
 - ◆ When garlic-like odor was detected:
 - ◇ Date and time of detection
 - ◇ Handler task/activity
 - ◇ Handler location where odor was detected
 - ◇ DMDS sampling results
 - ◇ Resulting action (e.g. continue operations with air-purifying respirators)
- Date of Fumigant Treated Area sign removal
- Date of Buffer Zone sign removal (if used)
- Any deviations from the FMP
- Record-keeping procedures (the owner/operator of the application block as well as the Certified Applicator must keep a signed copy of the post-application summary for 2 years from the date of application).

APPLICATION DIRECTIONS

Failure to meet these conditions may result in unsatisfactory product performance:

APPLICATION TIMING

PALADIN® can be applied at any time of the year when soil and weather conditions permit (see following sections). Conditions that allow rapid diffusion of the fumigant as a gas/liquid through the soil will normally give the best results. Because PALADIN® could be injurious to established vegetation, it should only be used as a preplant application.

SOIL CONDITIONS

Soil Temperature

See **Mandatory Good Agricultural Practices (GAPs)** section and **Mandatory Good Agricultural Practices (GAPs) for Bedded and Broadcast Shank Applications** section of this label.

Soil Moisture

See **Mandatory Good Agricultural Practices (GAPs) for Bedded and Broadcast Shank Applications** section of this label.

Soil Preparation

See **Mandatory Good Agricultural Practices (GAPs)** section and **Mandatory Good Agricultural Practices (GAPs) for Bedded and Broadcast Shank Applications** section of this label.

Placement of Fumigant

See **Mandatory Good Agricultural Practices (GAPs) for Bedded and Broadcast Shank Applications** section of this label.

Odor During Application

PALADIN® can range from garlic-like to propane-like odor. Some level of odor may be evident during application, however any strong odors during application are a signal that the fumigant is escaping and not properly sealed in the soil. Equipment should be checked for leaks. Tears in the tarp should be repaired immediately.

Temperature Inversions

See **Mandatory Good Agricultural Practices (GAPs)** section of this label.

RATES AND USES

PALADIN® is recommended for control or suppression of weeds, soil-borne plant pathogens and nematodes in soils to be planted with vegetables, small fruit crops, field grown nursery/ornamental crops, and forestry nursery crops listed in the table below where plastic tarp is used for fumigation.

Fumigation with PALADIN® shall only be performed in accordance with the following two application techniques: (1) a raised bed shank injection application or (2) a broadcast/flat fume application.

The following table provides application rates in gallons and pounds of PALADIN® per broadcast acre (if the entire surface acre was tarped and treated, such as a flat fume application).

PRE-PLANT SOIL FUMIGATION APPLICATION RATES TABLE

Crop	Pests	Broadcast Application Rate of PALADIN®/Treated Acre	
		Gallons	Pounds
Fruiting Vegetables Tomatoes Peppers Eggplant Cucurbit Crops Cucumbers Squash (all) Melons (all) Small Fruit Crops Strawberries Blueberries Field Grown Ornamentals Forest Nursery Crops	Weeds such as- <i>Nutsedge (Purple and Yellow), Chickweed, Lambsquarters, Purslane, Grasses</i>	51.3	455
	Soil Borne Plant Pathogens such as- <i>Verticillium, Fusarium, Pythium, Sclerotinia, Rhizoctonia</i>	40 - 51.3	355 - 455
	Nematodes such as- <i>Root Knot (Southern, Northern and Colombia), Stubby Root, Lesion, Stunt, Sting</i>	35 - 51.3	310 - 455

Note: Use the higher rate of product when there is a mixture of these pests.

The maximum application rate for pre-plant soil use is 455 lbs per treated acre of PALADIN®.

RAISED BED APPLICATIONS

- Use tractor mounted chisels spaced no more than 12 inches apart. Injection spacing of 12 inches or less is typically performed with a multiple shank applicator. The treated ground must be sealed using either:
 - **Soil sealing at time of application:** The treated ground must be sealed using closing shoes, roller, compaction roller, cultipacker, or other equivalent equipment that will sufficiently cover chisel marks left after soil injection. The equipment shall cover the chisel marks with soil immediately prior to placement of the tarp being laid down (with fumigant injection) by tarp-laying equipment mounted on the application tractor; or
 - **Bed shaper:** The chisels shall be placed with the injection point under the bed shaper, and the tarp shall be laid down simultaneously (with fumigant injection) by tarp-laying equipment mounted on the application tractor; or
 - **Combination bed former and bed shaper:** The chisels shall be placed between the bed former and the bed shaper. The tractor with the tarp-laying equipment shall immediately follow the application tractor.

PALADIN® Application Amounts for Raised Beds

The actual amount of PALADIN® to use for application to raised beds or the "effective broadcast equivalent rate" must be calculated as follows:

$$\frac{\text{Bed top width (inches)}}{\text{Row spacing (center to center in inches)}} \times \text{broadcast rate}^* = \text{effective broadcast equivalent rate}$$

The Bed top width/Row spacing (ratio) is equal to the Field Rate Modifier. The Field Rate Modifier is calculated for a number of common Bed top widths and Row spacing combinations in the Table below.

* from the table above

For example, the maximum amount/rate for PALADIN® is 455 lbs or 51.3 gallons/treated acre. If applied to pre-formed beds that are 30 inches wide with center-to-center row spacing of 48 inches, then the amount of PALADIN® that will be applied within a physical acre (the effective broadcast equivalent rate) will be 284 lbs/32 gallons/treated acre as per the following calculation.

$$\begin{aligned} \text{Bed width (30 in)} &= 0.625 \times 455 \text{ lbs/treated acre} = 284 \text{ lbs/treated acre effective broadcast equivalent rate} \\ \text{Row spacing (48 in)} &= 0.625 \times 51.3 \text{ gal/treated acre} = 32 \text{ gallons/treated acre effective broadcast equivalent rate} \end{aligned}$$

By using the bed width and row spacing in this formula and the desired broadcast use rate from the table, you can calculate the amount of PALADIN® needed to apply to the physical area. (see **Field Rate Modifier Table for Raised Bed Applications** below).

FIELD RATE MODIFIER TABLE FOR RAISED BED APPLICATIONS

Row Spacing (inches)	Bed Width (inches)	Field Rate Modifier
72	40	0.55
72	36	0.50
72	32	0.44
72	30	0.42
72	28	0.39
66	32	0.48
66	30	0.45
66	28	0.42
66	24	0.36
60	30	0.50
60	28	0.47
48	30	0.62
48	28	0.58

Once the appropriate field rate modifier has been determined and the corresponding effective broadcast equivalent application rate has been calculated, see the **Buffer Zone Distance Table for Raised Bed Shank Injected Applications** to determine the mandatory buffer zone distance.

BROADCAST/FLAT FUME APPLICATIONS

- Use tractor mounted chisels spaced no more than 12 inches apart. Injection spacing of 12 inches or less is typically performed with a multiple shank applicator. Inject PALADIN® at a minimum depth of 8 inches below the soil surface. The treated ground must be sealed using either:
 - **Soil sealing at time of application:** The treated ground must be sealed using closing shoes, roller, compaction roller, cultipacker, or other equivalent equipment that will sufficiently cover chisel marks left after soil injection. The equipment shall cover the chisel marks with soil immediately prior to placement of the tarp being laid down (with fumigant injection) by tarp-laying equipment mounted on the application tractor.
 - Cover immediately with one of the high barrier tarps specified on this label (see **Tarps**)
 - The applicator must ensure that the high barrier tarps used for broadcast applications can be effectively glued.
 - PALADIN® can be applied using the broadcast/flat fume application method at rates specified in the Pre-Plant Soil Fumigation Application Rates Table.
 - Once the appropriate application rate has been selected, see the **Buffer Zone Distance Table for Broadcast/Flat Fume Shank Injected Applications** to determine the mandatory buffer zone distance.

Co-application with chloropicrin with PALADIN® will enhance the spectrum of control of weeds and soil-borne pathogens.

If chloropicrin, metam-sodium or 1,3-dichloropropene products are co-applied with PALADIN®, follow the most restrictive use directions on the label, regarding reentry, buffer zones, PPE requirements, planting interval, etc., as these intervals may be longer, and/or more restrictive, and may require additional crop testing methods.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.

PESTICIDE HANDLING: Ensure all containers are bonded and grounded during filling, transferring or emptying operations.

PESTICIDE STORAGE: Store in well-ventilated area away from heat and sources of ignition such as flame, sparks, and static electricity. Do not store near or with oxidizers. Store only in areas that are authorized for flammable material storage. Cylinder storage must be in an area as designated by local and State requirements. Make certain cylinder tops are closed and cylinder remains in an upright position. Store only in original containers.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide 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 hazardous waste representative at the nearest EPA regional office for guidance.

CONTAINER RETURN: Return used cylinders or totes to the place of purchase, as directed on container or by container supplier/distributor. Container must never be refilled by the consumer or used for any other product purposes. **For cylinder return** (1) the valve protection bonnet and safety cap should be removed only when fumigant is about to be removed from the cylinder. The safety cap and valve protection bonnet must be replaced when the cylinder is not in use. (2) Cylinders should never be subjected to rough handling or to abnormal mechanical shock such as dropping, bumping, dragging or sliding. (3) Ropes, slings, hooks, tongs and similar handling devices should not be used for unloading cylinders. (4) A suitable hand truck, fork truck, or similar device to which the cylinders can be firmly secured should be used for transporting the heavier cylinders. If cylinder retains any unused material and there are no further requirements for the product, contact the distributor representative for return instructions. **For tote return**, ensure all valves are closed and valve openings are capped and sealed. For further instructions contact your distributor.

EMERGENCY TELEPHONE NUMBERS:

CHEMTREC: (800) 424-9300

MEDICAL: (866) 767-5089 (Rocky Mountain Poison Control Center)

CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

The Directions for Use of this product must be followed carefully. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as manner of use or application, weather or crop conditions, presence of other materials, resistant strains or other influencing factors in the use of the product. To the extent consistent with applicable law, all such risks shall be assumed by Buyer and User, and Buyer and User agree to hold Arkema Inc., Manufacturer and Seller harmless for any claims relating to such factors. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, ARKEMA INC. AND MANUFACTURER MAKE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ON THIS LABEL.

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