



STATE OF WASHINGTON

DEPARTMENT OF AGRICULTURE

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WASHINGTON STATE 1, 3-DICHLOROPROPENE USE SUMMARY

- 1, 3-dichloropropene is a Restricted Use Pesticide (RUP) used to kill nematodes, insects, and weeds on potatoes, flower bulbs and other vegetable and orchard crops.
- 1, 3-dichloropropene is typically applied pre-plant using chisel injection into the soil, row (banded) or overall (broadcast) treatment. The treated acreage must be sealed immediately after application by compacting the soil surface to prevent excessive fumigant loss. After application and sealing, the soil must be left undisturbed for 7 to 14 days.
- 1, 3-dichloropropene is available in a ready-to-use formulation as well as emulsifiable concentrate and pressurized gas.
- Emulsifiable concentrate formulations of 1, 3-dichloropropene are used for drip irrigation application through surface or buried drip tape. The application area must be tarped for 14 days after application.
- Some 1, 3-dichloropropene products contain chloropicrin, i.e., Telone C-35 contains 35 percent chloropicrin. While chloropicrin provides a greater level of fungicide activity, it is an expensive pesticide component.
- Based on formulation, products containing 1, 3-dichloropropene bear the signal words, "Warning," "Danger," or "Danger/Poison." 1, 3-dichloropropene is classified toxicity class I. 1, 3-dichloropropene belongs to the halogenated organic chemical class.
- 1,3-dichloropropene is moderately toxic to both freshwater fish and freshwater aquatic invertebrates.

CURRENT WASHINGTON STATE USE PRACTICES

CROP	WASS ¹ 2002 EST. ACRES	EST. % ACRES TREATED	EST. LBS. A.I./ACRE	# OF APPS	EST. ACRES TREATED	EST. LBS. A.I. APPLIED
Carrot ²	7,500	65.0	181.80	1	4,900	891,000
Grape	49,800	< 5.0	277.75	1	2,250	625,000
Mint	33,900			1		
Onion	17,100			1		
Orchard ³	220,000	NA	See narrative for use detail.			
Potato ⁴	163,000	12.4	157.83	1	19,560	3,189,000
Strawberry	1,800			1		
Raspberry	9,500	NA	See narrative for use detail.			

¹ Washington Agricultural Statistics Service

² Commodities noted in **BLUE** have not had peer review input.

³ Includes all tree fruit crops. See narrative section "ORCHARD" for the acreage breakdown.

⁴ USDA National Agricultural Statistics Service data

NOTE: The table reflects 2003 potato acreage. Acreage data for the other crops was taken from 2002 WASS statistics.

MAJOR USES (listed alphabetically):

The major use listing supplies the most commonly used formulations of the active ingredient. No discrimination or endorsement is intended.

The pesticide labels take precedence over any information contained herein. It is the responsibility of the user to comply with the label directions provided.

The following pesticide use summary reflects the general pesticide practices for the listed commodities. The use information is not intended to reflect the pesticide application practices of any individual.

CARROTS:

- There are nearly 10,000 acres in carrot production in Washington State - 7,500 acres of fresh and processing carrots (34 percent of the U.S. production) and 2,500 acres in carrot seed production. Franklin and Grant counties have an estimated 4,500 acres in carrot production, the nearly half of the total carrot acreage.
- Carrots are planted in early April to May. Fresh market carrots are harvested from July to November. Processing carrots are harvested in October or November.
- Only two chemicals, dichloropropene and metam sodium, are used in Washington State to control nematodes in carrots. The loss of either material would severely limit the options available to growers.
- Growers are already using a variety of non-chemical alternatives, including crop rotation, field selection, and cover crops. These methods alone do not ensure that carrots will not be adversely affected by nematodes.
- In some years, as much as 3/4 of the carrot acreage is fumigated with dichloropropene (Telone II) or metam sodium (Vapam) to control nematodes.
- Telone II applied preplant using ground equipment at a rate of 121.2 – 252.5 pounds active ingredient (12 to 25 gallons product) per acre. It is injected into the soil at a depth of 14 to 18 inches.

GRAPE:

- The primary grape producing counties in Washington state are: Benton (15,929 acres), Yakima (15,529 acres), Grant (3,132 acres), Franklin (2,813 acres) and Klickitat (419 acres) counties.
- Grapes are produced for wine, fresh market, or juice. Irrigation varies with the type of grape produced. For example, rill irrigation is used primarily on Concord grapes

produced for juice. Concords require heavy watering. Drip or sprinkler irrigation is used for wine grapes for more refined control.

- The decision whether or not to fumigate depends upon the history of the ground on which the vineyard will be planted. Fumigation is not practiced on virgin ground. Vineyards planted in fumigated ground are known to have improved growth and yields compared to those planted on non-fumigated ground.
- Fumigation is practiced by 20 to 30% of growers establishing a vineyard where another crop has been previously grown, and is generally found to be necessary when replanting new vineyards where old vineyards were established (due to the presence of nematodes and soil borne pathogens).
- Of the five nematode species present in Washington State grape vineyards, the most problematic are the root knot nematode and dagger nematode, which have been found in 66% and 74% of eastern Washington vineyards, respectively. *Pre-Plant Treatments*
- 1, 3-dichloropropene (Telone C-17) is applied to less than 5% of cropland intended for vineyards at a typical rate of 277.75 pounds active ingredient (27.5 gallons product) per acre. It is highly efficacious but expensive.
- Growers prefer to use metam sodium (Vapam). This product targets fewer organisms than 1,3-dichloropropene (Telone) and is less efficacious against some targets. However, Vapam is less costly than Telone C-17, is not a restricted-use pesticide, and has a shorter REI.

MINT:

- Mint is grown in Yakima (15,400 acres), Grant (9,200 acres) and Adams (3,500 acres) counties. The remaining mint acreage is located in Benton and Franklin counties.
- 1, 3-dichloropropene (Telone II) or 1,3-dichloropropene + chloropicrin (Telone C-17) may be injected pre-plant for the control of the following pests:

Nematodes

- ▶ Plant parasitic nematodes are a serious problem facing Washington mint growers. The most serious nematode pest is the root-lesion nematode (*Pratylenchus penetrans*) which is capable of causing severe economic damage.
- ▶ Managing damaging populations of nematodes in mint is difficult. Control may include pre-plant fumigation but it is very expensive.
- ▶ Metam sodium (Vapam) and 1, 3-dichloropropene (Telone II) both work well to control nematodes.
- ▶ Telone II is applied at a rate of 121.2 – 252.5 pounds active ingredient (12 to 25 gallons product) per acre and injected into the soil at a depth of 14 to 18 inches.

Verticillium wilt

- ▶ It is estimated that more than 50% of all PNW mint fields are infected with wilt. The soil fumigants, 1, 3-dichloropropene + chloropicrin (Telone C-17) and metam sodium (Vapam), are expensive but provide temporary suppression of Verticillium wilt by reducing the population which offers up to two years of acceptable results.
- ▶ This approach is not widely practiced because it is not cost effective.
- ▶ Telone C-17 is applied at a rate of 123 – 229.6 pounds active ingredient (15 to 28 gallons product) per acre and injected into the soil at a depth of 14 to 18 inches.

Wireworms

- ▶ Wireworms can be devastating and cause poor stand establishment in newly planted mint.
- ▶ Metam sodium (Vapam) or 1, 3-dichloropropene (Telone II) can be effective at reducing populations of wireworm if it is applied with correct timing. Due to cost, fumigation should not be for control of this pest alone.
- ▶ Telone II is applied at a rate of 121.2 – 252.5 pounds active ingredient (12 to 25 gallons product) per acre and injected into the soil at a depth of 14 to 18 inches.
- The point of injection must be at or near permanent wilting point and the surface must be moist enough to form a seal with tillage equipment at time of application. The soil temperature range must be between 40 and 80 degrees Fahrenheit at time of application.
- Telone II or Telone C-17 may not be applied through any irrigation system. 1, 3-dichloropropene is incorporated and contained in the soil by tillage and proper soil moisture. Timing of the fumigation takes advantage of the most effective soil temperatures, to target the most susceptible stage of pests, and to avoid the presence of damaging residues at planting.

ONION:

- Onions are the third most valuable vegetable crop produced in Washington State after potatoes and asparagus.
- Eastern Washington has the top onion producing counties. Onions produced in Washington State are either storage (16,000 acres) or non-storage (1,100 acres). Benton, Franklin and Grant counties (combined acreage of 12,100 acres) produce primarily storage onions. Walla Walla County produces the majority of non-storage onions (800 acres).
- Storage onions are planted in the spring and harvested in September or October. Walla Walla Sweets are the most noted non-storage onion. They are planted in the fall and overwinter and harvested in the early summer.
- Onion fields in the Columbia Basin are commonly fumigated once during each rotation cycle. If the rotation includes lower-value crops, the fumigation is done prior to planting onions. If the rotation partners are carrots or potatoes, fumigation may occur the year before or the year after onions are planted, as both carrots and potatoes are also high-value crops and successful management of their pests often requires fumigation.
- Onion crops in Washington are occasionally attacked by stubby-root and, in some small areas, by stem and bulb nematodes. Root knot nematodes can cause stand and yield reductions but are generally managed by crop rotation and/or soil fumigation for disease control. Nematodes are recognized as a problem more by large-scale growers than by small scale growers.
- 1, 3-dichloropropene (Telone II) is used to control stubby root nematode which is also a vector for corky ring-spot in potatoes.
- It is applied in the fall (post-harvest) at a rate of 181.8 pounds active ingredient (18 gallons product) per acre. Growers also use oxamyl (Vydate L) to treat for stubby-root nematodes.
- Fungicides are not effective in controlling pink root disease. 1,3- dichloropropene plus chloropicrin (Telone C- 17) may be used in some instances to the disease. However, the

most commonly used soil fumigant for control of pink root disease is metam sodium (Vapam or Sectagon).

ORCHARD:

- In 2002, Washington State had over 220,000 acres in fruit production:
 - ✓ apples – 164,000 acres
 - ✓ apricots – 1,300 acres
 - ✓ cherries – 25,000 acres
 - ✓ peaches & nectarines – 4,200 acres
 - ✓ pears – 24,800 acres
 - ✓ prunes & plums – 1,000 acres
- The Yakima Valley in eastern Washington is the most productive fruit growing area in the state, producing nearly 1.5 million tons of fruit. The Yakima Valley out-produces the next most productive area, Wenatchee (with production of 1.0 million tons), by half. However, Wenatchee does produce over 3 times more pears than what is grown in the Yakima Valley.
- The use of 1, 3-dichloropropene is critical for apple and stone fruit crop set. While there is not a large use of 1, 3-dichloropropene, growers would be out of business if the product were not available to control replant disease. 1, 3-dichloropropene is used as a soil fumigant, replacing methyl bromide. The economic impact caused by loss of 1, 3-dichloropropene would be tremendous.
- **1, 3-dichloropropene (Telone C-17) is applied once every 25 – 50 years on approximately 50 percent of the replanted trees.**
- 1, 3-dichloropropene is applied using ground equipment at a rate of 303 pounds active ingredient (30 gallons product) per acre and shanked into the soil at a depth of 14 to 18 inches.
- The product is applied by professional fumigation contractors.

POTATO, IRISH:

- The majority of potato acreage is located in eastern Washington in the following counties: Franklin (37,000 acres), Grant (36,500 acres), Benton (30,000 acres), Adams (27,000 acres), Walla Walla (12,000 acres), Lincoln (4,500 acres), Yakima (2,300 acres), Klickitat (1,700 acres) and Kittitas (500 acres). Most of the eastern Washington potato production contracted for processing (chipping, fries, etc.)
- The principal potato producing counties in western Washington are Skagit (9,000 acres) and Whatcom (2,600 acres). Potatoes production in western Washington (approximately 12,000 acres) is for the fresh market.
- Potatoes are usually grown in a four-year rotation (one in four) with wheat, alfalfa, and corn.
- 1, 3-dichloropropene (Telone II) or 1,3-dichloropropene + chloropicrin (Telone C-17) may be applied pre-plant for the control of nematodes, diseases (Verticillium wilt) and weeds.
 - ✓ Telone II is applied at a rate of 121.2 – 252.5 pounds active ingredient (12 to 25 gallons product) per acre and injected into the soil at a depth of 14 to 18 inches.
 - ✓ Telone C-17 is applied at a rate of 123.0 – 229.6 pounds active ingredient (15 to 28 gallons product) per acre and injected into the soil at a depth of 14 to 18 inches.

- The point of injection must be at or near permanent wilting point and the surface must be moist enough to form a seal with tillage equipment at time of application. The soil temperature range must be between 40 and 80 degrees Fahrenheit at time of application.
- Telone II or Telone C-17 may NOT be applied through any irrigation system.
- Timing of application
 - ✓ Columbia Basin: October – February
 - ✓ Western WA: Not used on potato crops west of the Cascade Mountains.
- 1, 3-dichloropropene is incorporated and contained in the soil by tillage and proper soil moisture. Timing of the fumigation takes advantage of the most effective soil temperatures, to target the most susceptible stage of pests, and to avoid the presence of damaging residues at planting.
- 1, 3-dichloropropene (Telone II) can be effective at reducing populations of wireworm if it is applied with correct timing.

STRAWBERRY:

- There are 1,800 acres of strawberries are grown in western Washington: Whatcom (380 acres), Skagit (550 acres), Clark (320 acres), Pierce (100 acres) and several other counties including Thurston County.
- Several different nematodes are commonly found in strawberry plantings: dagger, root-knot, and root-lesion nematodes.
- Each of these nematode species has the to vector virus diseases. Dagger nematodes are vectors of tomato ringspot virus. Growers are advised to avoid planting in nematode infested areas, if possible.
- Sampling for nematodes prior to planting is critical because any chemical controls are pre-plant only. However, pre-plant soil fumigation is best for controlling nematodes.
- 1, 3-dichloropropene is applied in the fall for planting the following spring.
- 1, 3-dichloropropene (Telone II) is broadcast at a rate of 242.4 – 363.6 pounds active ingredient (24 to 36 gallons of product) per acre. (Growers may also use Telone C-17.)
- Ground must remain undisturbed 2 to 3 weeks between treating and planting or until odor leaves the soil.
- Growers may also use metam sodium (Vapam), methyl bromide plus chloropicrin or fenamiphos (Nemacur 15G or 3) to control nematodes.

RASPBERRY:

- Seventy-seven percent (77%) of all raspberries grown in Washington State are grown in Whatcom County (6,400 acres). The remaining raspberry acreage is found in Skagit (1,330 acres), Clark (860 acres), Cowlitz (600 acres) and Pierce (110 acres) counties.
- 1,3 dichloropropene (Telone II) is used for nematode control only as a pre-plant or re-plant treatment. It is typically applied in the fall, several months before the plants are set. With good cultural maintenance, a planting may remain productive for 10 years or more.
- When replanting, chloropicrin (100 lbs. per acre) may be added to improve control.
- Nearly all re-plantings and about half of the new raspberry plantings require pre-plant treatment. However, new plantings are rarely made on ground that has never been planted to raspberries.

- 1,3 dichloropropene (Telone II) is shanked into the soil at a rate of 181.8 – 252.5 active ingredient (18 to 25 gallons product) per acre.

NOTE: Though rarely used, 1, 3-dichloropropene (Telone II - Washington Special Local Needs Number 94-0038) is available to control Canada thistle, field bindweed, quackgrass and certain other deep-rooted perennial weeds in cropland. 1, 3-dichloropropene is applied as a pre-plant broadcast treatment at a rate of 252.5 pounds active ingredient (25 gallons product) per acre. The product is shanked in at least 18 inches below the final soil surface. Application should be made in late summer or fall.

PRODUCT NAMES & LABELED CROP:

PRODUCT NAME	CROP
INLINE SOIL FUNGICIDE AND NEMATICIDE	ALL CROPLAND
TELONE C-15	ALL CROPLAND
TELONE C-17	ALL CROPLAND
TELONE C-17 (F-3: POTATOES/ONIONS)	ONION (DRY BULB)
TELONE C-17 (F-3: POTATOES/ONIONS)	ONION (GREEN)
TELONE C-17 (F-3: POTATOES/ONIONS)	POTATO
TELONE C-35	ALL CROPLAND
TELONE EC SOIL FUMIGANT	ALL CROPLAND
TELONE II	ALL CROPLAND
TELONE II (SLN: CROPLAND/THISTLE)	ALL CROPLAND
TELONE II (F-3: NEMATODE/WIREWORM-POTATO/ONION)	CARROT
TELONE II (F-3: NEMATODE/WIREWORM-POTATO/ONION)	ONION (DRY BULB)
TELONE II (F-3: NEMATODE/WIREWORM-POTATO/ONION)	ONION (GREEN)
TELONE II (F-3: NEMATODE/WIREWORM-POTATO/ONION)	POTATO
TRI-CAL TRILONE II	ALL CROPLAND
TRI-FORM 35	ALL CROPLAND

References:

2003 *Farm Chemicals Handbook*, Meister Pro Information Resources
 2003 *Pacific Northwest Insect Management Handbook*, Extension Services of OSU, WSU, and UI
 “Pesticide Management Strategic Plan for Washington State Wine Grape Production.” May 2004. Workshop Summary, Pasco WA
 United States Mint, Mint Industry Research Council. No date.
 Lundy, Rocky. Spray Profile for Mint Grown in Washington State. No date. Mint Industry Research Council
 Morrell, Anne, Alan Schreiber and Rocky Lundy. 1997. Pests, Pest Control, and Fertilizer Use in Washington Mint. Washington State University Extension Bulletin, MISC0188.
 Pelter, Gary Q. and E. J. Sorensen. 2003. Crop Profile for Onions in Washington. Washington State University. <http://www.tricity.wsu.edu/~cdaniels/profiles/Onion.pdf>
 Schreiber, Alan and Laurie Ritchie. “Washington Minor Crops.” 1994. Food and Environmental Quality Lab, Washington State University.
 2004 Washington State registered pesticide labels

CDMS Label Database: <http://www.cdms.net/manuf/manuf.aspwebsite>
ExToxNet Pesticide Information Profiles: <http://ace.orst.edu/info/extoxnet/pips/pips.html>
Greenbook, Chemical & Pharmaceutical Press Inc.: <http://www.greenbook.net/>
National Agricultural Statistics Service – Agricultural Chemical Use Database: <http://www.pestmanagement.info/nass/>
Pesticide Action Network Pesticide Database: <http://www.pesticideinfo.org/index.html>
U.S. Department of Agriculture National Agricultural Statistics Service: <http://www.usda.gov/nass/>
U.S. Department of Agriculture Pest Management Centers Crop Profiles: <http://www.pmcenters.org/cropprofiles/>
U.S. Department of Agriculture Crop Profiles: <http://pestdata.ncsu.edu/cropprofiles/>
Washington 2003 Annual Bulletin, Washington Agricultural Statistics Service ,
<http://www.nass.usda.gov/wa/annual03/content3.htm>
Washington State Pesticide Management Practices: <http://www.tricity.wsu.edu/~cdaniels/wapiap.html>
WSU PICOL Label/Crop Profile Database: <http://picol.cahe.wsu.edu/LabelTolerance.html>
WSU Pesticide Notification Network, <http://ext.wsu.edu/pnn/user/blank.php>

E-mail correspondence – Tim Smith, June 1, 2004, WSU North Central Washington Extension- Tree Fruit Production (apple)