# 2,4,7,9-Tetramethyl-5-decyne-4,7-diol

## Crop Production

## Identification of Petitioned Substance

**Chemical Name:**
2,4,7,9-Tetramethyl-5-decyne-4,7-diol

**Other Names:**
5-Decyne-4,7-diol, 2,4,7,9-tetramethyl
2,4,7,9-Tetramethyldec-5-in-4,7-diol
2,4,7,9-Tetramethyldec-5-yne-4,7-diol
1,4-Diisobutyl-1,4-dimethylbutynediol

**Trade Names:**
Surfynol 104 Surfactant

**CAS Number:**
126-86-3

**Other Codes:**
European Inventory of Existing Commercial Chemical Substances (EINECS) No. 204-809-1

## Characterization of Petitioned Substance

**Composition of the Substance:**

2,4,7,9-Tetramethyl-5-decyne-4,7-diol (2,4,7,9-Tetramethyl) is used as an industrial de-foaming, nonionic surfactant. Also, this compound is consumed as a chemical intermediate and is converted into polyethylene glycol ether surfactant, which is also used in industrial applications. The molecular formula for 2,4,7,9-Tetramethyl is $C_{14}H_{26}O_2$ and the molecular weight is 226.36 (U.S. EPA, Substance Registry System). The chemical structure of 2,4,7,9-Tetramethyl is given in Figure 1.

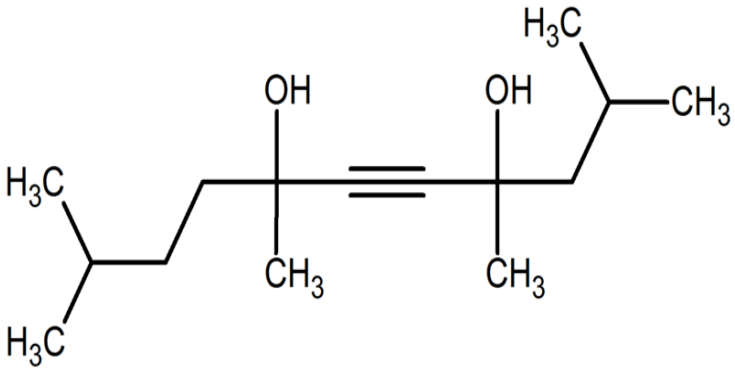


Figure 1. 2,4,7,9-Tetramethyl-5-decyne-4,7-diol

**Properties of the Substance:**

| Product Chemistry – International Uniform Chemical Information Database, 2001 | |
|---|---|
| **Physical State** | Waxy solid |
| **Color** | White |
| **Odor** | Menthol |
| **Melting Point** | 54 – 55 degrees Centigrade |
| **Boiling Point** | 262 – 263 degrees Centigrade |
| **pH** | 7.3 to 7.5 |
| **Water Solubility** | 1.7 g/L at 20 degrees Centigrade |
| **Vapor Pressure** | 0.0062 – 0.007 hPa at 20 degrees Centigrade |
| **Flammability/Flame Extension** | Flash point is greater than 100 degrees Centigrade |
| **Stability** | Stable under normal conditions |

**Specific Uses of the Substance:**

2,4,7,9-Tetramethyl is used in herbicides, fungicides, and insecticides as inert ingredients. Consumer products such as detergents, paints, coatings, adhesives, and metal working formulations also contain 2,4,7,9-Tetramethyl (Hazardous Substances Data Bank).

**Approved Legal Uses of the Substance:**

2,4,7,9-Tetramethyl is permitted as in inert ingredient for use in non-food use pesticide products by the U. S. Environmental Protection Agency – see:
http://www.epa.gov/opprd001/inerts/inert_nonfooduse.pdf

An inert ingredient is defined by the U.S. Environmental Protection Agency as any ingredient in a pesticide product that is not intended to affect a target pest.

Previously, 2,4,7,9-Tetramethyl was on the U.S. Environmental Protection Agency's List 3 – Inerts of Unknown Toxicity. List 3 is now obsolete – http://www.epa.gov/opprd001/inerts/inerts_list3name.pdf

2,4,7,9-Tetramethyl is not approved for use as a food additive by the U.S. Food and Drug Administration.

**Action of the Substance:**

2,4,7,9-Tetramethyl is used as a wetting agent, de-foamer, rinse aid, viscosity reducer, penetrating agent, and lubricity additive in industrial applications as well as consumer products (U.S. EPA, 2006).

## Status

**U.S. Environmental Protection Agency:**

The U.S. Environmental Protection Agency granted 2,4,7,9-Tetramethyl three exemptions from the requirement of a tolerance. 2,4,7,9-Tetramethyl is exempt from a tolerance when it is not more than 2.5% of the pesticide formulation (40 CFR180.910). In this case, 2,4,7,9-Tetramethyl must be used in accordance with good agricultural practices as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest. 2,4,7,9-Tetramethyl is exempt from a tolerance when in pesticide formulations for application to soil prior to planting or to plants before edible parts form (40 CFR 180.920). In this case, 2,4,7,9-Tetramethyl must be used in accordance with good agricultural practices as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. 2,4,7,9-Tetramethyl is exempt from a tolerance when it is not more than 2.5% of the pesticide formulation (40 CFR 180.930). In this case, 2,4,7,9-Tetramethyl must be used in accordance with good agricultural practices as inert (or occasionally active) ingredients in pesticide formulations applied to animals.

**U.S. Food and Drug Administration:**

2,4,7,9-Tetramethyl is not approved for use as a food additive by the U.S. Food and Drug Administration.

**International:**

The International Uniform Chemical Information Database (IUCLID) has physical and chemical properties, acute toxicity data, and eco-toxicity and ecological risk characterization data for 2,4,7,9-Tetramethyl. IUCLID is a database of existing chemicals that is being compiled by the European Chemicals Bureau. Also, IUCLID is the basic tool for data collection and evaluation within the EU-Risk Assessment Programme and it has been accepted by the Organization for Economic Cooperation and Development (OECD) as the data exchange tool under the OECD Existing Chemicals Programme.

2,4,7,9-Tetramethyl is not allowed for use in organic crop production by either the European Union (European Union, 2008) or Codex Alimentarius (Codex Alimentarius, 2008).

## Evaluation Questions for Substances to be used in Organic Crop or Livestock Production

**Evaluation Question #1: Is the petitioned substance formulated or manufactured by a chemical process? (From 7 U.S.C. § 6502 (21).)**

2,4,7,9-Tetramethyl is produced by the reaction of acetylene and methyl isobutyl ketone. The crude product is continuously extracted from the reactor and then batch distilled. Once the final product is obtained from the distillation, the product is blended with solvents to make one of several liquid products, or converted to polyethylene glycol ether surfactants via ethoxylation. Because the surfactant form is a difficult-to-handle, waxy solid, nearly all industrial users purchase the products in 55 gallon drums dissolved in a suitable solvent. The solvent form of the product enables ready formulation into a coating, ink, or adhesive and minimizes worker contact with the surfactant itself. For use in pesticide formulations, 2,4,7,9-Tetramethyl has been solubilized in ethylene glycol and used with copper fungicide products. The 2,4,7,9-Tetramethyl readily dissolves in ethylene glycol, however, this material is soluble in other solvents, including 2-ethylhexanol, 2-butoxy ethanol, di-propylene glycol mono-methyl ether, n-propyl alcohol, isopropyl alcohol, and propylene glycol. 2,4,7,9-Tetramethyl has intermediate water solubility and is a non-ionic surfactant used for anti-foam and wetting applications in water-based products such as printing inks, coatings, and adhesives. To increase coverage and uptake, 2,4,7,9-Tetramethyl could potentially be used in a number of pesticides, fungicides, and herbicides.

**Evaluation Question #2: Is the petitioned substance formulated or manufactured by a process that chemically changes the substance extracted from naturally occurring plant, animal, or mineral sources? (From 7 U.S.C. § 6502 (21).)**

There is no known naturally occurring plant, animal, or mineral sources of 2,4,7,9-Tetramethyl. The chemically synthesized 2,4,7,9-Tetramentyl is the only form that is available for use.

**Evaluation Question #3: Is the petitioned substance created by naturally occurring biological processes? (From 7 U.S.C. § 6502 (21).)**

There is no known naturally occurring biological process to produce 2,4,7,9-Tetramethyl.

**Evaluation Question #4: Is there environmental contamination during the petitioned substance's manufacture, use, misuse, or disposal? (From 7 U.S.C. § 6518 (m) (3).)**

From the limited information submitted by the petitioner on the manufacturing process, there appears to be trace quantities of 2,4,7,9-Tetramethyl released to the environmental (via both air and water). The water route involves the release into wastewater, which is subsequently treated in a municipal wastewater facility before release to the environment.

2,4,7,9-Tetramethyl has half-lives of 6, 900, 900, and 3,600 hours in air, water, soil, and sediment, respectively (U.S. EPA, Estimation Program Interface (EPI) Suite). It also exhibits negligible sorption to soil. Based on the use restrictions and limitations when used as inert ingredients in pesticide products applied to growing crops, raw agricultural commodities after harvest, and animals, 2,4,7,9-Tetramethyl is likely to be present in drinking water sources, however, it is likely to occur at low levels. This is based on the limitations and restrictions for use and possible primary degradation before ending up at a drinking water treatment facility. The fate and effects of potential primary metabolites is not available, but are likely less than the parent compound (U.S. EPA, 2006). Other potential concerns with the use of 2,4,7,9-Tetramethyl is the contamination of storm waters and run-off from fields after treatment. Ultimately, 2,4,7,9-Tetramethyl is likely to be present at low levels in drinking water sources as mentioned above. Residents of rural areas who are not connected to public water systems may be at a greater risk for exposure than residents of suburban and urban areas on public water systems.

**Evaluation Question #5: Is the petitioned substance harmful to the environment? (From 7 U.S.C. § 6517 (c) (1) (A) (i) and 7 U.S.C. § 6517 (c) (2) (A) (i).)**

For 2,4,7,9-Tetramethyl, the 24 hour and 96 hour median lethal concentration ($LC_{50}$) for carp was 42 mg/L with 0% mortality at 32 mg/L ($LC_0$) and 100% mortality at 56 mg/L ($LC_{100}$). Effects on swimming behavior and pigmentation were induced at concentrations down to 18 mg/L. with no sub-lethal effects occurring at 10 mg/L.

For *Daphnia magna* (Crustacea), the 24 hour effective concentration – 50% of maximal response ($EC_{50}$) was 99 mg/L and the 48 hour $EC_{50}$ was 91 mg/L. 2,4,7,9-Tetramethyl did not induce immobilization at 43 mg/L after 48 hours of exposure – no-observed-effect concentration (NOEC).

2,4,7,9-Tetramethyl affected growth of the fresh water species *Selenastrum capricornutum* (Algae) significantly at 2.2 mg/L and higher. The NOEC for cell growth inhibition and growth rate reduction was 1.0 mg/L. However, a recovery of growth was observed during the last 48 hours of exposure with a NOEC of 4.6 mg/L for growth rate. Cell growth inhibition $EC_{50}$ = 15 mg/L, cell growth rate reduction $EC_{50}$ (0 to 72 hours) = 82 mg/L, (24 to 72 hours) = 39 mg/L.

Based on the above results, the U.S. Environmental Protection Agency has classified 2,4,7,9-Tetramethyl as slightly toxic to fish and aquatic invertebrates and moderately toxic to aquatic plants (U.S. EPA, 2006). 2,4,7,9-Tetramethyl has half-lives of 6, 900, 900, and 3,600 hours in air, water, soil, and sediment, respectively (U.S. EPA, EPI Suite).

**Evaluation Question #6: Is there potential for the petitioned substance to cause chemical interaction with other substances used in organic crop or livestock production? (From 7 U.S.C. § 6518 (m) (1).)**

This is a very complex question to answer and it depends greatly on what type of organic production (crop, livestock, or both) that is taking place on the farm, as well as, what organic material or substances are being used in the organic production. 2,4,7,9-Tetramethyl is classified by the U.S. Environmental Protection Agency as an inert ingredient for use in non-food use pesticide products. It is used in pesticide formulations at low levels (2.5%) and is applied to growing crops, raw agricultural commodities after harvest, and to animals. Also, it can be applied to soil prior to planting and to plants before edible parts form. However, 2,4,7,9-Tetramethyl has long half-lives in water (900 hours), soil (900 hours), and sediment

(3,600 hours) and is classified as "not readily biodegradable". Therefore, it has the ability to persist in the environment and could potentially interact with other chemicals and organic substances.

**Evaluation Question #7: Are there adverse biological or chemical interactions in the agro-ecosystem by using the petitioned substance? (From 7 U.S.C. § 6518 (m) (5).)**

There is information available to indicate that 2,4,7,9-Tetramethyl may some have adverse biological or chemical inter-actions in the agro-ecosystem. The U.S. Environmental Protection Agency has classified 2,4,7,9-Tetramethyl as slightly toxic to fish and aquatic invertebrates and moderately toxic to aquatic plants (U.S. EPA, 2006). 2,4,7,9-Tetramethyl is limited to 2.5% in pesticide formulations for application to growing crops, raw agricultural commodities after harvest, and to animals. Additionally, for growing crops, it is restricted to application to soil prior to planting or to plants before edible parts form. As mentioned in the response to Question 4, 2,4,7,9-Tetramethyl is likely to be present in drinking water sources, however, it is likely to occur at low levels. The 900 hour half-life of 2,4,7,9-Tetramethyl in water is largely responsible for this. However, if the 2,4,7,9-Tetramethyl is solubilized in an organic solvent, there may be additional concerns about adverse effects on the agro-ecosystem.

**Evaluation Question #8: Are there detrimental physiological effects on soil, organisms, crops, or livestock by using the petitioned substance? (From 7 U.S.C. § 6518 (m) (5).)**

2,4,7,9-Tetramethyl may have some detrimental physiological effects on soil, organisms, crops, or livestock. The U.S. Environmental Protection Agency has classified 2,4,7,9-Tetramethyl as slightly toxic to fish and aquatic invertebrates and moderately toxic to aquatic plants (U.S. EPA, 2006). Please note the restrictions of use outlined in the response to Question 7 and in the Status Section of this Technical Evaluation Report. Based on these restrictions, the U.S. Environmental Protection Agency granted 2,4,7,9-Tetramethyl three exemptions from the requirement of a tolerance. (40 CFR 180.910, 40 CFR 180.920, and 40 CFR 180.930). Also, it is noted in the response to Question 7 that 2,4,7,9-Tetramethyl is likely present in low levels in drinking water sources and this is largely responsible to the 900 hour half-life of the petitioned substance in water. The organic solvent the 2,4,7,9-Tetramethyl may present additional concerns about detrimental effects on the environment. However, the prudent use of 2,4,7,9-Tetramethyl in organic agriculture may provide benefits to crops, as well as, livestock.

**Evaluation Question #9: Is there a toxic or other adverse action of the petitioned substance or its breakdown products? (From 7 U.S.C. § 6518 (m) (2).)**

There is information to indicate that 2,4,7,9-Tetramethyl has some toxic or adverse actions. The available toxicity database for 2,4,7,9-Tetramethyl consists of acute and sub-chronic studies in animals, as well as genotoxicity, developmental, and reproductive toxicity studies (U.S. EPA, 2006).

Acute toxicity (IUCLID, 2001):

Oral – lethal dose – 50 % response ($LD_{50}$) in rats - > 500mg/kg body weight (BW)
Dermal ($LD_{50}$) in rats - > 2,000 mg/kg BW
Dermal ($LD_{50}$) in rabbits - > 1,000 mg/kg BW
Inhalation ($LC_{50}$) in rats - > 20 mg/L (low volatility)
Eye irritation in rabbits – highly irritating
Skin irritation in rabbits – irritating; moderate to severe erythema and slight edema in the animals. Skin irritation was resolved within 21 days after exposure in all animals.

Sub-chronic toxicity:

In a 28-day oral study of rats fed 0, 625, 1250, 2500, and 5000 ppm (equivalent to 0, 31.2, 62.5, 125, and 250 mg/kg/day, respectively), mortality, physical observations, body weight, and food consumption data, as well as gross necropsy observations did not reveal any adverse effects considered to be attributable to the administration of 2,4,7,9-Tetramethyl at any of the dose levels. The no-observed-adverse-effect level (NOAEL) is equal to 5000 ppm.

In a 130 day oral study in dogs (0, 200, 250 and 300 mg/kg/day), all dogs survived for the duration of the study with few clinical findings. Occasionally, dogs in the mid- and high-dose groups (250 and 300 mg/kg/day) exhibited sporadic compound related neurologic disturbances (convulsions and tremors) during the study. All other observations, including feed consumption, body weight gains, organ weights (except liver), clinical chemistries, hematology, urinalysis, gross pathology, and histology were judged to reflect no compound-related/biologically significant changes. Mean liver weights and liver-to-body weight ratios in all 2,4,7,9-Tetramethyl treated groups were higher than in corresponding control groups; however, because no histological abnormalities were observed in these livers, the liver enlargement was judged to be due to hyperplasia of the hepatic endoplasmic reticulum, where xenobiotic/drug metabolizing enzymes are located. Based on the liver effects, a NOAEL could not be established. The lowest-observed-adverse-effect level (LOAEL) was determined to be 200 mg/kg/day.

Mutagenicity/Genotoxicity:

2,4,7,9- Tetramethyl was determined to be non-mutagenic in Ames testing with *Salmonella typhimurium* strains. Also, 2,4,7,9-Tetramethyl was determined to be negative in a cytogenetic assay using Chinese hamster ovary cells *in-vitro.*

Developmental and Reproductive toxicity:

In a one-generation reproductive study in rats, as well as in a one-generation development/teratogenicity study in rats (doses of 0, 500, 1000, and 2000 mg/kg/day), the only pertinent findings observed in the parents were a slight decrease in the mean weaning weight of both male and female pups of the high-dose group; a slight decrease in lactation indices of the high-dose group; decreased body weight and feed consumption of the high-dose female group; and normal histology of the reproductive organs in the parents. Fertility, viability, and gestational indices were not affected. In the reproductive phase of this experiment, there was a toxic effect at the 2000 mg/kg/day dose, a borderline effect at the 1000 mg/kg/day dose, and no effect at 500 mg/kg/day. The following pertinent findings were observed in the offspring: slight decrease in the mean rate of body weight gain in both sexes at the mid- and high-dose (there was also a significant decrease in this parameter in the low-dose male group during the first eight weeks); normal mean hematological measures, clinical chemistries measures, and urinalysis measures after 91 days on treatment; significant increase in absolute and relative liver weights of both sexes at mid- and high-doses; corresponding histopathology of the liver showing mild to moderate centri-lobular cloudy swelling of hepatocytes of rats on the mid- and high-doses. For both studies, the parental and offspring NOAELs were determined to be 500 mg/kg/day, with effects only observed at or above the 1000 mg/kg/day dose.

Neurotoxicity:

No relevant neurotoxicity data have been identified for 2,4,7,9-Tetramethyl. Neurological disturbances however, were only reported in high-dosed dogs in a 130 day study.

Carcinogenicity:

No carcinogenicity studies are available for 2,4,7,9-Tetramethyl.

Metabolism and Pharmacokinetic Data:

No metabolism or pharmacokinetic data are available for 2,4,7,9-Tetramethyl.

Toxicity of breakdown products:

Due to 2,4,7,9-Tetramethyl being classified as 'not readily biodegradable," information on the toxic or adverse actions of its breakdown products is not available (See response to Question 10).

**Evaluation Question #10: Is there undesirable persistence or concentration of the petitioned substance or its breakdown products in the environment? (From 7 U.S.C. § 6518 (m) (2).)**

2,4,7,9-Tetramethyl photo-degrades rapidly in the atmosphere (half-life = 3.021 hours), is soluble in water (1.7 g/L), non-volatile, and exhibits negligible sorption to soil (log Koc of 1.328). This chemical is classified as "not readily biodegradable" indicating that it has the potential to persist in the environment. Biodegradation results based on BIOWIN suggest primary degradation may occur in weeks and ultimate degradation in weeks or months. BIOWIN estimates aerobic and anaerobic bio-degradability of organic chemicals using seven different models (U.S. EPA, EPI Suite).

**Evaluation Question #11: Is there any harmful effect on human health by using the petitioned substance? (From 7 U.S.C. § 6517 (c) (1) (A) (i), 7 U.S.C. § 6517 (c) (2) (A) (i) and), 7 U.S.C. § 6518 (m) (4).)**

2,4,7,9-Tetramethyl has the acute effects of being severely irritating to the eyes and mildly irritating to the skin (U.S. EPA, 2006). Inhalation may cause headache, drowsiness, or other effects to the central nervous system including anesthetic effects. The following personal protection/exposure controls are recommended:

Eye protection: Splash-proof eye goggles. In emergency situations, use eye goggles with a full-face shield.

Hand protection: Neoprene rubber gloves. Nitrile rubber gloves. Insulated gloves such as thermal lined rubber when handling hot material.

Ventilation: Well-ventilated workplace.

Protective clothing: Long-sleeved clothing.

Work and hygiene practices: Provide readily accessible eye wash stations and safety showers. Wash at the end of each work shift and before eating, smoking, or using the toilet (IUCLID, 2001).

**Evaluation Question #12: Is there a wholly natural product that could be substituted for the petitioned substance? (From 7 U.S.C. § 6517 (c) (1) (A) (ii).)**

There are nine wetting agents on the Organic Materials Review Institute's Product List (2009) that possibly could be used in the place of 2,4,7,9-Tetramethyl. In addition, there are the non-synthetic saponins and microbial wetting agent on the Organic Material Review Institute's Generic Materials List (2007) that may be substituted for 2,4,7,9-Tetramethyl. If 2,4,7,9-Tetramethyl is used in fungicide formulations, there are natural fungicides available for use by both homeowners and professionals to combat plant diseases (Beckerman, 2008). The active ingredients in these compounds include sulfur, lime-sulfur, copper, horticultural oil, neem oil, and bicarbonates. Lecithin, an emulsifying agent, is listed by both Codex Alimentarius (2008) and the European Union (2008) for use in crop production and could be another possible substitute for the petitioned substance.

**Evaluation Question #13: Are there other already allowed substances that could be substituted for the petitioned substance? (From 7 U.S.C. § 6517 (m) (6).)**

2,4,7,9-Tetramethyl is a non-ionic surfactant that is used to evenly disperse active compounds to control plant pests and diseases and is defined by the U.S. Environmental Protection Agency as an inert ingredient. It is also used as a surfactant in herbicides. As alternatives, organic crop producers could use synthetic substances that are already allowed in organic crop production to control plant pest.s listed in 7 CFR 205.601. They include: ammonium carbonate; boric acid; copper sulfate; elemental sulfur; lime sulfur; oils – horticultural – narrow range oils as dormant, suffocating, and summer oils; insecticidal soaps; sticky traps/barriers; and sucrose octanoate esters. Also, these synthetic substances could possibly be used with phermones to control insects and pests. Some of these substances have conditions or restriction for use and depending on the crop of interest and the pest/insect of concern, some decision would have to be made about which one may be the most appropriate for use.

In the case of weed control, organic crop producers could use soap-based herbicides and mulches as prescribed in 7 CFR 205.601. Again, the crop of interest and the weed of concern would affect which method of control would be most applicable.

For plant diseases, the following synthetic substances can be used: coppers – fixed – copper hydroxide; copper oxide, copper oxy-chloride; copper products exempt from a U.S. Environmental Protection Agency tolerance; copper sulfate; hydrated lime; hydrogen peroxide; lime sulfur; oils – horticultural - narrow range oils – dormant, suffocating, and summer oils; peracetic acid; potassium bicarbonate; elemental sulfur; streptomycin; and tetracycline. The synthetic copper compounds allowed for use in organic crop production must be used in such a manner as to minimize the copper accumulation in soils. Other allowed synthetic substances such as peracetic acid, streptomycin (used in apples and pears only); and tetracycline are for fire blight control only. Therefore, depending on the infected crop and the plant disease of concern, these allowed substances may or may not be of benefit and some decision would be needed as to which one is the most appropriate for use. In all cases (pest/insect control; plant disease control; and weed control), the conditions for using materials on the National List of Synthetic Substances must be documented in the organic farming system plan.

**Evaluation Question #14: Are there alternative practices that would make the use of the petitioned substance unnecessary? (From 7 U.S.C. § 6517 (m) (6).)**

As found in 7 CFR 205.205, organic crop producers must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provides for pest management in annual and perennial crops. In addition, cultural practices that remove habitat for pest organisms and the selection of plant species and varieties that are resistant to prevalent pests are important alternative practices. Pest infestations may also be controlled by the augmentation or introduction of predators and parasites of the pest, development of habitat for natural enemies of the pests, and the use of non-synthetic controls such as lures, traps, and repellants. When these practices prove insufficient to prevent or control pests a biological or botanical substance or a substance on the National List of Synthetic Substances allowed for use in organic crop production (7 CFR 205.601) may be applied to prevent, suppress, or control pests. Also, these substances could possibly be used in conjunction with phermones to control insects and pests (see information in the response to Question 13).

In the case of weeds, sanitation measures to remove weed seeds and cultural practices that enhance crop health, including the selection of plant species and varieties with regard to suitability to site-specific conditions and resistance to prevalent weeds. Weeds may also be controlled through: 1) mulching with fully biodegradable materials; 2) mowing; 3) livestock grazing; 4) hand weeding and mechanical cultivation; 5) flame, heat, or electrical means; or 6) plastic or other synthetic mulches provided they are removed from the field at the end of the growing or harvest season. When these practices prove insufficient to prevent or control weeds, soap-based herbicides or mulches on the National List of Synthetic

Substances allowed for use in organic crop production (7 CFR 205.601) may be applied to prevent, suppress, or control weeds (see information in the response to Question 13).

In the case of plant diseases, sanitation measures to remove disease vectors and cultural practices that enhance crop health, including the selection of plant species and varieties with regard to suitability to site-specific conditions and resistance to prevalent diseases. Plant diseases may also be controlled through management practices which suppress the spread of disease organisms and the application of non-synthetic biological, botanical, or mineral inputs. When these practices prove insufficient to prevent or control plant diseases, a substance on the National List of Synthetic Substances allowed for use in organic crop production (7 CFR 205.601) may be applied to prevent, suppress, or control plant diseases (see information in the response to Question 13).

**References**

Beckerman, J. 2008. Using Organic Fungicides. Purdue University Extension Bulletin (No. BP-69-W).

Codex Alimentarius. 2008. Guideline 32: Guidelines for the Production, Processing, Labelling, and Marketing of Organically Produced Foods.

Wikimedia Commons, see:
http://commons.wikimedia.org/wiki/File:2-4-7-9-Tetramethyl-5-decyne-4,7-diol.png

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U.S. Environmental Protection Agency. 2006. Reassessment of Six Exemptions from the Requirement for a Tolerance: Three Exemptions for 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (CAS Reg. No. 126-86-3) and Three Exemptions for 3,6-Dimethyl-4-octyn3,6-diol (CAS Reg. No. 78-66-0). Memorandum from Keri Grinstead and Christina M. Jarvis to Pauline Wagner, dated May 22, 2006.

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