

Storage Limitation Statements: Temperature -- Fungicides¹

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This guide provides general temperature effects on storage properties of agricultural fungicides. A table is included that lists many of the common agricultural fungicides registered for use in Florida with storage limitations included.

Introduction

The effectiveness and usability of many pesticides is influenced by the temperature at which the pesticides are stored. Labels for most liquid pesticides contain specific information on adequate storage temperatures. Generally, the labels state a temperature in the range of 40 - 100°F. For most of Florida, freezing is not a concern with pesticide storage, but extreme heat is a factor for the entire state.

Freezing temperatures can render a liquid-formulated pesticide useless by causing the active ingredients to separate from its solvents, emulsifiers, and other inert ingredients. The result of this separation may be either crystallization or coagulation of the formulation. However, some products may be thawed and reused after adequate



Figure 1. Pesticide drum bulging from extreme heat.

agitation; labels for these products will specifically state if this is the case. (Because of the ingredients in the formulation, the freezing point of many products may be lower than 32°F.)

Heat is the major concern in Florida in regards to pesticide storage. Heat can cause some pesticides to volatilize and drift from their containers, especially if containers are not adequately sealed. Flammability is also a problem with some pesticides associated with heat and/or open flame. (For more on this topic, see EDIS Publication PI-97, *Pesticide Labeling: Physical or Chemical Hazards*, <http://edis.ifas.ufl.edu/PI134>).

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Containers in which pesticides are stored may be damaged by either temperature extreme. The integrity of the container may also be destroyed by freezing temperatures that cause glass, metal, and plastic materials to break. Alternatively, high temperatures can cause plastic containers to melt and cause glass to explode. The liquid pesticide contents in metal drums can cause expansion and eventual rupturing of the container (Figure 1).

Generally, dry pesticide formulations are not adversely affected by temperature extremes. The effectiveness of these pesticides is most often reduced by the presence of moisture in storage. These products have a high affinity for water and once absorbed, the pesticides may solidify into hard masses, like tombstone formation. The packaging that surrounds dry products formulated as water-soluble packets can become brittle after absorbing moisture. If freezing occurs, the packages can break when handled.

For more information on storage-temperature limitations for individual products, consult the "Storage and Disposal" section of the pesticide's label (Figure 2). Labels for many pesticide products will have specific temperature limitations mentioned in this section; labels for other pesticide products may include a more general description. If you have questions regarding these limitations, consult the product's manufacturer.

General information on storage and disposal language on pesticide labels is discussed in EDIS Publication PI-106, *Pesticide Labeling: Storage and Disposal* (<http://edis.ifas.ufl.edu/PI143>).

The following table provides a listing of many commonly used agricultural fungicides registered for use in Florida. These fungicides are listed alphabetically by active ingredient common name, along with their trade names and any storage limitation statements that may be listed in their label's Storage and Disposal section.

Additional Information

Fishel, F.M. 2006. Pesticide Labeling: Physical or Chemical Hazards. EDIS Publication PI-97, <http://edis.ifas.ufl.edu/PI134>. Agronomy Department, Institute of Food and Agricultural Sciences, University of Florida. Gainesville, FL.

Fishel, F.M. 2006. Pesticide Labeling: Storage and Disposal. EDIS Publication PI-106, <http://edis.ifas.ufl.edu/PI143>. Agronomy Department, Institute of Food and Agricultural Sciences, University of Florida. Gainesville, FL.

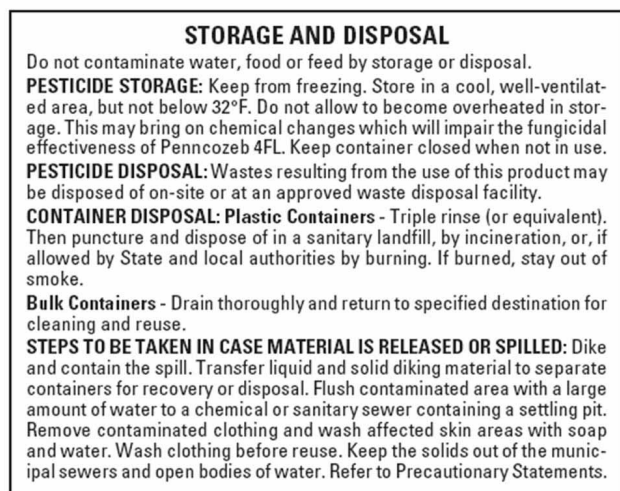


Figure 2. The Storage and Disposal section of the label often contains specific temperature information.

Table 1. Storage precaution statements for commonly-used agricultural fungicides.

Trade name*	Common name	Label statements
Actigard [®]	Acibenzolar-S-methyl	Store in a cool, dry place.
Abound [®] Amistar [®] Dynasty [®] Heritage [®] Heritage TL [®] Quadris [®] Flowable [®] Heritage G [®]	Azoxystrobin	No storage limitations specified. Store in a cool, dry place.
Captan 400 [®] Captan 4L [®] Captan 50WP [®] Captan 80WP [®] Captan 80WDG [®] Captan 4000 [®]	Captan	Store in a cool, dry location. Do not store in direct hot sunlight. After prolonged storage in intense cold, allow product to return to 25°F before using. Storage should be in a cool, dry area away from any heat or ignition source. Avoid storage at high temperatures. Protect from excessive heat. Store in a cool, dry place. Store in a cool, dry place.
Bravo Ultrex [®] Daconil Ultrex [®] Daconil Weather Stik [®] Bravo Weather Stik [®] Bravo Zn [®] Daconil Zn [®]	Chlorothalonil	Store in a dry place. Store in a cool place. Protect from excessive heat.
Curzate [®]	Cymoxanil	No storage limitations specified.
Vangard [®]	Cyprodinil	Store in a cool, dry, secure place.
Botran [®]	Dicloran	Store in a cool, dry place.
Dodine 65W [®] Elast 400 [®] Syllit FL [®]	Dodine	Storage should be in a cool, dry area away from any heat or ignition source. Do not allow storage in a damp or humid area. Do not use or store near heat, open flame or hot surfaces.
Terrazole 35WP [®] Terramaster 4 EC [®]	Etridiazole	Store in a dry location. Store the product in a cool and dry place. Protect from temperatures below 20°F. Do not store near heat sources or open flame.
Rubigan [®]	Fenarimol	Avoid freezing. Do not store near heat or open flame.
Enable [®]	Fenbuconazole	Store in a cool dry well ventilated area, but not below 32°F.
Elevate [®]	Fenhexamid	Store in a dry place away from excessive heat.

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Trade name*	Common name	Label statements
Super-Tin 4L [®]	Fentin-hydroxide	Store above 32°F.
Super-Tin 80WP [®]		Store above 32°F and below 95°F.
Ferbam Granuflo [®]	Ferbam	Keep away from fire and sparks. Store in a cool, dry place and avoid excess heat.
Graduate [®]	Fludioxonil	Store in a cool, dry place. Do not store this product under wet conditions.
Maxim 4 FS [®]		Store in a cool, dry place.
Maxim Potato Seed Protectant [®]		
Medallion [®]		Store in a cool, dry, secure place. Do not store this product under wet conditions.
Scholar [®]		Store in a cool, dry place. Do not store this product under wet conditions.
Scholar SC [®]		Do not store near heat or open flame.
Presidio [®]	Fluopicolide	Store in a cool, dry place. Do not store at temperature below 32°F. If the product is exposed to temperatures below 32°F, thaw at 50°F or higher and shake gently to unify the product.
Aliette [®]	Fosetyl-Al	Store in a cool, dry place.
Avalon [®]		
Magnate [®]	Imazalil	No storage limitations specified.
26 GT [®]	Iprodione	No storage limitations specified.
Iprodione 4L AG [®]		
Iprodione E Pro [®]		
Iprodione Pro 2SE [®]		
Rovral [®]		
Sovran [®]	Kresoxim-methyl	No storage limitations specified.
Dithane 75DF [®]	Mancozeb	Keep away from fire and sparks. Store in a cool, dry well-ventilated area. Do not allow stored product to become wet or overheated in storage; decomposition, impaired activity, or fire may result.
M45 [®]		
Fore 80WP [®]		
Dithane F-45 [®]		Keep from freezing. Store in a cool, well-ventilated area, but not below 32°F. Do not allow to become overheated in storage.
Penncozeb 4FL [®]		This may bring on chemical changes that will impair the fungicidal effectiveness.
Penncozeb 75DF [®]		If allowed to become wet the product will deteriorate and represent a fire hazard. Keep away from sources of ignition (e.g. sparks and open flame).
80WP [®]		
Protect DF [®]		
Manzate [®]		Keep in a cool place but not below 32°F. Temperature extremes will affect quality.
Manzate Pro-Stick [®]		Never allow to become wet during storage. This may lead to certain chemical changes which will reduce the effectiveness as a fungicide and create vapors which may be flammable.
Potato Seed Treater 6%		
Nubark [®]		Store in a cool, dry place. Avoid contact with the floor and with moisture.
Revus [®]	Mandipropamid	Store in a cool, dry place.

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Trade name*	Common name	Label statements
Maneb [®] Manex [®]	Maneb	If allowed to become wet, the product will deteriorate and represent a fire hazard. Keep away from sources of ignition. Store in a cool, dry place.
Ridomil Gold GR [®] Ridomil Gold/Copper [®]	Mefenoxam	Store in a dry place. Store in a cool, dry place. Do not store this product under wet conditions.
Metam CLR 42% [®] Metam KLR 54% [®] Metam Sodium [®] Vapam HL [®]	Metam-sodium	Do not store below 0°F. Product crystallizes at lower temperatures. If exposed, warm or store at higher temperatures and mix to redissolve crystals and assure uniformity before use. Do not store below 32°F. Product crystallizes at lower temperatures. Warm or store at higher temperatures and mix to redissolve crystals and assure uniformity before use.
Caramba [®] Quash [®] Tourney [®]	Metaconazole	Do not store below 10°F. Store in a cool, dry place. Store in a cool, dry place. Do not store at temperatures below 32°F. If the product is exposed to temperatures below 32°F, thaw at 50°F or higher and shake gently to unify the product.
Polyram [®]	Metiram	Store in a cool, dry place and avoid excess heat.
Eagle 20EW [®] Eagle 40WP [®] Nova 40W [®] Systhane WSP [®]	Mycobutanil	Store in a cool, dry area above freezing. Store in a cool, dry area above freezing. The water-soluble pouch may become brittle at storage temperatures below 32°F, but the fungicide is not affected.
Terraclor 15G [®] Terraclor 75WP [®] Terraclor 2E [®]	Pentachloronitrobenzene	Store in a dry location. Protect from temperatures below 20°F.
Endorse [®] Ph-D [®]	Polyoxin	Store in a dry place.
Banol [®] Previcur Flex [®] Promess [®]	Propamocarb	Store in a cool, dry place. Store in a cool, dry, secure place.
Banner GL [®] EchoPropiMax [®] Tilt [®] Tilt/Bravo [®]	Propiconazole	Store in a cool, dry place. Do not store below 40°F. Do not store this product under wet conditions. Store in a cool place. Protect from excessive heat. Store in cool place. Store in a cool place. Protect from excessive heat. Keep from freezing.
Proline [®]	Prothioconazole	Store in a cool, dry place and in such a manner to prevent cross contamination with other pesticides, fertilizers, food, and feed.

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Trade name*	Common name	Label statements
Cabrio [®] Headline [®] Stamina [®]	Pyraclostrobin	No storage limitations specified.
Quintec [®]	Quinoxifen	Avoid freezing.
Terraclor 15G [®] Terraclor 75WP [®]	Quintozene (PCNB)	Store in a dry location.
Terraclor 2E [®]		Protect from temperatures below 20°F.
Sulfur 6L [®]	Sulfur	Do not allow product to freeze.
Sulfur 90W [®]		Store in a cool, dry area away from any heat or ignition source.
Elite DF [®]	Tebuconazole	Store in a cool, dry place.
Elite WP [®]		Store in a cool, dry place. Do not store below freezing. Exposure to moisture or excessive handling of water soluble packets may cause breakage.
Folicur 3.6F [®]		Store in a cool, dry place.
Domark [®]	Tetraconazole	Store in a dry, temperature-controlled, secure place.
Mertect 340-F [®]	Thiabendazole	Store in a cool, dry place. Do not store below 32°F.
Thiophanate Methyl 85 WDG [®]	Thiophanate-methyl	Store in a dry area.
Thiram 42-S [®] Thiram 50WP [®]	Thiram	Do not subject to temperatures below 32°F.
Raxil [®]		Store in a cool, dry place.
Thiram Granuflo [®] Thiram 65WSB [®]		Protect from excessive heat.
Bayleton 50WSP [®]	Triadimefon	Store in a cool, dry place. Do not store below freezing (32°F).
Bayleton 50WDG [®] Bayleton 50DF [®] Strike 50WDG [®]		Store in a cool, dry place.
Compass [®] Flint [®] Gem [®]	Trifloxystrobin	Store in a cool, dry place.
Procure [®]	Triflumizole	Store in a cool, dry, secure location.
Terraguard 50W [®]		Do not use or store near heat or open flame. Store in a cool, dry location.
Terraguard SC [®]		Store in a cool, dry location.
Charter [®]	Triticonazole	Protect from frost and freezing.
Curalan EG [®] Touche [®] EG	Vinclozolin	Do not store below 32°F or above 100°F. Store in a place away from heat or open flame.

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Trade name*	Common name	Label statements
Ziram 76DF [®]	Ziram	Keep away from sources of ignition (e.g. sparks and open flame).
Ziram Granuflo [®]		Keep away from fire and sparks. Store in a cool, dry place and avoid excess heat.
Gavel [®]	Zoxamide	Keep away from fire and sparks. Store in a cool, dry, well-ventilated area. Do not allow to become wet or overheated in storage; decomposition, impaired activity, or fire may result. Decomposition produces a foul odor; if noted, check for hot containers and immediately remove to open areas for disposal.

*Does not include pre-packaged fungicide mixtures.