

Storage Limitation Statements: Temperature – Herbicides¹

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This guide provides information about how temperature affects storage of agricultural herbicides. A table is included that lists many common agricultural herbicides registered for use in Florida, with storage limitation statements.

Introduction

Storage temperature influences the effectiveness and usability of many pesticides. Most labels of liquid pesticides contain specific information on adequate storage temperatures for their products and will generally state a temperature in the 40°F–100°F range. Freezing is not a normal concern for pesticide storage in Florida, 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 may be either crystallization or coagulation of the formulation. Some products may be thawed and reused after adequate agitation; their labels 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 for pesticide storage problems. Heat can cause some pesticides to volatilize and drift from their containers, especially if containers are not

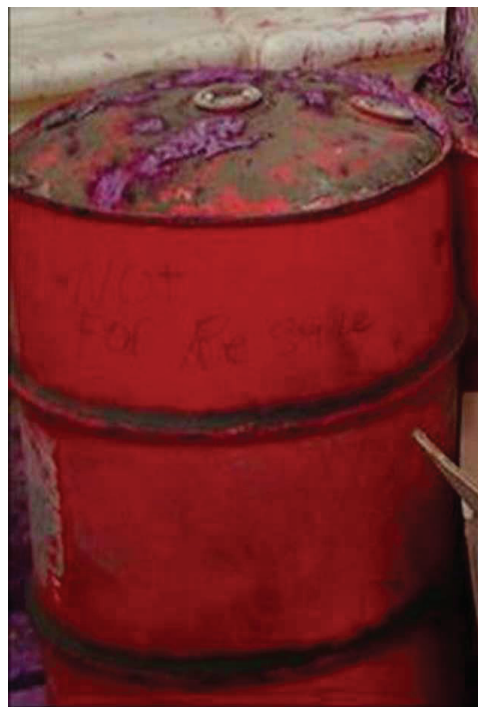


Figure 1. Pesticide drum bulging from extreme heat.

adequately sealed. Flammability is a problem with some pesticides in the presence of 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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The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication do not signify our approval to the exclusion of other products of suitable composition. Use herbicides safely. Read and follow directions on the manufacturer's label.

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Containers may be damaged by either temperature extreme. Freezing temperatures can cause containers made of glass, metal, or plastic to break. Alternatively, high temperatures can cause plastic containers to melt and glass to explode. Liquid pesticide contents stored in metal drums can expand and eventually rupture (Figure 1).

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

To learn storage temperature limitations for individual products, consult the “Storage and Disposal” section of the pesticide label (Figure 2). Many products will have specific temperature limitations mentioned in this section; others may be more general. If you have questions regarding these limitations, consult the product’s manufacturer.

STORAGE AND DISPOSAL

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

PESTICIDE STORAGE: Keep from freezing. Store in a cool, well-ventilated area, but not below 32°F. Do not allow to become overheated in storage. This may bring on chemical changes which will impair the fungicidal effectiveness of Penncozeb 4FL. Keep container closed when not in use.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on-site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Plastic Containers - Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, by incineration, or, if allowed by State and local authorities by burning. If burned, stay out of smoke.

Bulk Containers - Drain thoroughly and return to specified destination for cleaning and reuse.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Dike and contain the spill. Transfer liquid and solid diking material to separate containers for recovery or disposal. Flush contaminated area with a large amount of water to a chemical or sanitary sewer containing a settling pit. Remove contaminated clothing and wash affected skin areas with soap and water. Wash clothing before reuse. Keep the solids out of the municipal sewers and open bodies of water. Refer to Precautionary Statements.

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

General information on storage and disposal language found on pesticide labels is discussed in EDIS publication PI-106 *Pesticide Labeling: Storage and Disposal* (<http://edis.ifas.ufl.edu/pi143>).

Table 1 lists many commonly used agricultural herbicides registered for Florida. They are listed alphabetically by active ingredient common name (center column) with their trade names and any storage limitation statements from the Storage and Disposal directions. Not every herbicide common active ingredient and/or their associated trade products list storage limitations on the storage statements.

Additional Information

- Fishel, F.M. 2012. *Pesticide Labeling: Physical or Chemical Hazards*. PI-97. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <http://edis.ifas.ufl.edu/pi134>.
- Fishel, F.M. 2012. *Pesticide Labeling: Storage and Disposal*. PI-106. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <http://edis.ifas.ufl.edu/pi143>.

Table 1.

Trade Name*	Common Name	Label Statements
Hardball® Unison®	2,4-D	Do not store at temperatures below 0°F. If frozen, warm to 40°F and re-dissolve before using by rolling or shaking container.
Weedar®		Store at temperatures above 32°F. If allowed to freeze, warm to at least 40°F and remix before using. Freezing does not alter this product.
Weedone 650®		Do not store near heat or open flame.
2,4-DB 175® 2,4-DB 200® Butoxone®	2,4-DB	Store at temperatures above 32°F. If product is allowed to freeze, warm to 50°F and agitate thoroughly before using.
Butyrac®		No storage limitations specified.
Ultra Blazer®	Acifluorfen	Do not store below 32°F.
Evik®	Ametryn	Store in a cool, dry place.
Milestone®	Aminopyralid	If this product is exposed to subfreezing temperatures, the active ingredient may crystallize and settle out of solution. Under these conditions, the product should be warmed to at least 40°F and agitated well to dissolve any crystallized active ingredient prior to use.
Asulam 3.3® Asulam Herbicide® Asulox®	Asulam	Store at temperatures greater than 20°F.
AAtrex Nine-0® Atrazine 90DF®	Atrazine	Store in a dry place.
Atrazine 4L®		Containers must be stored in a cool, dry, well-ventilated area.
Agri-Star® Atrazine 4F®		Do not store near heat or open flame.
Atrazine 90WDG®		Store in a cool, dry place.
Balan DF®	Benefin	Do not store in direct sunlight. If stored above 120°F, Balan DF could lose some of its dispersing properties, resulting in difficult application, poor weed control, or crop injury.
Londax®	Bensulfuron-methyl	Store in a cool, dry place.
Prefar®	Bensulide	Protect from temperatures below 42°F. At temperatures below 42°F, product may crystallize. Dissolve crystals with quiet storage at warm temperatures (75°F). Re-dissolution rate: 40°F–48°F (40–60 days); 60°F (1–3 weeks); 70°F–80°F (1–3 days). Roll container and agitate contents to provide a uniform product prior to use.
Basagran®	Bentazon	Do not store at temperatures less than 32°F and do not allow product to freeze.
Hyvar®	Bromacil	Store in a cool, dry place.
Buctril® Moxy 2E®	Bromoxynil	Store at temperatures above 3°F. If allowed to freeze, remix before using.
Aim® Quicksilver®	Carfentrazone-ethyl	Store in a cool, dry place and avoid excess heat.
FirstRate®	Cloransulam	No storage limitations specified.
Classic®	Chlorimuron-ethyl	Store in a cool, dry place.
Corsair® Telar®	Chlorsulfuron	No storage limitations specified.
Arrow® Envoy® Section® Select® Trigger® Volunteer®	Clethodim	Store in a cool, dry place.
Command®	Clomazone	Store above -4°F to keep product from freezing. If frozen, thaw before use.
Lontrel® Transline®	Clopyralid	Combustible. Do not store near heat or open flame. Store above 28°F or warm to 40°F and agitate before use.

Clincher®	Cyhalofop	Combustible. Do not store near heat or open flame. Store in a cool place.
Dacthal®	DCPA	Store in a dry place.
Banvel®	Dicamba	Avoid cross-contamination with other pesticides.
Casoron®	Dichlobenil	Store in a dry location.
Hoelon® Illoxan®	Diclofop-methyl	Do not use or store near heat or open flame. Do not store below 20°F.
Strongarm®	Diclosulam	No storage limitations specified.
Reglone® Reward® Weedtrine®	Diquat dibromide	Store at temperatures above 32°F.
Dimension EC®	Dithiopyr	Store this product above 32°F to avoid crystallization. If crystals form or product freezes, move the product to an area with ambient temperature above 32°F and shake well until crystals have dissolved.
Dimension Ultra 2SC® and 40WP®		Store this product above 32°F.
Diuron 4L®, 4L® IVM®, 80®, 80 DF IVM®	Diuron	Storage should be in a cool, dry area away from any heat or ignition source. Avoid storage at high temperatures.
Reglone® Reward®	Diquat	Store at temperatures above 32°F.
Accelerate® Aquathol Super K Granular® Hydrothol®	Endothall	Do not store in a manner where cross-contamination with other pesticides, fertilizers, food or feed could occur.
Aquathol K®		Do not store in a manner where cross-contamination with other pesticides, fertilizers, food or feed could occur. Storage at temperature below 32°F may result in the product freezing or crystallizing. If this occurs, the product must be warmed to 50°F or higher and thoroughly agitated.
Eptam 20-G®	EPTC	Store in a cool, dry place.
Eptam 7-E®, Eradicane 6.7-E®		Can be stored at temperatures as low as -50°F.
Curbit® Sonalan HFP®	Ethalfuralin	Avoid freezing. Store above 40°F. If frozen, poor weed control may result. Do not use or store near heat or open flame.
Sonalan 10G®		Avoid freezing; store above 40°F.
Acclaim Extra®	Fenoxaprop	Do not store above 100°F or below 10°F.
Katana®	Flazasulfuron	Store in a cool, dry place and avoid excess heat.
Fusilade®, Ornamec®	Fluazifop-P-butyl	No storage limitations specified.
Define®	Flufenacet	Store in a cool, dry place.
Resource®	Flumiclorac-pentyl	Store in a cool, dry place.
Broadstar® Chateau® Payload® Sureguard® Valor®	Flumioxazin	Store in a cool, dry, secure place.
Cotoran® Flo-Met®	Fluometuron	No storage limitations specified.
Fluometuron 4L®		Store in a dry location.
Sonar Genesis®	Fluridone	Keep from freezing.
Cadet®	Fluthiacet-methyl	Store in a cool, dry place and avoid excess heat. Do not store below 32°F.
Battle Star®, Flexstar®, Reflex®, Ringside®, Shafen®	Fomesafen	Store above 32°F. If product solidifies, return to room temperature and agitate to reconstitute.
Spotlight® Vista®	Fluroxypyr 1-methylheptyl ester	Store above 10°F or warm and agitate before use.

Finale®	Glufosinate-ammonium	Do not use or store near heat or open flame.	
Ignite® Ignite 280 SL® Rely®		Do not use or store near heat or open flame. Keep the container tightly closed and dry in a cool, well-ventilated place. Storage temperature should not exceed 125°F. If storage temperature for bulk herbicide is below 32°F, the material should not be pumped until its temperature exceeds 32°F. Protect against direct sunlight.	
Extra Credit 5®	Glyphosate	Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and shake or roll to mix well before using.	
Recoil®		Do not store near heat or open flame.	
Credit Duo Extra®	Glyphosate, ammonium salt	Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and shake or roll to mix well before using.	
Accord Concentrate® Glypro® Rodeo®	Glyphosate, isopropylamine salt	Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.	
Aqua Star®		Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If crystals form, allow product to warm above 50°F and mix well or recirculate to redissolve.	
AquaMaster®		Store above 5°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.	
Cornerstone® Cornerstone Plus®		Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and shake or roll to mix well before using.	
Glyfos Aquatic®		Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to allow crystals to redissolve, then shake well before using.	
Rascal® Rascal Plus®		Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and roll or shake container or recirculate in mini-bulk or bulk container to mix well before using.	
Razor® Razor Pro®		Store above 10°F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F for several days to redissolve and shake, roll, or agitate to mix well before using.	
Sandea® Sedgehammer®		Halosulfuron	Store under cool, dry conditions (below 120°F). Do not store under moist conditions.
Velpar®		Hexazinone	Store in a cool, dry place.
Raptor®	Imazamox	Keep from freezing. Do not store below 32°F.	
Cadre® Plateau®	Imazapic	Keep from freezing. Do not store below 20°F.	
Cadre DF®		Store product in a cool, dry place. Do not store this product under wet conditions.	
Arsenal® Chopper® Habitat® Polaris® Stalker®	Imazapyr	Do not store below 10°F.	
Scepter®	Imazaquin	Keep from freezing. Do not store below 32°F.	
Pursuit®	Imazethapyr	Keep from freezing. Do not store below 32°F.	
Celero®, League®	Imazosulfuron	Store in a cool, dry secure place.	
Alion®, Esplanade®	Indaziflam	Protect the product from freezing temperatures. Store the product at temperatures above 32°F and preferably above 40°F (Alion®). Protect from freezing temperatures (Esplanade®).	

Gallery®	Isoxaben	Do not store in direct sunlight. Do not store at temperatures above 120°F.
Cobra® Phoenix®	Lactofen	Store in a cool, dry place.
Linex® Lorox®	Linuron	Store in a cool, dry place.
Tenkoz MCPA Amine 4®	MCPA	Store in a dry location. Do not store below 40°F or expose to subfreezing temperatures.
Tenkoz MCPA Ester 4®		Store in a dry location.
Callisto®	Mesotrione	Can be stored at temperatures as low as -20°F. Keep away from heat and flame.
Me-Too-Lachlor®	Metolachlor	No storage limitations specified.
Parallel® Parrlay® Stalwart®		This product may be stored at temperatures down to -30°F.
Sencor 4F® Sencor 75® Sencor DF®		Store in a cool, dry place.
Ally XP® Escort XP® Metsulfuron 60EG AG® Metsulfuron 60EG IVM® Purestand®	Metsulfuron-methyl	Store in a cool, dry place.
Drexel MSMA-6 Plus® Prokoz Turf Max MSMA 6+® Prokoz Turf Max MSMA 6.6®	Monosodium acid methanearsonate (MSMA)	Storage should be in a cool, dry area away from any heat or ignition source. High heat may form volatile arsenic compounds.
Devrinol 10-G® Devrinol 2-G Ornamental® Devrinol 50-DF® Devrinol 50-DF Ornamental®	Napropamide	Store in a cool dry place.
Devrinol 2-EC®		Store in a cool dry place. Do not store below 20°F.
Alanap®	Naptalam	Normal storage temperature should be between 60°F and 80°F. This product should not be stored below 60°F, or it may crystallize or precipitate. The crystallized product may be redissolved by gently warming to 95°F. ALWAYS ROLL, SHAKE, OR STIR PRODUCT WELL BEFORE USE.
Accent®	Nicosulfuron	Store in a cool, dry place.
Solicam®	Norflurazon	No storage limitations specified.
Oryzalin® Surflan®	Oryzalin	No storage limitations specified.
Ronstar®	Oxadiazon	No storage limitations specified.
Galigan 2E® Goal 2XL® GoalTender® OxiFlo 2EC®	Oxyfluorfen	Keep from freezing. Store above 32°F.
Firestorm® Gramoxone Inteon® Gramoxone Super Tres®	Paraquat dichloride	Store at temperatures above 32°F.

Acumen® Helena Pendimethalin® Pendant® Pendimax® Pendulum 3.3® Prowl 3.3 EC® Stealth®	Pendimethalin	Do not store below 40°F. Extended storage at temperatures below 40°F can result in the formation of crystals on the bottom of the container. If crystallization does occur, store the container on its side at room temperature (70°F) and rock occasionally until crystals redissolve.
Pendulum AquaCap®		Do not store below 15°F. Extended storage at temperatures below 15°F can result in the formation of crystals on the bottom of the container. If crystallization does occur, store the container on its side at room temperature (70°F) and rock occasionally until crystals redissolve.
Pendulum 2G® Pendulum WDG®		Do not store above 120°F. Store in a cool, dry place.
Prowl H ₂ O®		Prowl H ₂ O herbicide freezes around 15°F and is stable under conditions of freezing and thawing. Product that has been frozen should be thawed and recirculated prior to use.
Galleon®, Grasp®, Sapphire®	Penoxsulam	Store in a cool, dry place.
Spin-Aid®	Phenmedipham	Store in a cool, dry place. Do not use or store near heat or open flame.
Barricade® Endurance® Quali-Pro Prodiamine®	Prodiamine	No storage limitations specified.
Pramitol 25E® Pramitol 45C® Sonora 45C®	Prometon	Store at temperatures above 32°F.
Caparol 4L® Prometryne 4L® (Agrilliance)	Prometryn	Store in a dry place.
Prometryne 4L® (UAP-Loveland)		Store in a cool, dry place.
Kerb®	Pronamide	Store in a cool, dry place but not below 32°F.
Stam 4E® Stam 45C® Stam M4®	Propanil	Ground all metal containers when transferring product. Protect from freezing. If stored below 32°F and crystals form, warm to 72°F for 24 hours, periodically shaking or rolling container to reconstitute.
Stam 80 EDF®		Do not use, pour, spill, or store near heat or open flame.
Super Wham!®		Store at temperatures above 32°F. If product is allowed to freeze, warm to 50°F and agitate before using.
Edict® ET®	Pyraflufen	Store in a cool place.
Staple LX®	Pyriithiobac	Store in a cool, dry place.
Drive®	Quinclorac	Do not store box under dampness or high humidity.
Gowan Targa®	Quizalofop-p-ethyl	Store in a cool, dry place.
Matrix®	Rimsulfuron	Store in a cool, dry place.
Detail®, Sharpen®, Treevix®	Saflufenacil	Do not store near heat or open flame (Detail®, Sharpen®). Store in cool, dry, well-ventilated area. DO NOT store this product under wet conditions (Treevix®).
Poast® Poast Plus® Sethoxydim G-Pro®	Sethoxydim	Do not store below 32°F or above 100°F. Store in a dry place away from heat or open flame.
Rezult G®		Do not allow this product to freeze.

Sentry Simazine 90 DF® Agrisolutions Simazine 4L® Princep Caliber 90® Sim-Trol 90DF®	Simazine	Store in a dry place.
Drexel Simazine 4L® Drexel Simazine 90DF®		Store in a cool, dry area away from any heat or ignition source.
Clean Crop Simazine 4L® Clean Crop Simazine 90 WDG® Agrisolutions Simazine 90 DF® Sim-Trol 4L®		Store in a cool, dry place.
Dual Magnum® Dual II Magnum®	S-metolachlor	Product may be stored at temperatures down to -30°F.
Dual II G Magnum®		Store in a dry place.
Ultra Blazer®	Sodium salt of acifluorfen	Do not store below 32°F.
Basagran®	Sodium salt of bentazon	Do not store at less than 32°F and do not allow product to freeze.
Basagran T/O® Rezult B®		Do not allow product to freeze.
Dismiss Turf®, Spartan®	Sulfentrazone	Store in a cool, dry place, and avoid excess heat.
Oust XP®	Sulfometuron-methyl	Store in a cool, dry place.
Outrider®	Sulfosulfuron	Store under cool, dry conditions (below 120°F). Do not store under moist conditions.
Laudis®	Tembotrione	No storage limitations specified.
Sinbar®	Terbacil	Store in a cool, dry place.
Mandate®	Thiazopyr	Store this product under dry conditions (between 14°F and 104°F). If crystals develop, place in a warm area (40°F) until crystals redissolve.
Harmony GT XP®	Thifensulfuron-methyl	Store in a cool, dry place.
Bolero®	Thiobencarb	Store in cool, dry place. Protect from excessive heat.
Armezon®, Frequency®, Impact®	Topramezone	Store product in a cool, dry place. DO NOT store under wet conditions (Armezon®, Frequency®, Impact®). If this product has been stored where freezing temperatures have occurred, agitate or mix contents of container well before use.
Express XP®	Tribenuron-methyl	Store in a cool, dry place.
Forestry Garlon® Garlon 3A® Tahoe® Turflon II®	Triclopyr	Store above 28°F or agitate before use.
Grandstand®		Store above 28°F or agitate before use. Do not store near heat or open flame.
Monument®	Trifloxysulfuron-sodium	Store in a cool, dry place.
Treflan TR-10® Trifluralin 10G® Trust 10G®	Trifluralin	This product may be stored in unheated warehouses.
Treflan 4EC® Treflan 4L® Treflan HFP® Trifluralin 4EC® (several manufacturers) Trifluralin HF® Cornbelt Trifluralin® Royster Clark Trifluralin HFP4® Trilin® Trust Herbicide®		Avoid freezing. Store above 40°F. If frozen, poor weed control may result. Do not store near heat or flame.
*Does not include prepackaged herbicide mixtures.		