

Storage Limitation Statements: Temperature--Herbicides¹

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

Introduction

The effectiveness and usability of many pesticides is influenced by the temperature at which they were held in storage. Most labels of liquid pesticides that contain specific information on adequate storage temperatures for their products will generally state a temperature in the 40 to 100° F range. For most of Florida, freezing is not a normal 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 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 regarding pesticide storage problems. Heat can cause some pesticides to volatilize and drift from their containers, especially if containers are not adequately sealed. Flammability is a problem with some pesticides in the presence of heat and/or open flame. It is discussed in more detail in UF/IFAS EDIS document PI-97, *Pesticide Labeling: Physical or Chemical Hazards* (<http://edis.ifas.ufl.edu/PI134>).

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

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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 does 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.



Figure 1. Pesticide drum bulging from extreme heat.

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 of storage temperature limitations for individual products, consult the “Storage and Disposal” section of the pesticides label (e.g., 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 products manufacturer.

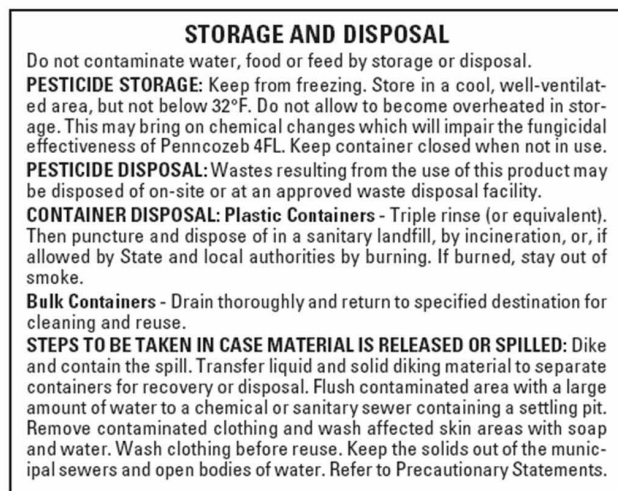


Figure 2. The Storage and Disposal section of the label often contains specific temperature information.

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

Table 1 provides a listing of many commonly-used agricultural herbicides registered for use in Florida. They are listed alphabetically by active ingredient common name (center column) with their trade names and any storage limitation statements that may be listed in their Storage and Disposal directions. Not every herbicide common active ingredient and/or their associated trade products list storage limitations within their storage statements.

Additional Information

Fishel, F.M. 2006. Pesticide Labeling: Physical or Chemical Hazards. UF/IFAS EDIS Extension Document PI-97. <http://edis.ifas.ufl.edu/PI134>

Fishel, F.M. 2006. Pesticide Labeling: Storage and Disposal. UF/IFAS EDIS Extension Document PI-106. <http://edis.ifas.ufl.edu/PI143>

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

| Trade name* | Common name | Label statements |
|---|---------------------|---|
| Hardball [®] Helena 2010 [®] Unison [®] Weedar [®] Weedone 650 [®] | 2,4-D | Do not store below temperature of 0° F. If frozen, warm to 40° F and re-dissolve before using by rolling or shaking container. Store at temperature above 32° F. If allowed to freeze, warm to at least 40° F and remix before using. Freezing does not alter this product. Do not store near heat or open flame. |
| Milestone [®] | Aminopyralid | If this product is exposed to subfreezing temperatures, the active ingredient may crystallize and settle out of solutions. 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 4L [®] Agri-Star [®] Atrazine 4F [®] Atrazine 90WDG [®] | Atrazine | Store in a dry place. Containers must be stored in a cool, dry, well-ventilated area. Do not store near heat or open flame. Store in cool, dry place. |
| Balan DF [®] | Benfenin | 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. |
| 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. |
| Classic [®] | Chlorimuron ethyl | Store in a cool, dry place. |
| Arrow [®] Envoy [®] Section [®] Select [®] Trigger [®] Volunteer [®] | Clethodim | Store in cool, dry place. |
| Command [®] | Clomazone | Store above -4° F to keep product from freezing. If frozen, thaw before use. |
| 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. |

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| Reglone [®] Reward [®] Weedtrine [®] | Diquat dibromide | Store at temperatures above 32° F. |
| Dimension EC [®] Dimension Ultra 2SC [®] and 40WP [®] | Dithiopyr | Store this product above 32° F to avoid crystallization. If crystals form or product freezes, move product to area with ambient temperature above 32° F and shake well until crystals have dissolved. 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. |
| Eptam 20-G [®] Eptam 7-E [®] , Eradicane 6.7-E [®] | EPTC | Store in a cool, dry place. Can be stored at temperatures as low as minus 50° F. |
| Curbit [®] Sonalan HFP [®] Sonalan 10G [®] | Ethalfuralin | Avoid freezing. Store above 40° F. If frozen, poor weed control may result. Do not use or store near heat or open flame. Avoid freezing - store above 40° F. |
| Resource [®] | Flumiclorac-pentyl | Store in a cool, dry place. |
| Broadstar [®] Chateau [®] Payload [®] Sureguard [®] Valor [®] | Flumioxazin | Store in a cool, dry, secure place. |
| Fluometuron 4L [®] | Fluometuron | Store in a dry location. |
| Spotlight [®] Vista [®] | Fluroxypyr 1-methylheptyl ester | Store above 10° F or warm and agitate before use. |
| Finale [®] Ignite [®] Ignite 280 SL [®] | Glufosinate-ammonium | Do not use or store near heat or open flame. 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 Ignite Herbicide is below 32° F, the material should not be pumped until its temperature exceeds 32° F. Protect against direct sunlight. |
| Extra Credit 5 [®] Recoil [®] | 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 68° F for several days to redissolve and shake or roll to mix well before using. Do not store near heat or open flame. |

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| 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 68° F for several days to redissolve and shake or roll to mix well before using. |
| Accord Concentrate [®] Glypro [®] Rodeo [®] Aqua Star [®] Aquamaster [®] Cornerstone [®] Cornerstone Plus [®] Glyphos Aquatic [®] Rascal [®] Rascal Plus [®] Razor [®] Razor Pro [®] | Glyphosate, isopropylamine salt | <p>Store above 10° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.</p> <p>Store above 5° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.</p> <p>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.</p> <p>Store above 5° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.</p> <p>Store above 10° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to redissolve and shake or roll to mix well before using.</p> <p>Store above 10° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to allow crystals to redissolve, then shake well before using.</p> <p>Store above 10° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 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.</p> <p>Store above 10° F to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68° F for several days to redissolve and shake, roll or agitate to mix well before using.</p> |
| Velpar [®] | Hexazinone | Store in a cool, dry place. |

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| Cadre [®] Plateau [®] Cadre DF [®] | Imazapic | Keep from freezing. Do not store below 20° F. 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. |
| 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 [®] Tenkoz MCPA Ester 4 [®] | MCPA | Store in a dry location. Do not store below 40° F or expose to subfreezing temperatures. Store in a dry location. |
| Sencor 4F [®] Sencor 75 [®] Sencor DF [®] | Metribuzin | 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 [®] Devrinol 2-EC [®] | Napropamide | Store in a cool dry place. Store in a cool dry place. Do not store below 20° F. |
| Accent [®] | Nicosulfuron | Store in a cool, dry place. |

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| 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 [®] Pendulum AquaCap [®] Pendulum 2G [®] Pendulum WDG [®] Prowl H ₂ O [®] | 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 re-dissolve. 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 re-dissolve. Do not store above 120° F. Store in a cool, dry place. 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. |
| Pramitol 25E [®] Pramitol 4SC [®] Sonora 4SC [®] | Prometon | Store at temperatures above 32° F. |
| Caparol 4L [®] Prometryne 4L [®] (Agrilliance) Prometryne 4L [®] (UAP-Loveland) | Prometryne | Store in a dry place. Store in a cool, dry place. |
| Stam 4E [®] Stam 4SC [®] Stam M4 [®] Stam 80 EDF [®] Super Wham! [®] | 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. Do not use, pour, spill, or store near heat or open flame. Store at temperature above 32° F. If product is allowed to freeze, warm to 50° F and agitate before using. |
| Drive [®] | Quinclorac | Do not store box under dampness or high humidity. |

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| Gowan Targa [®] | Quizalofop-p-ethyl | Store in a cool, dry place. |
| Matrix [®] | Rimsulfuron | Store in a cool, dry place. |
| Poast [®] Poast Plus [®] Sethoxydim G-Pro [®] Rezult G [®] | Sethoxydim | Do not store below 32° F or above 100° F. Store in a dry place away from heat or open flame. Do not allow this product to freeze. |
| Sentry Simazine 90 DF [®] Agrisolutions Simazine 4L [®] Princep Caliber 90 [®] Sim-Trol 90DF [®] Drexel Simazine 4L [®] Drexel Simazine 90DF [®] Clean Crop Simazine 4L [®] Clean Crop Simazine 90 WDG [®] Agrisolutions Simazine 90 DF [®] Sim-Trol 4L [®] | Simazine | Store in a dry place. Store in a cool, dry area away from any heat or ignition source. Store in a cool, dry place. |
| Ultra Blazer [®] | Sodium salt of acifluorfen | Do not store below 32° F. |
| Basagran [®] Basagran T/O [®] Rezult B [®] | Sodium salt of bentazon | Do not store at less than 32° F and do not allow product to freeze. Do not allow this product to freeze. |
| Oust XP [®] | Sulfometuron methyl | Store in a cool, dry place. |
| Sinbar [®] | Terbacil | Store in a cool, dry place. |
| Mandate [®] | Thiazopyr | Store this product under dry conditions (between 14° F and 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. |
| Express XP [®] | Tribenuron methyl | Store in a cool, dry place. |
| Forestry Garlon [®] Garlon 3A [®] Tahoe [®] Turflon II [®] Grandstand [®] | Triclopyr | Store above 28° F or agitate before use. 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. |

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| Treflan TR-10 [®] Trifluralin 10G [®] Trust 10G [®] Treflan 4EC [®] Treflan 4L [®] Treflan HFP [®] Trifluralin 4EC [®] (several manufacturers) Trifluralin HF [®] Combelt Trifluralin [®] Royster Clark Trifluralin HFP4 [®] Trilin [®] Trust Herbicide [®] | Trifluralin | This product may be stored in unheated warehouses. Avoid freezing. Store above 40° F. If frozen, poor weed control may result. Do not store near heat or flame. |
| *Does not include pre-packaged herbicide mixtures. | | |