

PM 25

241-346

12-16-99

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DEC 16 1999

Laura L. Whatley
American Cyanamid Company
P.O. Box 400
Princeton, NJ 08543-0400

Dear Ms. Whatley:

Subject: Revised Labeling
Arsenal Herbicide
EPA Registration No 241-346
Your Submission Dated December 9, 1999

The amendment referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended is acceptable provided that you:

1. Make the labeling changes listed below before you release the product for shipment bearing the amended labeling:

a. When the labeling is printed assure that the Signal Word and Keep Out Of The Reach of Children meet the type size requirements specified by 40 CFR 156.10(h)(1)(iv).

b. In the Environmental Hazards Section delete "For terrestrial uses,". Refer to PR Notice 93-8.

c. For clarity in the directions for Paved Surfaces specify the application rate intended for this product. An application rate in fluid ounces per 1000 square feet appears more appropriate than pints per acre.

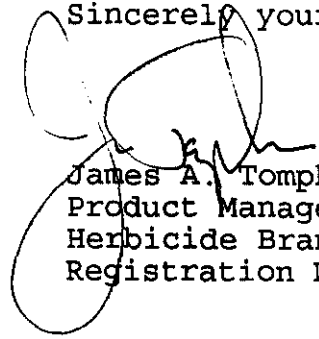
d. Specify an application rate for the product for bareground application either in pints per acre or add a reference to the rates specified in the Weeds Controlled By Arsenal Herbicide section.

2. Submit one (1) copy of your final printed labeling before you release the product for shipment.

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A stamped copy of the labeling is enclosed for your records.

Sincerely yours,

A handwritten signature in black ink, appearing to read "James A. Tompkins", is written over the typed name. The signature is somewhat stylized and overlaps the typed text.

James A. Tompkins
Product Manager (25)
Herbicide Branch
Registration Division (7505C)

Enclosure

ARSENAL® herbicide

ACTIVE INGREDIENT:

Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)* 28.7%

INERT INGREDIENTS 71.3%

TOTAL 100.0%

*Equivalent to 22.6% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon.

EPA Reg. No. 241-346

U.S. Patent No. 4,798,619

EPA Est. No.

**KEEP OUT OF REACH OF CHILDREN
CAUTION!/PRECAUCION!**

PRECAUCION AL USUARIO: Si usted no lee ingles, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

In case of an emergency endangering life or property involving this product, call collect, day or night, Area Code 973-683-3100.

See next page for Additional Precautionary Statements

AMERICAN CYANAMID COMPANY
~~NORTH AMERICA~~ GLOBAL AGRICULTURAL PRODUCTS DIVISION
SPECIALTY PRODUCTS DEPARTMENT
ONE CAMPUS DRIVE
PARSIPPANY, NJ 07054 ©1999

**ACCEPTED
with COMMENTS
In EPA Letter Dated:
DEC 16 1999**

Net Contents:

**Under the Federal Insecticide,
Fungicide, and Rodenticide Act,
as amended, for the pesticide
registered under EPA Reg. No.
241-346**

®Registered Trademark of American Cyanamid Company

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS

CAUTION!

Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

FIRST AID

IF ON SKIN: ~~Wash with plenty of soap and water.~~ Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

IF IN EYES: ~~Flush with plenty of water. Get medical attention if irritation persists.~~ Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice.

IF INHALED: ~~Remove victim to fresh air.~~ Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment.

PHYSICAL AND CHEMICAL HAZARDS

Spray solutions of ARSENAL herbicide should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

DO NOT mix, store or apply ARSENAL herbicide or spray solutions of ARSENAL herbicide in unlined steel (except stainless steel) containers or spray tanks.

ENVIRONMENTAL HAZARDS

For terrestrial uses, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. DO NOT contaminate water when disposing of equipment washwaters.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

ARSENAL herbicide should be used only in accordance with recommendations on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

STORAGE AND DISPOSAL

PROHIBITIONS: DO NOT store below 10°F. DO NOT contaminate water, food or feed by storage or disposal.

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 FOR 2.5 GALLON AND 30 GALLON: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in an approved sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

CONTAINER DISPOSAL FOR FIELD KEG, MINIBULK AND BULK: Return empty container for reuse.

IMPORTANT

DO NOT use on food or feed crops. **DO NOT** treat irrigation ditches, or water used for crop irrigation or for domestic uses. Keep from contact with fertilizers, insecticides, fungicides and seeds. **DO NOT** ~~apply except as recommended or~~ drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas. **DO NOT** side trim desirable vegetation with this product. Prevent drift of spray to desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

GENERAL INFORMATION

Use Sites: ARSENAL herbicide is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to noncropland areas such as railroad, utility, pipeline and highway rights-of-way, utility plant sites, petroleum tank farms, pumping installations, fence rows, storage areas, non-irrigation ditchbanks, and other similar areas. For maintenance of noncropland sites described above, ARSENAL herbicide may be applied to non-irrigation ditches and low lying areas when water has drained but may be isolated in pockets due to uneven or unlevel conditions. ARSENAL herbicide is recommended for the establishment and maintenance of wildlife openings. ARSENAL herbicide may also be used for the release of unimproved bermudagrass (see specific directions) and for use under certain paved surfaces (see specific directions).

Application Methods: ARSENAL herbicide will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species and ARSENAL herbicide will

provide residual control of labeled weeds which germinate in the treated areas. This product may be applied either preemergence or postemergence to the weeds; however, postemergence application is the method of choice in most situations, particularly for perennial species. For maximum activity, weeds should be growing vigorously at the time of postemergence application and the spray solution should include a surfactant (See Adjuvant Section for specific recommendations). These solutions may be applied selectively by using low-volume techniques or may be applied broadcast by using ground equipment or aerial equipment. In addition, ARSENAL herbicide may also be used for stump and cut stem treatments (see specific directions).

Herbicidal Activity: ARSENAL herbicide is readily absorbed through leaves, stems, and roots and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground storage organs which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until two weeks after application. Complete kill of plants may not occur for several weeks. Applications of ARSENAL herbicide are rainfast one hour after treatment.

PRECAUTIONS FOR AVOIDING INJURY TO NON-TARGET PLANTS

Untreated trees can occasionally be affected by root uptake of ARSENAL herbicide through movement into the top soil. Injury or loss of desirable trees or other plants may result if ARSENAL herbicide is applied on or near desirable trees or other plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots.

DISCLAIMER

The label instructions for the use of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the use or application of the product contrary to label instructions, all of which are beyond the control of American Cyanamid Company. All such risks shall be assumed by the user.

American Cyanamid Company warrants only that the material contained herein conforms to the chemical description on the label and is reasonably fit for the use therein described when used in accordance with the directions for use, subject to the risks referred to above.

Any damages arising from a breach of this warranty shall be limited to direct damages and shall not include consequential commercial damages such as loss of profits or values or any other special or indirect damages.

American Cyanamid Company makes no other express or implied warranty, including other express or implied warranty of FITNESS or of MERCHANTABILITY.

ADJUVANTS

Postemergence applications of ARSENAL herbicide require the addition of a spray adjuvant.

Nonionic Surfactants: Use a nonionic surfactant at the rate 0.25% v/v or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with a HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product (alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements).

Methylated Seed Oils or Vegetable Oil Concentrates: Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre methylated seed oil or vegetable based seed oil concentrates should be mixed at a rate of 1% of the total spray volume or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in ARSENAL herbicide deposition and uptake by plants under moisture or temperature stress.

Silicone Based Surfactants: See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Fertilizer/Surfactant Blends: Nitrogen based liquid fertilizers such as 28%N, 32%N, 10-34-0 or ammonium sulfate, may be added at the rate of 2 to 3 pints per acre in combination with the recommended rate of nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate. The use of fertilizers in a tank mix without a nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate is not recommended.

BRUSH CONTROL

AERIAL APPLICATIONS:

All precautions should be taken to minimize or eliminate spray drift. Fixed wing aircraft and helicopters can be used to apply ARSENAL herbicide, however, DO NOT make applications by fixed wing aircraft unless appropriate buffer zones can be maintained to prevent spray drift out of the target area or, when treating open tracts of land, spray drift as a result of fixed wing aircraft application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a Microfoil™ boom, Thru-Valve™ boom or raindrop nozzles, must be used and calibrated. Except when applying with a Microfoil boom, a drift control agent may be added at the recommended label rate. To avoid drift, applications should not be made during inversion conditions, when winds are gusty, or any other conditions which allow drift. Side trimming is not recommended with ARSENAL herbicide unless death of treated tree can be tolerated.

Uniformly apply the recommended amount of ARSENAL herbicide in 5 to 30 gallons of water per acre; include in the spray solution a nonionic surfactant or methylated seed oil or manufacturer's label rate of a silicone-based surfactant (See the Adjuvant section of this label for specific recommendations). A foam reducing agent may be added at the recommended label rate, if needed.

IMPORTANT: Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

GROUND APPLICATIONS:

IMPORTANT: To minimize spray drift, select proper nozzles to avoid spraying a fine mist, use pressures less than 50 psi, and do not spray under gusty or windy conditions. Add a foam reducing agent, if needed, and a spray pattern indicator, if desired, at the recommended label rates. Clean application equipment after using this product by thoroughly flushing with water.

When making applications to rights-of-way corridors where desirable tree roots may extend, use 1 to 3 pints of ARSENAL herbicide per acre in combination with recommended tank-mixes. It is not recommended to use rates higher than 3 pints per acre in these situations as injury or death of desirable trees may occur when their roots extend into treated zones.

Side Trimming:

DO NOT side trim with ARSENAL herbicide unless severe injury or death of the treated tree can be tolerated. ARSENAL herbicide is readily translocated and can result in death of the entire tree.

Low Volume:

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5 to 5% ARSENAL herbicide plus surfactant (See the Adjuvant section of this label for specific recommendations). A foam reducing agent may be applied at the recommended label rate, if needed. For control of difficult brush species (see "Weeds Controlled" section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but do not apply more than 6 pints of ARSENAL herbicide per acre. Excessive wetting of foliage is not recommended. See the Mixing Guide below for some suggested volumes of ARSENAL herbicide and water.

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SUGGESTED TANK-MIXES AND APPLICATION RATES*

Target Vegetation	Rate of ARSENAL herbicide	Tank Mix
Mixed hardwoods without elm, locust, or pine	1.0 - 1.5% by volume	Surfactant
Mixed hardwoods containing elm, locust, and pine	0.5 - 1.0% by volume	Accord™ at 2 - 3% by volume plus surfactant
Mixed hardwoods with locust and pine but no elm	0.5 - 1.0% by volume	Krenite™ at 2 - 5% by volume plus surfactant
Mixed hardwoods with locust and elm but no pine	0.5 - 1.0% by volume	Escort™ at 2 oz./Acre or 2.3 grams/gal. plus surfactant

*Tank mixes with 2,4-D or products containing 2,4-D have resulted in reduced efficacy of ARSENAL herbicide.

MIXING CHART

% Solution	Amount ARSENAL per Gallon of Mix	Amount ARSENAL per 4 Gallon Backpack
0.5 %	0.7 0.6 oz	2.7 2.6oz
1.0%	1.3 oz	5.5 5.1oz
2.0%	2.7 2.6oz	11.0 10.2oz
3.0%	4.0 3.8oz	16.0 15.4oz
5.0%	6.4 oz	25.6 oz

MEASURING CHART

128 ounces	=	1 gallon
16 ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

Application Tips: For low volume, select proper nozzles to avoid over-application. Proper application is critical to ensure desirable results. Best results are achieved when the spray covers the crown and approximately 70 percent of the plant. The use of an even flat fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Recommended tip sizes include 4004E, or 1504E. For a straight stream and cone pattern, adjustable cone nozzles such as 5500 X3 or 5500 X4 may be used. Attaching a roll-over valve onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat fan and cone tips on the same gun.

Proper Spray Pattern: Moisten, but do not drench target vegetation causing spray solution to run off.

Low Volume with Backpacks:

For brush up to 4 feet tall, spray down on the crown, covering crown and penetrating approximately 70% of the plant.

For brush 4 to 8 feet tall, swipe the sides of target vegetation by directing spray to at least two sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown ~~when ever~~ whenever possible.

For brush over 8 feet tall, lace sides of the brush by directing spray to at least two sides of the target in smooth zigzag motions from crown to bottom.

Low Volume with Hydraulic Handgun Application Equipment:

Use same technique as described above for ~~individual stem treatments~~ Low Volume with Backpacks.

For broadcast applications, simulate a gentle rain near the top of target vegetation, allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution which contacts the understory may result in severe injury or death of plants in the understory.

SPRAY SOLUTION MIXING GUIDE FOR LOW VOLUME APPLICATIONS

AMOUNT OF SPRAY SOLUTION BEING PREPARED	DESIRED CONCENTRATION (fluid volume)				
	0.5%	0.75%	1%	1.5%	5%
	(amount of ARSENAL to use)				
1 gallon	0.6 oz.	0.9 oz.	1.3 oz.	1.9 oz.	6.5 oz.
3 gallons	1.9 oz.	2.8 oz.	3.8 oz.	5.8 oz.	1.2 pints
4 gallons	2.5 oz.	3.8 oz.	5.1 oz.	7.7 oz.	1.6 pints
5 gallons	3.2 oz.	4.8 oz.	6.5 oz.	9.6 oz.	2 pints
50 gallons	2 pints	3 pints	4 pints	6 pints	10 quarts
100 gallons	4 pints	6 pints	8 pints	6 quarts	5 gallons

2 tablespoons = 1 fluid ounce

High Volumes:

For optimum performance when spraying medium to high density brush, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray run-off, causing increased ground cover injury, and injury to desirable species. To prepare the spray solution, thoroughly mix ARSENAL herbicide at a rate of 2 to 6 pints per acre (see Important section under Ground Applications) in

water and add a surfactant (See Adjuvant section for specific recommendations and rates of surfactants). A foam reducing agent may be added at the recommended label rate, if needed. For control of difficult species (see "Weeds Controlled" section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but do not apply more than 6 pints of ARSENAL herbicide per acre. Uniformly cover the foliage of the vegetation to be controlled but do not apply to run-off. Excessive wetting of foliage is not recommended.

TANK MIXES FOR BRUSH CONTROL:

ARSENAL herbicide may be tank-mixed with Accord, Roundup™, Krenite, Escort™, Telar™, Tordon™ K, Garlon™ 3A, Banvel™ and Vanquish™ to provide control of ARSENAL tolerant species.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank-mixes. Tank-mixing with 2,4-D or products which contain 2,4-D have resulted in reduced performance of ARSENAL herbicide.

INVERT EMULSIONS:

ARSENAL herbicide can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray run-off, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

CUT STUBBLE:

ARSENAL herbicide can be applied within 2 weeks after mechanical mowing or cutting of brush. To suppress or control resprouting, uniformly apply a spray solution of ARSENAL herbicide at the rate of 1 to 2 pints per acre to the cut area. ARSENAL herbicide may be tank-mixed with Tordon K to aid in control or suppression of brush. The addition of 5% (v/v) or more of a penetrating agent can aid in uptake through the bark or exposed roots.

Cut stubble applications are made to the soil and cut brush stumps. This type of application may increase ground cover injury. However, vegetation will recover. Making applications of ARSENAL herbicide directly to the soil can increase potential root uptake causing injury or death of desirable trees.

Efficacy can be increased and root uptake by desirable vegetation can be decreased if the brush is allowed to regrow and the foliage is treated. See the Brush Control section of this label.

STUMP AND CUT STEM TREATMENTS:

ARSENAL herbicide may be used to control undesirable woody vegetation on noncropland by applying the ARSENAL herbicide solution to the cambium area of freshly-cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. Do not overapply solution causing run-off or puddling.

Mixing: ARSENAL herbicide may be mixed as either a concentrated or dilute solution for stump and cut stem treatments. The dilute solution may be used for applications to the surface of the stump or to cuts on the stem of the target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

To prepare a dilute solution, mix 8 to 12 fluid ounces of ARSENAL herbicide with one gallon of water. If temperatures are such that freezing of the spray mixture may occur, antifreeze (ethylene glycol) may be used according to manufacturer's label to prevent freezing. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums. To prepare a concentrated solution, mix 2 quarts of ARSENAL herbicide with no more than 1 quart of water.

APPLICATION WITH DILUTE SOLUTIONS:

For cut stump treatments: Spray or brush the solution onto the cambium area of the freshly cut stump surface. Insure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

For tree injection treatments: Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than one inch intervals between cut edges. Insure that the injector completely penetrates the bark at each injection site.

For frill or girdle treatments: Using a hatchet, machete, or similar device, make cuts through the bark at intervals around the tree with no more than two inch intervals between cut edges. Spray or brush the solution into each cut until thoroughly wet.

APPLICATION WITH CONCENTRATED SOLUTIONS:

For tree injection treatments: Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least one injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3 inch DBH tree will receive 1 injection cut and a 6 inch DBH tree will receive 2 injection cuts. On trees requiring more than one injection site place the injection cuts at approximately equal intervals around the tree.

For frill or girdle treatments: Using a hatchet, machete, or similar device, make cuts through the bark at approximately equal intervals around the tree. Make at least one cut for every 3 inches of DBH on the target tree. For example, a 3 inch DBH tree will receive 1 cut and a 6 inch DBH tree will receive 2 cuts. Spray or brush the solution into each cut until thoroughly wet.

NOTE: Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

FOR CONTROL OF UNDESIRABLE WEEDS UNDER PAVED SURFACES

ARSENAL herbicide can be used under asphalt, pond liners and other paved areas, ONLY in industrial sites or where the pavement has a suitable barrier along the perimeter that prevents encroachment of roots of desirable plants.

ARSENAL herbicide should be used only where the area to be treated has been prepared according to good construction practices. If rhizomes, stolons, tubers or other vegetative plant parts are present in the site, they should be removed by scalping with a grader blade to a depth sufficient to insure their complete removal.

IMPORTANT: Paving should follow ARSENAL herbicide applications as soon as possible. **DO NOT** apply where the chemical may contact the roots of desirable trees or other plants.

The product is not recommended for use under pavement on residential properties such as driveways or parking lots, nor is it recommended for use in recreational areas such as under bike or jogging paths, golf cart paths, or tennis courts, or where landscape plantings could be anticipated.

Injury or death of desirable plants may result if this product is applied where roots are present or where they may extend into the treated area. Roots of trees and shrubs may extend a considerable distance beyond the branch extremities or so-called drip line.

rate ?

APPLICATION DIRECTIONS FOR PAVED SURFACES:

Applications should be made to the soil surface only when final grade is established. Do not move soil following ARSENAL herbicide application.

Apply ARSENAL herbicide in sufficient water (at least 100 gal. per acre) to ensure thorough and uniform wetting of the soil surface, including the shoulder areas. Add ARSENAL herbicide at a rate of 6 pints per acre to clean water in the spray tank during the filling operation. Agitate before spraying.

If the soil is not moist prior to treatment, incorporation of ARSENAL is needed for herbicide activation. ARSENAL herbicide can be incorporated into the soil to a depth of 4 to 6 inches using a rototiller or disc. Rainfall or irrigation of 1 inch will also provide uniform incorporation. Do not allow treated soil to wash or move into untreated areas.

FOR CONTROL OF UNDESIRABLE WEEDS IN UNIMPROVED BERMUDAGRASS AND BAHIAGRASS

ARSENAL herbicide may be used on unimproved bermudagrass and bahiagrass turf such as roadsides, utility rights-of-way and other non-cropland industrial sites. The application of ARSENAL herbicide on established common and coastal bermudagrass and bahiagrass provides control of labeled broadleaf and grass weeds. Competition from these weeds is eliminated, releasing the bermudagrass and bahiagrass. Treatment of bermudagrass with ARSENAL herbicide results in a compacted growth habit and seedhead inhibition.

Uniformly apply with properly calibrated ground equipment using at least 10 gallons of water per acre with a spray pressure 20 to 50 psi.

IMPORTANT: Temporary yellowing of grass may occur when treatment is made after growth commences. DO NOT add surfactant in excess of the recommended rate (1 oz. per 25 gallons of spray solution). DO NOT APPLY to grass during its first growing season. DO NOT APPLY to grass that is under stress from drought, disease, insects, or other causes.

DOSAGE RATES AND TIMING:

Bermudagrass - Apply ARSENAL herbicide at 6 to 12 oz. per acre when the bermudagrass is dormant. Apply ARSENAL herbicide at 6 to 8 oz. per acre after the bermudagrass has reached full green-up. Applications made during green-up will delay green-up. Include a surfactant in the spray solution ~~a surfactant~~ (See IMPORTANT statement above).

For additional pre-emergence control of annual grasses and small seeded broadleaf weeds, add PENDULUM® herbicide at the rate of 3.3 to 6.6 lbs. per acre. Consult the PENDULUM herbicide label for weeds controlled and for other use directions and precautions.

For control of johnsongrass in bermudagrass turf, apply ARSENAL herbicide at 8 oz. per acre plus Roundup at 12 oz. per acre plus surfactant. For additional control of broadleaves and vines, Garlon 3A may be added to the above mix at the rate of 1-2 pints per acre. Observe all precautions and restrictions on the Garlon 3A and Roundup label.

Bahiagrass - Apply ARSENAL herbicide at 4 to 8 oz. per acre when the bahiagrass is dormant or after the grass has initiated green-up but has not exceeded 25% green-up. Include in the spray solution a surfactant (See Adjuvant section for specific recommendations on surfactants).

WEEDS CONTROLLED:

Bedstraw (Galium spp.)
 Bishopweed (Ptilimnium capillaceum)
 Buttercup (Ranunculus parviflorus)
 Carolina geranium (Geranium carolinianum)
 Fescue (Festuca spp.)
 Foxtail (Setaria spp.)
 Little barley (Hordeum pusillum)
 Seedling Johnsongrass (Sorghum halepense)
 Wild carrot (Daucus carota)
 White clover (Trifolium repens)
 Yellow woodsorrel (Oxalis stricta)

GRASS GROWTH AND SEEDHEAD SUPPRESSION

ARSENAL herbicide may be used to suppress growth and seedhead development of certain turfgrass in unimproved areas. When applied to desirable turf, ARSENAL herbicide may result in temporary turf damage and/or discoloration. Effects to the desirable turf may vary with environmental conditions. For optimum performance, application should be made prior to culm elongation. Applications may be made before or after mowing. If applied prior to mowing, allow at least three days of active growth before mowing. If following a mowing, allow sufficient time for the grasses to recover before applying this product or injury may be amplified.

DO NOT APPLY to turf under stress (drought, cold, insect damaged, etc.) or severe injury or death may occur.

Bermudagrass - Apply ARSENAL herbicide at 6 to 8 oz. per acre from early green-up to prior to seed head initiation. Do not add a surfactant for this application.

Cool Season Unimproved Turf - Apply ARSENAL herbicide at 2 oz. per acre plus 0.25% nonionic surfactant. For increased suppression, ARSENAL herbicide may be tank-mixed with such products as Campaign™ (24 oz. per acre) or Embark™ (8 oz. per acre). Tank-mixes may increase injury to desired turf. Consult each product label for recommended turf species and other use directions and precautions. Tank mixes with 2,4-D or products containing 2,4-D may decrease the effectiveness of ARSENAL herbicide.

TOTAL VEGETATION CONTROL WHERE BAREGROUND IS DESIRED

ARSENAL herbicide is an effective herbicide for preemergence or postemergence control of many annual and perennial broadleaf and grass weeds where bareground is desired. ARSENAL herbicide is particularly effective on hard-to-control perennial grasses. ARSENAL herbicide can be used alone or in tank-mix with Roundup, Finale™, MSMA, Diuron, Karmex™, PENDULUM, PLATEAU®, Simazine, Banvel, Vanquish, Milestone™, or Oust™. The degree and duration of control are dependent on the rate of ARENAL herbicide used, tank-mix partner, the volume of carrier, soil texture, rainfall and other conditions. ~~See the table below for rates in your specific region.~~

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank-mixes.

TANK MIX RECOMMENDATIONS FOR BAREGROUND:

Herbicide Rates per Acre*

Average Annual Rainfall in inches	ARSENAL in pints	PENDULUM WDG in lbs.	PENDULUM 3.3 EC in Quarts	Diuron rate in lbs. a.i.
<15 inches	1.5-3	6.6	4.8	4-6
15-35 inches	2-4	6.6	4.8	6-10
>35 inches	3-6	6.6	4.8	8-12

* Use higher rates for fall applications and in areas that have not been previously treated or that feature heavy infestations.

(Add color U.S. rainfall diagram)

Applications of ARSENAL herbicide may be made anytime of the year. Use equipment calibrated to deliver desired gallons per acre spray volume and uniformly distribute the spray pattern over the treated area.

Postemergence Applications: Always use a spray adjuvant (See Adjuvant section of this label) when making a postemergence application. For optimum performance on tough to control annual grasses, applications should be made at a total volume of 100 gallons per acre **or less**. For quicker burndown or brown-out of target weeds, ARSENAL herbicide may be tank-mixed with products such as Roundup, Finale, or MSMA. Tank mixes with 2,4-D or products containing 2,4-D have reduced performance of ARSENAL herbicide. Always follow the more restrictive label when tank-mixing.

rate ?

Spot Treatments: ARSENAL herbicide may be used as a follow-up treatment to control escapes or weed encroachment in a bareground situation. To prepare the spray solution, thoroughly mix in each gallon of water 0.5 to 5% ARSENAL herbicide plus an adjuvant. For increased burndown, include Roundup, Finale, MSMA, or similar products. For added residual weed control or to increase the weed spectrum add PENDULUM or Diuron. Always follow the more restrictive label when tank-mixing.

- ® Registered Trademarks of American Cyanamid Company
- ™ Microfoil is a trademark of Rhone Poulenc Ag. Company
- ™ Thru-Valve is a trademark of Waldrum Specialties
- ™ Accord, Campaign and Roundup are trademarks of Monsanto Company
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- ™ Embark is a trademark of PBI/Gordon Corporation
- ™ Finale is a trademark of AgrEvo USA Company

WEEDS CONTROLLED BY ARSENAL HERBICIDE

ARSENAL herbicide will provide preemergence or postemergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of ARSENAL. **For established biennials and perennials postemergence applications of ARSENAL are recommended.** The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low volume spray solutions (see "Low Volume" section of "Ground Applications"); low volume applications may provide control of the target species with less ARSENAL per acre than is shown for the broadcast treatments. ARSENAL herbicide should be used only in accordance with the recommendations on this label and the leaflet label.

Resistant Biotypes: Naturally occurring biotypes (a plant within a given species that has a slightly different, but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled by this and/or other herbicides (OUST™) with the ALS/AHAS enzyme inhibiting mode of action. If naturally occurring ALS/AHAS resistant biotypes are present in an area, ARSENAL herbicide should be tank-

mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

GRASSES

Apply 2-3 pints per acre¹

<u>COMMON NAME</u>	<u>SPECIES</u>	<u>GROWTH HABIT²</u>
Annual bluegrass	(<u>Poa annua</u>)	A
Broadleaf signalgrass	(<u>Brachiaria platyphylla platyphylla</u>)	A
Canada bluegrass	(<u>Poa compressa</u>)	P
Downy brome	(<u>Bromus tectorum</u>)	A
Fescue	(<u>Festuca spp.</u>)	A/P
Foxtail	(<u>Setaria spp.</u>)	A
Italian ryegrass	(<u>Lolium multiflorum</u>)	A
Johnsongrass	(<u>Sorghum halepense</u>)	P
Kentucky bluegrass	(<u>Poa pratensis</u>)	P
Lovegrass	(<u>Eragrostis spp.</u>)	A/P
Orchardgrass	(<u>Dactylis glomerata</u>)	P
Paragrass	(<u>Brachiaria mutica</u>)	P
Quackgrass	(<u>Agropyron repens</u>)	P
Sandbur	(<u>Cenchrus spp.</u>)	A
Sand dropseed	(<u>Sporobulus cryptandrus</u>)	A
Smooth brome	(<u>Bromus inermis</u>)	P
Vaseygrass	(<u>Paspalum urvillei</u>)	P
Wild oats	(<u>Avena fatua</u>)	A
Witchgrass	(<u>Panicum capillare</u>)	A

Apply 3-4 pints per acre¹

Barnyardgrass ³	(<u>Echinochloa crus-gali</u>)	A
Beardgrass	(<u>Andropogon spp.</u>)	P
Bluegrass, Annual ³	(<u>Poa annua</u>)	A
Cheat	(<u>Bromus secalinus</u>)	A
Crabgrass	(<u>Digitaria spp.</u>)	A
Crowfootgrass ³	(<u>Dactyloctenium aegyptium</u>)	A
Fall panicum ³	(<u>Panicum dichotomiflorum</u>)	A
Giant Reed	(<u>Arundo donax</u>)	A
Goosegrass	(<u>Eleusine indica</u>)	A
Itchgrass ³	(<u>Rottboellia exaltata</u>)	A
Junglerice ³	(<u>Echinochloa colonum</u>)	A
Lovegrass ³	(<u>Eragrostis spp.</u>)	A
Maidencane	(<u>Panicum hemitomon</u>)	A
Panicum, Browntop ³	(<u>Panicum fasciculatum</u>)	A
Panicum, Texas ³	(<u>Panicum texanum</u>)	A
Prairie threeawn	(<u>Aristida oligantha</u>)	P

Reed canarygrass	(<u>Phalaris arundinacea</u>)	P
Sandbur, Field ³	(<u>Cenchrus incertus</u>)	A
Signalgrass ³	(<u>Brachiaria platyphylla</u> spp.)	A
Torpedograss	(<u>Panicum repens</u>)	P
Wild barley	(<u>Hordeum</u> spp.)	A
Wooly Cupgrass ³	(<u>Eriochloa villosa</u>)	A

Apply 4-6 pints per acre¹

Bahiagrass	(<u>Paspalum notatum</u>)	P
Bermudagrass ⁴	(<u>Cynodon dactylon</u>)	P
Big bluestem	(<u>Andropogon gerardii</u>)	P
Cattail	(<u>Typha</u> spp.)	P
Cogongrass	(<u>Imperata cylindrica</u>)	P
Dallisgrass	(<u>Paspalum dilatatum</u>)	P
Feathertop	(<u>Pennisetum villosum</u>)	P
Guineagrass	(<u>Panicum maximum</u>)	P
Phragmites	(<u>Phragmites australis</u>)	P
Prairie cordgrass	(<u>Spartina pectinata</u>)	P
Saltgrass ⁴	(<u>Distichlis stricta</u>)	P
Sand dropseed	(<u>Sporobolus cryptandrus</u>)	P
Sprangletop ³	(<u>Leptochloa</u> spp.)	A
Timothy	(<u>Phleum pratense</u>)	P
Wirestem muhly	(<u>Muhlenbergia frondosa</u>)	P

BROADLEAF WEEDS

Apply 2-3 pints per acre¹

Alligatorweed	(<u>Alternanthera philoxeroides</u>)	A/P
Burdock	(<u>Arctium</u> spp.)	B
Carpetweed	(<u>Mollugo verticillata</u>)	A
Carolina geranium	(<u>Geranium carolinianum</u>)	A
Clover	(<u>Trifolium</u> spp.)	A/P
Common chickweed	(<u>Stellaria media</u>)	A
Common ragweed	(<u>Ambrosia artemisiifolia</u>)	A
Dandelion	(<u>Taraxacum officinale</u>)	P
Dogfennel ;	(<u>Eupatorium capillifolium</u>)	A
Filaree	(<u>Erodium</u> spp.)	A
Fleabane	(<u>Erigeron</u> spp.)	A
Hoary vervain	(<u>Verbena stricta</u>)	P
Indian mustard	(<u>Brassica juncea</u>)	A
Kochia ⁵	(<u>Kochia scoparia</u>)	A
Lambsquarters	(<u>Chenopodium album</u>)	A
Lespedeza	(<u>Lespedeza</u> spp.)	P
Miners lettuce	(<u>Montia perfoliata</u>)	A
Mullein	(<u>Verbascum</u> spp.)	B

Nettleleaf goosefoot	(<u>Chenopodium murale</u>)	A
Oxeye daisy	(<u>Chrysanthemum leucanthemum</u>)	P
Pepperweed	(<u>Lepidium spp.</u>)	A
Pigweed	(<u>Amaranthus spp.</u>)	A
Puncturevine	(<u>Tribulus terrestris</u>)	A
Russian thistle	(<u>Salsola kali</u>)	A
Smartweed	(<u>Polygonum spp.</u>)	A/P
Sorrell	(<u>Rumex spp.</u>)	P
Sunflower	(<u>Helianthus spp.</u>)	A
Sweet clover	(<u>Melilotus spp.</u>)	A/B
Tansymustard	(<u>Descurainia pinnata</u>)	A
Western ragweed	(<u>Ambrosia psilostachya</u>)	P
Wild carrot	(<u>Daucus carota</u>)	B
Wild lettuce	(<u>Lactuca spp.</u>)	A/B
Wild parsnip	(<u>Pastinaca sativa</u>)	B
Wild turnip	(<u>Brassica campestris</u>)	B
Woollyleaf bursage	(<u>Franseria tomentosa</u>)	P
Yellow woodsorrel	(<u>Oxalis stricta</u>)	P

Apply 3-4 pints per acre¹

Broom snakeweed ⁶	(<u>Gutierrezia sarothrae</u>)	P
Bull thistle	(<u>Cirsium vulgare</u>)	B
Burclover ³	(<u>Medicago spp.</u>)	A
Chickweed, Mouseear ⁵	(<u>Cerastium vulgatum</u>)	A
Clover, Hop ³	(<u>Trifolium procumbens</u>)	A
Cocklebur	(<u>Xanthium strumarium</u>)	A
Cudweed ³	(<u>Gnaphalium spp.</u>)	A
Desert Camelthorn	(<u>Alhagi pseudalhagi</u>)	P
Diffuse knapweed	(<u>Centaurea diffusa</u>)	A
Dock	(<u>Rumex spp.</u>)	P
Fiddleneck ³	(<u>Amsinckia intermedia</u>)	A
Goldenrod	(<u>Solidago spp.</u>)	P
Henbit ³	(<u>Lamium applexicaule</u>)	A
Knotweed, prostrate ³	(<u>Polygonum aviculare</u>)	A/P
Pokeweed	(<u>Phytolacca americana</u>)	P
Purple loosestrife ⁶	(<u>Lythrum salicaria</u>)	P
Purslane	(<u>Portulaca spp.</u>)	A
Pusley, Florida ³	(<u>Richardia scabra</u>)	A
Rocket, London ³	(<u>Sisymbrium irio</u>)	A
Rush skeletonweed ⁶	(<u>Chondrilla juncea</u>)	B
Saltbush	(<u>Atriplex spp.</u>)	A
Shepherd's-purse ³	(<u>Capsella bursa-pastoris</u>)	A
Spurge, Annual ³	(<u>Euphorbia spp.</u>)	A
Stinging nettle ⁶	(<u>Urtica dioica</u>)	P
Velvetleaf ³	(<u>Abutilon theophrasti</u>)	A
Yellow starthistle	(<u>Centaurea solstitialis</u>)	A

Apply 4-6 pints per acre¹

Arrowwood	(<u>Pluchea sericea</u>)	A
Canada thistle	(<u>Cirsium arvense</u>)	P
Giant ragweed	(<u>Ambrosia trifida</u>)	A
Grey rabbitbrush	(<u>Chrysothamnus nauseosus</u>)	P
Japanese bamboo/knotweed	(<u>Polygonum cuspidatum</u>)	P
Little mallow	(<u>Malva parviflora</u>)	B
Milkweed	(<u>Asclepias spp.</u>)	P
Primrose	(<u>Oenothera kunthiana</u>)	P
Russian knapweed	(<u>Centaurea repens</u>)	P
Silverleaf nightshade	(<u>Solanum elaeagnifolium</u>)	P
Sowthistle	(<u>Sonchus spp.</u>)	A
Texas thistle	(<u>Cirsium texanum</u>)	P

VINES AND BRAMBLES

Apply 1 pint per acre

Field bindweed	(<u>Convolvulus arvensis</u>)	P
Hedge bindweed	(<u>Calystegia sepium</u>)	A

Apply 2-3 pints per acre¹

Wild buckwheat	(<u>Polygonum convolvulus</u>)	P
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Apply 3-4 pints per acre¹

Greenbriar	(<u>Smilax spp.</u>)	P
Honeysuckle	(<u>Lonicera spp.</u>)	P
Morningglory	(<u>Ipomoea spp.</u>)	A/P
Poison ivy	(<u>Rhus radicans</u>)	P
Redvine	(<u>Brunnichia cirrhosa</u>)	P
Wild rose	(<u>Rosa spp.</u>)	P
Including: Multiflora rose	(<u>Rosa multiflora</u>)	<u>P</u>
Macartney rose	(<u>Rosa bracteata</u>)	<u>P</u>

Apply 4-6 pints per acre¹

Kudzu ⁴	(<u>Pueraria lobata</u>)	P
Trumpet creeper	(<u>Campsis radicans</u>)	P
Virginia creeper	(<u>Parthenocissus quinquefolia</u>)	P
Wild grape	(<u>Vitis spp.</u>)	P

BRUSH SPECIES
Apply 4-6 pints per acre¹

American beech	(<u>Fagus grandifolia</u>)	P
Ash	(<u>Fraxinus</u> spp.)	P
Bald cypress	(<u>Taxodium distichum</u>)	P
Bigleaf Maple	(<u>Acer macrophyllum</u>)	P
Black Locust ⁷	(<u>Robinia pseudoacacia</u>)	P
Blackgum	(<u>Nyssa sylvatica</u>)	P
Boxelder	(<u>Acer negundo</u>)	P
Brazilian peppertree ⁸	(<u>Schinus terebinthifolius</u>)	P
Cherry	(<u>Prunus</u> spp.)	P
Chinaberry	(<u>Melia azadarach</u>)	P
Chinese tallow-tree	(<u>Sapium sebiferum</u>)	P
Dogwood	(<u>Cornus</u> spp.)	P
Elm ⁹	(<u>Ulmus</u> spp.)	P
Hawthorn	(<u>Crataegus</u> spp.)	P
Hickory	(<u>Carya</u> spp.)	P
Honeylocust ¹⁰	(<u>Gleditsia triacanthos</u>)	P
Maple	(<u>Acer</u> spp.)	P
Melaleuca ⁸	(<u>Melaleuca quiquenervia</u>)	P
Mulberry	(<u>Morus</u> spp.)	P
Oak	(<u>Quercus</u> spp.)	P
Persimmon	(<u>Diospyros virginiana</u>)	P
Pine ¹¹	(<u>Pinus</u> spp.)	P
Poplar	(<u>Populus</u> spp.)	P
Privet	(<u>Ligustrum vulgare</u>)	P
Red Alder	(<u>Alnus rubra</u>)	P
Red Maple	(<u>Acer rubrum</u>)	P
Russian Olive	(<u>Eleagnus angustifolia</u>)	P
Saltcedar	(<u>Tamarix ramosissima</u>)	P
Sassafras	(<u>Sassafras albidum</u>)	P
Sourwood	(<u>Oxydendrum arboreum</u>)	P
Sumac	(<u>Rhus</u> spp.)	P
Sweetgum	(<u>Liquidambar styraciflua</u>)	P
Willow	(<u>Salix</u> spp.)	P
Yellow poplar	(<u>Liriodendron tulipifera</u>)	P

¹ The higher rates should be used where heavy or well established infestations occur.

² Growth Habit - A = Annual, B = Biennial, P = Perennial

³ For preemergence control, tank-mix with PENDULUM.

⁴ Use a minimum of 75 GPA - Control of established stands may require repeat applications.

⁵ For preemergence control, tank-mix with PENDULUM or Karmex.

⁶ For best results early postemergence applications are required.

⁷ Tank-mix with Roundup, Accord, Escort, Krenite, Garlon 3A, or Tordon K.

⁸ See supplemental labeling for Florida.

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- ⁹ Tank-mix with Roundup, Accord, or Escort.
- ¹⁰ Tank-mix with Roundup, Accord, Garlon 3A, or Tordon K.
- ¹¹ Tank-mix with Accord, Roundup, Garlon 3A, Tordon K, or Krenite.

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