



CIRCULAR 423—Revised
Cooperative Extension Service
College of Tropical Agriculture & Human Resources
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A GUIDE
TO
CHEMICAL
WEED
CONTROL
IN TROPICAL
AND
SUBTROPICAL
FRUIT AND NUT
CROPS IN
HAWAII

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The use of herbicides, chemicals for killing weeds, is an accepted cultural practice in the fruit and nut agricultural industry of Hawaii. Herbicides are indispensable to the agricultural industry. They are essential for continued efficient crop yields to offset increasing labor and other production costs. Under present-day conditions, they are an effective and economic tool necessary to help control weeds.

Hawaii's climate, soils, and vegetation are tropical and subtropical, and herbicide recommendations approved for temperate areas do not always apply. Therefore, herbicides should be field tested before using under Hawaii conditions.

All of the chemicals listed in this circular have been approved for use and are registered with the Environmental Protection Agency or with the State Department of Agriculture. Although the Department of Horticulture, College of Tropical Agriculture, has field tested many of the herbicides, the chemicals are recommended *for trial use* before widespread field applications are made. This is necessary because the effectiveness of a herbicide may vary in the Islands depending on a specific soil and climatic conditions and weed species.

GENERAL SUGGESTIONS

1. Read the label on the herbicide container. Know the precautions to take and the limitations of the herbicide.
2. Weeds are generally easiest to kill when small.
3. Use low-pressure sprayers (25 pounds) with a flat-fan, spray-type nozzle.

4. Clean spraying equipment thoroughly after each use. Do not use herbicide spray equipment for insecticides and fungicides.
5. Do not spray in windy weather.
6. A herbicide usually does not control all weeds; it may be necessary to mix two chemicals together or to alternate the chemicals used.
7. Consult your county extension agent if you need advice and to make certain that no new regulations have been issued on the particular herbicide to be used.
8. Pesticides are poisonous and should always be used with caution. Store them in their original labeled containers in locked cabinets or sheds, away from food or feeds.

SPRAYER CALIBRATION

1. Fill sprayer with water only.
2. Spray a measured area at a comfortable speed at a fixed pressure.
3. Measure the amount of water required to refill the tank.
4. Calculate the amount of water needed for 1 acre. To do this, multiply the amount of water used in the measured area with the number of times the measured area (in square feet) is divided into 43,560 square feet. Usually, 30 to 40 gallons per acre are used for preemergence applications of herbicides, and 60 to 100 gallons per acre for postemergence applications.
5. Mix the amount of required commercial material per acre with the number of gallons of water the sprayer uses per acre.

ACTIVE INGREDIENTS OF HERBICIDES LISTED IN THIS CIRCULAR

Trade Name	Common Name	Active Ingredient	Chemical Name
Aatrex	atrazine	80W	2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine
Casoron	dichlobenil	50W 4% granular	2,6-dichlorobenzonitrile
Dowpon or Basfapon	dalapon	85% (74% acid equivalent)	sodium salt of 2,2-dichloropropionic acid
Evic	ametryne	80W	2-(ethylamino)-4-(isopropylamino)-6-(methylthio)-s-triazine
Karmex	diuron	80W	3-(3,4-dichlorophenyl)-1,1-dimethylurea
Paraquat CL	paraquat	2 lb/gal	Paraquat dichloride (1,1'-dimethyl-4,4'-bipyridinium dichloride)
Petroleum solvents		100%	
Princep	simazine	80W	2-chloro-4,6-bis(ethylamino)-s-triazine
Roundup	glyphosate	3 lb/gal acid equivalent	N-(phosphonomethyl)glycine
Sinbar	terbacil	80W	3-tert-butyl-5-chloro-6-methyluracil

GUIDE FOR TRIAL USE OF HERBICIDES WITH FRUIT CROPS

FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
AVOCADO		
Casoron W-50 ¹ or 4% granular	8 to 12 lb 100 to 150 lb	Apply as directed spray or as granular formulation to established crop before the weeds emerge above the soil surface. Follow with 1/2- to 1-inch irrigation. If possible, soil-incorporate at 1- to 2-inch depth. Do not apply within 4 weeks after transplanting. Do not graze live-stock on treated areas.
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Petroleum solvents	40 to 100 gal	Apply as directed spray when weeds are 1 to 3 inches tall on an as-needed basis. Do not allow spray to come in contact with tree foliage.
Roundup	1 to 5 qt	Apply as directed spray to emerged weeds in 20 to 100 gallons of spray mix per acre. Repeat treatments may be necessary, but no more than 10.6 quarts per acre per year can be used. Avoid contact of spray, drift or mist with green foliage, green bark or bark of trees established less than 2 years, or fruits. Do not allow animals to graze on treated areas for 8 weeks after application. Allow a minimum of 14 days between last application and harvest.
BANANA		
Dowpon or Basfapon	5 to 10 lb	Apply before grass-heading stage in 80 to 100 gallons of spray mix per acre. Do not apply more than 30 pounds of Dowpon or Basfapon per

GUIDE FOR TRIAL USE OF HERBICIDES WITH FRUIT CROPS

FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
BANANA (Continued)		
		acre per year. Use spray solution within 24 hours after mixing for maximum effect. Do not contaminate fruit, foliage, or young banana plants.
Evic	5 to 10 lb	Apply as directed spray after setting plants. Repeat at 3- to 4-month intervals if necessary. Do not apply more than 24 pounds actual per acre per year.
Karmex	2 1/2 to 5 lb	Apply only after the plants are established and keep away from the base or basin of newly set plants. Treat cautiously on loose or lighter soils. Apply as basal spray either as a preemergence treatment (no surfactant) in 40 gallons of spray mix per acre or as a postemergence spray on emerged weeds (with surfactant ²) in 80 to 100 gallons of spray mix per acre. Do not apply more than 12 pounds of Karmex per year. Do not plant other crops in the area for 2 years after last treatment.
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
CITRUS (Orange, grapefruit, lime, tangerine)		
Casoron W-50 ¹ or 4% granular	8 to 12 lb 100 to 150 lb	Apply as directed spray or as granular formulation to crop established 1 or more years before the weeds emerge above the soil surface. Follow with 1/2- to 1-inch irrigation. If possible, soil-incorporate at 1- to 2-inch depth. Do not graze livestock on treated areas.
Dowpon ¹ or Basfapon	1 1/2 to 3 1/2 lb	Apply 1 1/2 pounds at 2- to 4-day intervals for a series of three applications after grass starts to regrow. Do not apply in groves younger than 4 years, and use only one series of applications per year. Use with extreme caution on Island soils. Add nonionic wetting agent. Do not spray foliage.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
CITRUS (Continued)		
Karmex ¹	2 to 5 lb	Apply once a year to a weedfree soil in established orchards. A surfactant ² may be used if small weeds are present. Do not spray on loose soil in the planting basin. Do not spray foliage or fruit. Do not replant treated areas to any crop within 2 years after application.
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Petroleum solvents	40 to 80 gals	Apply as directed spray when weeds are 1 to 3 inches tall on an as-needed basis. Do not allow spray to come into contact with tree foliage.
Roundup	1 to 5 qt	Apply as directed spray to emerged weeds in 20 to 100 gallons of spray mix per acre. Repeat treatments may be necessary, but no more than 10.6 quarts per acre per year can be used. Avoid contact of spray, drift, or mist with green foliage, green bark or bark of trees established less than 2 years, or fruits. Do not allow animals to graze on treated areas. Allow a minimum of 14 days between last application and harvest.
Sinbar ¹	2 to 4 lb	Apply as a directed spray to orchard floor, where trees are established 1 or more years. Do not replant treated areas to crop within 2 years, except citrus transplants may be planted after 1 year. Do not contact foliage or fruit. Provides some control of purple nutsedge and perennial grasses at the higher rate. Do not use the higher rate on light, sandy soils.
COFFEE		
Dowpon or Basfapon	5 to 10 lb	Apply to grass as directed spray. Repeat application in 4 to 6 weeks. Do not apply more than twice a year. Do not apply within 8 months of harvest.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
COFFEE (Continued)		
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray on emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
GUAVA		
Paraquat CL	1 to 2 qt	Apply as a directed spray in 50 to 200 gallons of spray mix per acre. Add a nonionic surfactant. ² Apply when weeds are succulent and from 1 to 6 inches high. Do not allow spray to contact green stems, fruit, or foliage as injury may result. Do not spray under windy conditions and use a shield for young trees. Do not allow animals to graze on treated areas.
MACADAMIA NUTS		
Aatrex	2 1/2 to 5 lb	Apply just prior to weed emergence before harvest. Repeat applications as necessary after gathering nuts. Do not spray on loose soil in plant basin. Do not exceed 10 pounds of Aatrex 80W per acre per year.
Dowpon or Basfapon	5 to 10 lb	Apply before grass-heading stage. Do not apply during harvesting season unless nuts have been picked up. Do not apply more than 20 pounds of Dowpon or Basfapon per acre per year. Use with caution on loose soil.
Karmex	2 1/2 to 5 lb	Use only on established plantings which are at least 1 year old. Do not apply on loose soil in plant basin. Apply as directed basal spray either as a preemergence treatment (no surfactant ²) in 40 gallons of spray mix per acre or as a postemergence spray (with surfactant ²) on emerged weeds in 80 to 100 gallons of spray mix per acre. Spray cautiously and use lower rates on aa (rock) soils. Do not apply more than 10 pounds of Karmex per year. Do not graze livestock in treated orchards. Do not replant treated area to any crop within 2 years after last application.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
MACADAMIA NUTS (Continued)		
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Princep 80W	2 1/2 to 5 lb	Apply just prior to weed emergence before harvest. Repeat applications as necessary after gathering nuts. Do not spray on loose soil in plant basin. Do not spray while nuts are on the ground. Do not exceed 10 pounds of Princep 80W per acre per year.
Roundup	1 to 5 qt	Apply as directed spray to emerged weeds in 20 to 100 gallons of spray mix per acre. Repeat treatments may be necessary, but no more than 10.6 quarts per acre per year can be used. Avoid contact of spray, drift, or mist with green foliage, green bark or bark of trees established less than 2 years, or fruits. Do not allow animals to graze on treated areas. Allow a minimum of 21 days between last application and harvest.
MANGO		
Casoron W-50 ¹ or 4% granular	8 to 12 lb 100 to 150 lb	Apply as directed spray or as granular formulation to established crop before the weeds emerge above the soil surface. Follow with 1/2-to 1-inch irrigation. If possible, soil-incorporate at 1- to 2-inch depth. Do not graze livestock on treated areas.
PAPAYA		
Dowpon or Basfapon	5 to 10 lb	Apply in 50 to 100 gallons of water per acre between rows of papaya, or as a spot treatment in orchard area at 1/2 ounce per 200 square feet in 5 gallons of water. Add a surfactant. ² Apply to vigorously growing grassy weeds before heading. Do not contact fruit or foliage. Do not apply until plants are established for at least 4 months.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
PAPAYA (Continued)		
Karmex	2.5 to 5 lb	Use only on papaya trees established for at least 1 year. Apply as basal directed spray preferably as a preemergence treatment (no surfactant ²) in 40 gallons of spray mix per acre. If weeds have emerged, add surfactant to the spray mix. Do not contact fruit or foliage with spray or drift. Do not use on home plantings. Do not replant treated area to any crop within 2 years after last application.
Paraquat CL plus surfactant ²	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Petroleum solvents	50 gal	Apply as directed spray when weeds are 1 to 3 inches tall as needed. Do not allow spray to come in contact with crop stem and foliage.
PASSION FRUIT		
Dowpon or Basfapon	5 to 10 lb	Apply in 50 to 100 gallons of water per acre between rows of passion fruit, or as a spot treatment in orchard area at 1/2 ounce per 200 square feet in 5 gallons of water. Add a surfactant. ² Apply to vigorously growing grassy weeds before heading. Do not contact fruit or foliage with spray. Do not apply until plants are established for at least 4 months.
Paraquat CL	2 qt	Apply as a directed spray in 50 to 200 gallons of spray mix per acre. Add a nonionic surfactant. ² Apply when weeds are succulent and from 1 to 6 inches high. Do not allow spray to contact green stems, fruit, or foliage as injury may result. Do not spray under windy conditions and use a shield for young vines. If bark is still green, wrap base of vine prior to application to prevent injury. If applied during the harvesting season, apply only after picking fruits off the ground. Do not allow animals to graze on treated areas.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
PEACHES		
Casoron W-50 ¹ Casoron G-4	8 to 12 lb 100 to 150 lb	Apply as directed spray or as granular formulation to established crop before the weeds emerge above the soil surface. Follow with 1/2- to 1-inch irrigation. If possible, soil-incorporate at 1- to 2-inch depth. Do not apply within 4 weeks after transplanting. Do not graze livestock on treated areas. Do not apply within 1 month before harvest.
Paraquat CL ¹	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Petroleum solvents ¹	100 gal	Apply as directed spray when weeds are 1 to 3 inches tall. Keep spray off crop stem and foliage.
Sinbar ¹	2 to 4 lb	Apply as a directed spray to orchard floor, where trees are established 3 or more years. Do not replant treated areas to crop within 2 years, except citrus transplants may be planted after 1 year. Do not contact foliage or fruit. Provides some control of purple nutsedge and perennial grasses at the higher rate. Do not use the higher rate on light, sandy soils.
PLUMS		
Paraquat CL	1 to 2 qt	Apply as directed spray to emerged weeds in 80 to 100 gallons of spray mix per acre. Add a nonionic surfactant. ² Spray contact on green succulent trunks may cause injury. Do not allow spray to contact foliage, fruit, or stems. Do not allow animals to graze on treated areas.
Petroleum solvents	100 gal	Apply as directed spray when weeds are 1 to 3 inches tall as needed. Do not allow spray to come in contact with tree foliage.

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FRUIT/CHEMICAL	MAXIMUM DOSAGE RATE OF COMMERCIAL FORMULATION/ACRE	METHOD AND TIME OF APPLICATION
PLUMS (Continued)		
Princep ¹	2 1/2 to 5 lb	Apply as directed spray before weeds emerge above soil surface. Apply after trees have been established 1 year or more. Do not allow spray to contact foliage, fruit, or stems.

¹Suggestions based on recommendations from Mainland U.S. agricultural experiment stations. These herbicides should be tried on a small scale before large fields are tested.

²Surfactants are substances that reduce the interfacial tension of two boundary lines. These materials can be classified as nonionic, anionic, and cationic. Most surfactants are nonionic for they do not ionize. Examples are X-77 and Teritol NPX. Wetting agents and detergents are primarily anionic for they become ionized in solution, and the negative part of the molecule exerts the primary influence. Cationic forms also become ionized in solution but are not generally used. The positive portions of the molecule are dominant when these materials are ionized. Use the label recommendations for amounts to be added to the spray tank.

REFERENCE

EPA Compendium of Registered Pesticides. 1977.

NOTE: The use of brand names and names of manufacturers in this publication is for convenience and does not imply endorsement of the products or the manufacturers by the College of Tropical Agriculture and Human Resources.

EMERGENCY TREATMENT FOR POISONING

- A. Call your personal physician at once.
- B. If your physician is not available, call the POISON CONTROL CENTER OF HAWAII. Telephone 537-1831 or 531-3511 at Kauaikeolani Children's Hospital.
 1. Describe poison by name. They can advise you over the phone on how to manage the problem.
- C. In the meantime, move the patient away from the phone.
 1. If the poison has been spilled on the skin or clothing, remove the clothing and wash the skin with lots of water.
 2. If the poison has been inhaled, remove the patient to open air; if the patient is not breathing mouth-to-mouth artificial respiration must be administered.
 3. If the poison has been swallowed, attempt to empty the stomach immediately, unless indicated otherwise by the label.
 - a. Induce vomiting by giving large amounts of warm, strong salt water and attempt to gag patient to produce vomiting by putting finger or tongue depressor down patient's throat.
 - b. If the poison is in petroleum solvents, do not induce vomiting unless directed by physician.
 - c. DO NOT INDUCE VOMITING IN AN UNCONSCIOUS PATIENT.
- D. If you cannot contact your physician or the Poison Control Center, after performing the above first-aid measures, deliver the patient to the nearest Emergency Treatment Facility in a hospital for further care. Specific antidotes and treatment vary with the poison involved; remember to take the poison with you so the physician can read the name and contents of the poisonous compound involved.

Single copies of this publication available without charge to **Hawaii residents** from county agents. **Out-of-State inquiries** or **bulk orders** should be sent to the Agricultural Publications and Information Office, College of Tropical Agriculture and Human Resources, University of Hawaii, 2500 Dole Street, Krauss Hall 107, Honolulu, Hawaii 96822. Price per copy to bulk users, forty cents plus postage.

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