SECTION G.

OILS AND FIBER

Section contents

Camelina (Gold-of-Pleasure)

Andrew Hulting

Revised March 2018

Annual and Perennial Grasses

clethodim (SelectMax)

Rate 0.068 to 0.091 lb ai/a

Time Apply to actively growing annual or perennial grasses at the appropriate stage of grass growth as indicated on label.

Remarks For grass weed control only. See label for specific rates, weed species, and weed size. Always add a non-ionic surfactant at 0.25% v/v in the finished spray volume. Control may be erratic on grasses stressed by conditions such as drought, temperature extremes, and insect and herbicide damage. Do not apply if rain is expected within 1 hour of application.

Caution Do not exceed 0.091 lb ai/a of clethodim per season. Adding fertilizer to spray solution is not recommended. Do not apply after the crop has begun to bolt. See label for restrictions on livestock grazing and feeding, and cutting for forage or hay.

Site of action Group 1: acetyl CoA carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

sethoxydim (Poast)

Rate 0.19 to 0.48 lb ai/a (1 to 2.5 pints/a Poast)

Time Apply to actively growing grasses listed on label.

Remarks Ask knowledgeable individuals about susceptible grasses in your area. Control may be erratic on grasses stressed by lack of vigor, drought, or high temperature. Fine fescues and annual bluegrass are tolerant to sethoxydim; quackgrass is suppressed.

Caution Do not exceed 5 pints/a product per year. Preharvest interval is 60 days. Do not mix or apply with any other pesticide, additive, or fertilizer except as label directs.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

Annual Grass and Broadleaf Weeds

ethalfluralin (Sonalan 10G or Sonalan HFP)

Rate 0.68 to 0.94 lb ai/a (1.5 to 2.5 pints/a Sonalan HFP)

Time Apply prior to planting camelina and incorporate.

Remarks Application rate based on soil type. See label for a list of weed species controlled by preplant incorporated applications of ethalfluralin.

Caution Do not graze or harvest forage from camelina growing in treated soil. Camelina exhibits marginal tolerance to Sonalan HFP. Environmental conditions leading to poor camelina emergence and growth following ethalfluralin applications may result in camelina stunting or stand reduction.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

Harvest Aid

glyphosate (several trade names)

Rate **1.125** lb ae/a

Time Apply when camelina is physiologically mature.

Remarks To control weeds that will interfere with harvest or to suppress perennial weeds. Preharvest interval is 7 days.

Caution Make only 1 preharvest application. Not all glyphosate labels include this use.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

saflufenacil (Sharpen powered by Kixor herbicide)

Rate 0.022 to 0.044 lb ai/a (1.0 to 2.0 oz/a Sharpen)

Time Sharpen may be applied to camelina for desiccation, or as a harvest aid, when the crop has reached physiological maturity. Allow up to 7 days for optimum desiccation effect following application, depending on environmental conditions.

Remarks Sharpen does not control grass weed species. For optimum desiccation efficacy use a MSO plus an ammonium based adjuvant system applied at a minimum volume of 10 gal/a. Sharpen is rainfast 1 hour after application.

Caution See label for crop rotation intervals. Single or sequential applications may be made, but do not apply more than 0.044 lb ai/a (2 oz/a Sharpen) per cropping season for desiccation uses. Do not apply Sharpen to camelina being grown for seed production. Camelina may be harvested 3 days after application.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Uracil

Canola (including Rape Seed)

Judit Barroso

Revised March 2020

Annual Grass and Some Broadleaf Weeds

ethalfluralin (Sonalan)

Rate 0.55 to 0.95 lb ai/a (5.5 to 9.5 lb/a Sonalan 10G); 0.56 to 0.938 lb ai/a (1.5 to 2.5 pints/a Sonalan HFP)

Time Apply preplant and incorporate following label instructions.

Remarks Use either liquid or granular formulation. Proper soil preparation and incorporation of trifluralin are critical for best results. Restricted entry interval (REI) is 24 hr.

Caution Do not exceed labeled rates because crop may be injured. Do not graze crop grown in treated soil.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

trifluralin (Treflan)

Rate 0.5 to 1 lb ai/a (1 to 2 pints/a Treflan 4L, 4EC)

Time Apply preplant and incorporate into soil.

Remarks Use either liquid or granular formulation. Proper soil preparation and incorporation of trifluralin are critical for best results. Trifluralin is weak on members of the mustard and sunflower families, and on volunteer cereals. Restricted entry interval (REI) is 12 hr.

Caution Incorporate within 24 hours of applying. See label for crop rotation restrictions.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

Annual and Perennial Grasses

POSTEMERGENCE

clethodim (Select)

Rate 0.063 to 0.094 lb ai/a (4 to 6 oz/a Select 2EC)

Time After grasses emerge. See label for details.

Remarks Controls annual and perennial grasses. Use adjuvants recommended by the label. Restricted entry interval (REI) is 24 hr.

Caution Do not exceed 12 fl oz/a per season. Do not apply more than 6 fl oz/a per application. Preharvest interval is 70 days. Do not graze. Do not apply after crop begins bolting. Application during bloom period may injure crop. Addition of fertilizer is not recommended for this crop. Does not control rattail fescue.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

clethodim (Intensity One)

Rate 0.068 to 0.091 lb ai/a (9 to 12 fl oz/a Intensity One)

Time After grasses emerge. See label for details.

Remarks Controls annual and perennial grasses. Use adjuvants recommended by the label. Restricted entry interval (REI) is 24 hr.

Caution Do not apply after crop has begun bolting. Crop injury may occur if applied during bloom. Do not apply more than 12 fl oz/a in single application. Do not apply more than 12 fl oz/a in a season. Does not control rattail fescue.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

quizalofop P-ethyl (Assure II, Targa)

Rate 0.03 to 0.08 lb ai/a (5 to 12 fl oz/a Assure II, Targa)

Time Postemergence to grasses. Apply when weeds are young and actively growing. See label for details.

Remarks Controls annual and perennial grasses. Does not control rattail fescue. Use either a nonionic surfactant at 1 quart/100 gal of water or a petroleum-based crop oil at 1 gal/100 gal of water. Crop oil concentrates are the preferred adjuvant in arid regions. Restricted entry interval (REI) is 12 hr.

Caution Do not exceed 18 fl oz/a per season. Preharvest interval is 60 days. Do not graze.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Aryloxyphenoxy propionate

sethoxydim (Poast)

Rate 0.19 to 0.47 lb ai/a (1 to 2.5 pints/a Poast)

Time Apply to actively growing grasses listed on label. Add 2 pints/a nonphytotoxic crop oil concentrate for ground application to improve leaf penetration.

Remarks Control may be erratic on grasses stressed by lack of vigor, drought, or high temperature. Poast does not control fine fescues, annual bluegrass, or rattail fescue. Restricted entry interval (REI) is 12 hr.

Caution Do not apply more than 2.5 pints/a in single application. Do not exceed 5 pints/a of product per year. Preharvest interval (PHI) is 60 days. Do not mix or apply with any other pesticide, additive, or fertilizer except as label directs.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

Annual Broadleaf Weeds

POSTEMERGENCE

clopyralid (Stinger, Clean Slate)

Rate 0.094 to 0.188 lb ai/a (0.25 to 0.5 pints/a)

Time Apply to canola in the two- to six-leaf stage of crop growth.

Remarks Apply uniformly with aerial or ground equipment in 10 to 20 gal/a water or at least 5 gal/a by air. To control Canada thistle, apply after most basal leaves emerge but before bud stage. Restricted entry interval (REI) is 12 hr.

Caution Do not apply more than 2/3 pints/a per crop per year. Preharvest interval (PHI) is 50 days. See product label for crop rotation restrictions. Avoid drift to non-target crops.

Site of action Group 4: synthetic auxin

Chemical family Pyridine

glufosinate (Liberty 280 SL)

LibertyLink canola varieties only

Rate 0.40 lb ai/a (22 oz/a product) postemergence; 0.53 to 0.69 lb ai/a (29 to 36 oz/a product) burndown preplant or preemergence

Time Applications on canola may be made from cotyledon stage up to early bolting stage of canola. Apply to small and actively growing weeds, targeting those less than 3 inches in height.

Remarks Weed control may be reduced if application is made when heavy dew, fog, or mist/rain are present, or when weeds are under stress due to drought, cool temperatures, or extended periods of cloudiness. Rainfast in 4 hours. REI 12 hr.

Caution Use only on LibertyLink canola varieties. Preharvest interval is 65 days. Do not graze the treated crop or cut for hay. Do not add surfactants or crop oils (ammonium sulfate is allowed). Do not apply if canola shows injury from prior herbicide applications or environmental stress. Do not apply with other pesticides including herbicides unless recommended on the label. Do not apply more than 22 fl oz/a of Liberty 280 SL postemergence in a single application. Do not apply more than 36 fl oz/a of Libery 280 SL for burndown treatment prior to planting or prior to emergence. Do not apply more than 36 fl oz/a of Liberty 280 SL per growing season.

Site of action Group 10: inhibits glutamine synthase

Chemical family Phosphinic acid

glyphosate (Roundup)

Use only on Roundup Ready canola

Rate Single or sequential applications, refer to specific product label.

Time Make single application only to Roundup Ready canola no later than six-leaf stage, to control annual weeds. Apply sequentially on one- to three-leaf Roundup Ready canola followed by a sequential application at a minimum interval of 10 days but not later than the six-leaf stage.

Remarks Read product label before using any other glyphosate product on Roundup Ready canola. Overlapping at application may result in temporary yellowing, delayed flowering, and/or growth reduction. Restricted entry interval (REI) is 4 hr.

Caution Use only on Roundup Ready canola. Do not exceed two over-the-top broadcast applications from crop emergence through the six-leaf stage. Refer to specific product label for total in-crop application maximum application rates. Do not mix or apply with any other pesticide, additive, or fertilizer except as label directs. Preharvest interval (PHI) is 60 days. Avoid drift to non-target crops.

Site of action Group 9: inhibits EPSP synthase

Chemical family Glycine

imazamox (Beyond)

Use only on Clearfield canola varieties

Rate 0.031 lb ai/a (4 oz/a Beyond)

Time Apply early postemergence, but before bloom, only to Clearfield canola. Apply when most actively growing annual grass weeds are in the one- to five-leaf stage. Broadleaf weeds should be actively growing and less than 3 inches tall.

Remarks Adding a nonionic surfactant and a liquid nitrogen fertilizer or ammonium sulfate solution is required. Occasionally, crop plants may have shortened internodes and/or temporary yellowing after Beyond applications; effects can be more pronounced if crops are growing under environmental stress. Restricted entry interval (REI) is 4 hr.

Caution Use only on Clearfield canola varieties. Do not exceed 4 fl oz/a per season. See product label for crop rotation restrictions. Avoid drift to non-target crops. Be aware there may be a long plant-back period to some non-Clearfield crops. Consult the label for specific plant-back information

Site of action Group 2: acetolactate synthase (ALS) inhibitor

Chemical family Imidazolinone

Preharvest Desiccant

diquat (Reglone)

Rate 0.375 to 0.5 lb ai/a (1.5 to 2.0 pints/a Reglone)

Time Apply at physiological maturity (more than 50% brown seed in pods). Combine-harvest within 10 days of application.

Remarks Crop should be harvested within 10 days of application. Use a minimum of 5 gal spray volume for aerial application and 15 gal spray volume for ground application. Restricted entry interval (REI) is 4 hr.

Caution Read the label for specifics on surfactants and crop condition.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

saflufenacil (Sharpen)

Rate 0.0022 to 0.0045 lb ai/a (1 to 2 oz/a Sharpen)

Time Apply at physiological maturity (more than 50% brown seed in pods). Preharvest interval (PHI) is 3 days.

Remarks Uniformly apply as a broadcast spray by air or ground. Ground application is recommended at a minimum spray volume of 10 gal/a. Aerial applications recommended at a minimum spray volume of 5 gal/a. Restricted entry interval (REI) is 12 hr.

Caution Read the label for specifics on surfactants and crop condition. Do not apply on canola grown for seed production.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Pyrimidinedione

Flax

Kyle Roerig and Andy Hulting

Reviewed March 2020

Preemergence, Annual Grasses and Broadleaf Weeds

carfentrazone (Aim and other trade names)

Rate **up to 0.031 lb ai/a (2.0 oz/a Aim EC)**

Time Preplant burndown.

Remarks Apply to weeds up to 4 inches. Broad-spectrum weed control requires use of a labeled tank mix partner (e.g.. glyphosate).

Caution Apply carfentrazone no less than one day before planting. Do not exceed 0.096 lb ai/a per season.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor.

Chemical family Aryl triazinone

glyphosate (several trade names)

Rate **0.375 to 3.75 lb ae/a**

Time Apply preplant, at planting or before crop emergence.

Remarks Not all glyphosate labels include preplant, at planting, or preemergence uses. Rate is determined by weed species and size; see label for specific instructions.

Caution Do not apply to emerged flax. Do not exceed season maximum of 6.0 lb ae/a.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

mesotrione (Callisto)

Rate 0.188 lb ai/a (6 oz/a Callisto)

Time Apply before crop emergence.

Remarks For emerged weeds, see label for adjuvant recommendation.

Caution Do not exceed 0.188 lb ai/a (6 oz/a product) per season. See label for crop rotation restrictions. Do not apply to emerged flax.

Site of action Group 28: inhibits 4-hydroxyphenylpyruvate-dioxygenase (4-HPPD)

Chemical family Triketone

sulfentrazone (Spartan 4Fand other trade names)

Rate 0.094 lb ai/a to 0.25 lb ai/a (3.0 to 8.0 oz/a Spartan 4F)

Time Preplant incorporated or preemergence.

Remarks Efficacy may be reduced if 0.5 to 1 inch of rain or irrigation is not received or incorporated within 7 to 10 days. Do not incorporate deeper than 2 inches. Maximum use rate varies by soil type, pH, and organic matter. See label for details.

Caution Do not apply if seedlings are close to the surface. Plant at least 1 inch deep and ensure good furrow closure. Other situations may cause injury. See label for details. Do not apply more than 0.375 lb ai/a per 12-month period.

Site of action Group 14: protoporphyrinogen oxidase inhibitor

Chemical family Triazinone

trifluralin (Treflan and other trade names)

Rate 0.5 to 1 lb ai/a

Time Apply preplant and incorporate into soil.

Remarks Use either liquid or granular formulation. Proper soil preparation and incorporation of trifluralin are critical for best results. Trifluralin is weak on members of the mustard and sunflower families, and on volunteer cereals.

Caution Incorporate within 24 hours of application. See label for crop rotation restrictions. Trifluralin may only be applied in the fall prior to spring-planted flax. See label for special flax instructions.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

Annual and Perennial Grasses

clethodim (Select and other trade names)

Rate 0.068 to 0.125 lb ai/a

Time Apply to actively growing annual or perennial grasses.

Remarks For grass control only. Refer to label for specific weed species and weed size. Always add a crop oil concentrate containing at least 15% emulsifier at 1% v/v in the finished spray volume. Clethodim is most effective on actively growing grasses before they reach maximum size indicated on label.

Caution Control may be erratic if grasses are stressed by drought, temperature extremes, insect damage, herbicide injury, or other factors, or if grasses are larger than indicated on label. Do not apply if rain is expected within 1 hour after application. Preharvest interval is 60 days. Do not exceed 0.25 lb ai/a per season.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

quizalofop (Assure II and other trade names)

Rate 0.034 to 0.0825 lb ai/a (5 to 12 oz/a Assure II)

Time Apply to actively growing grasses listed on label.

Remarks See label for specific herbicide rates, weed species, and weed size. Under arid conditions, use higher rate for the target grass weed. Always include a nonphytotoxic crop oil concentrate at 1% v/v or a nonionic surfactant at 0.25% v/v. Crop oil concentrate is preferred in arid areas. Quizalofop will not control annual bluegrass or fine fescues. Control may be reduced on grasses stressed from lack of moisture, cold weather, herbicide injury, and insect injury or disease.

Caution Do not exceed 24 oz/a product per year.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

sethoxydim (Poast and other trade names)

Rate 0.19 to 0.28 lb ai/a (1 to 1.5 pints/a Poast)

Time Apply to actively growing grasses.

Remarks Control may be erratic on grasses stressed by lack of vigor, drought, or high temperature. Fine fescues and annual bluegrass are tolerant to sethoxydim; quackgrass is suppressed.

Caution Do not exceed 4 pints/a product per year. Preharvest interval is 75 days. Do not mix or apply with any other pesticide, additive, or fertilizer except as label directs.

Site of action Group 1: acetyl CoA Carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

Broadleaf Weeds

bromoxynil (Buctril and other trade names)

Rate 0.25 lb ai/a

Time Apply when flax is 2 to 8 inches tall. Do not apply during or after bud stage, or within 75 days of harvest.

Remarks Do not apply with crop oil concentrate, surfactants, or nitrogen solutions.

Caution Temperatures over 85°F within 3 days of application may cause injury. Other situations may also injure flax. To avoid injuring flax, see the "Restrictions and Precautions" section of the label.

Site of action Group 6: photosystem II inhibitor

Chemical family nitrile

bromoxynil + MCPA (Bromac and other trade names)

Rate 0.22 lb ai/a bromoxynil + 0.22 lb ae/a MCPA

Time Apply when flax is 2 to 8 inches tall. Do not apply during or after bud stage.

Remarks Do not apply with crop oil concentrate, surfactants, or nitrogen solutions.

Caution Temperatures over 85°F within 3 days of application may cause injury. Other situations may also injure flax. To avoid injuring flax, see the "Restrictions and Precautions" section of the label.

Site of action (bromoxynil) Group 6: photosystem II inhibitor; (MCPA) Group 4: synthetic auxin

Chemical family (bromoxynil) nitrile; (MCPA) phenoxy acetic acid

clopyralid + MCPA (Commando M and other trade names)

Rate 0.045 lb ae/a clopyralid + 0.25 lb ae/a MCPA

Time Apply when flax is 2 to 6 inches tall and weeds are actively growing.

Remarks Apply before target weeds reach 3 inches. For control of Canada thistle, apply after the majority of leaves have emerged, but before flax begins bolting.

Caution Make only one application. Do not apply more than 0.25 lb ae/acre of MCPA per year. Preharvest interval is 72 days.

Site of action (both) Group 4: synthetic auxin

Chemical family (clopyralid) pyridine; (MCPA) phenoxy acetic acid

MCPA (several trade names)

Rate 0.106 to 0.244 lb ae/a

Time Apply when flax is 2 to 8 inches tall, before early bud stage.

Remarks For Canada thistle control, it may be necessary to apply the high rate, but injury may occur.

Caution Rates and other instructions vary by product label.

Site of action Group 4: synthetic auxin

Chemical family phenoxy acetic acid

Harvest Aid

carfentrazone (Aim and other trade names)

Rate 0.031-0.096 lb ai/a, (2.0-6.1 oz/a Aim EC)

Time Harvest aid, when 75% of bolls have turned brown, up to day of harvest.

Remarks Apply with MSO or COC at 1 to 2 % v/v, in a minimum of 15 GPA. The addition of AMS may improve efficacy.

Caution Do not exceed 0.096 lb ai/a per season.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor.

Chemical family Aryl triazinone

flumioxazin (Valor)

Rate 0.048 to 0.064 lb ai/a (1.5 to 2.0 oz/a Valor)

Time Apply after 75% of bolls are brown and no less than 5 days before harvest.

Remarks Apply in 15 to 30 gal/a. Use 1 quart/a methylated seed oil.

Caution Valor is not labeled for this use in all states; see supplemental label for listed states. Preharvest interval is 5 days. Do not exceed 0.092 lb ai/a (3.0 oz/a Valor) per growing season.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Diphenylether

glyphosate (several trade names)

Rate 1.125 lb ae/a

Time Apply when flax is mature, but at least seven days before harvest.

Remarks Not all glyphosate labels include this use.

Caution Do not exceed maximum season rate of 6 lb ae/a, including preplant, at planting or preemergence applications. Do not plant crops not listed on the label within 30 days of application. **Pre harvest interval is 7 days.**

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

saflufenacil (Sharpen)

Rate 0.022 to 0.044 lb ai/a (1.0 to 2.0 oz/a Sharpen)

Time Apply when 70% to 80% of bolls are brown. It may take up to 7 days for optimum desiccation.

Remarks **Flax is listed under oilseed crops, subgroup 20A.** Use methylated seed oil plus ammonium-based adjuvant.

Caution Do not apply to crops grown for seed. Preharvest interval is 3 days.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Uracil (pyrimidinedione) amide

Mint

Rick Boydston, Kyle Roerig, and Andy Hulting

Revised March 2020

Annual Grass and Broadleaf Weeds in New Plantings and Established Crops

napropamide (Devrinol DF-XT, Devrinol 2XT, Devrinol 10G)

Rate 4 lb ai/a (8 lb/a of 50% products)

Time In furrow-irrigated mint, it is most effective to apply late in the fall to allow winter rain to carry herbicide into soil. In sprinkler-irrigated mint, apply any time before weeds emerge. May be applied to newly planted mint immediately after planting.

Remarks There is some evidence that napropamide breaks down with continued exposure to sun. This photodecomposition can be minimized by rain, sprinkler irrigation, or mechanical incorporation. November through February treatment must be incorporated or irrigated in if no rain falls within 2 weeks of application. Treatments outside of this November through February window must be incorporated or irrigated in within 24 hours if no rain falls. Results are best if mechanically incorporated within 24 hours after application regardless of time of year applied.

Caution Napropamide has injured mint that was not rotovated before herbicide application. Will not control emerged weeds. Do not apply to ground that is frozen or heavily covered with leaves or trash.

Site of action Group 15: inhibits very-long-chain fatty acid synthesis

Chemical family Acetamide

sulfentrazone (Spartan 4F and other trade names)

Rate 0.14 to 0.375 lb ai/a (4.5 to 12 oz/a) depending on soil type and organic matter. Reduce application rate by 25% for new plantings. Do not apply more than 12 oz/a per year.

Time Apply to dormant mint in spring after any cultivation and before new growth emerges, or postharvest in fall or winter after any cultivation when mint is dormant. Split applications may be used for preemergence sequential control of winter annual and summer annual weeds. May be applied to new mint plantings before weeds emerge and mint begins growth.

Remarks Adjust rate for soil type, soil organic matter content, and soil pH. Will not adequately control most grasses. In new plantings, reduce application rate 25% from the rate for established plantings with the particular soil characteristics. Apply with a registered burndown herbicide to control weeds emerged at application. A surfactant is recommended with these tank-mixes to increase control of emerged weeds. Overhead moisture required after application to activate the herbicide. Foliage that persists during dormancy may be discolored. Foliage on new growth may be discolored temporarily. May be tank mixed with other labeled herbicides to broaden weed control spectrum.

Caution **Do not apply to soils classified as sand and with less than 1% organic matter content.** Applications to stressed mint may injure crop. Applications to emerged mint will severely injure exposed plant tissue. Do not cultivate after applying. Do not exceed 0.375 lb ai/a in a 12-month period. Do not mix with fertilizers. Note re-cropping restrictions on the label.

Site of action Group 14: protoporphyrinogen oxidase inhibitor

Chemical family Triazinone

terbacil (Sinbar WDG)

Rate 0.8 to 1.6 lb ai/a applied preemergence to mint or 0.8 to 1.6 lb ai/a plus recommended surfactant or nonphytotoxic spray oil applied postemergence to small, actively growing weeds (1 to 2 lb/a Sinbar)

Time West of the Cascades, apply before crop emerges in spring or in fall after last cultivation. East of the Cascades, apply before emergence any time after the first settling rain in fall. Do not apply when ground is frozen. Make postemergence applications before broadleaf weeds are 2 inches tall or across, and grasses are 1 inch tall or across. If not applied preemergence, two postemergence treatments may be made.

Remarks Almost all spring terbacil application failures result from inadequate moisture to activate the chemical during the time when weeds are germinating and growing. If moisture is inadequate to activate the chemical, irrigation must follow fall or winter treatment as soon as soil thaws in spring (or promptly after spring treatment). On soils with good subsurface moisture, best results are by applying 0.75 to 1 inch of overhead moisture before weeds are more than 1 inch high. If subsoil is dry, or if weeds have germinated and their roots penetrate deeply into the soil, 1.5 to 3 inches of irrigation may be required. For furrow-irrigated or rill-irrigated mint, take care to thoroughly wet across the entire bed after applying, or weed control may be poor. Control under those conditions may improve by applying in fall, for activation by winter rain, or by incorporating terbacil into top 1 inch of soil during final bed preparation before crop emerges in spring. This is especially true if spring rain is erratic or inadequate to activate terbacil. For fall application west of Cascades, apply early, before weeds emerge. Results have been poor after weeds, such as groundsel and prickly lettuce, develop a taproot. For postemergence application, apply before broadleaf weeds are 2 inches tall or across and before grasses are 1 inch tall or across. Add 0.5 to 1 pint of surfactant per 25 gal of spray mixture, 1 gal/a of nonphytotoxic superior-type spray oil, or 1 quart/a of surfactant-oil mixture (such as Herbimax or MorAct). Two applications of terbacil (preemergence + postemergence or postemergence + postemergence) may be made within 1 year, but the total applied should not exceed 1.6 lb ai/a in any 1 year. This treatment will not control green foxtail. Terbacil resistant common lambsquarters and redroot pigweed are present in many fields in the PNW.

Caution Do not apply within 60 days of harvest. Unless otherwise directed, do not use on sand, loamy sand, or gravelly soils or on soils with less than 1% organic matter. If used on soils with these conditions, limit use to a small area to determine crop response prior to treating larger areas. Do not exceed 1.6 lb ai/a total per season. Residues can persist after mint plow-out and can injure later crops. Do not replant treated areas to any other crop within 2 years after last terbacil application. Deep plowing (10 to 12 inches) helps reduce injury from carryover. Mint

sometimes has been injured when terbacil was applied before, with, or after certain insecticides, especially organophosphates such as Dyfonate. Injury usually has been with applications less than 3 weeks apart and has been especially severe on new stands or on mint emerging from shallow, weak roots, particularly on sandy or gravelly soils. To minimize the possibility of injury, follow the labels of both products carefully. Avoid closely timed applications, especially to weak mint on coarse soils. Mint stressed by double cutting, drought, high salt content of soils, insects, diseases, or other factors may be injured.

Site of action Group 5: photosystem II inhibitor

Chemical family Uracil

Annual Grass and Broadleaf Weeds in Established Crop

clomazone (Command 3ME)

Rate 0.5 lb ai/a (21.3 oz/a product)

Time Apply to soil surface before weeds emerge and mint begins new growth.

Remarks Preemergent herbicide. Will not adequately control most grasses. Only one application per season allowed. Off-site movement of spray drift or vapors of clomazone can whiten or yellow some plants. Before applying, check adjacent properties and avoid spraying within 1,200 ft of desirable plants. Overhead moisture after application required to move herbicide into soil. Some, usually temporary, mint discoloration may occur when mint emerges. All use is at the user's and/or grower's risk; users should review the vegetable disclaimer at the end of the label before using. May be tank-mixed with other labeled herbicides to broaden weed control spectrum.

Caution Do not apply more than once per season. Preharvest interval is 84 days. Do not exceed 0.5 lb ai/a (21.3 pints/a Command 3ME). Do not allow particle or vapor drift. Twelve month rotation interval to wheat. Note other crop restriction intervals on label.

Site of action Group 13: inhibits DOXP synthase

Chemical family Isoxazolidinone

diuron (Diuron, Direx, and other trade names)

Rate 0.6 to 2.4 lb ai/a depending on soil organic matter

Time Apply to mint during late-winter dormant period or after flaming in spring before new growth emerges.

Remarks Adjust application rate according to soil organic matter. Treatments applied to growing mint often injure crop. Diuron works best when applied to moist soils and followed by 0.5 to 1 inch of rain or overhead irrigation to move herbicide into the weed root zone before weeds germinate. If weeds are present at time of application, a surfactant at 0.25% v/v or a crop oil concentrate at 1% v/v may enhance control. Weeds larger than 2 inches tall or across at time of treatment may not be controlled. May be tank-mixed with other herbicides, provided mixture is not applied to actively growing mint. Tank-mixes and sequential treatments with other herbicides can increase the risk of crop injury. Use lower rate of diuron unless experience indicates it is safe to use higher rates.

Caution This product is only labeled for use in peppermint. Do not use on sand, loamy sand, gravelly soils, or exposed subsoils, or if soil organic matter is less than 1%. Do not apply to soils that have a high salt content and/or high water table or poor drainage that retards mint root development, resulting in a shallow root system. Do not cultivate after treatment. Do not apply to actively growing mint. Do not apply to mint established less than one growing season in the field or to mint stressed by low fertility, drought, winter injury, insects, disease, or damage from other herbicides or other causes. Do not apply to snow-covered or frozen ground.

Site of action Group 7: photosystem II inhibitor

Chemical family Substituted urea

flumioxazin (Chateau and other trade names)

Rate 0.128 lb ai/a (4 oz/a of products containing 51% ai)

Time Apply to established dormant mint between November 25 and March 1.

Remarks Use for residual preemergence weed control and to aid postemergence burndown of many annual and perennial weeds where established mint is dormant. To control emerged weeds, tank mix with paraquat and apply with a nonionic surfactant. A spray-grade nitrogen source (either ammonium sulfate at 2 to 2.5 lb/a or 28 to 32% nitrogen solution at 1 to 2 quarts/a) may be added to increase burndown of emerged weeds. Controls broadleaf weeds better than grasses.

Caution Applications to nondormant mint may result in unacceptable crop injury. Do not exceed 0.128 lb ai/a (4 oz/a product) in a single application or 0.255 lb ai/a (8 oz/a product) in a single growing season. Do not reapply within 60 days of the first application. Preharvest interval is 80 days. Do not apply to stands established longer than 3 years. Do not apply south of Ladd Canyon in Union or Baker counties in Oregon. Note crop restriction intervals on label. Refer to label for complete list of restrictions. Weather related conditions, including high wind, splashing, heavy rains or cool conditions at or near mint emergence may cause crop injury in fields treated with flumioxazin.

Site of action Group 14: protoporphyrinogen oxidase inhibitor

Chemical family N-phenylphthalimide

napropamide (Devrinol DF-XT, Devrinol 2XT, Devrinol 10G)

See listing in Annual Grass and Broadleaf Weeds in New Plantings and Established Crops

paraquat (Gramoxone Inteon and other trade names)

Rate 0.49 to 0.75 lb ai/a (2 to 3 pints/a Gramoxone Inteon) + nonionic surfactant or crop oil concentrate

Time Apply to dormant mint from November through mid-February.

Remarks Apply in at least 10 gal/a water by ground or 5 gal/a by air. Always add nonionic surfactant or crop oil concentrate as specified on label. Weeds should be succulent, growing, and less than 6 inches tall or across at application. Weeds that germinate after application will not be controlled. The addition of oxyfluorfen improves weed control and this combination is more effective on many weeds than either herbicide alone. Tank mixing with terbacil can improve contact activity and control of Italian ryegrass, prickly lettuce and groundsel. **Caution A restricted-use herbicide**. Do not apply after mint begins spring growth. Mint foliage present at application may be burned. Use a respirator, chemical resistant gloves, and protective eyewear during application. When handling concentrate a face shield and apron are also required. Paraquat is highly toxic to humans; follow the PPE

requirements on the label carefully. Maximum of two applications per year.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

pelargonic acid (Scythe)

Rate Apply in a total water volume of 75 to 200 gal per acre. Apply as a 3-5% (v/v) solution on young, small annual weeds and 5-7% (v/v) solution on perennial herbaceous weeds or annual weeds over 6 inches tall. For difficult to control weeds and maximum vegetation control use 7-10% (v/v).

Time Apply while mint is dormant and before mint emerges to control winter annual or early emerged weeds. Don't allow spray to contact emerged mint. Small weeds are easier to control than larger weeds. Warm weather promotes rapid activity on plants.

Remarks Apply as a spot treatment or as a directed and shielded spray avoiding contact with emerged mint. Contact of spray or spray drift with emerged vegetation will result in damage. Repeat applications required to control new weeds emerging from seed or underground vegetative parts. Broadleaf weeds are generally controlled better than grass weeds and repeated use may select for grasses.

Caution Pelargonic acid is a nonselective herbicide and any spray contacting desirable vegetation will likely result in damage. Partially green growth contacted with spray will be killed or stunted.

Site of action Group 26 unknown. Disrupts cell membranes causing leakage from the cells and rapid wilting.

Chemical family Carboxylic acid

pendimethalin (Prowl H_2O and other trade names)

Rate 0.71 to 1.9 lb ai/a (1.5 to 4 pints/a of 38.7% formulations). Rate depends on soil texture.

Time Apply to dormant, established peppermint and spearmint before weed seedlings emerge.

Remarks Apply by ground in 10 to 40 gal/a of water, or by air in at least 5 gal/a water. Adequate rain or irrigation after application and before weed seedlings emerge will enhance control.

Caution Do not apply to mint in first year of growth and establishment. Do not apply if mint has broken dormancy. Mint growing under stress conditions is more susceptible to herbicide damage. Preharvest interval is 90 days. Refer to main labels for crop rotation restrictions. Do not exceed 1.9 lb ai/a (4 pints/a) per season. Do not apply through any type of irrigation system.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

pyroxasulfone (Zidua)

Rate 0.098 lb ai/a (1.85 oz/a) as one single application per year.

Time Apply to dormant, established peppermint and spearmint before target weeds emerge.

Remarks Residual pre-emergent herbicide. Only apply to dormant mint. Can be tank mixed or applied sequentially to improve control spectrum and/or control emerged weeds. Strong on winter annual grasses and pigweed spp.

Caution Do not apply in the first year of growth and establishment. To ensure crop safety, apply well before crop dormancy is expected to break. Do not apply to soils with <1.0% OM or on coarse soils. Temporary crop injury may be observed when the crop first breaks dormancy. Extreme rainfall or extended periods of soil saturation at the time of dormancy break, may result in crop injury in fields treated with pyroxasulfone.

Site of action Group 15: mitosis inhibitor

Chemical family pyrazole

sulfentrazone (Spartan 4F and other trade names)

Rate 0.14 to 0.375 lb ai/a (4.5 to 12 oz/a) depending on soil type and organic matter. Reduce application rate by 25% for new plantings. Do not apply more than 12 oz/a per year.

Time Apply to dormant mint in spring after any cultivation and before new growth emerges, or postharvest in fall or winter after any cultivation when mint is dormant. Split applications may be used for preemergence sequential control of winter annual and summer annual weeds. May be applied to new mint plantings before weeds emerge and mint begins growth.

Remarks Adjust rate for soil type, soil organic matter content, and soil pH. Will not adequately control most grasses. In new plantings, reduce application rate 25% from the rate for established plantings with the particular soil characteristics. Apply with a registered burndown herbicide to control weeds emerged at application. A surfactant is recommended with these tank-mixes to increase control of emerged weeds. Overhead moisture required after application to activate the herbicide. Foliage that persists during dormancy may be discolored. Foliage on new growth may be discolored temporarily. May be tank mixed with other labeled herbicides to broaden weed control spectrum.

Caution Do not apply to soils classified as sand and with less than 1% organic matter content. Applications to stressed mint may injure crop. Applications to emerged mint will severely injure exposed plant tissue. Do not cultivate after applying. Do not exceed 0.375 lb ai/a in a 12-month period. Do not mix with fertilizers. Note re-cropping restrictions on the label.

Site of action Group 14: protoporphyrinogen oxidase inhibitor

Chemical family Triazinone

terbacil (Sinbar WDG)

Rate 0.8 to 1.6 lb ai/a applied preemergence to mint or 0.8 to 1.6 lb ai/a plus recommended surfactant or nonphytotoxic spray oil applied postemergence to small, actively growing weeds (1 to 2 lb/a Sinbar)

Time West of the Cascades, apply before crop emerges in spring or in fall after last cultivation. East of the Cascades, apply before emergence any time after the first settling rain in fall. Do not apply when ground is frozen. Make postemergence applications before broadleaf weeds are 2 inches tall or across, and grasses are 1 inch tall or across. If not applied preemergence, two postemergence treatments may be made.

Remarks Almost all spring terbacil application failures result from inadequate moisture to activate the chemical during the time when weeds are germinating and growing. If moisture is inadequate to activate the chemical, irrigation must follow fall or winter treatment as soon as soil thaws in spring (or promptly after spring treatment). On soils with good subsurface moisture, best results are by applying 0.75 to 1 inch of overhead moisture before weeds are more than 1 inch high. If subsoil is dry, or if weeds have germinated and their roots penetrate deeply into the soil, 1.5 to 3 inches of irrigation may be required. For furrow-irrigated or

rill-irrigated mint, take care to thoroughly wet across the entire bed after applying, or weed control may be poor. Control under those conditions may improve by applying in fall, for activation by winter rain, or by incorporating terbacil into top 1 inch of soil during final bed preparation before crop emerges in spring. This is especially true if spring rain is erratic or inadequate to activate terbacil. For fall application west of Cascades, apply early, before weeds emerge. Results have been poor after weeds, such as groundsel and prickly lettuce, develop a taproot. For postemergence application, apply before broadleaf weeds are 2 inches tall or across and before grasses are 1 inch tall or across. Add 0.5 to 1 pint of surfactant per 25 gal of spray mixture, 1 gal/a of nonphytotoxic superior-type spray oil, or 1 quart/a of surfactant-oil mixture (such as Herbimax or MorAct). Two applications of terbacil (preemergence + postemergence or postemergence + postemergence) may be made within 1 year, but the total applied should not exceed 1.6 lb ai/a in any 1 year. This treatment will not control green foxtail. Terbacil resistant common lambsquarters and redroot pigweed are present in many fields in the PNW.

Caution Do not apply within 60 days of harvest. Unless otherwise directed, do not use on sand, loamy sand, or gravelly soils or on soils with less than 1% organic matter. If used on soils with these conditions, limit use to a small area to determine crop response prior to treating larger areas. Do not exceed 1.6 lb ai/a total per season. Residues can persist after mint plow-out and can injure later crops. Do not replant treated areas to any other crop within 2 years after last terbacil application. Deep plowing (10 to 12 inches) helps reduce injury from carryover. Mint sometimes has been injured when terbacil was applied before, with, or after certain insecticides, especially organophosphates such as Dyfonate. Injury usually has been with applications less than 3 weeks apart and has been especially severe on new stands or on mint emerging from shallow, weak roots, particularly on sandy or gravelly soils. To minimize the possibility of injury, follow the labels of both products carefully. Avoid closely timed applications, especially to weak mint on coarse soils. Mint stressed by double cutting, drought, high salt content of soils, insects, diseases, or other factors may be injured.

Site of action Group 5: photosystem II inhibitor

Chemical family Uracil

trifluralin (Treflan and other trade names)

Rate 0.5 to 0.75 lb ai/a (1 to 1.5 pt/a Treflan) depending on soil type

Time Apply to dormant, established peppermint and spearmint.

Remarks Application rate depends on soil type. Must be soil-incorporated 1 to 2 inches deep with equipment that ensures thorough soil mixing and minimum damage to mint. Granular formulation (Treflan TR-10) can be activated within 3 days with 0.5 inch rainfall or sprinkler irrigation rather than mechanical incorporation. It is also possible to apply via chemigation; see label for specific chemigation application instructions. Trifluralin will not control mustards, prickly lettuce, horseweed (marestail), salsify, mallow, or nightshade.

Caution Take care to avoid exposing untreated soil when ditching for rill irrigation. Do not plant sugar beets, red beets, or spinach for 12 months after applying. Do not plant corn, sorghum (milo), or oats for 14 months after applying.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

Annual Broadleaf Weeds

bromoxynil (Several trade names)

Rate 0.25 to 0.38 lb ai/a (0.5 lb ai/a allowed with chemigation application only)

Time Apply to established mint in early spring using lower rate. In autumn, there is more crop safety and applications can be made to spring-planted or established mint. Do not apply within 2 weeks of a terbacil (Sinbar) application.

Remarks Crop injury may be unacceptable if applied when temperature is expected to exceed 70°F for the first 5 days after treatment. Injury is less likely in fall. For best results, treat when weeds have fewer than four leaves, or when rosettes are less than 1.5 inches across. Use multiple applications if needed, but do not exceed 1.5 lb ai/a per growing season (6 pints/a for 2 lb bromoxynnil/gal and 3 pints/a for 4 lb bromoxynil/gal. Use 10 to 20 gal/a water in ground applications or 5 to 10 gal/a water by air. May also be applied through sprinkler irrigation systems to dormant mint.

Caution Preharvest interval is 70 days. May stunt or discolor mint. Do not apply to mint growing under adverse conditions including disease, insects, high salt, drought, or excessive moisture. Applications to mint growing under cool, cloudy weather and favorable moisture conditions followed by hot conditions, may cause leaf burn and can stunt mint. Do not tank-mix with terbacil when mint is actively growing because the crop may be injured. Do not plant rotational crops within 30 days of product application.

Site of action Group 6: photosystem II inhibitor

Chemical family Nitrile

carfentrazone (Aim EC)

Rate 0.008 to 0.03 lb ai/a (0.5 to 1.92 fl oz/a) + nonionic surfactant or crop oil concentrate or methylated seed oil

Time Apply to dormant mint

Remarks Apply in at least 10 gal/a water by ground or 5 gal/a by air. Always add nonionic surfactant or crop oil concentrate or methylated seed oil as specified on label. Controls only broadleaf weeds. Weeds should be succulent, growing, and small at application. Weeds that germinate after application will not be controlled. Use higher rates when weeds are under stress or larger. Liquid nitrogen fertilizer or ammonium sulfate additives are allowed in spray mixture.

Caution Do not apply after mint breaks dormancy and begins spring growth. Green mint foliage present at application will be injured. Do not apply within 5 days of harvest.

Site of action Group 14: protoporphyrinogen oxidase inhibitor

Chemical family Triazolinone

oxyfluorfen (Several trade names)

Rate 0.5 lb ai/a in western Oregon (Willamette Valley). In other areas, use 0.75 to 1.5 lb ai/a (2-3 pints/a of Goal 2XL)

Time Apply only to established, dormant mint before weeds exceed 2 to 4 inches in diameter or height. West of Cascades, treatments in December, January and through February generally provide best results. In other areas, apply from December through early March. Injury can be serious if spring growth has begun before application. Use the higher rates for longer weed control.

Remarks Add 1 quart/100 gal nonionic surfactant. Non-tilled mint may be injured; the injury is believed to occur when herbicide contacts roots and rhizomes growing near the soil surface. Apply oxyfluorfen only to strong, healthy mint. Controls annual bluegrass, Italian ryegrass, and wild oat if applied preemergence. The addition of paraquat improves weed control, especially grasses. This combination is more effective on many weeds than either herbicide alone. Paraquat is a restricted-use herbicide. Check the 'cautions' section in this handbook and read the label carefully before using.

Caution Do not apply to emerged mint. Do not apply to plowed mint in the Willamette Valley. East of Cascades, do not harrow plowed fields after application. In furrow-irrigated mint, corrugating must be done before application. Do not apply to mint weakened by disease, nematodes, insects, winter injury, high salt, or other factors because severe injury may result. Do not apply to frozen ground.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Diphenylether

Annual and Perennial Broadleaf Weeds

bentazon (Basagran 5L and other trade names)

Rate 1 to 2 lb ai/a (1.5 to 3.2 pt/a Basagran 5L)

Time Apply postemergence to actively growing broadleaf weeds. For annual broadleaf weeds, apply when weeds are small.

Remarks Rate depends on target weed. Canada thistle should be at least 8 inches tall, western goldenrod less than 8 inches, salsify 4 to 8 inches, and common groundsel less than 3 inches tall at treatment. Make a second application 7 to 10 days later. Bentazon acts on contact, so thorough coverage is important. Use at least 20 gal/a water and at least 40 psi by ground. For aerial application, use at least 5 gal/a water and at least 40 psi. Add up to 1 quart/a of oil concentrate for ground application and 1 pint/a for aerial application. Unsatisfactory results can be expected if daytime temperatures do not reach at least 70°F in the week after application. Good soil moisture is essential for activity on weeds. May be tank mixed with bromoxynil, terbacil, or clopyralid to broaden broadleaf weed control spectrum. Preharvest interval is 20 days.

Caution Some mint leaves may burn under certain conditions. Do not apply during unseasonably cold weather or drought. Rain or overhead irrigation within 8 hours may nullify effectiveness of bentazon. Do not exceed 4 lb ai/a in one season. See various product labels for allowed tank mixes with other pesticides and fertilizers.

Site of action Group 6: photosystem II inhibitor

Chemical family Benzothiadiazole

clopyralid (Stinger and other trade names)

Rate Fall treatment (Sept. 15 - first frost): for annual weeds use 0.19 lb ae/a (0.5 pint/a product); for perennial weeds use 0.25 lb ae/a (0.66 pint/a product); for hard-to-kill perennial weeds use 0.375 lb ae/a (1 pint/a product). Spring treatment: annual weeds use 0.124 lb ae/a (0.33 pint/a product); perennial weeds use 0.19 lb ae/a (0.5 pint/a product). Max annual rate of 1 pint/a of product (fall + spring); if applying in both seasons, max fall rate is 0.66 pint/a and spring rate of 0.33 pint/a.

Time Treat small, actively growing annual weeds. For Canada thistle, apply after most basal leaves emerge but before bud stage. Fall application on winter annuals and perennials often is more effective than spring application. For difficult-to-control perennials such as Canada thistle and dandelion, a follow-up application in spring may be needed. Applying after the first fall frost usually results in reduced control.

Remarks A nonionic surfactant of at least 80% ai may be added at 1 pint/100 gal spray solution. Do not apply within 45 days of harvest. Clopyralid can cause stunting of mint growth and application to dormant mint or mint under 8 inches tall allows more time for mint to fully recover. Most weeds in the family Compositae or Asteraceae, such as mayweed (dog fennel), groundsel, dandelion, and salsify, and in the legume family, such as vetch, alfalfa and clover, are susceptible to clopyralid. Will not control broadleaf weeds such as mustards, henbit, chickweed, kochia, lambsquarters, pigweed, Russian thistle, and bindweed.

Caution Use treated mint for oil distillation only. Do not feed spent mint hay to livestock. Consult label for crop rotation restrictions. Mint straw, hay, or spent hay from treated areas cannot be used for composting or mulching on ground where susceptible crops may grow the next season.

Site of action Group 4: synthetic auxin

Chemical family Pyridine

glyphosate (many trade names)

Rate 1% to 2% solution

Time Apply to actively growing weeds.

Remarks Not all glyphosate formulations have mint on the label. Application rate and timing depend on target weeds. Apply as a spot treatment only, to no more than 10% of any acre. Can reapply in the same area at 30-day intervals.

Caution Any emerged crop sprayed will be killed. Avoid any drift outside spayed area, or those plants could be killed or injured. Allow at least 7 days between application and harvest.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted.

glyphosate (many trade names)

Rate 33% solution (1 gal Roundup Ultra in 2 gal water) in rope or sponge wick applicators or a 33% to 100% glyphosate solution in porous-plastic applicators

Time Apply to actively growing weeds that are at least 6 inches taller than the mint.

Remarks Not all glyphosate formulations have this use on the label. Wiper applicator contact point with weed foliage should be at least 2 inches above crop. Weeds should be at least 6 inches taller than crop. Results improve by making two applications in opposite directions. Operate at no more than 5 mph. Do not apply to wet weeds.

Caution Contact with herbicide solution, whether by dripping from the applicator or inadvertently wiping the mint, will damage or kill the mint plants contacted. Allow at least 7 days between application and harvest. Sequential application may be made to the same area at 30-day intervals.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

MCPB (Thistrol Herbicide)

Rate Use 0.25 to 0.5 lb ae/a (1 to 2 pints/a product).

Time For field bindweed suppression, a single spring application works best. Field bindweed control improves as runners begin to exceed 6 to 8 inches. Apply in fall for susceptible winter annuals, and in spring for summer annuals when weeds are small and actively growing.

Remarks Do not apply within 40 days of harvest. Many broadleaf weed species will not be controlled at low rates labeled for use in mint.

Caution Mint may be discolored or twisted following MCPB application. Mint oil yields may be reduced if applications are made when the crop is 6 inches or taller. Do not use if minor mint injury is unacceptable. If tank mixing with other herbicides, test on small area prior to application to entire field to determine if mint injury is acceptable.

Site of action Group 4: synthetic auxin

Chemical family Phenoxy; phenoxyalkanoic acid

Annual and Perennial Grass Weeds

clethodim (Select2EC and other trade names)

Rate 0.09 to 0.25 lb ai/a (6 to 16 oz/a Select 2EC or Intensity); 0.07 to 0.24 lb ai/a (9 to 32 fl oz/a Select Max or Intensity One)

Time Apply to actively growing grasses at labeled stage of growth.

Remarks Controls grass only. Refer to label for specific herbicide rates, weed species, and weed size. Use crop oil concentrate at 1 gal/100 gal spray mix. Most effective on actively growing grasses. Larger, more mature grasses often can be controlled but may require two applications. Use the higher rates for perennial grass control.

Caution Do not exceed 0.5 lb/a (32 oz/a of Select 2EC or 64 fl oz/a of Select Max) per season. When using Select 2EC, do not add nitrogen fertilizer-source spray-adjuvants to the spray mixture. Preharvest interval is 21 days. For repeat applications, wait at least 14 days between applications.

Site of action Group 1: acetyl CoA carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

glyphosate (many trade names)

Rate 1% to 2% solution

Time Apply to actively growing weeds.

Remarks Not all glyphosate formulations have mint on the label. Rate and timing depend on target weeds. Apply as a spot treatment only, to no more than 10% of any acre. Can reapply in the same area at 30-day intervals.

Caution The sprayed crop will be killed. Avoid any drift outside of spayed area, otherwise those plants could be killed or injured. Preharvest interval is 7 days.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

glyphosate (many trade names)

Rate 33% solution (1 gal Roundup Ultra in 2 gal water) in rope or sponge-wick applicators, or a 33% to 100% glyphosate solution in porous-plastic applicators

Time Apply to actively growing weeds that are at least 6 inches taller than the mint.

Remarks Not all glyphosate formulations are labeled for this use. Wiper applicator contact point with the weed foliage should be at least 2 inches above the crop. Weeds should be at least 6 inches taller than the crop. Results may be better with two applications made in opposite directions. Operate at no more than 5 mph. Do not apply to wet weeds.

Caution Contact with the herbicide solution, whether by applicator drips or inadvertent wiping of the mint, will damage or kill the mint plants contacted. Preharvest interval is 7 days. Sequential application may be made to the same area at 30-day intervals.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

quizalofop (Assure II and other trade names)

Rate 0.034 to 0.0825 lb ai/a (5 to 12 oz/a product)

Time Apply to actively growing annual or perennial grasses at appropriate stage of grass growth as indicated on the label.

Remarks Controls grass only. Refer to label for specific herbicide rates, weed species, and weed size. Always add a crop oil concentrate at 1% v/v gal spray mix. Most effective on actively growing grasses; larger, more mature grasses can often be controlled but two applications may be required. Will not control annual bluegrass or any of the fine fescues.

Caution Preharvest interval is 30 days. Do not exceed two applications per season (0.165 lb ai/a). Tank-mixes with postemergence broadleaf herbicides have reduced control of most grass species. Application interval must be seven days or greater. Do not apply if rain is expected within 1 hour after application. Consult label for crop rotation restrictions.

Site of action Group 1: acetyl CoA carboxylase (ACCase) inhibitor

Chemical family Aryloxyphenoxy propionate

sethoxydim (Poast,Rezult G)

Rate 0.28 to 0.47 lb ai/a (1.5 to 2.5 pints/a, maximum 5 pints/a per year)

Time Apply to actively growing annual or perennial grasses at growth stage indicated on label.

Remarks For grass control only. Refer to label for specific herbicide rates, weed species, and weed sizes. Always add a nonphytotoxic crop oil concentrate to the spray tank at 2 pints/a or Dash HC at 1 pint/a. Sethoxydim is most effective on actively growing grasses before they have been cut and before they reach the maximum size indicated on the label. Larger, more mature grasses can often be controlled, but two applications may be required. Sethoxydim will not control annual bluegrass or any of the fine fescues and is weak on downy brome and quackgrass.

Caution Control may be erratic on grass stressed by drought, temperature extremes, insect damage, herbicide injury, or other factors. Do not apply if rain is expected within 1 hour after applying. Preharvest interval is 20 days. Do not graze treated fields or use spent hay or straw as livestock feed. Do not exceed two applications or 5 pints/a a season. Do not tank-mix except with herbicides listed on the Poast label.

Site of action Group 1: acetyl CoA carboxylase (ACCase) inhibitor

Chemical family Cyclohexanedione

Herbicide Effectiveness on Weeds in Mint

Weed Family	pyroxasulfone	MCPB	flumioxazin	sethoxydim	quizalofop	clethodim	sulfentrazone	oxyfluorfen	diuron	terbacil	clomazone	trifluralin	napropamide	clopyralid	bentazon	paraquat	pendimethalin
AMARANTH																	
Amaranth, Powell (A) *Amaranthus powellii*	E	F-G	F-G	P	P	P	G	F-G	F-G	F	F	G	G	P	F	G	F-G
Pigweed, redroot (A) *Amaranthus retroflexus*	E	F-G	F-G	P	P	P	G	F-G	F-G	F	F	G	G	P	F	G	F-G
Pigweed, tumble (A) *Amaranthus graecizans*	E	-	—	P	P	P	—	G	G	F	—	G	G	P	F	G	F-G
BORAGE																	
Fiddleneck, coast (A) *Amsinckia intermedia*	E	-	—	P	P	P	—	—	G	—	—	P	G	—	G	—	—
BUTTERCUP																	
Buttercup, celery-leaved (A) *Ranunculus sceleratus*	-	-	—	P	P	P	—	—	—	F	—	P*	—	—	—	G	—
Buttercup, creeping (P) *Ranunculus repens*	-	-	—	P	P	P	—	—	—	P	—	P*	—	—	—	P	—
CALTROP																	
Puncturevine (A) *Tribulus terrestris*	-	-	G	P	P	P	F-G	—	—	F	—	G	—	P	—	G	G
COMPOSITE																	
Catsear, spotted (P) *Hypochaeris radicata*	-	-	—	P	P	P	—	G*	P	P	—	P	P	—	P	—	—
DAISY, OXEYE																	
Chrysanthemum *Leucanthemum*	-	-	—	P	P	P	—	—	G*	P	—	P	P	—	F	P	—
Dandelion, common (P) *Taraxacum officinale*	-	-	F	P	P	P	P	P	F*	P	F	—	P	F-G	G*	P	P
Devil's beggarsticks (A) *Bidens frondosa*	-	-	—	P	P	P	—	—	G	F	—	P	—	—	—	—	—
Goldenrod, Canada (P) *Solidago canadensis*	-	-	—	P	P	P	—	P	P	P	—	P	P	—	—	P	P
Goldenrod, western (P) *Solidago occidentalis*	-	-	—	P	P	P	—	P	P	P	—	P	P	—	P	P	P
Groundsel, common (A) *Senecio vulgaris*	G	-	F	P	P	P	F-G	G	F	F	F	F	F-G	F-G	F-G	G	P
Horseweed (A) *Conyza canadensis*	-	-	F-G	P	P	P	G	P	F	P	—	P	F	G	F	F	P
Lettuce, prickly (A) *Lactuca serriola*	-	F	F-G	P	P	P	F-G	F-G	G	F	F-G	P	G	G	F	G	P
Mayweed (A) *Anthemis cotula*	-	-	—	P	P	P	G	—	G	G	—	P	—	G	F	F	—
Pineappleweed (A) *Matricaria matricarioides*	-	-	—	P	P	P	—	—	G	G	—	P	G	G	G	G	—
Ragwort, tansy (B) *Senecio jacobaea*	-	-	—	P	P	P	—	—	P	P	—	P	P	—	P	P	—
Salsify, common (B) *Tragopogon porrifolius*	-	-	—	P	P	P	—	F	P	P	—	P	P	G	P	F	P
Salsify, meadow (B) *Tragopogon pratensis*	-	-	—	P	P	P	—	F	P	P	—	P	P	G	P	F	P

Weed Family	pyroxasulfone	MCPB	flumioxazin	sethoxydim	quizalofop	clethodim	sulfentrazone	oxyfluorfen	diuron	terbacil	clomazone	trifluralin	napropamide	clopyralid	bentazon	paraquat	pendimethalin
Salsify, western (B) *Tragopogon dubius*	-	-	F	P	P	P	F	F	P	P	F-P	P	P	G	P	F	P
Sowthistle, annual (A) *Sonchus oleraceus*	F	F-G	G	P	P	P	G	G	F	G	—	P	G	G	F	F	—
Sunflower, wild (A) *Helianthus annuus*	-	-	—	P	P	P	P	—	—	—	—	P	—	G	G	—	—
Thistle, bull (B) *Cirsium vulgare*	-	-	—	P	P	P	—	—	G	F	—	P	—	—	—	—	—
Thistle, Canada (P) *Cirsium arvense*	-	F	—	P	P	P	P	P	P	P	F	P	P	G	F	P	P
FIGWORT																	
Mullein, common (B) *Verbascum thapsus*	-	-	—	P	P	P	—	—	P	—	—	—	—	P	—	F	—
Speedwell, birdseye (A) *Veronica persica*	E	-	—	P	P	P	—	G	P	F	—	G	—	P	F	G	—
Speedwell, ivyleaf (A) Veronica hederifolia	-	-	—	P	P	P	—	G	P	F	—	G	—	P	F	G	—
Toadflax, yellow (P) *Linaria vulgaris*	-	-	—	P	P	P	—	—	P	P	—	P	P	P	P	P	—
GERANIUM																	
Filaree (A) *Erodium cicutarium*	-	-	—	P	P	P	—	G	F	G	—	F	G	—	—	F	—
Geranium, cutleaf (A) *Geranium dissectum*	-	-	—	P	P	P	—	G	G	G	—	P	G	—	—	G	—
Geranium, dovefoot (A) *Geranium molle*	-	-	—	P	P	P	—	G	G	G	—	P	G	—	—	G	—
GOOSEFOOT																	
Kochia (A) *Kochia scoparia*	-	-	G	P	P	P	G	F	F	F	G	G	P	P	F-G	G	G
Lambsquarters (A) *Chenopodium album*	-	F-G	G	P	P	P	G	G	G	G	G	G	G	P	F	G	G
Orach, red (A) *Atriplex rosea*	-	-	—	P	P	P	—	G	G	G	—	G	—	P	F	—	—
Thistle, Russian (A) *Salsola kali*	-	-	G	P	P	P	G	G	P	F	—	F	P	P	F	G	F
GOARD																	
Cucumber, western wild (P) *Marah oreganus*	-	-	—	P	P	P	—	P	P	P	—	P	P	—	P	P	—
GRASS																	
Barnyardgrass (A) *Echinochloa crus-galli*	-	P	F	G	G	G	P	F	G	F	G	G	G	P	P	G	G
Bermudagrass (P) *Cynodon dactylon*	-	P	—	F	G	G	P	P	P	P	—	P	P	P	P	P	P
Bluegrass, annual (A-P) *Poa annua*	-	P	—	P	P	G	—	G	G	G	—	G	G	P	P	P	G
Bluegrass, Canada (P) *Poa compressa*	-	P	—	—	—	—	—	P	P	P	—	P	P	P	P	F	P
Bluegrass, Kentucky (P) *Poa pratensis*	-	P	—	F	G	F	—	P	P	P	—	P	P	P	P	F	P

Weed Family	pyroxasulfone	MCPB	flumioxazin	sethoxydim	quizalofop	clethodim	sulfentrazone	oxyfluorfen	diuron	terbacil	clomazone	trifluralin	napropamide	clopyralid	bentazon	paraquat	pendimethalin
Brome, downy (A) *Bromus tectorum*	-	P	—	P	F-G	F-G	—	—	P	G	F-G	F	G	P	P	G	F
Crabgrass, large (A) *Digitaria sanguinalis*	-	P	F	—	—	—	P	—	—	—	G	—	—	P	—	—	—
Fescue, rattail (A) *Vulpia myuros*	-	P	—	P	P	P	—	F	F-G	G	F-G	G	P	P	P	F-G	—
Foxtail, green (A) *Setaria viridis*	-	P	F	F-G	G	G	P	F	F	F	G	G	F	P	P	G	G
Foxtail, yellow (A) *Setaria lutescens*	-	P	—	G	G	G	P	F	F	F	G	G	G	P	P	G	G
Oat, wild (A) *Avena fatua*	-	P	—	G	G	G	—	F	P	G	—	P	G	P	P	G	G
Quackgrass (P) *Elytrigia repens*	-	P	—	F	G	F-G	P	P	P	G	F-G	P	P	P	P	F	P
Ryegrass, Italian (A-B) *Lolium multiflorum*	E	P	—	G	G	G	—	G	F	F	—	F	F	P	P	G	—
Ryegrass, perennial (P) *Lolium perenne*	-	P	—	G	G	G	—	P	P	P	—	P	P	P	P	F	—
Sandbur (A) *Cenchrus longispinus*	-	P	—	G	G	G	P	—	F	F	—	G	—	P	P	—	G
Velvetgrass (P) *Holcus lanatus*	-	P	—	F-G	P	F-G	—	P	P	G	—	P	P	P	P	F	—
Wheat, volunteer (A) *Triticum aestivum*	-	P	—	G	G	G	—	—	P	F	G	P	F	P	P	G	—
Witchgrass (A) *Panicum capillare*	-	P	—	G	G	G	—	F	P	G	—	G	G	P	P	G	—
HORSETAIL																	
Horsetail, field (P) *Equisetum arvense*	-	-	—	P	P	P	—	—	P	P	—	P	P	P	P	P	P
KNOTWEED																	
Buckwheat, wild (A) *Polygonum convolvulus*	-	-	—	P	P	P	—	G	G	G	—	G	—	G	G	—	—
Dock, broadleaf (P) *Rumex obtusifolius*	-	-	—	P	P	P	—	—	F**	G**	—	F	—	F	—	—	—
Knotweed, prostrate (A) *Polygonum aviculare*	-	-	—	P	P	P	—	G	F	G	—	G	F	F	F	—	—
Ladysthumb (A) *Polygonum persicaria*	-	F-G	G	P	P	P	G	G	F	G	—	G	—	F-G	G	—	—
Sorrel, red (P) *Rumex acetosella*	E	-	—	P	P	P	—	—	G**	G**	—	F	—	G	F	—	—
LEGUME																	
Clover, hop (A) *Trifolium dubium*	-	-	—	P	P	P	—	G	—	—	—	—	—	G	P	—	P
Clover, white (P) *Trifolium repens*	-	-	P	P	P	P	—	G	P	—	—	P	P	G	P	P	P
Vetch, common (A) *Vicia sativa*	-	-	—	P	P	P	—	G	P	—	—	P	—	G	P	—	P
Vetch, hairy (A) *Vicia villosa*	-	-	—	P	P	P	—	G	P	—	—	P	—	G	P	—	P

Weed Family	pyroxasulfone	MCPB	flumioxazin	sethoxydim	quizalofop	clethodim	sulfentrazone	oxyfluorfen	diuron	terbacil	clomazone	trifluralin	napropamide	clopyralid	bentazon	paraquat	pendimethalin
LILY																	
Garlic, volunteer (P) *Allium sativum*	-	-	—	P	P	P	—	P	P	F	—	P	P	P	P	G	—
Garlic, wild (P) *Allium vineale*	-	-	—	P	P	P	—	P	P	P	—	P	P	P	P	G	—
MADDER																	
Bedstraw, catchweed (A) *Galium aparine*	-	-	G	P	P	P	G	G	P	P	—	F	—	P	F	P	P
Madder, field (A) *Sherardia arvensis*	-	-	—	P	P	P	—	—	—	—	—	—	—	P	—	—	—
MALLOW																	
Mallow, common (A-B) *Malva neglecta*	-	-	F-G	P	P	P	F-G	G	P	G	G	P	G	—	G	F	P
MINT																	
Deadnettle, red (A) *Lamium purpureum*	-	-	—	P	P	P	—	G	G	F	—	G	P	—	F	G	—
Henbit (A) *Lamium amplexicaule*	-	-	—	P	P	P	—	G	G	F	G	G	P	—	F	G	G
MORNINGGLORY																	
Bindweed, field (P) *Convolvulus arvensis*	P	F	—	P	P	P	F	P	P	P	F	P	P	P	P	P	P
MUSTARD																	
Bittercress, little (A) *Cardamine oligosperma*	G	—	—	P	P	P	—	G	G	G	—	P	G	P	—	G	P
Falseflax, smallseed (A) *Camelina microcarpa*	-	—	—	P	P	P	—	—	G	G	—	P	—	—	—	—	—
Flixweed (A) *Descurainia sophia*	-	—	G	P	P	P	G	G	G	G	—	P	F	P	G	G	P
Mustard, blue (A) *Chorispora tenella*	-	—	—	P	P	P	—	G	—	P	—	P	—	P	P	P	P
Mustard, hedge (A) *Sisymbrium officinale*	-	—	F	P	P	P	F	—	G	G	F-G	P	—	P	—	—	—
Mustard, tall hedge (A) *Sissymbrium loeselii*	-	—	F-G	P	P	P	P	F-G	F	F	G	P	—	F	—	F-G	—
Mustard, tansy (A) *Descurainia pinnata*	-	—	—	P	P	P	—	G	G	G	—	P	—	P	—	G	—
Mustard, tumble (A) *Sisymbrium altissimum*	-	—	G	P	P	P	F	G	G	G	G	P	—	P	—	—	—
Pepperweed, field (A) *Lepidium campestre*	-	—	—	P	P	P	—	—	G	G	—	P	—	—	G	G	—
Pepperweed, yellowflower (A) *Lepidium perfoliatum*	-	—	—	P	P	P	—	G	G	G	—	P	—	—	G	G	—
Shepherdspurse (A) *Capsella bursa-pastoris*	-	—	G	P	P	P	G	G	G	G	—	P	P	P	G	G	—
Turnip, wild (A) *Brassica campestris*	-	—	—	P	P	P	—	G	G	G	—	P	P	P	F	G	—

Weed Family	pyroxasulfone	MCPB	flumioxazin	sethoxydim	quizalofop	clethodim	sulfentrazone	oxyfluorfen	diuron	terbacil	clomazone	trifluralin	napropamide	clopyralid	bentazon	paraquat	pendimethalin
NIGHTSHADE																	
Nightshade, black (A) *Solanum nigrum*	-	-	G	P	P	P	G	G	G	G	—	P	—	G	P	—	F
Nightshade, cutleaf (A) *Solanum triflorum*	-	-	G	P	P	P	G	—	G	G	—	P	—	G	—	—	F
Nightshade, hairy (A) *Solanum sarrachoides*	-	-	G	P	P	P	G	G	G	G	—	P	P	G	G	—	F
PHLOX																	
Polemonium, annual (A) *Polemonium micranthum*	-	-	—	P	P	P	—	—	G	G	—	—	—	—	—	G	—
PINK																	
Chickweed, common (A) *Stellaria media*	-	-	G	P	P	P	—	F	G	G	—	G	G	P	G	G	—
Chickweed, jagged (A) *Holosteum umbellatum*	-	-	—	P	P	P	—	P	G	G	—	G	G	P	—	G	—
Chickweed, mouseear (P) *Cerastium vulgatum*	-	-	G	P	P	P	—	F	G	G	—	G	G	P	G	G	—
Chickweed, sticky (A) *Cerastium viscosum*	-	-	G	P	P	P	—	F	G	G	—	G	G	P	G	G	—
PRIMROSE																	
Willowweed, panicle (A) *Epilobium paniculatum*	E	-	—	P	P	P	—	—	G	G	—	—	P	—	—	G	—
PURSLANE																	
Minerslettuce (A) *Montia perfoliata*	-	-	—	P	P	P	—	—	G	G	—	F	P	—	—	G	—
Purslane, common (A) *Portulaca oleracea*	-	-	—	P	P	P	—	G	G	G	G	G	G	—	G	—	G
ROSE																	
Cinquefoil, silverweed (P) *Potentilla anserina*	-	-	—	P	P	P	—	—	P	F	—	—	—	—	—	—	—
Ladysmantle, western (A) *Alchemilla occidentalis*	-	-	—	P	P	P	—	G	G	G	—	—	—	P	—	G	—
ST. JOHNSWORT																	
St. Johnswort (P) *Hypericum perforatum*	E	-	—	P	P	P	—	—	P	P	—	P	P	—	—	P	—
SEDGE																	
Nutsedge, yellow (P) *Cyperus esculentus*	-	-	P	P	P	P	F-G	P	P	G	—	P	P	P	F	G	P
VIOLET																	
Pansy, field (P) *Viola arvensis*	-	-	—	P	P	P	—	—	P	P	—	P	—	P	P	P	P

E = excellent G = good F = fair P = poor — = no information