

SECTION F.

LEGUMES (LARGE-SEEDED)

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Dry beans are sensitive to weed competition. Weed growth reduces bean yields by competing for light, moisture, and nutrients. High weed populations also are likely to cause a buildup of disease and/or insect problems that may affect bean growth, development, and marketability. Weeds also increase harvest losses, reduce bean quality, and make seed cleaning more difficult and expensive.

Good seedbed preparation is essential to give dry beans a head start on weeds at planting time. Cultivating emerging weed seedlings between bean rows usually controls weeds adequately without using herbicides. However, weeds usually are not adequately controlled in the bean row; herbicides and tillage are usually necessary. Dry edible beans may be cultivated several times during the growing season to control weeds and maintain irrigation furrows. However, cultivation should be shallow to avoid damaging the bean's shallow root system. Do not cultivate or harrow when bean foliage is wet because bacterial leaf diseases may be spread.

Dry Beans East of the Cascades

Phaseolus spp. (field bean, kidney, lima, navy, and pinto)

Don Morishita

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Annual Grass and Broadleaf Weeds

dimethenamid-P (Outlook)

Dry bean classes such as small whites, navy, black turtle, pink, pinto, great northern, red Mexican, red kidney, and cranberry

Rate 0.56 to 0.98 lb ai/A (12 to 21 fl oz/A Outlook 6EC)

Time Apply preplant surface, preplant incorporated, preemergence, or early postemergence (first to third trifoliate leaves).

Remarks Application rate depends on soil texture and organic matter content. Before applying Outlook, verify with your local seed company the selectivity of Outlook on your specific dry bean class and variety. May be applied preplant surface, pre-emergence, or early postemergence (first to third trifoliate stage). Effective for controlling hairy nightshade, but weak on common lambsquarters. Will not control emerged weeds. Outlook may be applied in a single application up to 21 fl oz/A or used in split applications of 10 to 14 fl oz/A followed by 7 to 11 fl oz/A, but total application amount cannot exceed 21 fl oz/A. Preplant incorporated applications may be applied up to 2 weeks before planting, however the effectiveness controlling weeds in the crop is shortened. Incorporate 1 to 2 inches deep. May be tank mixed with other dry-bean herbicides including bentazon, sethoxydim, pendimethalin, imazethapyr, glyphosate, and paraquat. S-metolachlor may only be applied sequentially with Outlook. May be applied through most sprinkler irrigation systems, but check label for limitations. Outlook applied postemergence may occasionally cause some temporary leaf spotting, browning or stunting. Restricted entry interval (REI) is 12 hours.

Caution Outlook is not registered for use in succulent beans or cowpeas. Growth may be temporarily suppressed if heavy rain

falls, or if soil is saturated for long periods during bean germination or early seedling development. Avoid incorporating more than 1 or 2 inches deep; weed control may be reduced and/or the crop may be injured.

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

Chemical family Chloroacetamide

EPTC (Eptam 7EC)

Dry beans only

Rate 1.97 to 4 lb ai/A (2.25 to 4.5 pints/A Eptam 7EC)

Time Apply preplant and incorporate, or apply as a directed spray at layby and shallowly incorporate.

Remarks Before applying Eptam 7E to untested varieties, verify with your local seed supplier the selectivity of Eptam 7E on your specific dry bean class and variety. If incorporating, Eptam may be applied at 3.5 to 4.5 pints/A, and thoroughly incorporated 2 to 3 inches deep immediately after applying. As a subsurface application, apply 2.25 pints/A. As a layby directed application, apply 3.5 to 4.5 pints/A to the soil at the base of the bean plants before pod formation. Eptam gives good general weed control for about six weeks as well as early-season control of hairy nightshade and suppression of yellow nutsedge and quackgrass. However, on some PNW fields, effective control may be shorter. These fields have a history of continued thiocarbamate herbicide use. Eptam also can be metered into furrow irrigation water before weeds emerge. Eptam may be tank mixed with ethalfluralin, S-metolachlor, pendimethalin, trifluralin, or dimethenamid-P. During germination and early growth, extended periods of unusually cold and wet or hot and dry weather, as well as insects, nematodes, plant diseases, carry-over soil residues of certain

persistent herbicides, the use of certain soil applied systemic insecticides, highly saline or alkaline soil conditions, or improperly placed fertilizers or soil-applied insecticides may create abnormal conditions that weaken crop seedlings. Used under these abnormal conditions, Eptam could result in crop injury. Restricted entry interval (REI) is 12 hours.

Caution Do not apply before pre-irrigation. Do not apply to Adzuki beans, cowpeas, lima beans, soybeans, Mung beans, Garbanzo beans, or other flat-podded beans except Romano. Do not feed bean hay, vines, or forage to livestock. Do not graze livestock in treated bean fields within 45 days of application. Cold, wet soils after planting may delay crop maturity or reduce yields. Do not exceed 9 pints/A Eptam in one season.

Site of action Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

Chemical family Thiocarbamate

EPTC (EPTAM 20G)

Dry beans only

Rate 3.0 to 4.0 lb ai/A (15 to 20 lb/A Eptam 20G)

Time Apply and incorporate just before planting, immediately after planting, or at the time of last cultivation. If applied before planting, rotary hoe during or shortly after emergence of the beans to break any crust that occurs. If applied at the time of last cultivation, apply to the soil before bean pods start to form.

Remarks Do not exceed the 15 lb/A rate on small white beans or on green beans grown on coarse-textured soils. Eptam 20G can be incorporated with irrigation water. Incorporate immediately using flood or sprinkler irrigation systems. Apply enough water to wet soil to a minimum of 3 to 4 inches deep. During germination and early growth, extended periods of unusually cold and wet or hot and dry weather, as well as insects, nematodes, plant diseases, carry-over soil residues of certain persistent herbicides, the use of certain soil applied systemic insecticides, highly saline or alkaline soil conditions, or improperly placed fertilizers or soil-applied insecticides may create abnormal conditions that weaken crop seedlings. Used under these abnormal conditions, Eptam 20G could result in crop injury. Restricted entry interval (REI) is 12 hours.

Caution Do not apply to Adzuki beans, cowpeas, lima beans, soybeans, Mung beans, Garbanzo beans, or other flat-podded beans except Romano. Do not feed or pasture vines to livestock within 45 days after application.

Site of action Group 8: lipid synthesis inhibitor

Chemical family Thiocarbamate

ethalfluralin (Sonalan)

Rate 0.56 to 1.69 lb ai/A (1.5 to 4.5 pints/A Sonalan 3EC)

Time After the final tillage operation, preplant applications should be incorporated within 48 hours after application. Preemergence applications must be applied within 2 days after planting and prior to crop emergence.

Remarks Application rate depends on soil type, amount of organic matter, and whether nightshade is to be controlled. Incorporate herbicide uniformly into top 2 to 3 inches of soil. Excessive amounts of crop residue or weeds may interfere with the incorporation of Sonalan HFP into the soil. To control nightshade, use higher rate and make two incorporation passes. Sonalan may be tank mixed with EPTC (but not on lima beans) or s-metolachlor. When impregnated

on dry bulk fertilizer, Sonalan HFP must be incorporated two times. Restricted entry interval (REI) is 24 hours.

Caution Do not apply to soils that are wet, cloddy, or subject to prolonged flooding; poor weed control or crop injury may result. If crop fails, replant only crops listed on label. Do not plant sugar beets or red beets within 13 months after applying 3 pints/A or more. If less than 3 pints/A were used, sugar beets and red beets may be planted 8 months after application if field is moldboard-plowed at least 12 inches deep before planting. Do not cut for hay or forage or graze livestock.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

glyphosate (several trade names)

Rate 0.75 to 1.5 lb ae/A (22 to 44 fl oz/A Roundup PowerMax 4.5SL)

Time Apply to weeds in seedling growth stage before planting, or before beans emerge or as a preharvest application.

Remarks Be aware that glyphosate is formulated as 3 lb, 4 lb, 4.17 lb, 4.5 lb, and 5 lb ae/gal. Take care to ensure using the correct amount of herbicide. Use highest rates on field bindweed. Delay applying to allow maximum weed emergence but apply before beans emerge. Glyphosate will not control weeds that emerge after application. Rain within 6 hours after application may reduce effectiveness of some brands. Other brands are rain-fast in 1 hour. Some products require the addition of a nonionic surfactant (NIS). Be sure to check the label. Addition of ammonium sulfate (AMS) at 1 to 2% by weight or 8.5 to 17 lb/100 gal spray solution may increase the performance particularly with hard water or spraying during drought conditions. Restricted entry interval (REI) is 4 or 12 hours depending on the glyphosate product used.

Caution Glyphosate applied after crop emerges will injure or kill the crop. Do not apply if weed is stressed by drought, weather, or maturity. Do not plant subsequent crops other than those on label for 30 days after applying. Do not feed or forage treated crops within eight weeks after applying.

Site of action Group 9: inhibits EPSP synthase

Chemical family Organophosphorus

glyphosate + S-metolachlor (Sequence)

Rate 1.64 to 2.625 lb ai/A (2.5 to 4 pt/A Sequence 5.25EW)

Time Apply before, during or after planting, but prior to crop emergence

Remarks Weed control may be improved by adding ammonium sulfate (AMS) at 8.5 to 17 lb/100 gal spray solution). If heavy rainfall occurs soon after application, crop injury may occur. Injury will be greatest in poorly drained areas where water stands for several hours or days, or where the seeding slit has not been properly closed. If available, beans grown under sprinkler irrigation may benefit from 0.5 to 1 inch of water, but do not water soon after application. Use less water on lighter soils. If irrigation is not possible or rain does not occur within 2 days after application, weed control may be decreased. Sequence Herbicide may be tank-mixed with pendimethalin or additional S-metolachlor or glyphosate. Restricted entry interval (REI) is 24 hours.

Caution Do not exceed 3.5 pt/A on coarse soils. Do not cut Sequence-treated dry beans for hay within 120 days following application. Do not graze or feed for age from treated area.

Site of action (glyphosate) Group 9: inhibits EPSP synthase and (s-metolachlor) Group 15: inhibits very long chain fatty acid synthesis.

Chemical family Organophosphorus and chloroacetamide

halosulfuron (Sandea)

Rate 0.023 to 0.031 lb ai/A (0.5 to 0.66 oz/A Sandea 75DF)

Time Apply preemergence (after planting but prior to soil cracking) or postemergence when plants have 1 to 3 trifoliolate leaves, but before flowering. Weed size should be less than, or up to 6 inches.

Remarks Use lower rate on lighter texture soil with low organic matter. Activating soil moisture is necessary for optimum pre-emergence weed control. Include a nonionic surfactant (NIS) at 0.25 to 0.5% v/v (1 to 2 quarts/100 gal of spray solution) when weeds are present. Sandea may be tank-mixed for additional broadleaf control. It can also be tank-mixed with quizalofop or other graminicides for postemergence grass control. Restricted entry interval (REI) is 12 hours.

Caution Do not apply more than 1 oz/A per crop cycle or 2 oz/A per 12-month period. Refer to label for rotational crop restrictions.

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

Chemical family Sulfonylurea

imazamox (Raptor)

Dry beans only

Rate 0.031 lb ae/A (4 oz/A Raptor 1SC)

Time Apply to actively growing weeds, and postemergence, to dry beans with at least one full, expanded trifoliolate leaf and before bloom.

Remarks Raptor may be applied to Adzuki, Anasazi, black, black turtle, cranberry, Great Northern, lima (dry), navy, pink, pinto, red kidney, small red, and small white. Growers should check with the seed company regarding the safety of Raptor to their variety. Weed control may be improved by adding 12 to 15 lb ammonium sulfate (AMS) or 2.5 gal liquid fertilizer (28% or 32% N) per 100 gal spray solution. If using crop oil concentrate (COC) or nonionic surfactant (NIS), Basagran must be added at 6 to 16 oz/A to minimize crop response. Raptor application must be made before dry beans flower. Only one Raptor application may be made per season. Restricted entry interval (REI) is 4 hours.

Caution Do not apply Raptor to chickpeas (garbanzo beans), fresh lima beans, or lentils. Some varieties of edible legumes are more sensitive to Raptor, and Raptor may delay crop maturity. Do not apply Raptor if planting is delayed and chance of frost prior to maturity is likely. Adding nitrogen-based fertilizer or adjuvants may increase crop response. See label for crop rotation guidelines. Recommended rotation interval of 18 months for potato and 26 months for sugar beets.

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

Chemical family Imidazolinone

imazamox + bentazon (Varisto)

Dry beans only

Rate 0.523 to 0.686 lb ai/A (16 to 21 fl oz/A product)

Time Apply to actively growing weeds, and postemergence to dry beans with at least one fully expanded trifoliolate leaf and before bloom.

Remarks Raptor may be applied to Adzuki, Anasazi, black, black turtle, cranberry, faba, Great Northern, lima (dry), navy, pink, pinto, red kidney, small red, and small white. Growers should check with their seed company regarding the safety of imazamox (Raptor) to their variety. An adjuvant, such as methylated seed oil (MSO), crop oil concentrate (COC), or nonionic surfactant (NIS) and a nitrogen fertilizer, such as urea ammonium nitrate (UAN) or ammonium sulfate (AMS) must be used with Varisto. MSO, COC, or NIS is recommended at 1% v/v (1 gallon/100 gal spray solution), 1 to 2% v/v (1 to 2 gal/100 gal spray solution) or 0.25% v/v (1 quart/100 gal spray solution). AMS is recommended at 12 to 15 lb/100 gal spray solution and UAN (28% or 32% N) is recommended at 2.5 gal/100 gal spray solution. Application must be made before dry beans flower. Only one Varisto application may be made per season. Do not apply within 30 days of harvest. Restricted entry interval (REI) is 48 hours.

Caution Do not apply Varisto to chickpeas (garbanzo beans), fresh lima beans, or lentils. Some varieties of edible legumes are more sensitive to Varisto, and Varisto may delay crop maturity. Do not apply Varisto if planting is delayed and chance of frost prior to maturity is likely. Adding nitrogen-based fertilizer or adjuvants may increase crop response. See label for crop rotation guidelines. Recommended rotation interval of 18 months for potato and 26 months for sugar beet.

Site of action (imazamox) Group 2: acetolactate synthase (ALS) inhibitor; (bentazon) Group 6: photosystem II inhibitor

Chemical family (imazamox) Imidazolinone; (bentazon) Benzothiadiazole

imazethapyr (Pursuit)

Lima beans only

Rate 0.047 lb ai/A (3 fl oz/A Pursuit 2LC)

Time Apply preplant incorporated in spring or preplant for no-till or minimum tillage systems only.

Remarks If incorporated, apply Pursuit at 3 fl oz/A within 1 week before planting and do not incorporate deeper than 3 inches. Pursuit may be applied in the fall prior to spring planting. Rainfall is required for incorporation and activation. If applied in the fall, wait until 4-inch soil depth is less than 55°F. Apply preplant incorporated in spring within 1 week before planting. Do not incorporate deeper than 3 inches. Preemergence application may be made after planting but before crop emergence. Pursuit is not labeled for postemergence applications in lima beans. Wheat may be planted four months after applying. Barley may be planted 9.5 months after applying. Restricted entry interval (REI) is 4 hours.

Caution Do not apply if cold and/or wet conditions are present or predicted within 1 week of application. Alfalfa, clover, edible beans, and wheat may be planted four months after application. Field corn and barley cannot be planted for 8.5 and 9.5 months, respectively after application. Potatoes and sugar beets cannot be planted for 26 and 40 months, respectively after application. See label for other crop rotation guidelines. Do not feed treated forage, hay, or straw to livestock. Do not apply postemergence after crop has begun to flower.

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

Chemical family Imidazolinone

pendimethalin (Prowl H₂O)

Rate 0.95 to 1.43 lb ai/A (2 to 3 pints/A Prowl H₂O 3.8AS)

Time Apply preplant, and incorporate up to 60 days before planting under furrow or sprinkler irrigation. Under sprinkler irrigation only, may apply 2 pints/A postplant, preemergence within 1 to 4 days of planting.

Remarks Dry beans must have a minimum planting depth of 2 inches. Applications must be immediately followed by 0.5 to 0.75 inch water from overhead irrigation and/or rainfall. Application rate depends on soil type and amount of organic matter. Incorporate preplant applications 1 to 2 inches deep within 7 days of application. Refer to label for suitable incorporation equipment. Growers should check with their local seed company for varieties sensitive to Prowl H₂O. Restricted entry interval (REI) is 24 hours.

Caution Cold, wet soils after planting may delay crop maturity or reduce yields. If crop is lost, crops labeled for preplant-incorporated pendimethalin may be replanted. Winter wheat and winter barley can be planted 120 days after applying. Do not plant red beets, sugar beets, or spinach for 12 months after applying pendimethalin. Plow 12 inches deep before planting. Do not feed bean hay or vines to livestock or grass livestock in treated fields.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

S-metolachlor (Dual Magnum or Dual II Magnum)

Rate 0.96 to 1.9 lb ai/A (1 to 2 pints/A Dual II Magnum 7.64EC or Dual Magnum 7.62EC)

Time Apply preplant incorporated or preemergence.

Remarks Application rate depends on soil type and organic matter content. Pod crops, including garbanzo, great northern, kidney, lima, mung, navy, pinto, snap beans and lupines may be treated with S-metolachlor. Incorporation into top 2 inches of soil is required. Under furrow irrigation, apply and incorporate before planting. When applied through center-pivot irrigation systems, apply proper rate in 0.5 to 1 inch of water (depending on soil type). Preplant-incorporated treatments will control yellow nutsedge. S-metolachlor may be tank mixed with EPTC (but not on lima beans), ethalfluralin, or trifluralin. Restricted entry interval (REI) is 24 hours.

Caution Crops may be injured if soil moisture is abnormally high during early crop development. If crop fails, beans, corn, potatoes, or safflower may be planted. Do not plant small grains for 4.5 months after treatment. Corn, potatoes, safflower, pod crops, root crops, barley, oats, rye, or wheat may be planted the spring after treatment. All other rotation crops may be planted 18 months later. Do not cut for hay within 120 days; residues may be illegal.

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

Chemical family Chloroacetamide

trifluralin (several trade names)

Rate 0.5 to 1 lb ai/A for dry beans (1 to 2 pints/A trifluralin 4EC); 0.5 to 0.75 lb ai/A for lima beans (1 to 1.5 pints/A trifluralin 4EC)

Time Apply to dry soil and incorporate either in fall, between October 15 and December 31, or just before planting in spring. If spring applied, apply prior to planting, or immediately after planting and before crop germination. Trifluralin may be applied

and incorporated at or before the last cultivation as long as it is 90 days before harvest.

Remarks Rate depends on soil type, amount of organic matter and rain. Incorporate thoroughly into soil 2 to 3 inches deep as soon as possible, but no later than 24 hours after applying. Trifluralin may be tank mixed with other herbicides registered for use in dry beans and lima beans. Trifluralin is susceptible to photodegradation; incorporation soon after application is best. Restricted entry interval (REI) is 12 hours.

Caution Do not apply to soils that are wet, cloddy, or subject to prolonged flooding; poor weed control or crop injury may result. Do not plant sugar beets, red beets, corn, oats, or spinach for 12 months after spring application or 14 months after a fall application. Plow 12 inches deep before planting sugar beets to prevent possible crop injury. Do not plant vegetable crops other than those listed on label within 5 months after application.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

Annual Grass and Perennial Grasses

Postemergence

clethodim (Select, Select Max and several other trade names)

Dry beans only

Rate 0.094 to 0.25 lb ai/A (6 to 16 fl oz/A Select 2EC) or 0.068 to 0.25 lb ai/A (9 to 32 fl oz/A Select Max 0.97EC)

Time Apply to actively growing grasses 1 to 8 inches tall (generally three-leaf to tillering).

Remarks Apply when the first grass-weed species in a mixed grass-weed population reaches the recommended growth stage for treatment. Be aware that clethodim is formulated as 0.97, 2, and 3 lb ai/gal; be sure to use the correct amount of herbicide. In arid regions where irrigation is used to supplement limited rainfall, clethodim should be applied within 7 days after irrigation. In general, two applications of clethodim will control perennial grasses more effectively than a single application. Make the second application to actively growing grass 2 to 3 weeks after emergence of new growth. Cultivation of treated grasses 7 days prior to or within 7 days after application may reduce weed control. With Select 2EC always use crop oil concentrate (COC) that contains a minimum of 80% oils and 15% emulsifier at 1 quart/A by ground or 1% v/v (1 gal/100 gal spray solution) by air. An additional 1 to 2 quarts/A liquid fertilizer (10-34-0, 28% N or 32% N) or 2.5 to 4 lb/A spray grade ammonium sulfate (AMS) fertilizer may be added to enhance quackgrass, wild oats, volunteer cereals and volunteer corn control with Select 2EC. When using Select Max, use a nonionic surfactant (NIS) at 0.25% v/v (1 quart/100 gal spray solution) or COC that contains a minimum of 80% oils and 15% emulsifier at 1 quart/A by ground or 1% v/v (1 gal/100 gal spray solution) by air. Do not apply if rain is expected within 1 hour of application. See label for tank mixing with broadleaf herbicides. Restricted entry interval (REI) is 24 hours.

Caution Do not apply more than 0.5 lb ai/A (64 fl oz/A) in a season or within 30 days of harvesting or cutting beans.

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

Chemical family Cyclohexanedione

fluazifop (Fusilade DX)

Rate 0.094 to 0.1875 lb ai/A (6 to 12 fl oz/A Fusilade DX 2EC)

Time Apply when grasses do not exceed 4 leaves with most species. Refer to label for specific timing recommendations for each grass species.

Remarks Add crop oil concentrate at 0.5 to 1% v/v (0.5 to 1 gal/100 gal spray solution) or a nonionic surfactant at 0.25 to 0.5% v/v (1 to 2 quarts/100 gal spray solution) with each application. Do not apply if rain is expected within 1 hour of application. Fusilade DX is not registered for use in cowpeas. For quackgrass control, apply Fusilade sequentially at 16 to 24 fl oz/A when the grass is 6 to 10 inches tall and again up to 10 inch tall quackgrass at 12 to 24 fl oz/A. Restricted entry interval (REI) is 12 hours.

Caution Do not apply more than 48 fl oz/A per season or more than 24 fl oz/A per application. Do not harvest within 60 days of last application. Do not plant grass crops such as corn, sorghum, and cereals within 60 days of last application of fluazifop.

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

Chemical family Aryloxyphenoxy propionate

quizalofop P-ethyl (Assure II or Targa)

Dry beans only

Rate 0.034 to 0.08 lb ai/A (5 to 12 fl oz/A Assure II 0.88EC or Targa 0.88EC)

Time Postemergence to grasses. See label for details.

Remarks Always use either a nonionic surfactant at 0.25% v/v (1 quart/100 gal spray solution) or a petroleum-based crop oil at 1 to 2% v/v (1 to 2 gal/100 gal spray solution). Use higher crop oil concentration in arid areas. Oil adjuvants must contain at least 80% high quality petroleum (mineral), or modified vegetable seed oil with at least 15% surfactant emulsifiers. Ammonium nitrogen fertilizer may be added to crop oil concentrate or NIS, but is not required. Use 2 quart/A 28% N or 32% N, or 2 lb/A of spray grade AMS. Do not apply if rain is expected within 1 hour of application. Restricted entry interval (REI) is 12 hours.

Caution Do not exceed 28 fl oz/A per season. Do not feed vines or hay. Do not harvest within 30 days after application.

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

Chemical family Aryloxyphenoxypropionate

sethoxydim (Poast)

Dry beans only

Rate 0.187 to 0.48 lb ai/A (1 to 2.5 pints/A Poast 1.5EC)

Time Apply to actively growing grasses at grass growth stage indicated on label.

Remarks Always add Sundance HC spray adjuvant at 1 pint/A, or a crop oil concentrate to the spray tank at 2 pints/A. Add UAN at 4 to 8 pint/A, or AMS at 2.5 lb/A for controlling crabgrass, witchgrass, volunteer corn, and all volunteer cereals. Sethoxydim is most effective on actively growing grasses that are not stressed. Sethoxydim is rainfast 1 hour after application. Restricted entry interval (REI) is 12 hours.

Caution Control often is erratic if grasses are stressed by drought, insect damage, extreme temperatures, or herbicide injury. Do not apply within 30 days of dry bean harvest, or within 15 days of succulent bean harvest. Do not exceed 0.96 lb ai/A (4 pints/A Poast) during the season.

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

Chemical family Cyclohexanedione

Annual Broadleaf Weeds and Sedges

bentazon (Basagran)

Rate 0.5 to 1 lb ai/A (1 to 2 pints/A Basagran 4L or 1.2 to 1.6 pints/A Basagran 5L)

Time Apply postemergence to actively growing weeds in the 2- to 10-leaf stage of growth (refer to label). Beans must have first trifoliate leaf fully expanded.

Remarks Tolerant bean types are Adzuki, navy, pinto, pink, great northern, kidney, red, white, cranberry, black turtle, small lima, large lima, and snap beans. Controls certain annual broadleaf weeds, including nightshade and cocklebur. Can control Canada thistle and yellow nutsedge with two applications 7 to 10 days apart. Basagran is effective mainly through contact action. Therefore, weeds must be thoroughly covered with spray. Does not control grasses. May be tank mixed with dimethenamid-P, imazamox, imazethapyr, and sethoxydim. Add crop oil concentrate (COC) at 1% v/v (1 gal/100 gal spray solution), methylated seed oil (MSO) containing at least 60% MSO at 1% v/v, or nonionic surfactant (NIS) containing at least 80% active ingredient at 0.25% to 0.5% v/v (1 to 2 quarts/100 gal spray solution). Organosilicone surfactant may be used in place of NIS. Ammonium sulfate (AMS) at 8.5 to 17 lb/100 gal spray solution or urea ammonium nitrate (UAN) such as 32% N or 10-34-0 at 1.25 to 2.5 gal/100 gal spray solution may also be added to improve weed control. Additives may cause some leaf burn, but new growth is normal and crop vigor is not reduced. Injury potential is increased when relative humidity and temperature are high. Irrigation may be needed before application to ensure weeds are growing actively. Restricted entry interval (REI) is 48 hours.

Caution Bean leaves may temporarily yellow, bronze, or speckle under some conditions. Do not apply in cool weather (days below 75°F and nights below 55°F for two to five days) or weed control will be poor. Do not apply to stressed beans or to garbanzo beans. Do not exceed 2 lb ai/A (3.2 pints/A Basagran 5L, 4.0 pints/A 4L) in one season. Do not apply if rain is expected within 4 hours. Do not cultivate within 5 days before or after application. Do not apply to dry or succulent beans within 30 days of harvest.

Site of action Group 6: photosystem II inhibitor

Chemical family Benzothiadiazole

Harvest Aid

paraquat (Gramoxone)

Rate 0.3 to 0.5 lb ai/A (1.2 to 2 pints/A Gramoxone 2 SL)

Time Apply when crop is mature: at least 80% of pods yellowing and mostly ripe, and no more than 40% (bush-type) or 30% (vine-type) of leaves still green.

Remarks Apply in 20 gal/A of water by ground or in at least 5 gal/A of water by air. Add a nonionic surfactant at 0.25% v/v (1 quart/100 gal spray solution). For vining or bush beans with lush and vigorous growth, use a single application at the higher rate. May also be applied as a split application. May be used on adzuki, black, broad, field, garbanzo, kidney, lima, mung, navy, pinto, rice, snap, and wax beans. Restricted entry interval (REI) is 24 hours.

Caution A restricted-use herbicide. Applicators, mixers and loaders must wear long-sleeve shirt and long pants, shoes plus socks, protective eyewear (applicator), face shield (mixers and loaders), Category A chemical resistant gloves, chemical resistant apron (mixers and loaders), and a dust mist NIOSH-approved respirator with an N, R, P, or HE filter. Do not use on fava beans or faba beans. Do not make more than two applications or exceed 2 pints/A. Follow all safety precautions on label. Do not harvest within seven days.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

glyphosate (several trade names)

Rate 0.77 lb ae/A (22 fl oz/A Roundup PowerMax 4.5SL)

Time Apply at the hard dough stage of the legume seed (30% grain moisture or less)

Remarks Be aware that glyphosate is formulated as 3, 4, 4.5, and 5 lb ae/gal. Take care to ensure using the correct amount of herbicide. Apply in 3 to 20 gal water/A. Apply at least seven days before harvest. Only one preharvest application may be made per year. Observe at least a 30-day plant-back interval between treatment and replanting of any crop not listed on product's label. Restricted entry interval (REI) is 4 or 12 hours depending on the glyphosate product used.

Caution Do not feed treated vines and hay to livestock. Preharvest application is not recommended for legumes grown for seed, as a reduction in germination or vigor may occur.

Site of action Group 9: inhibits EPSP synthase

Chemical family Organophosphorus

saflufenacil (Sharpen 2.85SC)

Rate 0.022 to 0.045 lb ai/A (1 to 2 fl oz/A Sharpen 2.85SC)

Time Spray over the top of dry edible beans that have reached physiological maturity (beans have at least 80% yellow/brown pods and not more than 30% of leaves still green for vine-type beans, and no more than 40% of leaves still green for bush-type beans).

Remarks Allow up to 7 days for optimum desiccation effect depending on environmental conditions. Restricted entry interval (REI) is 4 or 12 hours depending on the glyphosate product used.

Caution Do not apply on dry edible beans grown for seed production. Do not graze or feed desiccation-treated hay or straw to livestock. Do not exceed cumulative amount of 2.0 fl oz/A per season for desiccation.

Site of action Group 14 Protoporphyrinogen oxidase (PPO) inhibitor

Chemical family Pyrimidinedione

flumioxazin (Valor)

Rate 0.096 lb ai/A (3 oz/A Valor 51WDG)

Time When 80% of the pods are yellowing or mostly ripe with no more than 40% (bush-type) or 30% (vine-type) of the leaves still green in color.

Remarks Include a methylated seed oil (MSO) with a minimum of 15% emulsifiers and 80% oil. Use 2% v/v (2 gal/100 gal spray). A spray-grade nitrogen source, such as ammonium sulfate (AMS) at 2 to 2.5 lb ai/A or 28% or 32% urea ammonium nitrate (UAN) at 1 to 2 quarts/A may be added to improve performance. To ensure thorough coverage, apply with 15 to 30 gal/A spray solution. Restricted entry interval (REI) is 12 hours.

Caution Do not harvest within 5 days after application. Do not use more than 3 oz/A in a season.

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

Chemical family N-phenylphthalimide

Quackgrass

glyphosate (several trade names)

Rate 0.75 to 2.25 lb ae/A (22 to 64 fl oz/A Roundup PowerMax 4.5SL)

Time Apply to quackgrass 6 to 8 inches tall before planting, or bean emergence.

Remarks Be aware that glyphosate is formulated as 3, 4, 4.17, 4.5, and 5 lb ae/gal. Take care to ensure using the correct amount of herbicide. Spring applications for perennial weed control are generally not very effective due to poor glyphosate translocation down to roots and rhizomes. Wait three or more days after application before tilling. Herbicide will not control weeds that emerge after application. Rain within 6 hours may reduce effectiveness of some brands. Some products require adding a nonionic surfactant; be sure to check the label. Control weed escapes in following years. Restricted entry interval (REI) is 4 or 12 hours depending on the glyphosate product used.

Caution Do not till before applying. Glyphosate applied after crop emerges will injure or kill crop. Do not apply to quackgrass stressed by drought, weather, or maturity. Do not plant crops other than those listed on label for one year after application. Do not feed or forage treated crops within eight weeks after application.

Site of action Group 9: inhibits EPSP synthase

Chemical family Organophosphorus

Herbicide Effectiveness on Weeds in Dry Beans

Weed Species	Preemergence							Postemergence				
		dimethenamid (Outlook)	EPTC (Eptam)	ethalfluralin (Sonalan)	metolachlor (Dual)	pendimethalin (Prowl)	trifluralin (Treflan)	bentazon (Basagran)	glyphosate (Roundup)	imazamox (Raptor)	quizalofop (Assure II)	sethoxydim (Poast)
Annual Grass												
Barnyardgrass		E	E	E	E	E	E	P	E	G	E	E
Foxtail, green		E	E	E	E	E	E	P	E	G	E	E
Grain, volunteer		F	E	F-G	P	F	F-G	P	E	G	E	E
Oat, wild		F	G	G	P	F	F	P	E	G	E	E
Proso millet, wild		F-G	G	—	F	F-G	—	P	E	G	E	E
Sandbur, field		F	F-G	G	F	G	G	P	E	G	E	E
Witchgrass		G	G	—	E	G-E	—	P	E	G	E	E
Annual Broadleaf												
Buckwheat, wild		F	F	G	P-F	P-F	G	G-E	G-E	F	P	P
Cocklebur, common		P	P	P	P	F	P	E	E	E	P	P
Dodder, field		—	P	P-F	P	F	P-F	P	G	F	P	P
Knotweed, prostrate		F-G	F-G	G	F	G	G	P	G-E	F-G	P	P
Kochia		F	F	G-E	F	G-E	G-E	F-G	G-E	G	P	P
Lambsquarters		F-G	F-G	E	F-G	E	E	F	E	G	P	P
Mallow, common		F	P	P	P-F	P	P	F-G	E	F	P	P
Nightshade, hairy		E	G	G	F-G	P-F	P-F	F-G	E	E	P	P
Pigweed, redroot		E	G	E	G-E	E	E	F	E	E	P	P
Puncturevine		G-E	F	G-E	P	F	G-E	P	E	E	P	P
Purslane, common		F-G	F-G	E	F	E	E	G-E	E	E	P	P
Sowthistle, annual		—	G-E	P	F	P-F	F	—	E	F	P	P
Sunflower, common		P	P	P	P	P	P	G-E	E	E	P	P
Thistle, Russian		F	P	F	P	F	F	—	G-E	F-G	P	P
Perennial Weed												
Bindweed, field		P	P	P	P	P	P	P	F-G	F	P	P
Nutsedge, yellow		F-G	E	P	G	P	P	F-G	F	P-F	P	P
Sowthistle, perennial		—	—	—	P	P	—	—	F	P	P	P
Thistle, Canada		P	P	P	P	P	P	P	G-E	P	P	P
Quackgrass		F	F-G	P	P	P	P	P	G-E	P-F	G	F
Crop Safety												
Tolerance		G	G-E	E	G	E	E	G	P	G	E	E
Carryover ¹		3-6	1-2	2-6	2-4	3-6	3-12	0	0	3-26	4	1-4

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

¹ Number of months after application to plant an unlabeled crop.

Peas (Dry)

Drew Lyon

Revised March 2018

Annual Grass and Broadleaf Weeds

Preplant incorporated

ethalfluralin (Sonalan HFP)

Rate 0.56 to 0.75 lb ai/A (1.5 to 2 pints/A Sonalan HFP)

Time Apply preplant and incorporate by following label instructions.

Caution Not all pea varieties are tolerant. Do not exceed labeled rates because crop may be injured. Do not graze or plant forage crop in treated soil or cut for hay or silage.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

imazethapyr (Pursuit)

Rate 0.047 lb ai/A (3 oz/A Pursuit)

Time Apply preplant and incorporate within 30 days before planting.

Remarks Do not incorporate deeper than 3 inches. A maximum of 0.047 lb ai/A may be applied to peas.

Caution Do not apply more than once per year. Preharvest interval is 60 days. Consult label restrictions regarding planting subsequent crops.

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

Chemical family Imidazolinone

pendimethalin (Prowl 3.3EC, Prowl H₂O, or other trade names)

Rate 0.75 to 1.5 lb ai/A (1.8 to 3.6 pints/A Prowl 3.3EC; 1.5 to 3 pints/A Prowl H₂O). Use the lower rate on coarse soils, the higher rate on fine soils.

Time Apply up to 60 days preplant and incorporate by following label instructions.

Remarks Incorporate thoroughly, 1 to 2 inches deep. Apply in at least 10 gal/A water or in 20 gal/A or more liquid fertilizer. Also controls several broadleaf weed species.

Caution Do not apply to pea or lentil forage, silage, hay, or straw grown for feed. Do not apply through any type of irrigation system.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

pendimethalin + metribuzin (Tripzin ZC)

Rate 0.91 to 1.375 lb ai/A (29 to 44 oz/A Tripzin ZC).

Time Apply up to 60 days preplant and incorporate within 7 days of application. Do not apply more than once per cropping season. Do not apply when the air temperature is below 45°F.

Remarks Apply in 10 to 40 gal/A water.

Caution Do not use on coarse-textured soils, sandy soils, or soils with less than 1.5% organic matter.

Site of action (pendimethalin) Group 3: microtubule assembly inhibitor; (metribuzin) Group 5: photosystem II inhibitor

Chemical family (pendimethalin) Dinitroaniline; (metribuzin) Triazine

trifluralin (Far-Go or Avadex)

Rate 1.5 lb ai/A (3 pints/A Far-Go)

Time Apply preplant or postplant and incorporate.

Remarks Incorporate thoroughly 1 to 2 inches deep. Do not graze treated areas. For control of wild oats, only.

Site of action Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

Chemical family Thiocarbamate

trifluralin (Treflan HFP or other trade names)

Rate 0.5 to 0.75 lb ai/A (1 to 1.5 pints/A Treflan HFP)

Time Apply preplant and incorporate. May be fall-applied.

Remarks Incorporate thoroughly, 2 to 3 inches deep, immediately after applying. Use lower rate on coarse soils. Controls some broadleaf weeds; weak on nightshade, mustard, and mayweed.

Caution Consult label about planting subsequent crops. Trifluralin may injure stressed crop seedlings.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

trifluralin + triallate (Buckle)

Rate 0.3 to 0.36 lb ai/A trifluralin + 1 to 1.2 lb ai/A triallate as Buckle (10 to 12.5 lb/A Buckle)

Time Apply preplant and incorporate.

Remarks Buckle is a granular formulation of two herbicides. Incorporate thoroughly, 1 to 2 inches deep, immediately after application. Use the lower trifluralin rate for coarse soils. See remarks in trifluralin entry in this section. Do not use foliage from treated peas for feed or forage.

Caution Consult label about planting subsequent crops.

Site of action (trifluralin) Group 3: microtubule assembly inhibitor; (triallate) Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

Chemical family (trifluralin) Dinitroaniline; (triallate) Thiocarbamate

Preplant incorporated or preemergence

S-metolachlor (Dual Magnum or other trade names)

Rate 0.95 to 1.90 lb ai/A (1 to 2 pints/A Dual Magnum)

Time Apply preplant incorporated or preemergence.

Remarks Application rate depends on soil type and organic matter content.

Caution Do not exceed an incorporation depth of 2 to 3 inches. Preharvest interval for hay is 120 days.

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

Chemical family Chloroacetamide

sulfentrazone (Spartan 4F or other trade names)

Rate 0.07 to 0.25 lb ai/A (2.25 to 8 oz/A Spartan 4F)

Time Apply preplant incorporated (spring only) or early preplant in the fall or spring up to 3 days after planting as a preemergence application.

Remarks See current label for appropriate use areas. Use rate depends on soil texture and organic matter. Consult label for use rates for specific soil type. PNW data suggest that use rates above 4.5 oz/A may cause injury to dry peas.

Caution Do not exceed 8 oz/A per 12-month period. See label before planting subsequent crops. Do not incorporate to depths greater than 2 inches. Do not apply after crop emerges, or if seedlings are near soil surface. Do not apply to frozen soil.

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

Chemical family Aryl triazinone

Preplant surface or preemergence

sulfentrazone + carfentrazone (Spartan Charge)

Rate 0.074 to 0.251 lb ai/A sulfentrazone + 0.008 to 0.028 lb ai/A carfentrazone (3.0 to 10.2 oz Spartan Charge)

Time Apply fall or spring as preplant or preemergence.

Remarks Consult label to determine rate for soil pH, percentage of organic matter, and texture. Consult label for specific crop rotation restrictions.

Caution Do not exceed 0.28 lb ai (10.2 oz) Spartan Charge per 12-month period. Do not apply after crop emerges or if seedlings are near soil surface. Do not apply on sandy soils with less than 1% organic matter. Do not apply to frozen soil. Do not incorporate as this can destroy the herbicide barrier.

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

Chemical family Aryl triazinone

sulfentrazone + S-metolachlor (Spartan Elite or other trade names)

Rate 0.1 to 0.2 lb ai/A sulfentrazone + 0.94 to 1.88 lb ai/A S-metolachlor (19 to 38 oz/A Spartan Elite)

Time Apply fall or spring as preplant or preemergence.

Remarks Consult label to determine rate for soil's percentage of organic matter and texture. Consult label for specific crop rotation restrictions.

Caution Do not apply to coarse-textured soils with less than 1% organic matter. Adequate rainfall is required for herbicide activation from rainfall. If activating moisture is not received within 7 to 10 days after application, a shallow incorporation may be needed to obtain adequate weed control. Do not incorporate to depths greater than 2 inches. Do not apply to frozen soils. Do not use for forage within 60 days after an application. Do not cut for hay within 120 days after application.

Site of action (sulfentrazone) Group 14: protoporphyrinogen oxidase inhibitor; (S-metolachlor) Group 15: inhibits very long chain fatty acid synthesis

Chemical family (sulfentrazone) Aryl triazinone; (S-metolachlor) Chloroacetamide

Preemergence**diuron (Diuron 4L or other trade names)**

Austrian field pea only and only in western Oregon

Rate 1.2 to 2.6 lb ai/A (1.2 to 2.6 quart/A Diuron), depending on soil type

Time Apply as soon as possible after planting and before crop emerges.

Remarks Diuron will only control certain weeds, consult label. Do not apply on sand, sandy loam, or gravelly soils. Aerial application is prohibited.

Caution Crop injury may result if soil organic matter is less than 1%. Consult label for other restrictions.

Site of action Group 7: Photosystem II inhibitor

Chemical family Urea

imazethapyr (Pursuit)

Rate 0.047 lb ai/A (3 oz/A Pursuit)

Time Apply from immediately after, or up to 3 days after planting.

Remarks Do not apply more than once per year. Preharvest interval is 60 days

Caution Consult label restrictions regarding planting subsequent crops.

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

Chemical family Imidazolinone

linuron (Lorox)

Rate 0.5 to 1.0 lb ai/A (1 to 2 lb/A Lorox)

Time Apply after planting but preemergence to the crop.

Remarks Use lower rates on coarse-textured soils and higher rates on heavier-textured soils. For Idaho and Washington only: winter wheat and winter barley may be planted 4 months after application; do not apply more than 1.25 lb/A Lorox if the field will be rotated to winter wheat or winter barley in the fall or winter and average annual precipitation is less than 16 inches.

Caution Do not apply to sand or loamy sand soil types or to soils with less than 1% organic matter.

Site of action Group 7: photosystem II inhibitor

Chemical family Urea

Annual and Perennial Grass Weeds**Postemergence**

clethodim (Select Max or other trade names)

Rate 0.068 to 0.121 lb ai/A (9 to 16 oz/A Select Max)

Time Apply postemergence to actively growing grasses. See label for details.

Remarks Apply with an approved nonionic surfactant at 0.25% v/v.

Caution Do not exceed 16 oz/A per season. Do not apply more than one application per season. Apply before bloom but not later than 30 days prior to harvest. Application during bloom period may injure crop.

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

Chemical family Cyclohexanedione

pronamide (Kerb SC or other trade names)

Austrian field pea only

Rate 0.75 to 1.5 lb ai/A (2 to 3.5 pints/A Kerb SC)

Time November to January, when peas are in the second node (2 to 3 inches).

Remarks Ground sprayer only; apply in at least 20 gal/A water. If weeds are larger than 3 inches, use the higher rate.

Caution A restricted-use herbicide. Protective measures required for applicator. Do not feed, or allow animals to graze vines, after treatment. Do not make more than one treatment per season.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Benzamide

quizalofop-P (Assure II or other trade names)

Rate 0.04 to 0.08 lb ai/A (6 to 12 oz/A Assure II)

Time After grasses emerge. See label for details.

Remarks Controls annual and perennial grasses. Always use either a nonionic surfactant at 1 quart/100 gal, or a petroleum-based crop oil at 1 gal/100 gal.

Caution Do not exceed 14 oz/A per season. Preharvest interval is 60 days. Do not graze livestock in treated areas or feed forage, hay, or straw from treated areas.

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

Chemical family Aryloxyphenoxypropionate

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. Add 2 pints/A nonphytotoxic crop oil concentrate for ground application to improve leaf penetration.

Remarks Ask knowledgeable people about susceptible grasses in your area. Control may be erratic if grasses are stressed from lack of vigor, drought, or high temperature. Fine fescues and annual bluegrass resist treatment; quackgrass is suppressed.

Caution Preharvest interval is 30 days. Do not exceed 4 pints/A product per year. Do not mix or apply with any other pesticide, additive, or fertilizer except as directed on the label.

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

Chemical family Cyclohexanedione

Annual Broadleaf Weeds**Preplant surface, preplant incorporated, or preemergence**

metribuzin (several trade names)

Rate 0.1875 to 0.375 lb ai/A (4 to 8 oz/A of a 75% DF product)

Time Apply before or after planting, but before crop emerges.

Remarks Rain or mechanical incorporation is needed to suppress weeds. Under dry conditions, incorporate 1 to 2 inches. Apply in 10 gal/A or more of water for ground equipment or 5 gal/A or more for aerial spray equipment.

Caution Do not apply if seeds are planted less than 2 inches deep. Do not use on clay knobs or poorly covered subsoils. Do not use on coarse soils or soils with less than 1.5% organic matter. Heavy rain after application may injure crop.

This treatment may cause some chlorosis or minor necrosis. Preharvest interval is 50 days for dry peas, 120 days for hay.

Site of action Group 5: photosystem II inhibitor

Chemical family Triazinone

saflufenacil (Sharpen)

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

Time Apply early preplant, preplant incorporated or preemergence for limited residual broadleaf weed control.

Remarks Sharpen controls mainly broadleaf weeds. Methylated seed oil (MSO) or crop oil concentrate (COC), at 1% v/v + ammonium sulfate (AMS) at 8.5 to 17 lb/100 gal of water, are required for satisfactory control of emerged weeds. An early preplant application of Sharpen at 1.0 to 2.0 oz/A can be made prior to a PPI or preemergence application. Sequential applications must be at least 30 days apart.

Caution Do not substitute a nonionic surfactant for MSO or COC as control of emerged weeds will suffer. Do not exceed 2.0 oz/A during the cropping season. Do not apply when the peas have reached the cracking stage, or after emergence, because severe crop injury will occur. Legume forage may be fed or grazed 65 or more days after application.

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

Chemical family Uracil

Postemergence**bentazon (Basagran or other trade names)**

Rate 0.5 to 1 lb ai/A (1 to 2 pints/A Basagran)

Time Peas tolerate bentazon after 3-leaf (or 4-node) stage. Apply to small, actively growing annual broadleaf weeds as per label. Do not apply to peas in bloom. For Canada thistle and yellow nutsedge, use higher rate and apply twice, 7 to 10 days apart.

Remarks Avoid applying bentazon during prolonged cold weather; weed control may be inadequate. See label for adjuvant rates. Crop may show temporary symptoms under certain environmental conditions. Preharvest interval is 30 days. Do not exceed 2 lb ai/A per year. Do not cultivate within 5 days before or 7 days after applying.

Site of action Group 6: photosystem II inhibitor

Chemical family Benzothiadiazole

imazamox (Raptor)

Rate 0.031 lb ai/A (4 oz/A Raptor)

Time Apply to dry peas with at least three pairs of leaves before blooming.

Remarks Apply with nonionic surfactant at 1 quart/100 gal. In dry peas, always apply 6 to 16 oz/A Basagran to minimize potential for crop response. Only one application of Raptor may be made during the season.

Caution Read and observe all precautions on the label to ensure maximum crop safety. Consult label restrictions regarding planting subsequent crops.

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

Chemical family Imidazolinone

imazamox + bentazon (Varisto)

Rate 0.023 to 0.031 lb ae/A imazamox + 0.5 to 0.66 lb ae/A bentazon (16 to 21 oz/A Varisto)

Time Apply to dry peas with at least three pairs of leaves before blooming. Do not apply within 30 days of harvest.

Remarks Apply with nonionic surfactant at 1 quart/100 gal. Weed control may be improved by adding 12 to 15 lb ammonium sulfate or 2.5 gal liquid fertilizer (28% or 32%) per 100 gal of spray solution. Only one application may be made per season.

Caution Read and observe all precautions on the label to ensure maximum crop safety. Consult label restrictions regarding planting subsequent crops.

Site of action (imazamox) Group 2: acetolactate synthase (ALS) inhibitor; (bentazon) Group 6: photosystem II inhibitor

Chemical family (imazamox) Imidazolinone; (bentazon) Benzothiadiazole

MCPA sodium salt or dimethylamine salt (Chiptox, MCPA amine 4, or other trade names)

Rate 0.125 to 0.375 lb ae/A (0.5 to 1.5 pints/A Chiptox; 0.25 to 0.75 pints/A MCPA amine 4). Lower the rate as temperature increases.

Time Apply when peas are 4 to 6 inches tall and weeds are less than 2 inches wide or 3 inches high.

Remarks Do not apply when peas are blooming. Peas may show slight injury, but usually recover a few days after treatment. Not recommended for use in western Washington.

Caution Do not apply when the temperature is expected to reach 90°F within the next 24 hours. Do not permit MCPA to drift off target. Do not graze or feed.

Site of action Group 4: synthetic auxin

Chemical family Phenoxy acetic acid

metribuzin (several trade names)

Rate 0.125 to 0.25 lb ai/A (2.6 to 5.3 oz/A of a 75% DF product)

Time Apply only once per season to susceptible broadleaf weeds less than 2 inches tall or wide.

Remarks Temporary chlorosis of the crop may occur, particularly under moist conditions or if a postemergence application follows a preemergence metribuzin herbicide application. Weed control may be reduced if dry conditions persist after treatment.

Caution Do not use on clay knobs or poorly covered subsoils. Do not use on coarse soils or soils with less than 1.5% organic matter. Heavy rain after application may injure crop. Preharvest interval is 50 days for dry peas, 40 days for hay. Do not exceed 0.5 lb ai/A metribuzin per crop year.

Site of action Group 5: photosystem II inhibitor

Chemical family Triazinone

Canada Thistle and Annual Broadleaf Weeds

MCPB (Thistrol)

Rate 0.5 to 1.5 lb ae/A (2 to 6 pints/A). Use higher rate during cool weather.

Time Apply when peas have six to twelve nodes, but before flower buds form, and Canada thistle is 4 to 10 inches tall.

Remarks Canada thistle is only suppressed and usually re-grows.

Caution Do not permit MCPB to drift off target. Do not feed peas or vines to livestock. Do not apply if temperature is expected to exceed 85°F within the next 24 hours. Do not spray peas under moisture stress.

Site of action Group 4: synthetic auxin

Chemical family Phenoxy acetic acid

Harvest Aid

carfentrazone (Aim EC)

Rate 0.016 to 0.096 lb ai/A (1.0 to 6.1 oz/A Aim EC)

Time Apply at maturity when 80 to 90% of seed pods are yellow or buck skin color and only 30% of green leaves remain on the plant.

Remarks Can be applied up to 0 days before harvest. Use a minimum of 15 gallons of finished spray per acre for ground application and 5 gallons per acre for aerial application. MSO or COC is required at 1 to 2% v/v. The addition of liquid nitrogen fertilizer at 2 to 4% v/v may enhance performance.

Caution Do not apply more than 6.1 oz/A per season.

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

Chemical family Triazinone

paraquat (Gramoxone SL 2.0 or other trade names)

Rate 0.3 to 0.5 lb ai/A (1.2 to 2 pints/A Gramoxone SL 2.0)

Time Apply when crop is mature: this means at least 80% of pods are yellowing and mostly ripe, and no more than 40% of leaves in bush-type peas, or 30% of leaves in vine-type peas, are still green.

Remarks Use with a nonionic surfactant at 0.25 % v/v. Split applications permitted. Do not exceed two applications per season or 2 pints/A of Gramoxone SL 2.0. Apply in at least 20 gal/A water by ground or 5 gal/A by air.

Caution A restricted-use herbicide. Do not allow to drift from target site. Do not apply within 7 days of harvest.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

saflufenacil (Sharpen)

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

Time Apply over the top of dry peas that have reached physiological maturity (at least 80% yellow/brown pods and no more than 30% of leaves still green for vine-type peas, and no more than 40% of leaves are still green for bush-type peas..

Remarks Allow up to 10 days for optimum desiccation effect. Thorough spray coverage and an MSO plus ammonium-based adjuvant system are required for optimum desiccation.

Caution Maximum cumulative amount per cropping season for desiccation uses is 2.0 oz/A. Do not apply within 3 days of harvest.

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

Chemical family Uracil

Lentils

Drew Lyon

Revised March 2018

Wild Oat Control

Preplant or preemergence

triallate (Far-Go or Avadex)

Rate 1.5 lb ai/A (1.5 quarts/A Far-Go, 12.5 to 15 lb/A Avadex)

Time Apply preplant or postplant, but before lentil emergence; incorporate thoroughly 1 to 2 inches deep.

Remarks Do not graze treated areas. Use only in the spring before wild oat germination. Follow label directions for crop rotation restrictions.

Site of action Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

Chemical family Thiocarbamate

Annual Grass and Broadleaf Weeds

Preplant incorporated

pendimethalin + metribuzin (Trippzin ZC)

Rate 0.91 to 1.375 lb ai/A (29 to 44 oz/A Trippzin ZC).

Time Apply up to 60 days preplant and incorporate within 7 days of application. Do not apply more than once per cropping season. Do not apply when the air temperature is below 45°F.

Remarks Apply in 10 to 40 gal/A water.

Caution Do not use on coarse-textured soils, sandy soils, or soils with less than 1.5% organic matter. Do not apply to "Estin" lentils.

Site of action (pendimethalin) Group 3: microtubule assembly inhibitor; (metribuzin) Group 5: photosystem II inhibitor

Chemical family (pendimethalin) Dinitroaniline; (metribuzin) Triazine

Preplant incorporated or preemergence

pendimethalin (Prowl 3.3EC, Prowl H₂O, or other trade names)

Rate 0.75 to 1.5 lb ai/A (1.8 to 3.6 pints/A pendimethalin 3.3EC; 1.5 to 3.0 pints/A Prowl H₂O). Use lower rate on coarse soils, higher rate on fine soils.

Time Apply up to 60 days preplant, and incorporate by following label instructions. Prowl H₂O may be preplant surface applied up to 30 days prior to planting in reduced tillage systems.

Remarks Incorporate thoroughly 1 to 2 inches deep. Apply in at least 10 gal/A water, or in 20 gal/A or more liquid fertilizer. Adequate rainfall or irrigation after surface application prior to weed germination will provide the most effective weed control. Herbicide performance from surface application may be decreased compared to soil incorporated applications.

Caution Do not apply to pea or lentil forage, silage, hay, or straw grown for feed.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

5-metolachlor (Dual Magnum or other trade names)

Rate 0.95 to 1.91 lb ai/A (1 to 2 pints/A Dual Magnum)

Time Apply preplant incorporated or preemergence.

Remarks Application rate depends on soil type and organic-matter content.

Caution Do not exceed an incorporation depth of 2 to 3 inches. Do not cut for hay within 120 days after application.

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

Chemical family Chloroacetamide

Preplant or preemergence

dimethenamid-P (Outlook or other trade names)

Rate 0.56 to 0.98 lb ai/A (12 to 21 oz/A Outlook)

Time Apply preplant or preemergence.

Remarks Consult label for application rate in relation to soil type. Use lower rate on coarse-textured soils with low organic matter or low cation exchange capacity (CEC). Control is best if incorporated into soil by overhead moisture or light tillage (1 to 2 inches deep) before weed seedlings emerge. Do not apply Outlook early postemergence.

Caution Do not apply through any type of irrigation system. To avoid injuring sensitive varieties, before applying Outlook consult your local seed company supplier about your variety's sensitivity.

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

Chemical family Chloroacetamide

Preemergence

linuron (Lorox)

Rate 0.5 to 1.0 lb ai/A (1.0 to 2.0 lb/A of Lorox)

Time Apply after planting but preemergence to the crop.

Remarks Use lower rates on coarse-textured soils and higher rates on heavier-textured soils. For Idaho and Washington only: winter wheat and winter barley may be planted 4 months after application; do not apply more than 1.25 lb/A Lorox if the field will be rotated to winter wheat or winter barley in the fall or winter and average annual precipitation is less than 16 inches.

Caution Do not apply to sand or loamy sand soil types or to soils with less than 1% organic matter.

Site of action Group 7: photosystem II inhibitor

Chemical family Urea

Annual Grasses

Postemergence

clethodim (SelectMax or other trade names)

Rate Annual grasses: use 0.068 to 0.121 lb ai/A (9 to 16 oz/A SelectMax); perennial grasses: use 0.091 to 0.242 lb ai/A (12 to 32 oz/A SelectMax)

Time Apply postemergence to actively growing grasses. See label for details.

Remarks Apply with an approved nonionic surfactant at 0.25% v/v.

Caution Do not exceed 32 oz/A per application or 64 oz/A per year. Preharvest interval is 30 days. Allow at least 14 days between re-treatments.

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

Chemical family Cyclohexanedione

quizalofop-P (Assure II or other trade names)

Rate 0.04 to 0.08 lb ai/A (6 to 12 oz/A Assure II)

Time Postemergence to grasses. See label for details.

Remarks Controls annual and perennial grasses. Always use a nonionic surfactant at 1 quart/100 gal or a petroleum-based crop oil at 1 gal/100 gal.

Caution Do not exceed 14 oz/A per season. Preharvest interval is 60 days. Do not feed vines or hay.

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 wild oat and volunteer cereals up to 4 inches tall, and to other grasses according to label.

Remarks Refer to label for specific herbicide rates, weed species, and weed size. Always add nonphytotoxic oil concentrate at 2 pints/A.

Caution Control is erratic on grasses stressed by drought, temperature extremes, herbicide injury, or other factors. Do not apply if rain is expected within 1 hour of application. Do not mix with other pesticides. Do not exceed 0.75 lb ai/A in one season. Preharvest interval is 50 days.

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

Chemical family Cyclohexanedione

Annual Broadleaf Weeds

Preplant incorporated or preemergence

imazethapyr (Pursuit)

Rate 0.047 lb ai/A (3 oz/A Pursuit)

Time Apply preplant incorporated within 1 week of planting. Do not incorporate more than 3 inches deep. Apply preemergence after planting but before crop emerges. Application may be followed by shallow incorporation to improve control.

Remarks May be tank mixed with metribuzin to help control lambsquarters or mayweed. Rainfall is required to move surface applications into weed germination zone. If adequate moisture is not received within 7 days of application, control escaped weeds with rotary hoeing or shallow cultivation.

Caution Do not apply postemergence to lentil. Consult label for crop rotation restrictions. Do not feed treated lentil hay or straw to livestock. Allow at least 60 days between application and harvest.

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

Chemical family Imidazolinone

Preemergence

metribuzin (various trade names)

Rate 0.19 to 0.38 lb ai/A (4 to 8 oz/A of the 75% DF)

Time Apply after seeding, but before lentils germinate. Metribuzin may be incorporated 1 to 2 inches deep if soil is dry. If moisture is present or expected, preemergence treatment is best.

Remarks Will not control nightshade.

Caution Determine your lentil variety's tolerance before applying metribuzin. See other label precautions. Do not use on coarse soils or on any soil with less than 1.5% organic matter. Do not use on clay knobs or poorly covered subsoils. Crop may be injured if it becomes stressed. Follow label regarding crop rotations. Do not exceed one application or 0.66 lb/A metribuzin 75DF per season. Do not apply if seeds planted less than 2 inches deep. Preharvest interval is 75 days.

Site of action Group 5: photosystem II inhibitor

Chemical family Triazine

Postemergence

imazamox (Beyond)

Clearfield lentil only

Rate 0.031 to 0.047 lb ai/A (4 to 6 oz/A Beyond)

Time Apply early postemergence to Clearfield lentil from the 2-leaf stage to before flower bud formation when weeds are actively growing and are 1 to 3 inches tall or wide.

Remarks A nonionic surfactant and a liquid nitrogen fertilizer or ammonium sulfate solution is required for maximum efficacy. See label for more information on adjuvants and tank-mixes.

Caution Use only on Clearfield lentil varieties. Do not use crop oil concentrate or methylated seed oil with Beyond on Clearfield lentils. Do not apply more than 0.047 lb ai/A during the growing season. See label for crop rotation restrictions.

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

Chemical family Imidazolinone

metribuzin (various trade names)

Rate 0.125 to 0.25 lb ai/A (1.67 to 5.3 oz/A of the 75% DF)

Time Apply to weeds less than 2 inches high and before lentils are 6 inches high.

Remarks Will not control nightshade.

Caution Do not use on coarse soils or on soils with less than 1.5% organic matter. Do not use on clay knobs or poorly covered subsoils. Crop symptoms may appear, especially under moist conditions. Use the low rate when conditions are moist. Do not apply more than once preemergence and once postemergence per season. Do not apply over moist soils, wet foliage, or within 3 days of cool, wet weather. Do not exceed 0.66 lb/A metribuzin 75 DF per year. Preharvest interval is 75 days.

Site of action Group 5: photosystem II inhibitor

Chemical family Triazine

Harvest aid

carfentrazone (Aim EC)

Rate 0.016 to 0.096 lb ai/A (1.0 to 6.1 oz/A Aim EC)

Time Apply at maturity when 80 to 90% of seed pods are yellow or buck skin color and only 30% of green leaves remain on the plant.

Remarks Can be applied up to 0 days before harvest. Use a minimum of 15 gallons of finished spray per acre for ground application and 5 gallons per acre for aerial application. MSO or COC is required at 1 to 2% v/v. The addition of liquid nitrogen fertilizer at 2 to 4% v/v may enhance performance.

Caution Do not apply more than 6.1 oz/A per season.

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

Chemical family Triazinone

glyphosate (several trade names)

Rate 0.6 to 2.25 lb ae/A glyphosate (product rate will vary depending on formulation)

Time Apply to crop at the hard dough stage.

Remarks Preharvest interval is 7 days. Not recommended for lentils grown for seed.

Caution Only certain formulations are labeled. See label. See label for adjuvant use. Do not feed treated vines or hay.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

paraquat (Gramoxone SL 2.0 or other trade names)

Rate 0.3 to 0.5 lb ai/A (1.2 to 2 pints/A Gramoxone)

Time Apply when crop is mature: this means at least 80% of pods are yellowing and mostly ripe with no more than 30% of leaves still green.

Remarks Use with a nonionic surfactant at 0.25 % v/v. Split applications permitted. Do not exceed two applications per season or 2 pints/A of Gramoxone SL 2.0. Apply in at least 20 gal/A water by ground or in at least 5 gal/A by air.

Caution A restricted-use herbicide. Do not allow to drift from target site. Do not apply within 7 days of harvest.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

saflufenacil (Sharpen)

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

Time Apply over the top of lentils that have reached physiological maturity (at least 80% yellow/brown pods and no more than 30% of leaves are still green).

Remarks Allow up to 10 days for optimum desiccation effect. Thorough spray coverage and an MSO plus ammonium-based adjuvant system are required for optimum desiccation.

Caution Maximum cumulative amount per cropping season for desiccation uses is 2.0 oz/A. **Do not apply within 2 days of harvest.**

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

Chemical family Uracil

Garbanzo Beans (Chickpeas), *Cicer arietinum*

Drew Lyon

Revised March 2018

Garbanzo beans (chickpeas) are included in EPA designated Crop Group 6C that includes peas and beans. Therefore, labels for dry beans and peas may have special restrictions regarding garbanzo beans.

Wild Oat

Preplant or preemergence

triallate (Far-Go or Avadex)

Rate 1.5 lb ai/A (1.5 quarts/A Far-Go, 12.5 to 15 lb/A Avadex)

Time Apply preplant or postplant; incorporate thoroughly 1 to 2 inches deep.

Remarks Do not graze treated area. Certain crops cannot be planted within 12 months of triallate application. Consult label for specific restrictions.

Site of action Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

Chemical family Thiocarbamate

Annual Grass and Broadleaf Weeds

Preplant incorporated or preplant surface

pendimethalin + metribuzin (Tripzin ZC)

Rate 0.91 to 1.31 lb ai/A (29 to 42 oz/A Tripzin ZC).

Time Apply up to 60 days preplant and incorporate within 7 days of application. Do not apply more than once per cropping season.

Remarks Apply in 10 to 40 gal/A water. Thorough incorporation, either by rainfall or mechanical means, is essential for weed control. Applications may be made in late fall when soil temperatures are 45F or below.

Caution Do not use on clay knobs or poorly covered subsoils.

Site of action (pendimethalin) Group 3: microtubule assembly inhibitor; (metribuzin) Group 5: photosystem II inhibitor

Chemical family (pendimethalin) Dinitroaniline; (metribuzin) Triazine

Preplant incorporated or preemergence

imazethapyr (Pursuit)

Rate 0.047 lb ai/A (3 oz/A Pursuit)

Time Apply preplant incorporated within 1 week of planting. Do not incorporate more than 3 inches deep. Apply preemergence after planting but before crop emerges. Application may be followed by shallow incorporation to improve control. Do not make more than one application per year.

Remarks May be tank-mixed with metribuzin to help control lambsquarters or mayweed. Rain is required to move surface applications into weed germination zone. If adequate moisture is not received within 7 days of application, control escaped weeds with rotary hoeing or cultivation.

Caution Consult current label for specific crop rotation restrictions. Do not feed treated garbanzo bean hay or straw to livestock. Do not harvest chickpea within 60 days of application.

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

Chemical family Imidazolinone

pendimethalin (Prowl 3.3EC, Prowl H₂O, or other trade names)

Rate 0.75 to 1.5 lb ai/A (1.8 to 3.6 pints/A Prowl 3.3EC or 1.5 to 3 pints/A Prowl H₂O). Use lower rate on coarse soils, higher rate on fine soils.

Time Apply up to 60 days preplant and incorporate as label instructs. Up to 1.5 pints/A Prowl H₂O may be applied postplant preemergence within 2 days of planting garbanzo beans. Do not apply more than once per cropping season.

Remarks Incorporate thoroughly 1 to 2 inches deep. Apply in at least 10 gal/A water or in 20 gal/A or more liquid fertilizer. Consult label for specific crop rotation restrictions.

Caution Do not apply to pea, lentil, or garbanzo bean forage, silage, hay, or straw grown for feed.

Site of action Group 3: microtubule assembly inhibitor

Chemical family Dinitroaniline

saflufenacil + imazethapyr (Optill)

Rate 0.016 lb ai/A saflufenacil + 0.047 lb ai/A (1.5 oz/A Optill)

Time Apply up to 30 days before planting for burndown activity or up to 1 week before planting if mechanically incorporated; do not incorporate more than 3 inches deep. Apply preemergence immediately after planting but before crop emergence.

Remarks Burndown control of emerged grasses or additional broadleaf weeds not listed on the label will require a tank-mix with another herbicide such as glyphosate. Methylated seed oil plus ammonium sulfate is required for burndown applications. See label for more information on adjuvants and tank-mixes.

Caution Do not apply when legumes have reached the cracking stage or after emergence or severe crop injury will occur. Do not make more than one application of Optill per cropping season. Do not apply more than a maximum cumulative amount of 0.045 lb ai/A saflufenacil or 0.047 lb ai/A of imazethapyr per cropping season.

Site of action (saflufenacil) Group 14: protoporphyrinogen oxidase (PPO) inhibitor; (imazethapyr) Group 2: acetolactate synthase (ALS) inhibitor

Chemical family (saflufenacil) Pyrimidinedione; (imazethapyr) Imidazolinone

S-metolachlor (Dual Magnum or other trade names)

Rate 0.95 to 1.91 lb ai/A (1 to 2 pints/A Dual Magnum)

Time Apply preplant incorporated or preemergence.

Remarks Application rate depends on soil type and organic-matter content.

Caution Do not cut for hay within 120 days after application. Do not use for forage within 60 days after application.

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

Chemical family Chloroacetamide

Preplant or preemergence

dimethenamid-P (Outlook)

Rate 0.56 to 0.98 lb ai/A (12 to 21 oz/A Outlook)

Time Apply preplant or preemergence.

Remarks Consult label for application rate in relation to soil type. Use lower rate on coarse-textured soils with low organic matter or low cation exchange capacity (CEC). Control is best if incorporated into soil by precipitation before weed seedlings emerge. Do not apply Outlook early postemergence on garbanzo bean.

Caution Do not apply through any irrigation system. To avoid injuring sensitive varieties, before applying Outlook consult your local seed company supplier about your variety's sensitivity.

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

Chemical family Chloroacetamide

Preemergence

linuron (Lorox)

Idaho and Washington only

Rate 0.5 to 1.0 lb ai/A (1.0 to 2.0 lb/A of Lorox)

Time Apply after planting but preemergence to the crop.

Remarks Use lower rates on coarse-textured soils and higher rates on heavier-textured soils. For Idaho and Washington only: winter wheat and winter barley may be planted 4 months after application; do not apply more than 1.25 lb/A Lorox if the field will be rotated to winter wheat or winter barley in the fall or winter and average annual precipitation is less than 16 inches.

Caution Do not apply to sand or loamy sand soil types or to soils with less than 1% organic matter.

Site of action Group 7: photosystem II inhibitor

Chemical family Urea

Annual Broadleaf Weeds

Preplant surface, preplant incorporated, or preemergence

flumioxazin (Valor SX or other trade names)

Rate 0.064 lb ai/A (2 oz/A Valor SX)

Time Apply before planting, or within 2 days after planting but before crop emerges.

Remarks Preplant incorporation applications may result in reduced weed control. Valor is labeled for weed suppression in garbanzo, not for control.

Caution Do not exceed 2.0 oz/A in a single application or 2.0 oz/A in a single growing season.

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

Chemical family N-phenylphthalimide

saflufenacil (Sharpen)

Rate 0.022 to 0.066 lb ai/A (1 to 3 oz/A Sharpen)

Time For most effective control, apply 1.0 oz/A Sharpen early preplant for burndown of broadleaf weeds and follow with 1.0 to 3.0 oz/A Sharpen at least 14 days later from early preplant until prior to crop emergence for burndown plus residual broadleaf weed control.

Remarks An adjuvant system is required for optimum broadleaf burndown activity. Do not apply more than a maximum cumulative rate of 4.0 oz/A of Sharpen per cropping season.

Caution Do not apply when legumes have reached the cracking stage or after emergence, as severe crop injury will occur. Ensure that the seed row is closed. Do not apply with other products containing Group 14 herbicides (sulfentrazone/Spartan; flumioxazin/Valor) as a tank-mix or sequential application within 30 days, because crop injury may result.

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

Chemical family Pyrimidinedione

sulfentrazone (Spartan 4F or other trade names)

Rate 0.07 to 0.25 lb ai/A (2.25 to 8 oz/A Spartan 4F)

Time Apply fall or spring preplant, preemergence, or preplant incorporated (spring only).

Remarks Consult label to determine rate for soil pH, percentage of organic matter, and texture. Consult label for specific crop rotation restrictions.

Caution Do not exceed 8 oz/A per 12-month period. Do not incorporate to depths greater than 2 inches. Do not apply after crop emerges or if seedlings are near soil surface. Do not apply to frozen soil.

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

Chemical family Aryl triazinone

Preplant surface or preemergence

sulfentrazone + carfentrazone (Spartan Charge)

Rate 0.074 to 0.251 lb ai/A sulfentrazone + 0.008 to 0.028 lb ai/A carfentrazone (3.0 to 10.2 oz Spartan Charge)

Time Apply fall or spring as preplant or preemergence.

Remarks Consult label to determine rate for soil pH, percentage of organic matter, and texture. Consult label for specific crop rotation restrictions.

Caution Do not exceed 0.28 lb ai (10.2 oz) Spartan Charge per 12-month period. Do not apply after crop emerges or if seedlings are near soil surface. Do not apply on sandy soils with less than 1% organic matter. Do not apply to frozen soil. Do not incorporate as this can destroy the herbicide barrier.

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

Chemical family Aryl triazinone

sulfentrazone + S-metolachlor (Spartan Elite or other trade names)

Rate 0.10 to 0.21 lb ai/A sulfentrazone and 0.94 to 1.87 lb ai/A S-metolachlor (19 to 38 oz/A Spartan Elite)

Time Apply fall or spring as preplant or preemergence.

Remarks Consult label to determine rate for soil percentage of organic matter, and texture. Consult label for specific crop rotation restrictions.

Caution Do not apply to coarse-textured soils with less than 1% organic matter. Adequate rainfall is required for herbicide activation from rainfall. If activating moisture is not received within 7 to 10 days after application, a shallow incorporation may be needed to obtain adequate weed control. Do not incorporate to depths greater than 2 inches. Do not apply to frozen soils. Do not use for forage within 60 days after an application. Do not cut for hay within 120 days after application.

Site of action Group 14: protoporphyrinogen oxidase (PPO) inhibitor; Group 15: inhibits very long chain fatty acid synthesis

Chemical family (sulfentrazone) Aryl triazinone; (S-metolachlor) Chloroacetamide

Preemergence

metribuzin (various trade names)

Rate 0.25 to 0.38 lb ai/A (5.3 to 8 oz/A of the 75% DF metribuzin)

Time Apply after planting but before crop germinates.

Remarks Will not control nightshade. Under dry conditions, shallow, 1 to 2 inch incorporation will improve weed suppression.

Caution Determine the chickpea variety's tolerance before applying metribuzin. See other label precautions. Do not use on coarse soils or if organic matter is less than 1.5%. Do not use on clay knobs or poorly covered subsoils. Crop may be injured if stressed. Follow label regarding crop rotations. Do not apply more than once per season. Do not apply if seeding depth is less than 2 inches.

Site of action Group 5: photosystem II inhibitor

Chemical family Triazine

Annual Grass Weeds

Postemergence

clethodim (Select Max or other trade names)

Rate Annual grasses: use 0.068 to 0.121 lb ai/A (9 to 16 oz/A Select Max); perennial grasses: use 0.091 to 0.242 lb ai/A (12 to 32 oz/A Select Max)

Time Apply postemergence to actively growing grasses. See label for details.

Remarks Apply with an approved nonionic surfactant at 0.25% v/v.

Caution Do not exceed 32 oz/A per application or 64 oz/A per year. Preharvest interval is 30 days. Allow at least 14 days between re-treatments.

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

Chemical family Cyclohexanedione

quizalofop-P (Assure II or other trade names)

Rate 0.04 to 0.08 lb ai/A (6 to 12 oz/A Assure II)

Time After grasses emerge; see label for details.

Remarks Controls annual and perennial grasses. Always use either a nonionic surfactant at 1 quart/100 gal or a petroleum-based crop oil at 1 gal/100 gal.

Caution Do not exceed 24 oz/A per season. Preharvest interval is 30 days. Do not feed vines or hay.

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

Chemical family Aryloxyphenoxypropionate

sethoxydim (Poast)

Rate 0.281 to 0.468 lb ai/A (1.5 to 2.5 pints/A)

Time Apply postemergence to actively growing weeds.

Remarks Add crop oil concentrate or methylated seed oil and liquid urea ammonium nitrate fertilizer or ammonium sulfate as adjuvants. See label for more information on adjuvants and tank-mixes. Apply to most grasses when 4 to 8 inches tall. Refer to label for specific weed recommendations and other restrictions.

Caution Do not apply to grasses or crops under moisture stress.

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

Chemical family Cyclohexanedione

Harvest Aid**carfentrazone (Aim EC)**

Rate 0.016 to 0.096 lb ai/A (1.0 to 6.1 oz/A Aim EC)

Time Apply at maturity when 80 to 90% of seed pods are yellow or buck skin color and only 30% of green leaves remain on the plant.

Remarks Can be applied up to 0 days before harvest. Use a minimum of 15 gallons of finished spray per acre for ground application and 5 gallons per acre for aerial application. MSO or COC is required at 1 to 2% v/v. The addition of liquid nitrogen fertilizer at 2 to 4% v/v may enhance performance.

Caution Do not apply more than 6.1 oz/A per season.

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

Chemical family Triazinone

glyphosate (several trade names)

Rate 0.6 to 2.25 glyphosate ae/A (product rate will vary depending on formulation)

Time Apply to crop at the hard dough stage.

Remarks Preharvest interval is 7 days.

Caution Only certain formulations are labeled. See label for adjuvant use. Do not feed treated vines or hay to livestock.

Site of action Group 9: inhibits EPSP synthase

Chemical family None generally accepted

paraquat (Gramoxone SL 2.0 or other trade names)

Rate 0.3 to 0.5 lb ai/A (1.2 to 2 pints/A Gramoxone SL 2.0)

Time Apply when crop is mature: this means at least 80% of pods are yellowing and mostly ripe with no more than 40% of leaves still green.

Remarks Use with a nonionic surfactant at 0.25 % v/v. Split applications permitted. Do not exceed two applications per season or 2 pints/A of Gramoxone SL 2.0. Apply in at least 20 gal/A water by ground or in at least 5 gal/A water by air.

Caution **A restricted-use herbicide.** Do not allow drift from target site. Do not apply within 7 days of harvest.

Site of action Group 22: photosystem I electron diversion

Chemical family Bipyridilium

saflufenacil (Sharpen)

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

Time Apply over the top of garbanzo beans that have reached physiological maturity (at least 80% yellow/brown pods and no more than 40% of leaves are still green).

Remarks Allow up to 10 days for optimum desiccation effect. Thorough spray coverage and an MSO plus ammonium-based adjuvant system are required for optimum desiccation.

Caution Maximum cumulative amount per cropping season for desiccation uses is 2.0 oz/A. Do not apply within 2 days of harvest.

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

Chemical family Uracil
