

# 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 Bean East of the Cascades

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

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Revised March 2019

#### Annual Grass and Broadleaf Weeds

##### dimethenamid-P (Outlook)

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

**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 (garden) 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

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### 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

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### 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.

Sonalan may be applied to dry beans by chemigation. See label for specific chemigation guidelines. 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

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### 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. Time to rainfast varies with glyphosate product. See label for specific information. 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** Glycine

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### glyphosate + S-metolachlor (Sequence)

**Rate** 1.64 to 2.625 lb ai/a (2.5 to 4 pints/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. Heavy rainfall or irrigation shortly after application may require re-treatment. 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. Do not apply through any irrigation system.

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

**Chemical family** (glyphosate) Glycine; (s-metolachlor) chloroacetamide

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### halosulfuron (Sanda)

**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 trifoliate 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 2 applications of 0.66 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

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### imazamox (Raptor)

*Dry beans only*

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

**Time** Apply postemergence to actively growing weeds and dry beans with at least one full, expanded trifoliate 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. Rainfast 1 hour after application. 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

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### 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 trifoliate 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 beans. 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. Rainfall or overhead irrigation within 4 hours after application may reduce the effectiveness. 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

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### 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 pre-plant 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

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### pendimethalin (Prowl and other trade names)

**Rate** 0.95 to 1.43 lb ai/a (2 to 3 pints/a Prowl H<sub>2</sub>O 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** Be aware that pendimethalin is formulated as 3.3 lb ai/gal and 3.8 lb ai/gal. 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 H<sub>2</sub>O. 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 graze livestock in treated fields.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Dinitroaniline

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### 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** Apply at 0.95 to 1.26 lb ai/a on coarse soils with less than 3% organic matter, 1.26 to 1.59 lb ai/a on medium soils, 1.26 to 1.59 lb ai/a on fine soils with less than 3% organic matter, or 1.59 to 1.9 lb ai/a on fine soil with greater than 3% organic matter. 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 after application or use for forage within 60 day of application. Do not apply more than 2 pints/a during any one crop year.

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

**Chemical family** Chloroacetamide

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### 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

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## Annual Grass and Perennial Grasses

### Postemergence

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#### 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 in addition to crop oil concentrate 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 broad-leaf 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

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### fluazifop (Fusilade DX)

**Rate** 0.094 to 0.375 lb ai/a (6 to 24 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. Maintain a minimum of 14 days between applications. Where irrigation is used as part of normal cropping practice, best results are obtained when fluazifop is applied within 7 days after irrigation. Fusilade is rainfast 1 hour after application. Restricted entry interval (REI) is 12 hours.

**Caution** Do not apply more than 48 fl oz/a per year 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

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### 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 apply more than 4 applications per acre per season with application intervals greater than 7 days. Do not exceed 28 fl oz/a per season. Do not feed vines or hay. Do not apply through any type of irrigation equipment. Do not harvest within 30 days after application.

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

**Chemical family** Aryloxyphenoxypropionate

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### 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

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## Annual Broadleaf Weeds and Sedges

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### bentazon (Basagran)

**Rate** 0.5 to 1 lb ai/a (1 to 2 pints/a Basagran 4L or 0.8 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. Rainfall or overhead irrigation within 4 hours after application may reduce effectiveness. 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

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### 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. Rainfast 15 to 30 minutes after application. 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

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### 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** Glycine

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### 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

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### 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

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### 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** Glycine

# 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 <sup>1</sup>		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												
<sup>1</sup> Number of months after application to plant an unlabeled crop.												

# Pea (Dry)

Drew Lyon

Revised March 2019

## Annual Grass and Broadleaf Weeds

### Preplant surface, preplant incorporated, or preemergence

#### sulfentrazone + pyoxasulfone (Authority Supreme)

##### Supplemental label

**Rate** 0.141 to 0.5 oz ai/a (4.3 to 15.4 oz/a Authority Supreme)

**Time** May be applied in the fall for crops planted in the fall or for crops planted the following spring. In spring, may be applied from 30 days before planting up to 3 days after planting.

**Remarks** In early preplant and fall applications, Authority Supreme can be applied in sequential programs, but do not exceed the maximum use rate per year. Where weeds are emerged, use appropriate tank mixtures for control of the weed species present. Crop seeds must be planted at least 1 inch deep. Do not incorporate greater than 2 inches deep.

**Caution** Some adverse crop response may occur on coarse textured soils with low organic matter (less than 1.5%) and pH of 7.8 or higher, or on highly eroded soils, or in areas of calcareous outcroppings. Authority Supreme use rates should be reduced in those areas. Inadequate seed furrow closure or shallow planting (less than 1 inch) may result in undesirable crop response. Verify selectivity of Authority Supreme on your variety before applying to avoid injury to sensitive varieties.

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

**Chemical family** (sulfentrazone) Aryl triazinone; (pyoxasulfone) Isoxazoline

### 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 or other trade names)

**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 H<sub>2</sub>O, 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 H<sub>2</sub>O). 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

#### triallate (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



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**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**

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**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

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**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**

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**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

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**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**

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**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

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**imazethapyr (Pursuit or other trade names)**

**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

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**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

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**Annual and Perennial Grass Weeds****Postemergence**

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**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

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**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

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**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 (ACCCase) inhibitor

**Chemical family** Aryloxyphenoxypropionate

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**sethoxydim (Poast or other trade names)**

**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 (ACCCase) inhibitor

**Chemical family** Cyclohexanedione

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

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**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

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**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

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### 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

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### imazamox (Raptor or other trade names)

**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

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### 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

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### 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

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### 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

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## Canada Thistle and Annual Broadleaf Weeds

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### 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

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## Harvest Aid

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### 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 gal of finished spray per acre for ground application and 5 gal 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

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**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

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**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



# Lentil

Drew Lyon

Revised March 2019

## 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 (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. 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 H<sub>2</sub>O, 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 H<sub>2</sub>O). 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 H<sub>2</sub>O 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

### 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 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

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### 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

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### sethoxydim (Poast or other trade names)

**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

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#### imazethapyr (Pursuit or other trade names)

**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

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### 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

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## Postemergence

### imazamox (Beyond or other trade names)

*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

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### 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 gal of finished spray per acre for ground application and 5 gal 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 Bean (Chickpea), *Cicer arietinum*

Drew Lyon

Revised March 2019

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 surface, preplant incorporated, or preemergence

#### sulfentrazone + pyroxasulfone (Authority Supreme)

*Supplemental label*

**Rate** 0.141 to 0.5 oz ai/a (4.3 to 15.4 oz/a Authority Supreme)

**Time** May be applied in the fall for crops planted in the fall or for crops planted the following spring. In spring, may be applied from 30 days before planting up to 3 days after planting.

**Remarks** In early preplant and fall applications, Authority Supreme can be applied in sequential programs, but do not exceed the maximum use rate per year. Where weeds are emerged, use appropriate tank mixtures for control of the weed species present. Crop seeds must be planted at least 1 inch deep. Do not incorporate greater than 2 inches deep.

**Caution** Some adverse crop response may occur on coarse textured soils with low organic matter (less than 1.5%) and pH of 7.8 or higher, or on highly eroded soils, or in areas of calcareous outcroppings. Authority Supreme use rates should be reduced in

those areas. Inadequate seed furrow closure or shallow planting (less than 1 inch) may result in undesirable crop response. Verify selectivity of Authority Supreme on your variety before applying to avoid injury to sensitive varieties.

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

**Chemical family** (sulfentrazone) Aryl triazinone; (*pyroxasulfone*) Isoxazoline

### 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 45°F 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 or other trade names)

**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 H<sub>2</sub>O, 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 H<sub>2</sub>O). 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 H<sub>2</sub>O 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 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 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



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## 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

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## Annual Broadleaf Weeds

### Preplant surface, preplant incorporated, or preemergence

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#### 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

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#### 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

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## 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

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## Preplant surface or preemergence

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### 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

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### 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 or other trade names)

**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 gal of finished spray per acre for ground application and 5 gal 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