

WEED CONTROL IN DRY EDIBLE BEANS

(R.L. Becker)

- DB1.** Dry beans do not compete well with weeds. Early weed growth reduces bean yields by competing for light, moisture, and nutrients. Weeds also are likely to cause a buildup of disease and/or insect problems that may adversely affect bean growth and development. Weeds increase harvest losses and reduce bean quality. Cultivation or other tillage sometimes controls weeds adequately without the use of herbicides. However, weeds usually are not controlled adequately in the row. Therefore, a combination of herbicides and tillage is often necessary for adequate weed control.

Early Growth and Development of Beans

- DB2.** Dry beans grown in Minnesota include five common bean (*Phaseolus sp.*) classes: navy, pinto, kidney, pink, and small red, as well as the adzuki bean (*Vigna sp.*). All common beans emerge by elongation of the hypocotyl (portion of the stem below the cotyledons or seed leaves), which “crooks” or arches through the soil and then straightens out with unfolding cotyledons. These common beans emerge quite rapidly (usually within 7-10 days) if planted in warm soil (50°F or higher) in late May or early June in Minnesota. However, earlier planting may delay emergence. Adzuki beans, on the other hand, emerge by elongation of the epicotyl (portion of the stem above the cotyledons), and the cotyledons (seeds) remain below the soil surface. Adzuki beans emerge more slowly than common beans, usually 10-14 days in warm soils and 15-20 days in cold soils. Because of the type and time required for emergence, weed control in adzuki beans is more critical and they are more susceptible to injury from preplanting or preemergence herbicides. For example, EPTC (Eptam), alachlor (Lasso) and metolachlor (Dual II) can be used on common beans but should not be used on adzuki beans. Herbicides are also available for dry beans less common in Minnesota; chickpea (*Cicer arietinum* L.), lentil (*Lens culinaris* Medik), lima (*Phaseolus lunatus* L.) and dry pea (*Pisum sativum* L.).

Cultural Practices

- DB3.** Before emergence, dry beans can be spike-toothed harrowed or rotary hoed to kill emerging weeds. The rotary hoe or flexible-tined harrow are less likely to damage emerging dry beans than the spike-toothed harrow. More than one harrowing or rotary hoeing may be necessary. After the beans emerge, they develop quite rapidly and progress through the cotyledon stage (or plumule stage in the adzuki bean) to the fully expanded unifoliate leaf stage and then to the first and subsequent trifoliate (three-part) leaves. Beans differ in canopy growth. Most navy and adzuki bean varieties are erect or “bush” type. Most pinto, pink, and small red bean varieties are prostrate vines, although bush or semi-vine types of small red and pinto are available. Dry edible beans may be cultivated once or twice to control weeds; however, cultivation should be shallow to avoid damaging the rather shallow root systems. **Do not** cultivate or harrow when the bean foliage is wet because bacterial diseases may be spread. Beans are hilled at the last cultivation to allow use of bean pullers. However, if beans are to be direct-combined or swathed, the last cultivation should leave the field as level as possible.

Herbicides

Preplant-Incorporated or Preemergence Applications

- DB4.** The acetanilides alachlor (Lasso*/Micro-Tech), dimethenamid (Outlook), and s-metolachlor (Dual Magnum*/Dual II Magnum*); thiocarbamate EPTC (Eptam, Eptam 20G), and the dinitroanilines ethalfluralin (Sonalan), pendimethalin (Prowl*), and trifluralin (Treflan*) can be applied preplant incorporated for annual grass and some small-seeded broadleaf weed control. Additionally, s-metolachlor can also be applied preemergence, and dimethenamid can also be applied preemergence or early postemergence (1st to 3rd trifoliate stage). Wild oat control is not adequate with any of these herbicides. Rates are dependent on soil type. **Do not** use alachlor (Lasso*/Micro-Tech), EPTC (Eptam), metolachlor (Dual II*), or pendimethalin (Prowl*) on adzuki beans. EPTC (Eptam, Eptam 20G), ethalfluralin (Sonalan, Sonlan 10G) metholachlor (Dual II*) and trifluralin (Treflan*) can be applied PPI in the fall. See label for time of application restrictions. Alachlor products are a restricted use herbicide. Outlook has a 70 day PHI.
- DB5.** Alachlor (Lasso*/Micro-Tech), dimethenamid (Outlook), s-metolachlor (Dual Magnum*/Dual II Magnum*), and ethalfluralin (Sonalan) will give early season control of eastern black and hairy nightshade. Use the highest rate of ethalfluralin.
- DB6.** Permit (halosulfuron) at 0.023 to 0.031 lb ai/A (1/2 to 2/3 oz product/A) may be applied after planting but prior to soil cracking. Use the lower rates on lighter textured soils or soils with low organic matter. Rates less than 2/3 oz will give only weed suppression. May be applied at 1/2 to 1 oz product/A banded between rows for yellow nutsedge and additional broadleaf weed control. Do not apply rates higher than 2/3 oz product/A directly over the row. Do not apply more than 1 oz product/A per crop-cycle, or more than 2 oz product/A per 12-month period. May also be applied with 3 1/2 to 4 1/2 pts/A EPTAM 7E for broad-spectrum control of

* or generic equivalent.

weeds (Restrictions on Eptam label also apply). No PHI for dry bean. Do not plant (or replant) dry beans for 9 months following application.

- DB7. Pursuit (imazethapyr)** can be applied preplant incorporated or preemergence, but approved bean types differ by method of application and geographic areas delimited by Hwy 210. Refer to the label for application method specific to bean type and geographic region. Apply up to 3 fl. oz. 2L or 1.08 oz DG per acre south of Hwy 210 to labeled bean types. North of Hwy 210, apply up to 2 fl. oz. 2L or 0.72 oz. DG only to lima, chickpeas, lentils, and white lupine. (Other dry beans should only be treated postemergence north of Hwy 210, see DB11). Apply and incorporate within 1 week of planting or preemergence within 3 days after planting. **Do not** apply by air. **Do not** apply to white lupine on sand or loamy sand soils. Imazethapyr will provide control of eastern black nightshade, redroot pigweed, kochia and wild mustard. Imazethapyr will not adequately control other broadleaf weeds or grasses. Therefore, imazethapyr should be tank mixed with other herbicides for broad spectrum weed control. Under Minnesota's environmental conditions, preemergence applications will give less weed control than preplant incorporated applications due to the need for sufficient and timely rainfall to move the herbicide into the weed germination zone. If sufficient rainfall does not occur within 10 days after application, irrigation where possible, will increase the weed control of a preemergence application. Available as a prepackage mixture with pendimethalin (Pursuit Plus) for use south of highway 210 for lima, navy, great northern, red kidney, black turtle, cranberry, and small white beans only. 30 day PHI for lima beans, 60 day PHI for all others.

Postemergence

- DB8. Assure II/Targa (quizalofop)** at 0.036 to 0.06 lb/A (6-10 oz/A) will give good control of annual grasses and suppression of perennial grasses. Dry beans have good tolerance to quizalofop. A crop oil concentrate at 1 qt/A or a nonionic surfactant at 0.25% v/v must always be added for consistent grass control. 30 day PHI.
- DB9. Basagran (bentazon)**, applied postemergence at 0.5 to 1.0 lb ai/A (1 to 2 pt/A) will control many small, annual broadleaf weeds usually less than 6 inches tall (see label for specific product rates by weed heights and leaf stages listed by species), and will suppress Canada thistle. Use the lower rate on adzuki beans. Addition of crop oil may cause bean injury. To improve weed control and increase crop tolerance, Basagran can also be applied in a split application of 1 pt/A approximately two weeks after dry bean planting, followed by 1 pt/A 10 to 14 days later if necessary. See label and Table DB1 for tank mix information. 30 day PHI. **Rezult (sethoxydim + bentazon)** co-packaged product applied at 3.2 pt/A (1.6 pt/A of each product) with 1 pt/A COC + 1 to 2 lbs AMS/A will provide grass and small seed broadleaf weed control. Apply to small actively growing weeds after dry beans have 1 fully expanded trifoliolate leaf. An additional 4.4 pt/A of Poast Plus or 2 pt/A Basagran may be applied per season following a single application of Rezult. Rezult also has a 30 day PHI.
- DB10. Poast (sethoxydim)** at 0.09 to 0.5 lb/A (0.5 to 2.5 pts/A) will give good control of annual grasses and suppression of perennial grasses. Use the lower rates for annual grass control. Dry beans have good tolerance to sethoxydim. An oil concentrate at 1 qt/A must be used for consistently good grass control. Liquid nitrogen or ammonium sulfate can be added in addition to crop oil concentrate for harder-to-control grass weeds such as volunteer corn, wild oats and volunteer cereals. 30 day PHI. **See DB9** for information on **Rezult**.
- DB11. Select 2EC*/Select Max/Prism 1EC** applied at 0.063 to 0.125 lb/A (4 to 8 oz/A Select; 9 to 12 oz/A Select Max; 8.5 to 17 oz/A Prism) will give good control of annual grasses and suppression of perennial grasses. Dry beans have good tolerance to clethodim. Always add a crop oil concentrate at 1% v/v but not less than 1 pt/A. 30 day PHI.
- DB12. Pursuit (imazethapyr)** can be applied to navy, great northern, red kidney, black turtle, cranberry, pinto, small white dry beans and dry peas at 3 fl. oz. 2L or 1.08 oz DG per acre 1 to 2 pts. nonionic surfactant per 100 gal spray solution south of Hwy 210. North of Hwy 210, apply up to 2 fl. oz. 2L or 0.72 oz. DG. **Do not** apply postemergence to lima, chickpea, lentils or white lupine. Apply after at least one trifoliolate is fully expanded. Apply to dry pea after 3 inches in height, but prior to five nodes before flowering. Will control nightshade, kochia, pigweed and mustards at these application rates. If N fertilizer is added, also add Basagran to minimize crop injury. Use of trifluralin preplant may increase risk of injury. **Do not** apply to dry pea or cowpea fields treated with trifluralin or injury may occur. 2 fl. oz. 2L can be applied after trifluralin to suppress nightshade, but may cause injury. Numerous label precautions, exemptions, and regional- and species-specific instructions. See label for details. **Do not** apply by air. 30 day PHI for lima beans, 60 day PHI for all others.
- DB13. Raptor (imazamox)** can be applied at 4 fl oz per acre with 1 to 2 gal COC or 1 to 2 qt nonionic surfactant per 100 gal spray solution for dry beans. Apply to dry beans after at least one trifoliolate is fully expanded. Apply 4 fl.oz. to dry pea and cowpea per acre plus 1 qt. nonionic surfactant per 100 gal spray solution. Apply to dry pea or cowpea after 3 inches in height, but prior to five nodes before flowering. Application to dry pea or cowpea fields treated with trifluralin may increase the likelihood of injury. COC can be used instead of nonionic surfactant to improve grass control. If N fertilizer or COC are added, Basagran must be added at 6 to 16 fl. oz. per acre to minimize crop injury. Rezult may be used instead of Basagran. Must be applied before edible legumes bloom to avoid injury. **Do not apply to chickpeas**. 60 day PHI dry beans, dry pea and cowpea.

* or generic equivalent.

- DB14. Reflex 2LC (fomesafen)** applied at 0.188 lb ai/A (0.75 pt/A) will control eastern black nightshade or common ragweed at the 1- to 4-leaf stage. Apply with 0.25 to 0.5% v/v NIS or 0.5 to 1.0% v/v COC. COC improves weed control but also increases risk of crop injury. 30 day PHI. **Do not** apply to the same acreage more than once every 2 years. A current **Minnesota Section 18 Emergency Exemption label** must be in the possession of the user at the time of application. Check each year to see if still labeled since Section 18 labels must be renewed each year.
- DB15. Roundup Ultra Max (glyphosate)** may be applied as a spot treatment to control troublesome weeds such as Canada thistle, quackgrass, and milkweed in dry pea, lentils, and chickpeas. **Crop sprayed will be killed.** Apply when weeds are at or beyond the bud stage of growth. Broadcast spot-apply at up to 20 oz product (0.625 lb ai) or spot apply with a hand held sprayer at a 2% solution. 14 day PHI.

Shielded-spray Applications

- DB16. Aim (carfentrazone-ethyl)** may applied up to 0.031 lb ai/A (up to 1.24 oz product) using hooded sprayers and a minimum of 10 gpa to control weeds between rows. **Do not** apply under windy conditions or drive equipment faster than 5 mph to avoid wind currents depositing spray on the crop. Serious leaf necrosis will occur if spray contacts dry beans. Use NIS at 0.25% v/v to improve control or for specific weeds, COC at 1.0% v/v. 0 day PHI.

Desiccants and Pre-Harvest Aids

- DB17. Defol 6* (sodium chlorate)** may be used as a desiccant to aid in harvest. Sodium chlorate can be applied by air in at least 5-10 gallons of water per acre or by ground applications in 10-20 gallons of water per acre. Larger spray volume will result in more complete coverage and more reliable desiccation. Thorough coverage is important. Make application 7-10 days before anticipated harvest. Defoliation may be slowed under cool conditions. **Do not** mix with any other pesticide.
- DB18. Gramoxone Max 3L/Gramoxone Inteon 2L (paraquat)** may be applied at 0.31 - 0.47 lb ai/A (0.8 to 1.3 pt. 3L or 1 to 1.5 pt. 2.5L) as a harvest aid application when the crop is mature and at least 80% of the pods are yellowing and mostly ripe with no more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves still green in color. Ground applications require 20 GPA and aerial application requires 5 GPA. Add NIS at 1 qt/100 gal spray mixture. **Do not** apply when weather conditions favor spray drift. 7 day PHI. See label for approved bean types.
- DB19. Roundup Ultra Max (glyphosate)** may be applied over-the-top broadcast by ground or air equipment at up to 20 oz product (0.625 lb ai) to dry pea, lentils, and chickpeas when legume seed is at the hard dough stage (30% grain moisture or less) to control weeds prior to harvest. Paraquat or sodium chlorate are relatively quick desiccating agents, glyphosate is not. 14 day PHI.

* or generic equivalent.

Table DB1. Package mixtures labeled for use in Dry Edible Beans are as follows:

Trade Name	Formulation	Common Name	Active Ingredient
Rezult	1E + 5S	sethoxydim + bentazon	1 lb/gal + 5 lb/gal

Table DB2. Crop Stage and Harvest Restrictions for Dry Edible Beans

Herbicide Name	Minimum Crop Stage	Maximum Crop Stage	Harvest Restriction (days)
Aim (carfentrazone-ethyl)	hooded sprayer	hooded sprayer	none
Arrow (clethodim)	none	none	30
Assure II (quizalofop)	none	none	30
Basagran (bentazon)	first trifoliate	none	30
Charger MAX (s-metolachlor & benoxacor)	n.a.	n.a.	none
Cinch (s-metolachlor & benoxacor)	n.a.	n.a.	none
Dual II Magnum (s-metolachlor & benoxacor)	n.a.	n.a.	none
Dual Magnum (s-metolachlor)	n.a.	n.a.	none
Eptam (EPTC)	n.a.	n.a.	none
glyphosate, others (glyphosate)	dessicant, hard dough (30% moisture or less)	--	14
Gramoxone (paraquat)	80% yellow pods	--	7
Intrro (alachlor)	n.a.	n.a.	none
Lasso (alachlor)	n.a.	n.a.	none
Micro Tech (alachlor)	n.a.	n.a.	none
Outlook (dimethenamid-P)	n.a.	third trifoliate	70
Parallel (metolachlor & benoxacor)	n.a.	n.a.	none
Parallel PCS (metolachlor)	n.a.	n.a.	none
Pendant (pendimethalin)	n.a.	n.a.	none
Pendimax (pendimethalin)	n.a.	n.a.	none
Permit (halosulfuron)	none	none	n.a.
Poast (sethoxydim)	none	none	30
Prism (clethodim)	none	none	30
Prowl (pendimethalin)	n.a.	n.a.	none
Prowl H20 (pendimethalin)	n.a.	n.a.	none
Pursuit (imazethapyr)	see label	see label	30 lima beans, 60 others
Raptor (imazamox)	one expanded trifoliate	before bloom	60
Reflex (fomesafen)	n.a.	n.a.	30
Rezult (sethoxydim + bentazon)	none	none	30
Roundup (glyphosate)	spot treatment, none	spot treatment, none	14
Section (clethodim)	none	none	30
Select (clethodim)	none	none	30
Select Max (clethodim)	none	none	30
sodium chlorate, others (sodium chlorate)	7-10 days preharvest	--	7
Sonalan (ethalfuralin)	n.a.	n.a.	none
Targa (quizalofop)	none	none	30
Treflan (trifluralin)	n.a.	n.a.	none
trifluralin, others (trifluralin)	n.a.	n.a.	none
Trust (trifluralin)	n.a.	n.a.	none

Table DB3. Summary of herbicides for use in Dry Edible Beans

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Fall</u>			
Charger MAX 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Cinch 7.64 E (s-metolachlor & benoxacor)	1.4 to 2.9 pts (1.5 to 3 lb ai/A)	G	Must be incorporated. Rate dependent on soil type. Do not use on adzuki beans.
Dual II Magnum 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Dual Magnum 7.62 E (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Eptam 20 G Eptam 7 E (EPTC)	15 lbs 4.5 to 5.25 pts (3 to 4.6 lb ai/A)	G	Do not use on adzuki beans. Apply after October 15 and before freeze up.
Parallel 7.8 E (metolachlor & benoxacor)	1.5 to 2 pts (1.5 to 1.95 lb ai/A)	G	Must be incorporated. Rate dependent on soil type. Do not use on adzuki beans.
Parallel PCS 8 E (metolachlor)	1.5 to 2 pts (1.5 to 2 lb ai/A)	G	Must be incorporated. Rate dependent on soil type. Do not use on adzuki beans.
Treflan 10 G Treflan 4 E (trifluralin)	5 to 10 lbs 1 to 2 pts (0.5 to 1 lb ai/A)	G	Must be incorporated. Rate dependent on soil type.
trifluralin 10 G trifluralin 4 E (trifluralin)	5 to 10 lbs 1 to 2 pts (0.5 to 1 lb ai/A)	G	Must be incorporated. Rate dependent on soil type.
Trust 4 E (trifluralin)	1 to 2 pts (0.5 to 1 lb ai/A)	G	Must be incorporated. Rate dependent on soil type.
<u>Preplant Surface Applied</u>			
Outlook 6 E (dimethenamid-P)	1 to 2 pts (0.75 to 1.5 lb ai/A)	F	Do not incorporate as crop injury may occur.
<u>Preplant Incorporated</u>			
Charger MAX 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Cinch 7.64 E (s-metolachlor & benoxacor)	1.4 to 2.9 pts (1.5 to 3 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Dual II Magnum 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.

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Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
Preplant Incorporated			
Dual Magnum 7.62 E (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Eptam 20 G	15 lbs	G	Do not use on adzuki beans.
Eptam 7 E (EPTC)	3.5 to 4.5 pts (3 to 4 lb ai/A)		
Intro 4 EC (alachlor)	1.5 to 3 qts (1.5 to 3 lb ai/A)	G	Do not use on adzuki beans. Restricted use herbicide. Do not feed forage or hay.
Lasso 10 G	15 to 30 lbs	G	Do not use on adzuki beans. Restricted use herbicide. Do not feed forage or hay.
Lasso 4 EC (alachlor)	1.5 to 3 qts (1.5 to 3 lb ai/A)		
Micro-Tech 4 MT (alachlor)	1.5 to 3 qts (1.5 to 3 lb ai/A)	G	Do not use on adzuki beans. Restricted use herbicide. Do not feed forage or hay.
Parallel 7.8 E (metolachlor & benoxacor)	1.5 to 2 pts (1.5 to 1.95 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Parallel PCS 8 E (metolachlor)	1.5 to 2 pts (1.5 to 2 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Pendant 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Do not use on adzuki beans.
Pendimax 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Do not use on adzuki beans.
Prowl 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Do not use on adzuki beans.
Prowl H20 3.8 CS (pendimethalin)	1 to 3.2 pts (0.5 to 1.5 lb ai/A)	G	Do not use on adzuki beans.
Pursuit 2 S	3 fl oz	F	Apply after beans are in the first trifoliolate atage and weeds are small. For control of nightshade, pigweed, kochia, and mustard. Applt with a nonionic surfactant. See narrative for recropping restrictions. Maximum use rate north of Highway 212 is 2 oz/A (0.75 oz/A DG).
Pursuit 70 DG	1.08 oz		
Pursuit W 2 S	3 oz		
Pursuit W 70 DG (imazethapyr)	1.08 oz (0.045 lb ai/A)		
Sonalan 10 G	5.5 to 17 lbs	G	Use higher rate for nightshade control. Adzuki bean tolerance unknown.
Sonalan 3 E (ethalfuralin)	1.5 to 4.5 pts (0.56 to 1.69 lb ai/A)		

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Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Preplant Incorporated</u>			
Treflan 10 G	5 to 10 lbs	G	Rate dependent on soil type.
Treflan 4 E (trifluralin)	1 to 2 pts (0.5 to 1 lb ai/A)		
trifluralin 10 G	5 to 10 lbs	G	Rate dependent on soil type.
trifluralin 4 E (trifluralin)	1 to 2 pts (0.5 to 1 lb ai/A)		
Trust 4 E (trifluralin)	1 to 2 pts (0.5 to 1 lb ai/A)	G	Rate dependent on soil type.
<u>Preemergence</u>			
Charger MAX 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Cinch 7.64 E (s-metolachlor & benoxacor)	1.4 to 2.9 pts (1.5 to 3 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Dual II Magnum 7.64 E (s-metolachlor & benoxacor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Dual Magnum 7.62 E (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Parallel 7.8 E (metolachlor & benoxacor)	1.5 to 2 pts (1.5 to 1.95 lb ai/A)	G	Rate dependent on soil type. Do not use on adzuki beans.
Parallel PCS 8 E	1.5 to 3.0 pts	G	Rate dependent on soil type. Do not use on adzuki beans.
Parallel PCS 8 E (metolachlor)	1.5 to 2 pts (1.5 to 2 lb ai/A)		
Permit 75 DG (halosulfuron)	0.5 to 0.67 oz (0.023 to 0.031 lb ai/A)	F/G	Controls pigweeds and giant ragweed, suppresses others. Banded between row treatments at higher rates will control inter-row yellow nutsedge and additional broadleaf weeds.
Pursuit 2 S	2 to 3 oz	F	Apply 0.045 lb ai/A for lima, navy, or red kidney beans and 0.03 lb ai/A for pinto beans. Controls some broadleaf weeds. See narrative for recropping restrictions.
Pursuit 70 DG	0.72 to 1.08 oz		
Pursuit W 2 S	2 to 3 oz		
Pursuit W 70 DG (imazethapyr)	0.72 to 1.08 oz (0.03 to 0.045 lb ai/A)		
<u>Postemergence</u>			
Aim 40 DF (carfentrazone-ethyl)	1.24 oz/A (up to 0.031 lb ai/A)	P	Hooded sprayer application only. Serious injury will occur if crop is contacted with spray mist. Use for emergency control of weeds between the rows.

Table DB3. Summary of herbicides for use in Dry Edible Beans

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
Postemergence			
Arrow 2 EC (clethodim)	6 to 8 fl oz (0.094 to 0.125 lb ai/A)	G	Controls annual grasses. Apply when grasses are 2 to 6 inches. Always add a crop oil concentrate at 1% v/v but not less than 1 pt/A.
Assure II 0.88 E (quizalofop)	6 to 10 fl oz (0.036 to 0.06 lb ai/A)	G	Controls annual grass and suppresses quackgrass. Apply when grasses are 2 to 6 inches tall. Always add a crop oil concentrate or a nonionic surfactant.
Basagran 4 S (bentazon)	1 to 2 pts (0.5 to 1 lb ai/A)	G	Apply after beans are in the first trifoliolate stage and weeds are small. Use lower rate on adzuki beans. Addition of crop oil may cause bean injury. May be applied in split application.
Poast 1.5 E (sethoxydim)	0.5 to 2.6 pts (0.09 to 0.5 lb ai/A)	G	Controls annual grass and suppresses quackgrass. For best results apply when grasses are 2 to 6 inches tall and actively growing. Quackgrass may require two applications. Always add a crop oil concentrate.
Prism 0.94 E (clethodim)	13 to 17 fl oz (0.09 to 0.125 lb ai/A)	G	Controls annual grasses. Apply when grasses are 2 to 6 inches. Always add a crop oil concentrate at 1% v/v but not less than 1 pt/A.
Pursuit 2 S Pursuit 70 DG Pursuit W 2 S Pursuit W 70 DG (imazethapyr)	2 to 3 oz 0.72 to 1.08 oz 2 to 3 oz 0.72 to 1.08 oz (0.03 to 0.045 lb ai/A)	F	Apply after beans are in the first trifoliolate stage and weeds are small. For control of nightshade, pigweeds, kochia, and mustard. See narrative for recropping restrictions. Maximum use rate north of Highway 212 is 2 0.03 lb ai/A.
Raptor 1 S (imazamox)	4 fl oz (0.032 lb ai/A)	F	Apply to dry beans after at least one trifoliolate is fully expanded, to dry pea or cowpea after three inches in height, but prior to five nodes before flowering. See label for additives and restrictions. For pigweeds, mustards, nightshades, and kochia.
Reflex 2 LC (fomesafen)	0.75 pt (0.188 lb ai/A)	F	Section 18 label for Minnesota must be in possession of the applicator. Low rate used for eastern black nightshade and common ragweed control.
Rezult 1E + 5S (sethoxydim + bentazon)	1.6 pt + 1.6 pt (0.3 + 0.8 lb ai/A)	G	Co-packaged Poast (Rezult G) and Basagran (Rezult B). May offer convenience or cost savings over these products individually.
Roundup UltraMax 3.7 S (glyphosate)	2% solution (-- lb ai/A)	P	Spot-treat weeds in dry pea, lentils, or chick peas. Crop contacted by spray will be damaged.
Section 2 EC (clethodim)	6 to 8 fl oz (0.09 to 0.125 lb ai/A)	G	Controls annual grasses. Apply when grasses are 2 to 6 inches. Always add a crop oil concentrate at 1% v/v but not less than 1 pt/A.
Select 2 EC (clethodim)	6 to 8 fl oz (0.09 to 0.125 lb ai/A)	G	Controls annual grasses. Apply when grasses are 2 to 6 inches. Always add a crop oil concentrate at 1% v/v but not less than 1 pt/A.
Select Max 0.97 EC (clethodim)	9 to 12 fl oz (0.068 to 0.091 lb ai/A)	G	Controls annual grasses. Apply when grasses are 2 to 6 inches.
Targa 0.88 E (quizalofop)	5 to 12 fl oz (0.034 to .083 lb ai/A)	G	Controls annual grass and suppresses quackgrass. Apply when grasses are 2 to 6 inches tall. Always add a crop oil concentrate or a nonionic surfactant.

Table DB3. Summary of herbicides for use in Dry Edible Beans

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Dessicants and Pre-Harvest Aids</u>			
glyphosate, others (glyphosate)	see label (0.625 lb ai/A)	-	Harvest aid for dry pea, lentils, and chickpeas at the hard dough stage (30% grain moisture or less) to control weeds prior to harvest.
Gramoxone Inteon 2 S	1.2 to 2 pts	-	Thorough coverage is essential. Apply when 80% of pods are yellow.
Gramoxone Max 3 S (paraquat)	0.8 to 1.3 pt (0.3 to 0.5 lb ai/A)	-	
sodium chlorate, others (sodium chlorate)	see label (6 lb lb ai/A)	-	Thorough coverage is essential. Make application 7-10 days before harvest.

Table DB4. Effectiveness of herbicides on major weeds in Dry Edible Beans

Herbicides	Grasses			Broadleaves									Perennials	
	Green Foxtail	Yellow Foxtail	Wild Oats	Common Cocklebur	Common Lambsquarters	Common Ragweed	Eastern Black Nightshade	Hairy Nightshade	Kochia	Pigweed spp.	Smartweed spp.	Wild Mustard	Canada Thistle	Yellow Nutsedge
Preplant Surface Applied														
Outlook (dimethenamid-P)	G	G	F	N	F	P	G	F	P	G	P	P	N	F/G
Preplant Incorporated														
Charger MAX (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Cinch (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Dual II Magnum (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Dual Magnum (s-metolachlor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Eptam (EPTC)	G	G	F	P	F	F	P	P	F	F	F	P	N	P/F
Intro (alachlor)	G	G	P	P	F	P	G	G	P	G	P	P	N	G
Lasso (alachlor)	G	G	P	P	F	P	G	G	P	G	P	P	N	G
Micro Tech (alachlor)	G	G	P	P	F	P	G	G	P	G	P	P	N	G
Parallel (metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Parallel PCS (metolachlor)	G	G	P	P	F	P	G	F	P	G	P	P	N	G
Pendant (pendimethalin)	G	G	P	N	F	N	P	P	G	G	F	N	N	N
Pendimax (pendimethalin)	G	G	P	N	F	N	P	P	G	G	F	N	N	N
Prowl (pendimethalin)	G	G	P	N	F	N	P	P	G	G	F	N	N	N
Prowl H2O (pendimethalin)	G	G	P	N	F	N	P	P	G	G	F	N	N	N
Pursuit (imazethapyr)	P	P	P	P	P/F	P/F	F/G	G	G	G	P	G	N	P
Sonalan (ethalfuralin)	G	G	F	N	F	N	F	F	G	G	P	N	N	N
Treflan (trifluralin)	G	G	P	N	F	N	P	P	G	G	P	N	N	N
trifluralin, others (trifluralin)	G	G	P	N	F	N	P	P	G	G	P	N	N	N
Trust (trifluralin)	G	G	P	N	F	N	P	P	G	G	P	N	N	N
Preemergence														
Charger MAX (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Cinch (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Dual II Magnum (s-metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Dual Magnum (s-metolachlor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Parallel (metolachlor & benoxacor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Parallel PCS (metolachlor)	G	G	P	P	F	P	G	F	P	G	P	P	N	F
Permit (halosulfuron)	N	N	N	F/G	P	G	N	N	F	F/G	F/G	F	P	G
Pursuit (imazethapyr)	P	P	P	P	P/F	P/F	F/G	G	G	G	P	G	N	P

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.

Table DB4. Effectiveness of herbicides on major weeds in Dry Edible Beans

Herbicides	Grasses			Broadleaves									Perennials	
	Green Foxtail	Yellow Foxtail	Wild Oats	Common Cocklebur	Common Lambsquarters	Common Ragweed	Eastern Black Nightshade	Hairy Nightshade	Kochia	Pigweed spp.	Smartweed spp.	Wild Mustard	Canada Thistle	Yellow Nutsedge
Postemergence														
Aim (carfentrazone-ethyl)	N	N	N	P	G	P	G	F	G	G	P	G	N	N
Arrow (clethodim)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Assure II (quizalofop)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Basagran (bentazon)	N	N	N	G	F	G	P	F	F	P	G	G	G	F/G
Poast (sethoxydim)	G	G	P	N	N	N	N	N	N	N	N	N	N	N
Prism (clethodim)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Pursuit (imazethapyr)	P	P	P	P	P/F	P/F	F/G	G	G	G	P	G	N	P
Raptor (imazamox)	P	P	P	F/G	F/G	P/F	F/G	G	G	G	P	G	N	P
Reflex (fomesafen)	N	N	N	P	P	F/G	F/G	P	P	F	P	F	N	N
Rezult (sethoxydim + bentazon)	G	G	G	G	F	F/G	P	F	F	P	G	G	F	F
Section (clethodim)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Select (clethodim)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Select Max (clethodim)	G	G	G	N	N	N	N	N	N	N	N	N	N	N
Targa (quizalofop)	G	G	G	N	N	N	N	N	N	N	N	N	N	N

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.