5-1-2009

Weed Control in Pulse Crops: 2009

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Dry Edible Beans, Field Peas, Garbanzo Beans, Lentils

FS525PC

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Weed competition can cause significant yield reduction in pulse crops. Pulse crops are weak competitors with weeds, therefore planning an effective weed control program is one of the keys to profitable production.

Herbicide Suggestions

Information in this publication is based on South Dakota Agricultural Experiment Station research and other research or observations. Herbicides are included only after the chemical is registered by the Environmental Protection Agency (EPA) as to residue tolerance in crops used for food or feed.

There is no intent to specify product performance guarantee; such agreements involve the labeler and user. Users are responsible for following all label directions and precautions.

Rates. Rates for each treatment are stated as the amount of product per acre. All rates are on a broadcast basis. Labeled rates for the range in soil types and suggested rates based on SDSU tests are also stated. These rates have provided acceptable weed control under favorable conditions.

Tank-Mixes and Combinations. Selected tank-mixes are listed for several herbicides where specific products and rates are given on the label. Most interpretations allow mixing unless prohibited; however, the user assumes responsibility if the specific combination is not shown. There may be additional tank-mixes for special situations.

Tradenames for herbicides are used in this publication to aid reader recognition. The common name is also listed and is used for herbicides that are available in many labeled products. Examples of other product names are listed where possible based on information available. As patents expire and marketing agreements are formed, additional products may be marketed. Be sure crop use and application directions are followed for the product being used.

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SOUTH DAKOTA STATE UNIVERSITY
College of Agriculture & Biological Sciences • Cooperative Extension Service • U.S. Department of Agriculture

ABBREVIATIONS and DEFINITIONS

EARLY PREPLANT (EPP): Surface applications usually 2 to 6 weeks before planting in no-till systems.
PREPLANT INCORPORATED (PPI): Before the crop is planted, incorporated as directed.
PREEMERGENCE (PRE): After planting, but before crop or weeds emerge.
EARLY POSTEMERGENCE:
POSTEMERGENCE (POST): After the crop or weeds have emerged.

pt	=	pint
qt	=	quart
gal	=	gallon
lb	=	pound
lb/gal	=	pound per gallon
ae	=	acid equivalent
ai	=	active ingredient
and/+	=	split application (and) or as a tank-mix (+)
gpa	=	gallons per acre
psi	=	pounds per square inch pressure

G	=	granule
L	=	liquid or flowable
DG, DF	=	dry flowable
ME	=	micro-encapsulated
COC	=	crop oil concentrate
NIS	=	non-ionic surfactant
28% N	=	28% liquid nitrogen fertilizer
AMS	=	ammonium sulfate
MSO	=	processed seed oil
ME	=	micro-encapsulated
OM	=	organic matter
CEC	=	cation exchange capacity

SAFETY FIRST

Follow the Label. It is a violation of federal pesticide laws to use an herbicide in a manner inconsistent with its labeling. Read the entire label before using.

Applicator Safety. The most serious risk of exposure is during handling and mixing the concentrated product. Use protective equipment specified on the label. Use chemical resistant gloves, eye shield, long-sleeved clothing, rubber boots, and appropriate respirator as required. In case of emergency, contact the Poison Control Center via 24 hour phone line:

POISON CONTROL CENTER: 1-800-222-1222

Water Protection. Water quality is a public concern. Preventing spills and accidents reduces risk of groundwater and surface water contamination. Mix herbicides away from wells and water sources. Prevent back siphoning. Install anti-backflow devices in irrigation equipment used for pesticides. Triple rinse containers. Store herbicides properly. Identify high-risk areas such as coarse soils or areas where the water table is near the surface. Be aware of herbicide properties that increase the risk of contamination in the critical area. Some treatments have specific restrictions requiring buffer strips and border areas around wells, lakes, and streams.

WEED CONTROL in DRY EDIBLE BEANS

Dry edible beans are less capable of competing with weeds than other pulse crops. Early weed growth will reduce bean yield by competing for light, moisture, and nutrients. Heavy weed competition can also cause a buildup of disease and insect problems. Harvest loss and bean quality can also be affected by excessive weed pressure.

Cultivation is an option to control weeds in dry edible beans. A rotary hoe, spike-tooth harrow, or finger weeder can be used before the bean plant is 4 to 6 inches. Weed control is more effective and bean losses are reduced if cultivation is done on a hot day when bean plants are dry and slightly wilted. However, even under the best conditions, 5 to 10% plant loss can be expected. These losses increase when the plants are over six inches tall.

Row cropped beans should be cultivated at the 2 to 3 leaf stage and followed by a second cultivation in three weeks if necessary. Cultivation should be shallow to avoid damaging the shallow root system of the bean plants. Do not cultivate or harrow when bean foliage is wet as bacterial disease could be spread.

A combination of herbicides and tillage may be necessary to adequately control weeds for successful dry edible bean production.

Several types of beans are included. For the purpose of this guide, dry beans include pinto, navy, great northern, kidney, white, and pink beans. Use lower rates of herbicide on navy type dry beans as they generally have less tolerance to most herbicides. Rates may be adjusted if prior experience or research shows the higher rates to be safe. Special restrictions for these types of dry beans will be noted in the remarks and restrictions section. Other types of dry edible beans listed in this guide include lima, black turtle soup, and adzuki beans.

TRIFLURALIN PRODUCTS (trifluralin) ($2.35-9.10)

Trifluralin is available in several brandname products including Treflan, Trifluralin, Trilin, and others. Formulation and use may vary. Follow directions for product used.

1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (.5-1 lb ai)

Grasses and some small-seeded broadleaf weeds controlled, such as pigweed and lambsquarters. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves.

PPI: Apply and incorporate in the spring before planting or in the fall from September 1 to freeze-up. Incorporate within 24 hours. Use the lower rate on coarser and the higher rate on finer soils or soils with high organic matter. Use lower rate range in areas receiving less than 20 inches total annual rainfall or irrigation. Consult label for sensitive crops rotated in 12 months.

SONALAN (ethalfluralin) ($6.55-20.15)

1.5-4.5 pt Sonalan 3L or 5.5-17 lb Sonalan 10G (.55-1.7 lb ai)

PPI: Grasses and some broadleaf weeds. Apply and incorporate in the spring before planting or in the fall between October 1 and December 1 prior to spring planting in SD, ND, and MN. Use the higher rates for fall application. Use lower rates on coarse soils and the higher rates on finer soils. Consult label for sensitive crops rotated in 12 months. Use 3 to 4.5 pt per acre to control nightshade and groundcherry.

TANK-MIXES

Tank-mix combinations will control a broader spectrum of weeds than either product used separately. Refer to label of the tank-mix partner for specific restrictions.

EPTAM (EPTC) ($17.85-22.95)

3.5-4.5 pt Eptam 7L (3-4 lb ai) or 15 lbs Eptam 20G (3 lb ai)

PPI: Grass and some broadleaf weeds. Incorporate into the top 2 to 3 inches of soil with small-bladed tandem disk set to cut 4 to 6 inches deep, field cultivator or other suitable equipment. Second incorporation insures uniformity especially in wet, trashy conditions. Do not exceed 3.5 pt per acre on small white or green beans grown on coarse soils. Do not use on adzuki or lima beans. Eptam may be applied PPI as a directed lay-by application or in irrigation water.

TANK-MIXES

Tank-mix combinations give broader spectrum control than either product used separately. Refer to label of tank-mix partner for specific restrictions.

Eptam + trifluralin ($15.10-22.95)
PPI: Tank-mix 2.5 to 3.5 pt Eptam 7L with 1 to 1.5 pt trifluralin 4L product per acre. Incorporate thoroughly into top 2 to 3 inches of soil immediately after spraying. Plant dry beans within 48 hours after application.

Eptam + Sonalan ($18.20-30.95)
PPI: Tank-mix 2.5 to 3.5 pt Eptam 7L with 1.25 to 3 pt Sonalan 3L per acre. Incorporate thoroughly into the top 2 to 3 inches of soil immediately after spraying. Plant as soon as possible after treatment for maximum weed control. Special Sonalan rates for nightshade and groundcherry range from 3 to 4.5 pt per acre with 2 incorporation passes required. Do not feed or graze forage from treated fields to livestock.

Eptam + Dual II Magnum ($32.45-52.15)
PPI: Tank-mix 3.5 to 4.5 pt Eptam 7L with 1 to 2 pt Dual II Magnum 7.6L per acre. Incorporate thoroughly into the top 2 to 3 inches of soil immediately after spraying. Plant as soon as possible after treatment for maximum weed control.

Eptam + MicroTech or Intrro ($22.90-37.40)
PPI: Tank-mix 2 to 3 pt Eptam 7L with 4 to 6 pt Micro-Tech 4L or Intrro 4L per acre. Improves common ragweed and smartweed control. Incorporate thoroughly into the top 2 to 3 inches of soil immediately after spraying. Plant as soon as possible after treatment for maximum weed control.

EPTAM TANK-MIXES (Continued . . .)

Eptam + pendimethalin ($16.05-33.30)

PPI: Tank-mix 2.5 to 4.5 pt Eptam 7L with 1 to 2.5 pt pendimethalin 3.3L per acre. Improves kochia control. Use higher rates where nightshade or nutsedge are present.

PENDIMETHALIN PRODUCTS (pendimethalin) ($3.95-14.90)

Pendimethalin is available in several brand name products including Prowl, Prowl H_2O, Pendimax, Stealth and others. Formulation and use may vary. Follow directions for product used.

1.2-3.6 pt pendimethalin 3.3L (.5-1.5 lb ai)
2-3 pt Prowl H_2O 3.8L (.95-1.43 ai)

***PPI*:** Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Doesn't control mustard, nightshade, smartweed, or large-seeded annual broadleaves. May be applied up to 45 days before planting. One inch rainfall or mechanical incorporation required prior to planting. Rates based on soil type and organic matter. Use higher rates for fine textured soils and soils with over 3% OM. Apply up to 60 days before planting and incorporate within 7 days. Consult label for rotational restrictions. Do not apply Prowl 3.3EC preemergence after planting as serious crop injury can result. Do not use on adzuki beans. Black turtle soup beans are included on the label. Prowl H_2O is labeled for use on dry beans, lima beans, and snapbeans and may be applied 60 days prior to planting.

FALL: Supplemental labeling allows for fall application in several states including South Dakota. Apply Prowl 3.3EC or Prowl H_2O at 1.2 to 3.6 pts per acre based on soil type and organic matter and incorporate in late fall when soil temperatures are 45° F. or below, but before the ground freezes.

TANK-MIXES

Tank-mix combinations give broader spectrum control than either product used separately. Refer to label of tank-mix partner alone for specific remarks and restrictions.

pendimethalin + Dual II Magnum ($18.55-44.10)

PPI: Tank-mix 1.2 to 3.6 pt pendimethalin 3.3L with 1 to 2 pt Dual II Magnum 7.6 per acre. Apply up to 14 days prior to planting and incorporate within 7 days of application. Do not graze or feed forage or fodder. Do not apply postemergence.

pendimethalin + Eptam ($16.70-30.20)

PPI: Tank-mix 1.2 to 3.6 pt pendimethalin 3.3L with 2.5 to 3 pt Eptam 7L per acre. Apply up to 2 days prior to planting; incorporate immediately. Do not use on adzuki beans. Do not exceed 3.5 pt Eptam per acre on small white beans on coarse textured soils. For nutsedge control use Eptam at 4.5 pt per acre. Do not feed hay, vines, etc., or harvest forage or graze treated areas.

pendimethalin + Micro-Tech or Intrro ($11.90-31.50)

PPI: Tank-mix 1.2 to 3.6 pt pendimethalin 3.3L with 2.5 to 4.5 pt Micro-Tech 4L or Intrro 4L per acre. Apply within 7 days prior to planting and incorporate within 7 days. This tank-mix may delay crop maturity and or reduce yield if cold, wet conditions occur after planting.

MICRO-TECH or INTRRO (alachlor)

2.5-3 qt Micro-Tech 4L or Intrro 4L (2.5-3 lb ai) ($15.90-22.10)

PPI: Controls yellow nutsedge, annual grasses, and some broadleaf weeds. Do not make more than one application per year or exceed 3 qt of Micro-Tech or Intrro per acre per year. Do not apply on dry beans after planting as crop injury may occur. May delay crop maturity and reduce yield if cold, wet soil conditions occur at planting. Apply within 7 days prior to planting and shallowly incorporate into the upper 1 to 2 inches of soil. Use the higher rate for heavy weed infestations or when black nightshade or yellow nutsedge are present. Do not feed forage or hay from treated crop.

TANK-MIXES

Micro-Tech or Intrro + Eptam ($26.10-37.40)

PPI: Tank-mix 2.5 to 3 qt Micro-Tech or Intrro 4L with 2 to 3 pt of Eptam 7L per acre. Incorporate uniformly into the top 2 inches of soil within 24 hours of application and within 7 days of planting.

Micro-Tech or Intrro (Continued . . .)

Micro-Tech or Intrro + trifluralin **($18.25-25.50)**
PPI: Tank-mix 2.5 to 3 qt Micro-Tech or Intrro with 1 pt trifluralin 4L per acre. Incorporate uniformly into the top 2 inches of soil within 8 hours of application and within 7 days of planting.

S-METOLACHLOR PRODUCTS ($14.25-29.20)

1-2 pt Dual II Magnum, Brawl, Charger, Basic or Cinch 7.6L (.95-1.9 lb ai)

Dual II Magnum contains s-metolachlor, a more active chemical form of metolachlor and was labeled at lower product rates than previous products.

PPI or ***PRE:*** For annual grass and some broadleaf weeds. Use low rates on coarse textured soils. Use higher rates on fine textured and high organic matter soils. Incorporation improves control. Do not cut for hay within 120 days following application.

Do not apply more than 2 pt per acre of Dual II during any one crop year. Special label allows fall application in SD. Apply to crop stubble after September 30 when the sustained soil temperature at a 4 inch depth is less than 55° F. and falling. Use 1.67 to 2 pt per acre on minimum till and/or no-till systems on medium soils having greater than 2.5% OM. Use 2 pt per acre on fine textured soils. NOTE: If a spring application is made, the total rate of the fall plus spring application must not exceed the maximum total rate for the specific crop or illegal residues may result. Do not incorporate deeper than 2 to 3 inches.

TANK-MIXES

Tank-mix combinations control a broader spectrum of weeds than either product used separately. Refer to the label of tank-mix partner for specific restrictions.

Dual II Magnum + Eptam **($24.45-47.35)**
PPI: Tank-mix .8 to 1.67 pt Dual II Magnum 7.6L with 2.5 to 4.5 pt of Eptam 7L per acre. Labeled for tank-mix or sequential application. For sequential applications, apply Eptam alone PPI and follow with PRE application rates for Dual II Magnum alone, during or after planting, but before weeds or crop emerge. Do not cut for hay within 120 days of application. Do not exceed 3.5 pt per acre Eptam 7L on small white beans or green beans grown on coarse-textured soils.

Dual II Magnum + trifluralin **($16.95-36.05)**
PPI: Tank-mix 1 to 2 pt of Dual II Magnum 7.6L with 1 to 2 pt of trifluralin 4L per acre. Tank-mix may be applied up to 14 days prior to planting by ground or air. Incorporate 2 inches deep.

PERMIT (halosulfuron) ($10.00-13.35)

.5-.67 oz Permit 75WSG (0.024-0.032 lb ai)

Permit is a sulfonyl-urea herbicide that controls annual broadleaf weeds. Permit provides very good to excellent control of cocklebur, sunflower, pigweed, velvetleaf, and common ragweed.

PRE: Apply after planting but prior to soil cracking at a rate of .5-.67 oz per acre uniformly with ground equipment. Use 15 gallons of water per acre. Lower rate is for lighter textured soils with low organic matter.

BETWEEN ROWS: Permit may be applied at a rate of .5-1 oz per acre between rows of crop for control of nutsedge and some broadleaf weeds. Avoid contact of herbicide with the crop. If plastic is used on the planted row, adjust equipment to keep herbicide off the plastic. Reduce rate and spray volume in proportion to area actually sprayed.

Do not apply more than 1 oz/A Permit per crop cycle and do not exceed 2 oz/acre per 10 month period.

TANK-MIX

Permit+Eptam 7E **($27.85-36.30)**
PRE: Tank-mix Permit + Eptam 7E for broader weed spectrum. Apply .5-.67 oz per acre Permit + 3.5 to 4.5 pt Eptam 7E per acre and incorporate to a depth of 2 inches prior to planting. Use lower rate on lighter textured soils with low organic matter. Do not use on Adzuki beans, cow peas (blackeyed peas), lima beans, mung beans, or garbanzo beans. Under abnormal weather conditions, stunting may occur in some varieties.

OUTLOOK (dimethenamid-p) ($12.85-26.95)

10-21 oz Outlook 6L or Propel 6L or Establish 6L (.5-1 lb ai)

Chloroacetamide herbicide chemically related to Micro-Tech, Intrro, or Dual. Very good to excellent control of several annual grasses. Sandbur and wild proso millet are partially controlled. Fair to good control of certain annual broadleaves such as pigweed, waterhemp, or black nightshade. Outlook is registered for use on small white, navy, black turtle soup, pink, pinto, great northern, red Mexican, red kidney, and cranberry beans. May occasionally result in temporary browning or spotting of leaves, consult your local seed dealer (supplier) for application restrictions on specific varieties.

Outlook at 16 to 21 oz 6L per acre is suggested for most situations, based on soil type and organic matter. Do not use more than 12 fl oz per acre on coarse soil with less than 1.5% OM. Minimum carrier is 2 gpa for ground or air. There are no crop rotation restrictions for the next season. Winter wheat can be planted 4 months after application. Do not graze or feed forage. Dry beans cannot be harvested for 70 days after Outlook application.

PPI, PRE, or POST: Controls most annual grasses, certain annual broadleaf weeds and sedges. Early postemergence application should be made at the first to third trifoliate leaf. Emerged weeds are not controlled.

TANK-MIXES

Tank-mix combinations control a broader spectrum of weeds than either product used separately. Refer to product label of tank-mix partner alone for specific restrictions.

Outlook 6L may be tank-mixed or applied sequentially in dry bean crops with one or more of the following herbicides according to the specific tank-mixing label instructions: Basagran, Eptam, Far-go, Gramoxone Extra, Poast, Prowl, Pursuit, Roundup Ultra, Sonalan, or Treflan. The following herbicides may only be applied sequentially with Outlook 6L, Dual II Magnum, Micro-Tech or Intrro.

AIM (carfentrazone) ($3.15-12.60)

.5-2.0 oz Aim EW (0.008-0.031 lb ai)

Aim is a contact herbicide often used to improve weed control with glyphosate (e.g. Roundup). It controls ALS or normal kochia, redroot pigweed, nightshade, and lambsquarters. Weeds should be small for best results, stressed or large weeds are affected less.

PREPLANT BURNDOWN: Rate is .5-1.0 oz Aim per acre. Apply alone or with other labeled herbicide tank-mix partners prior to planting or within 24 hours after planting. Coverage is essential for good control. May plant immediately after application. Do not apply more than 2 fl oz/A prior to planting or more than 4.1 oz/A during the growing season.

HOODED SPRAYER APPLICATIONS: Aim may be used at rates up to 2 fl oz per acre applied with hooded sprayers to control labeled weeds between the rows of dry bean, field pea, chickpea, and lentil. Hooded sprayers must be designed, adjusted, and operated in a manner to totally enclose the spray pattern and prevent any spray deposition to green stem tissue, foliage, blooms, or fruit of crop. Add NIS (0.25% v/v), COC (1-2% v/v), or MSO (1-2% v/v) and either a liquid nitrogen fertilizer (2-4% v/v) or AMS (2-4 lb/A).

HARVEST AID: Aim may be applied 1-2 fl oz per acre to dry bean, dry pea, chickpea, or lentil to defoliate and/or desiccate troublesome broadleaf weeds that may be present at harvest. Aim EW may be used alone or as a tank-mix with other harvest aids such as paraquat (e.g. Gramoxone), for a broader weed control spectrum. Minimum carrier is 10 gpa for ground (20 gpa recommended) or 5 gpa for aerial application. Use adjuvants recommended for hooded sprayer application, but MSO may be most effective. There are no preharvest intervals for vegetable legume crops. Application may be made when the crop is mature and the grain has begun to dry down (pods buckskin color and <30-40% green leaves remain).

PURSUIT (imazethapyr) ($9.25-13.90)

2-3 oz Pursuit 2L or .72-1.08 oz Pursuit 70DG (.03-.045 lb ai)

Pursuit action is by root and foliar uptake. It controls several annual broadleaves and provides some foxtail control. Control of redroot pigweed, mustard, non-ALS kochia, velvetleaf, and black nightshade has been very good to excellent. Velvetleaf is controlled most effectively with preplant incorporated treatments. Cocklebur and sunflower are controlled postemergence. If heavy grass, lambsquarters, or common ragweed pressure is expected, use Pursuit with another herbicide. Not satisfactory for common waterhemp.

Do not make more than one application of Pursuit per year. Labeler assumes no risk for crop injury, loss, or damage when used on edible bean crops. The decision to use or not to use this product on edible legume crops is solely that of the grower.

Pursuit may be applied to the following types of dry edible beans: navy, great northern, red kidney, black turtle, cranberry, pinto, and small white. Do not apply to Domino variety of black turtle beans.

PPI: Apply Pursuit at the broadcast rate of up to 3 oz of 2L or 1.08 oz 70DG per acre to dry beans (navy, great northern, red kidney, black turtle, cranberry, pinto, and small white type dry beans) within one week before planting. Applied preplant incorporated, Pursuit may be tank-mixed with a registered grass herbicide.

PRE: Apply Pursuit at the broadcast rate of up to 3 oz of 2L or 1.08 oz 70DG per acre to dry beans immediately after, or up to 3 days after planting. Pursuit may be applied in a tank-mix with a registered grass herbicide or applied preemergence following a preplant incorporated application of a registered grass herbicide.

EPOST: Apply Pursuit at the broadcast rate of up to 3 oz of 2L or 1.08 oz 70DG per acre to dry beans. Apply to dry beans with at least one fully expanded trifoliate leaf. The use of trifluralin prior to Pursuit application may increase the likelihood and severity of crop injury. A nonionic surfactant containing at least 80% active ingredient should be used at a rate of 2 pints per 100 gallons of spray mixture.

Basagran may be tank-mixed with Pursuit to control weeds not listed on the Pursuit label. Addition of Basagran may also cause antagonism, thereby reducing control of grassy weeds. Nitrogen-based fertilizer may be included as a spray additive only when Pursuit is tank-mixed with Basagran. Refer to the Basagran label for proper application rates and restrictions. Always use in accordance with the more restrictive label restrictions and precautions.

Do not use crop oils, methylated seed oils, or petroleum oils. Do not apply before crop has at least one trifoliate leaf or crop injury may result.

Do not apply to Domino variety black turtle beans. Pinto varieties UI-III and Olathe are more sensitive to Pursuit than other pinto varieties. Do not make more than one application per year. Allow at least 60 days between application and harvest.

PREMIXES

PURSUIT PLUS (imazethapyr + pendimethalin) ($9.10)

1.25 pt Pursuit Plus (0.03 lb a.i. imazethapyr + 0.45 lb a.i. pendimethalin)

Supplemental label for English peas, lima beans, navy, great northern, red kidney, black turtle, pinto, cranberry, and small white type dry beans. Do not apply to Domino variety black turtle beans. Do not use if cold or wet conditions are expected within a week of application. Use for control of some annual grass species and broadleaf weed species including mustards, nightshades, and redroot pigweed.

The rotation restriction is 4 months for wheat or barley, 8.5 months for field corn, or 18 month rotation restriction to sunflower, oats, sorghum, or safflower. There is no rotation restriction for soybean.

Application rate is equivalent to 2 oz/A Pursuit 2L + 1 pt/A Prowl H_2O. Do not make more than one application per year.

PPI: Apply within 1 week before planting. Do not apply after June 30.

RAPTOR (imazamox) ($18.55)

4 oz Raptor 1L (.03 lb ai)

Raptor controls several annual grasses and annual broadleaf weeds. Raptor is an imidazolinone herbicide with foliar and root uptake. Residual activity is less than for Pursuit; therefore Raptor has potential where rotation restrictions must be minimized.

POST: Raptor may be applied to the following types of dry beans; Anazazi, black turtle, cranberry, great northern, lima (dry), navy, pink, pinto, red kidney, small red, and small white. Apply Raptor postemergence to dry beans with at least one fully expanded trifoliate leaf and before bloom stage. Delay application until the majority of the weeds are at the label recommended growth stage. Apply to weeds that are actively growing. Reduced crop growth, temporary yellowing, and delayed maturity may occur. Raptor applications may be made with or without the addition of 28% N or AMS to improve weed control. The addition of 28% N or AMS also increases the likelihood of dry bean response. When 28% N and/or COC are used in the spray mixture, add Basagran at the rate of 6 to 16 oz per acre to minimize crop response. Tank-mixing Raptor at 2 oz per acre with Rezult is allowed in South Dakota, North Dakota, and Minnesota by 2(ee) labeling to aid in the control of mustard species in edible bean and field pea. Use appropriate adjuvants as recommended in Rezult label. Only one application of Raptor may be made during a season.

Crop rotational intervals are based on regional restrictions. Crop plant back intervals include: wheat (non-Clearfield) and alfalfa at 3 mo; barley and rye 4 mo; corn (field, pop, sweet and seed) Clearfield and non-Clearfield at 8.5 mo; and no restriction for Clearfield canola, wheat and sunflower, dry beans, dry peas, and sorghum.

Do not apply Raptor to snap beans, succulent peas, chickpeas (garbanzo beans), fresh limas, or lentils.

REZULT B & G (bentazon-sodium salt & sethoxydim) ($23.80)

3.2 pt Rezult (1.6 pt Rezult B + 1.6 pt Rezult G)/A (1 + .2 lb ai)

Rezult B must be used in combination with Rezult G and is intended for postemergence control of many broadleaf and grass weeds. Rezult B&G is available as a duplex II plastic container, prodigy system, and mini-bulk container.

EPOST: In dry beans, apply Rezult early postemergence to actively growing weeds before they reach maximum labeled size. All dry bean varieties are tolerant to Rezult after the first trifoliate leaf has fully expanded. Do not apply prior to fully expanded first trifoliate leaf stage. Dry bean injury can be very pronounced. Even at the tolerant stages, yellowing, bronzing, speckling, or burning of leaves may occur under certain conditions. This injury is temporary and generally is outgrown without delaying podset or maturity or reducing yield.

Using oil may increase injury and reduce yields. Tolerant bean types are adzuki, navy, pinto, pink, great northern, kidney, red, white, cranberry, black turtle soup, dry lima, and dry snap bean.

Avoid applications during prolonged periods of cold weather (day temperatures below 75^{o} F. and night temperatures below 55^{o} F. for 2-5 days) as weed control may be reduced.

An additional 2 pt per acre of Basagran may be applied after a single application of Rezult.

An additional 4.4 pt per acre of Poast Plus may be applied after a single application of Rezult.

Do not apply more than 2 pt of Basagran or 4.4 pt of Poast Plus per acre after an application of 3.2 pt of Rezult per acre in one season.

REFLEX (fomesafen) ($10.90-14.55)

.75-1 pt Reflex 2L (.18-.25 lb a.i.)

Reflex is a postemergence contact herbicide for annual broadleaf weeds. Rates for use in South Dakota are limited to defined geographical areas (see label for regional maps). The maximum rate of 1 pt per acre may be used east of I-29 from North Dakota to Watertown, east of Hwy 81 from Watertown to Madison, and south of Hwy 34 and east of Hwy 281 to Nebraska. In addition to the above area, a maximum of .75 pt per acre may be applied east of Hwy 281.

Reflex (Continued . . .)

Reflex has good activity on wild mustard, Venice mallow, common ragweed, wild mustard, pigweed, common waterhemp, and smartweed at the low rate. Weeds should be at the 2- to 3-true leaf stage. Nightshade and lambsquarters control may not be satisfactory, kochia control has been fair. The higher rate improves control, especially under less favorable conditions. Coverage is important. Minimum carrier is 10 gpa for ground or 5 gpa for air. Use 30 to 60 psi pressure. Apply with NIS at 0.125 to 0.25% v/v or oil adjuvant at 0.5 to 1% v/v. Do not use 28% N.

Small grains may be planted after 4 mo; corn or peas after 10 mo; and alfalfa, sunflower, sorghum, and other crops not specified on the label after 18 mo. Depending on the application region in South Dakota, a maximum of 0.75-1 pt Reflex or 0.19- 0.25 lbs ai/A fomesafen from any source is allowed only in alternate years. Do not graze or harvest forage or straw from crop planted on treated areas. Do not graze or harvest dry beans for forage. Do not apply within 45 days of harvest.

POST: Apply when beans have at least one fully expanded trifoliate leaf.

TANK-MIXES

Reflex can be tank mixed with several postemergence grass and broadleaf herbicides. Several programs include: Assure II, Basagran, Dual Magnum, Eptam, Outlook, Poast, Prowl, Pursuit, Raptor, Select, Sonalan or Treflan. Tank mix applications can result in increased crop injury as compared to either product used alone.

For sequential applications allow 2-3 days after application of grass herbicide before applying Reflex or Reflex mixtures. If Reflex is applied first apply the grass herbicide when grassy weeds begin to develop new leaves (7 days).

BASAGRAN (bentazon) ($12.50-24.95)

1-2 pt Basagran 4L (.5-1 lb ai)

POST: For selective postemergence control of certain broadleaf weeds and sedges. Beans are tolerant to Basagran after first trifoliate leaf has fully expanded. Even at tolerant stages, yellowing, bronzing, speckling or burning of leaves may occur under certain conditions. Temporary injury is generally outgrown without delaying podset. Basagran should be applied with COC additive at 1 to 2 pt per acre. Addition of COC may cause bean injury. Use lower rate for adzuki beans. Canada thistle control requires a second application 7 to 10 days later. Basagran can be applied as sequential treatment. First application should be made before weeds are .5 to 4 inches tall depending on weed species. Refer to label for weed size. Apply Basagran at 1 pt per acre plus petroleum COC at .5 to 1 pt per acre and repeat application 7 to 10 days later.

POAST (sethoxydim) ($4.90-24.40)

.5-2.5 pt Poast 1.5L (.1-.5 lb ai)

POST: Controls annual grasses and suppresses quackgrass. For best results apply when grasses are 2 to 6 inches and actively growing. Do not apply more than 4 pt during the season. Always add 2 pt per acre COC. Do not apply within 30 days of harvest. Refer to label for rotational crop guidelines.

TANK-MIXES

Poast + Basagran **($17.40-39.60)**
POST: Tank-mix .5 to 1.5 pt Poast 1.5L with 1 to 2 pt Basagran 4L per acre.

Poast + Outlook **($20.30-37.75)**
POST: Tank-mix .5 to 1.5 pt Poast 1.5L with 12 to 18 oz Outlook 6L per acre on coarse textured soil or 18 to 21 oz Outlook 6L per acre on medium to fine textured soil.

CLETHODIM PRODUCTS ($9.65-34.25)

6-16 oz Select, Arrow, Clethodim, Intensity, Section, Shadow, Volunteer 2L or 9-32 oz Select Max, Intensity One .94L (.09-.24 lb ai)

POST: For control of annual grasses. Rates based on grass species and height. Use high rate for heavy grass pressure and or when grasses are at maximum height. For use on the following beans: dry, field, kidney, dry lima, navy, pinto, tepary, adzuki, moth, mung, rice, and urd. Do not apply within 30 days of harvest. Always use COC (containing at least 15% emulsifier) at 1 qt/100 gal. May also add 1-2 qt/A liquid fertilizer (10-34-0, 285 N, or 32% N) or 2.5 to 4 lb/A AMS.

ASSURE II (quizalofop) ($5.75-13.75)

5-12 oz Assure II or Targa .88L (.035-.07 lb ai)

POST: Supplemental labeling. For postemergence control of annual and perennial grass in dry beans. Rates based on weed species and size. Always use a nonphytotoxic petroleum based COC at 1 qt/100 gal or NIS at 1 pt/100 gal. COC is preferred in arid areas. Rainfall within 1 hour of application will reduce control. Do not use more than 24 oz per acre per season. Do not apply within 30 days of harvest. Do not graze treated fields or harvest for forage or hay.

TANK-MIX

Assure II + Basagran ($18.20-36.45)

POST: Tank-mix 5 to 10 oz Assure II .88L with 1 to 2 pt Basagran 4L per acre. Annual grass antagonism can be minimized by increasing the recommended Assure II rate by 2 oz. Perennial grasses may need sequential application. Refer to Basagran crop rotation restrictions.

DREXEL DEFOL (sodium chlorate)

1 gal Drexel Defol 6L (6 lb ai)

HARVEST AID: Apply 7 to 10 days prior to harvest and after pods are brown. Thorough coverage of plant is essential. Apply 5 to 10 gpa by air or 20 to 30 gpa by ground. Do not graze treated fields or feed treated fodder or forage to livestock.

VALOR SX (flumioxazin) ($14.75)

3 oz Valor SX (0.096 lb ai)

Valor SX herbicide is a water dispersible granule containing 51% active ingredient. Valor is a PPO herbicide that is non-volatile and is absorbed primarily by shoot and some by root. It does not photo degrade and has activity on broadleaf weeds.

HARVEST AID: For use on dry bean as a harvest aid. Do not use more than 3 oz/A of Valor SX during a single application or during the growing season. Do not harvest within 5 days of application. To insure thorough coverage use 15-30 gal carrier per acre. Desiccation requires the addition of an approved adjuvant. COC or MSO containing 15% emulsifier and 80% oil at 2% v/v may be used. AMS or 28% N may also be used to enhance desiccation. Tank mixing with glyphosate will increase control of emerged weeds and aid in harvest.

PARAQUAT PRODUCTS (paraquat) ($3.35-8.40)

0.8-1.3 pt paraquat 3L (.3-.48 lb ai)
1.2-2 pt Gramoxone Inteon (0.3-0.5 lb ai)

Paraquat is available in several brand name products including Gramoxone Inteon, Gramoxone Max, Firestorm, Parazone 3SL and others. Follow specific label directions for product used.

HARVEST AID: For use on the following beans: adzuki, asparagus, black, broad, field, kidney, lablab, lima, moth, mung, navy, pinto, rice, snap, tepary, urd, and wax. Apply when at least 80% of the pods are yellowing and mostly ripe and when leaves are no more than 40% of bush type beans or 30% of vine type beans are green. Use single application of the higher rate for vining type or bush type beans with lush growth. May apply as split application to improve vine coverage. Do not make more than two applications or exceed a total of 2 pt per acre 2.5L or 1.3 pt per acre for 3L product. Minimum carrier is 20 gpa for ground or 5 gpa for air. Add non-ionic spreader at 1 qt/100 gal spray mix. Do not harvest or graze treated fields for 7 days after spraying. Follow handling precautions, as paraquat is toxic when ingested. **Restricted Use Pesticide.**

GLYPHOSATE PRODUCTS (glyphosate)

Glyphosate is a non-selective, translocated, foliage-applied herbicide used in reduced tillage systems. Glyphosate is applied before planting up to emergence, as a spot treatment, or as a harvest-aid desiccant in certain situations.

Glyphosate is available in several products having different formulations and different amounts (lbs) of acid equivalent (ae) and active ingredient (ai). Examples include:

3 ae, 4 ai: Roundup Original (II) (RT), ClearOut 41 (Plus), Credit (Duo) (Duo Extra) (Extra), Glystar Plus (Original), Glyphomax (Plus), Honcho (Plus), Mirage (Plus), Cornerstone (Plus), Glyphos (X-Tra), Gly-4 (Plus), Buccaneer (Plus), Rattler (Plus), Glyphosate Original, Gly-Flo, Acquire, Glyphosate 41 and Glyphosate 4. ***3.75 ae, 5 ai:*** Roundup UltraMax RT, Roundup UltraMax. ***4 ae, 5.4 ai:*** GlyStar 5 and Roundup Custom. ***4.17 ae:*** Touchdown Total. ***4.5 ae, 5.5 ai:*** Roundup Original Max, Roundup UltraMax II, and Roundup WeatherMax. Some products require the addition of NIS; AMS products at the equivalent rate of 8.5 to 17 lb/100 gal are required for most formulations. Check crop use and application directions on the product being used.

8-32 oz glyphosate 3 lb ae (.19-.75 lb ae)	**($2.05-9.20)**
6.5-26 oz glyphosate 3.75 lb ae (.19-.75 lb ae)	**($2.40-9.60)**
6-24 oz glyphosate 4 lb ae (.19-.75 lb ae)	**($2.45-13.50)**
6-24 oz glyphosate 4.17 lb ae (.19-.75 lb ae)	**($2.75-13.50)**
5.4-21 oz glyphosate 4.5 lb ae (.19-.75 lb ae)	**($3.05-13.35)**

BURNDOWN: Weeds should be actively growing. Avoid tillage for one day after treating annual weeds and three to seven days for perennials. Some products contain adequate surfactant; others require NIS additive. AMS at 8.5 to 17 lb/100 gal is required. Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Use caution to avoid droplet drift to non-target crops. Follow tank cleanup procedures to avoid crop damage from equipment contamination. A number of glyphosate products are labeled for dry bean burndown, refer to label for specific rate information depending on product formulation and concentration.

SPOT TREATMENT: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage. Crop will be killed in treated areas. Allow a 7 day preharvest interval for spot treatment. Refer to label for specific glyphosate products, rates, and precautions.

PREHARVEST: Supplemental labeling allows preharvest use of several glyphosate products, which include: Roundup Original Max, RT Master II, Roundup WeatherMax, Roundup UltraMax II, Credit, Credit Extra, Glyphosate Plus, and Glyphomax XRT. Apply up to 22 oz per acre of Roundup Original Max at the hard dough stage or less than 30% grain moisture. Refer to specific product label for rate information depending on formulation and concentration. Ground or aerial application at 3 to 20 gpa carrier. Apply at least 7 days before harvest. Make only one application per year, do not apply a spot treatment and preharvest spray on the same crop area. Do not apply to seed crop as germination and seed vigor reduction may occur. Do not feed or graze livestock with treated vines and hay. Do not apply to dry bean grain intended for livestock feed.

WEED CONTROL in FIELD PEAS

Field peas have slow early development and can allow weeds to get a headstart. Peas do not form a thick closed canopy like some of the more commonly grown crops.

Canada thistle at harvest is a special problem. Canada thistle reduces pea yield and flower buds are difficult to remove from the harvested crop, resulting in loss of crop quality.

Field peas can be harrowed with a tine harrow between seeding and crop emergence to control escaped weeds. Avoid harrowing immediately after crop emergence. Harrowing after emergence is generally less effective and may cause crop damage and variable field pea maturity. Damage is reduced with finger-type weeders or flexible harrows. Postemergent harrowing should be done on a dry, warm, sunny day. This provides the best opportunity to kill weeds and to reduce seedling damage and spread of disease.

Types of field peas in this publication are referred to in several main groups. Those groups include dry edible peas (the more common reference in South Dakota), English peas, green or succulent peas, and Southern peas (blackeyed, pinkeyed, crowder, and cow peas).

Not all pea varieties within these groups have been tested for tolerance to the labeled herbicides. Consult your seed dealer about specific variety and herbicide use.

FAR-GO (triallate) ($13.80-16.55)

1.25 qt Far-Go 4L or 12.5-15 lb Far-Go 10G (1.25 or 1.25-2.5 lb ai)

For wild oat control. For spring application only. Do not use on pea-oat mixtures. Do not graze or use treated foliage for livestock feed.

PPI: Dry edible, green peas. Apply prior to seeding or before emergence. Pea shoot sprouts should not be over 1/4 inch long. Apply prior to wild oat germination. Some leaf crinkling and delayed maturity of peas may occur. Shallow incorporate within 48 hours, but do not disturb seed. Apply lower rate for coarse textured soils and higher rate for fine textured soils.

TANK-MIX

Far-Go 4L + Treflan 4L **($18.75-20.45)**

Buckle 10G

PPI: Dry edible, English peas. Tank-mix 1.25 qt Far-Go 4L + 1 to 1.5 pt Treflan 4L per acre or use 10 to 12 lb per acre of the commercial premix (Buckle 10G). For control of some broadleaf weeds, grasses and increased control of wild oats. Apply within 3 weeks of planting and incorporate within 24 hours. Leaf crinkling and delayed maturity may occur, particularly in fine soils. Slight stand reduction may occur but normally does not affect yield. Do not graze or use treated foliage for livestock feed.

TRIFLURALIN PRODUCTS (trifluralin)

Trifluralin is available in several brandname products, including Treflan, Trifluralin, Trilin, and others. Formulation and use may vary. Follow directions for product used.

1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (.5-1 lb ai) **($2.35-9.10)**

Controls grasses and some small-seeded broadleaf weeds such as pigweed and lambsquarters. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves.

PPI: Dry edible, English, Southern peas. Use 1 to 2 pt of 4L or 5 to 10 lb per acre of 10G product. Apply and incorporate in the spring before planting or in the fall from September 1 to freeze up. Stunting may be observed when maximum labeled rate is applied. Use lower rate range in areas receiving less than 20 inches total rainfall. Apply only once during the season and incorporate 1 to 2 inches deep within 24 hours. Apply uniformly across the field, avoid overlapping. Use the lower rate on coarse textured soils and the higher rate on fine textured soils. Consult label for sensitive crops rotated in 12 months.

SONALAN (ethalfluralin) ($6.55-8.90)

1.5-2 pt Sonalan 3L or 5.5-7.5 lb Sonalan 10G (.55-.75 lb ai)

Controls certain grass and broadleaf weeds except groundcherry and nightshade.

PPI: Dry edible peas. Do not exceed recommended rates as crop injury may occur. All pea varieties have not been tested for tolerance, consult your seed dealer for tolerance on a particular variety. Two incorporation passes are necessary for Sonalan 10G. First incorporation should be as soon as possible (<48 hours). For best results, the second incorporation should be delayed for 3 to 5 days after the first. Use incorporation equipment capable of thoroughly and uniformly mixing Sonalan 10G into the top 2 to 3 inches of the seedbed. Apply and incorporate in the spring before planting or in the fall between October 1 and December 1 prior to spring planting in South Dakota, North Dakota, and Minnesota. Use the higher rates for fall application. Do not graze or use treated foliage for livestock feed.

COMMAND (clomazone) ($17.40)

1.3 pt Command 3ME (.5 lb ai)

For control or suppression of annual grasses and broadleaf weeds. Has provided good kochia control in some tests.

PRE: Succulent peas only. Apply as soil applied treatment prior to seeding or after seeding but prior to crop emergence. Make a single application in a minimum of 10 gpa. Temporary whitening and/or yellowing of the treated crop may occur. Do not allow livestock to graze on treated vines or feed vines to livestock.

PENDIMETHALIN PRODUCTS (pendimethalin) ($3.95-14.90)

Pendimethalin is available in several brandname products, including Prowl, Prowl H_2O, Pendimax, Acumen and others. Formulation and use may vary. Follow directions for product used.

1.2-3.6 pt pendimethalin 3.3L (.5-1.5 lb ai)
1.5-3 pt Prowl H_2O 3.8L (.61-1.4 lb ai)

PPI: English, dry edible, and pigeon peas. Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves. May be applied up to 45 days before planting. One inch rainfall or mechanical incorporation required prior to planting. Apply up to 60 days prior to planting and incorporate within 7 days of application. Do not apply preemergence surface treatment after planting as serious crop injury can result. Use low rate on coarse textured soils and higher rates on fine textured soils. Do not apply to peas, pea forage, pea silage, pea hay, or straw grown for livestock feed. Prowl H_2O may be applied 60 days prior to planting up to immediately before planting. Rates range from 2 to 3 pts per acre and are dependent on organic matter and soil texture for southern peas (cow peas) and 1.5 to 3 pt per acre for English, dry, garden, green, dwarf, and pigeon peas.

FALL: Supplemental labeling allows for fall application in several states including South Dakota. Apply Prowl 3.3EC or Prowl H_2O at 1.2 to 3.6 pts per acre based on soil type and organic matter and incorporate in late fall when soil temperatures are 45° F. or below, but before the ground freezes.

TANK-MIX

Prowl + Dual II Magnum
PPI: Southern pea (cow pea). For annual grass and some broadleaf weeds. Apply 14 days prior to planting and incorporate within 7 days. Do not graze or use treated foliage for livestock feed.

S-METOLACHLOR PRODUCTS ($14.25-29.20)

1-2 pt Dual II Magnum, Brawl, Charger, Basic, Medal, or Cinch 7.6L (.95-1.9 lb ai)

Dual II Magnum contains s-metolachlor, a more active chemical form of metolachlor and was labeled at lower product rates than previous products.

Very good to excellent control of several grasses and fair control of pigweed. Useful for special weed problems such as nightshade, nutsedge, or waterhemp. Consistent on annual grasses when rainfall is adequate.

FALL: Special label allows fall application in South Dakota. Refer to label for special requirements and restrictions.

PPI or ***PRE:*** English, Southern, black eye, pink eye, and crowder pea. (English peas are PRE only). Incorporation improves control. Use low rates on coarse soils with less than 3% OM. Do not cut for hay within 120 days following application. Do not apply more than 2 pt of Dual II Magnum during any one cropping year.

SENCOR (metribuzin) ($4.35-8.65)

.25-.5 lb Sencor 75DF (.19-.38 lb ai)

Special 24(c) local needs labeling for South Dakota allows use on spring and winter peas. Sencor gives good to excellent control of small-seeded annual broadleaves and fair to good control of certain large seeded broadleaves. Results in SDSU tests have been variable; best potential is for use as a partner with other herbicides. Do not apply more than .5 lb Sencor per acre per year. Crop injury may result under stress conditions caused by cold weather, low fertility, disease or insect damage, or if application is followed by heavy rain. Do not use on coarse-textured soils, soils with less than 1.5% OM or clay knobs or poorly covered subsoils. Do not apply within 50 days of harvest. Do not graze or feed treated vines to livestock within 40 days after application. Overlapping may cause crop injury.

PRE: Apply .25 to .5 lb Sencor DF per acre prior to or after planting. Use higher rate for fine textured soils or fields with a history of high weed populations. Minimum carrier is 10 gpa for ground and 5 gpa for air. Do not apply on shallow seedings less than 2 inches deep.

SENCOR (Continued . . .)

POST: Apply .25 to .33 lb Sencor DF per acre when weeds are less than 2 inches tall and crop is less than 6 inches tall. Minimum carrier is 20 gpa for ground and 5 gpa for air. Do not exceed 40 psi for ground application. Temporary crop chlorosis may occur. Added risk of crop injury is possible if a postemergence application is made following preemergence application. Do not apply over very moist soils or on wet crop foliage. Do not apply within 3 days after periods of cool, wet, or cloudy weather. Do not apply within 24 hours of other pesticide treatments.

SPARTAN (sulfentrazone) ($8.75-31.05)

2.25 to 8.0 oz Spartan 4F (.07-.25 lb ai)

Spartan is a soil-applied herbicide with root and shoot activity. Spartan is used primarily for annual broadleaf weeds including pigweed, normal and ALS resistant kochia, and black nightshade. Fair to good control of wild buckwheat and lambsquarters is possible under favorable conditions. Activity on biennial wormwood has been reported. Crop tolerance is very good.

EPP, PPI, or ***PRE:*** Rates vary with soil texture, OM, and pH. Lower rate is for coarse soil with low OM and pH > 7.0. The high rate is suggested for heavy soil, especially if applied long before planting. Requires precipitation for activation. Minimum carrier is 10 gpa for ground equipment. Do not apply more than 8 oz per acre per year.

FALL: Do not mechanically incorporate or apply to frozen soil. Use a mid to high rate that is appropriate for your soil type. If weeds emerge prior to application, add glyphosate (e.g. Roundup) or paraquat (e.g. Gramoxone).

AIM (carfentrazone) ($3.15-12.60)

.5-2.0 oz Aim EW 1.9L (0.008-0.031 lb ai)

Aim is a contact herbicide often used to improve weed control with glyphosate (e.g. Roundup). It controls ALS or normal kochia, redroot pigweed, nightshade, and lambsquarters. Weeds should be small for best results, stressed or large weeds are affected less.

PREPLANT BURNDOWN: Rate is .5-1.0 oz Aim per acre. Apply alone or with other labeled herbicide tank-mix partners prior to planting or within 24 hours after planting. Coverage is essential for good control. May plant immediately after application. Do not apply more than 2 fl oz/A prior to planting or more than 4.1 oz/A during the growing season.

HOODED SPRAYER APPLICATIONS: Aim may be used at rates up to 2 fl oz per acre applied with hooded sprayers to control labeled weeds between the rows of dry bean, field pea, chickpea, and lentil. Hooded sprayers must be designed, adjusted, and operated in a manner to totally enclose the spray pattern and prevent any spray deposition to green stem tissue, foliage, blooms, or fruit of crop. Add NIS (0.25% v/v), COC (1-2% v/v), or MSO (1-2% v/v) and either a liquid nitrogen fertilizer (2-4% v/v) or AMS (2-4 lb/A).

HARVEST AID: Aim may be applied 1-2 fl oz per acre to dry bean, dry pea, chickpea, or lentil to defoliate and/or desiccate troublesome broadleaf weeds that may be present at harvest. Aim EW may be used alone or as a tank-mix with other harvest aids such as paraquat (e.g. Gramoxone), for a broader weed control spectrum. Minimum carrier is 10 gpa for ground (20 gpa recommended) or 5 gpa for aerial application. Use adjuvants recommended for hooded sprayer application, but MSO may be most effective. There are no preharvest intervals for vegetable legume crops. Application may be made when the crop is mature and the grain has begun to dry down (pods buckskin color and <30-40% green leaves remain).

PURSUIT (imazethapyr) ($9.25-18.55)

2-4 oz Pursuit 2L or .72-1.44 oz Pursuit 70DG (.03-.06 lb ai)

Pursuit action is by root and foliar uptake. It controls several annual broadleaves and provides some foxtail control. Control of redroot pigweed, mustard, non-ALS kochia, velvetleaf, and black nightshade has been very good to excellent. Velvetleaf is controlled most effectively with preplant incorporated treatments. Cocklebur and sunflower are controlled postemergence. Not satisfactory for common waterhemp.

Pursuit may be applied to the following types of field peas: dry edible peas, English, and southern peas.

PURSUIT (Continued . . .)

PPI: Apply Pursuit at the broadcast rate of up to 3 oz 2L or 1.08 oz 70DG per acre to dry edible peas and English peas, or up to 4 oz 2L or 1.44 oz 70DG per acre for southern peas only, within one week before planting. Applied preplant incorporated, Pursuit may be tank-mixed with a registered grass herbicide.

PRE: Apply Pursuit at the broadcast rate of up to 3 oz 2L or 1.08 oz 70DG per acre to dry edible peas and English peas, or up to 4 oz 2L or 1.08 oz 70DG per acre for southern peas only, immediately after or up to 3 days after planting. Pursuit may be applied in a tank-mix with a registered grass herbicide or applied preemergence following a preplant incorporated registered grass herbicide.

EPOST: Apply Pursuit at the broadcast rate of up to 3 oz 2L or 1.08 oz 70DG per acre to dry edible peas and English peas, or up to 4 oz 2L or 1.44 oz 70DG per acre for southern peas only. Apply to dry edible peas, English peas, and southern peas at least 3 inches in height but prior to 5 nodes and before flowering. The use of trifluralin prior to Pursuit application may increase the likelihood and severity of crop injury. A nonionic surfactant containing at least 80% active ingredient should be used at a rate of 2 pints per 100 gallons of spray mixture.

Basagran may be tank-mixed with Pursuit to control weeds not listed on the Pursuit label. Addition of Basagran may also cause antagonism, thereby reducing control of grassy weeds. Nitrogen-based fertilizer may be included as a spray additive only when Pursuit is tank-mixed with Basagran. Refer to the Basagran label for application rates and restrictions. Always use in accordance with the more restrictive label restrictions and precautions.

Do not use crop oils, methylated seed oils, or petroleum oils for postemergence application. Do not apply Pursuit before crop is at least three inches in height or crop injury may result. Do not make more than one application per year.

Allow at least 30 days between application and harvest of English peas and southern peas, and 60 days for dry edible beans.

Labeler assumes no risk for crop injury, loss or damage when used on edible legume crops. The decision to use or not to use this product on edible legume crops is solely that of the grower.

PREMIX

Pursuit Plus (imazethapyr + pendimethalin) **($9.10)**

1.25 pt Pursuit Plus (0.03 lb a.i. imazethapyr + 0.45 lb a.i. pendimethalin)

Supplemental label for English peas. Do not use if cold or wet conditions are expected within a week of application. Use for control of some annual grass species and broadleaf weed species including mustards, nightshades, and redroot pigweed.

The rotation restriction is 4 months for wheat or barley, 8.5 months for field corn, or 18 month rotation restriction to sunflower, oats, sorghum, or safflower. There is no rotation restriction for soybean.

Application rate is equivalent to 2 oz/A Pursuit 2L + 1 pt/A Prowl H_2O. Do not make more than one application per year.

PPI: Apply within 1 week before planting. Do not apply after June 30.

RAPTOR (imazamox) ($18.55)

4 oz Raptor 1L (.03 lb ai)

Raptor controls several grasses and annual broadleaf weeds. Raptor is an imidazolinone herbicide with foliar and root uptake action. Residual activity is less than for Pursuit; therefore Raptor has potential where rotation restrictions must be minimized.

Foxtail control has been very good. It also controls velvetleaf, cocklebur, sunflower, non-ALS kochia, mustard, and black nightshade. Raptor will suppress woolly cupgrass, wild proso millet, and sandbur. Perennials such as Canada thistle, common waterhemp, and ALS resistant weed biotypes are not controlled. Common ragweed control is variable. Lambsquarters should be treated when small.

Treat early when weeds are less than 4 to 5 inches. Stress reduces crop tolerance; avoid application immediately after cold weather. Hot, humid weather may cause temporary crop response.

RAPTOR (Continued . . .)

POST: Dry edible peas, southern peas (cow peas). The rate is 4 oz per acre. Apply Raptor postemergence to dry peas with at least 3 pair of leaves and prior to bloom. Raptor may be applied with or without 28% N or AMS to improve weed control. When 28% N or COC is added to the mix, tank-mix Basagran at 6 to 16 oz per acre to minimize crop response. Tank-mixing Raptor at 2 oz per acre with Rezult is allowed in South Dakota, North Dakota, and Minnesota by 2(ee) labeling to aid in the control of mustard species in edible beans and field pea. Use appropriate adjuvants as recommended in Rezult label. Only one application of Raptor may be made per season. Crop rotational intervals are based on regional restrictions. Crop plant back intervals include: wheat (non-Clearfield) and alfalfa at 3 mo; barley and rye 4 mo; corn (field, pop, sweet, and seed) Clearfield and non-Clearfield at 8.5 mo; and no restriction for Clearfield canola, wheat and sunflower, dry beans, dry peas, and sorghum.

Do not apply Raptor to succulent peas, chickpeas (garbanzo beans), or lentils.

THISTROL MCPB **($11.80-35.45)**

2-6 pt Thistrol MCPB 2L (.5-1.5 lb ai)

POST: Dry edible peas. Controls certain broadleaf weeds, sedges, and Canada thistle. Treat at 6 to 12 node stage. Do not apply to peas later than 3 nodes prior to flowering or after flower buds appear. Do not apply to peas under moisture stress or when air temperatures exceeds 90° F. Do not graze or use treated foliage for livestock feed.

BASAGRAN (bentazon) **($12.50-24.95)**

1-2 pt Basagran 4L (.5-1 lb ai)

POST: Dry edible, succulent, English, and Southern pea. Controls certain broadleaved weeds, sedges, and Canada thistle. Application made prior to 3 pair leaves or 4 nodes can cause pronounced pea injury. Yellowing, bronzing, speckling, or burning of leaves may occur under certain conditions even at tolerant crop stages. Peas usually recover without yield loss. English and southern peas are more tolerant. Do not add COC. Do not apply within 30 days of harvest. Do not graze or hay vines for livestock feed. Do not apply when peas are in bloom.

ASSURE II (quizalofop) **($5.75-13.75)**

5-12 oz Assure II or Targa .88L (.035-.07 lb ai)

POST: Dry edible, blackeyed, cowpeas. Controls annual grasses and quackgrass. Peas must have 1 to 2 trifoliates. Use caution and consult with seed dealer when treating other than dry peas, blackeyed peas, or cow peas. Maximum rate of Assure II is 14 oz per acre per season. Minimum carrier is 10 gpa for ground application; do not apply through irrigation systems. Do not harvest for 60 days of harvest for dry peas or 30 days for succulent peas. Use nonphytotoxic petroleum based COC at 4 qt/100 gal or NIS at 1 qt/100 gal. Do not graze or use treated foliage for livestock feed.

POAST (sethoxydim) **($4.90-14.65)**

.5-1.5 pt Poast 1.5L (.1-.3 lb ai)

POST: Dry edible, succulent peas. For annual and perennial grass, does not control sedges. Refer to label for rates according to weed size and species. Maximum rate per application is 2.5 pt per acre and maximum per season is 4 qt per acre. 2Do not apply when air temperature exceeds 90° F. and relative humidity is 60% or greater. Use nonphytotoxic COC. Do not harvest within 30 days following application.

Rezult

POST: Rezult is a commercial premix using the prodigy system that will discharge Rezult B (bentazon) and Rezult G (sethoxydim) in a ratio of 1:1. Supplemental labeling allows for use on dry peas in South Dakota and some other states. Apply Rezult at 3.2 pt per acre after dry peas have at least 3 pair of leaves or 4 nodes. Applications before this stage may result in severe crop injury. Use COC at 1 to 2 pt per acre.

CLETHODIM PRODUCTS ($6.40-34.25)

6-16oz Shadow or Clethodim 2L or 9-32 oz Select Max 1L (.09-0.24 lb a.i.)

POST: For control of annual grasses. Rates based on grass species and height. Use high rate for heavy grass pressure and /or when grasses are at maximum height. Do not apply within 30 days of harvest for field and pigeon peas and 21 days for other types. Use NIS at 0.25% v/v. Apply before bloom. Do not make more than one application per year. For 1L formulation, use on field, pigeon, dwarf, edible-pod, snow, sugarsnap, English, garden, and green at a rate of 9 to 16 oz/A; and 9 to 32 oz/A for blackeyed pea, cow pea, crowder pea and southern pea.

PARAQUAT PRODUCTS (paraquat) ($3.35-8.40)

0.8-1.3 pt paraquat 3L (.3-.48 lb ai)
1.2-2 pt Gramoxone Inteon (0.3-0.5 lb ai)

Paraquat is available in several brand name products including Gramoxone Inteon, Gramoxone Max, Firestorm, Parazone 3SL and others. Follow specific label directions for product used.

HARVEST AID: Dry peas, blackeyed peas, cow peas, crowder peas, and southern peas. Apply when at least 80% of the pods are yellowing and mostly ripe and when leaves are no more than 40% of bush type peas or 30% of vine type peas are green. Use single application of the higher rate for vining type or bush type peas with lush growth. May apply as split application to improve vine coverage. Do not make more than two applications or exceed a total of 2 pt per acre 2.5L or 1.3 pt per acre for 3L product. Minimum carrier is 20 gpa for ground or 5 gpa for air. Add non-ionic spreader at 1 qt/100 gal spray mix. Do not harvest or graze treated fields for 7 days after spraying. Follow handling precautions, as paraquat is toxic when ingested. Restricted Use Pesticide.

GLYPHOSATE PRODUCTS (glyphosate)

Glyphosate is a non-selective, translocated, foliage-applied herbicide used in reduced tillage systems. Glyphosate is applied before planting up to emergence, as a spot treatment, or as a harvest-aid desiccant in certain situations.

Glyphosate is available in several products having different formulations and different amounts (lbs) of acid equivalent **(**ae**)** and active ingredient (ai). Examples include:

3 ae, 4 ai: Roundup Original (II) (RT), ClearOut 41 (Plus), Credit (Duo) (Duo Extra) (Extra), Glystar Plus (Original), Glyphomax (Plus), Honcho (Plus), Mirage (Plus), Cornerstone (Plus), Glyphos (X-Tra), Gly-4 (Plus), Buccaneer (Plus), Rattler (Plus), Glyphosate Original, Gly-Flo, Acquire, Glyphosate 41, and Glyphosate 4. ***3.75 ae, 5 ai:*** Roundup UltraMax RT, Roundup UltraMax. ***4 ae, 5.4 ai:*** GlyStar 5 and Roundup Custom. ***4.17 ae:*** Touchdown Total. ***4.5 ae, 5.5 ai:*** Roundup Original Max, Roundup UltraMax II, and Roundup WeatherMax. Some products require the addition of NIS; AMS products at the equivalent rate of 8.5 to 17 lb/100 gal are required for most formulations. Check crop use and application directions on the product being used.

8-32 oz glyphosate 3 lb ae (.19-.75 lb ae)	**($2.05-9.20)**
6.5-26 oz glyphosate 3.75 lb ae (.19-.75 lb ae)	**($2.40-9.60)**
6-24 oz glyphosate 4 lb ae (.19-.75 lb ae)	**($2.45-13.50)**
6-24 oz glyphosate 4.17 lb ae (.19-.75 lb ae)	**($2.75-13.50)**
5.4-21 oz glyphosate 4.5 lb ae (.19-.75 lb ae)	**($3.05-13.35)**

BURNDOWN: Weeds should be actively growing. Avoid tillage for one day after treating annual weeds and three to seven days for perennials. Some products contain adequate surfactant; others require NIS additive. AMS at 8.5 to 17 lb/100 gal is required. Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Use caution to avoid droplet drift to non-target crops. Follow tank cleanup procedures to avoid crop damage from equipment contamination. A number of glyphosate products are labeled for dry field pea burndown, refer to label for specific rate information depending on product formulation and concentration.

SPOT TREATMENT: Use 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage, and crop will be killed in treated areas. Allow a 14 day preharvest interval for spot treatment. Refer to specific glyphosate product label for rates and precautions.

GLYPHOSATE PRODUCTS (Continued . . .)

PREHARVEST: Supplemental labeling for South Dakota and other states allows for preharvest use of several glyphosate products, which include: Roundup Original Max, Roundup UltraMax II, RT Master II, Roundup WeatherMax, Duramax, Durango DMA, Credit, Credit Extra, and Glyphomax XRT. Apply up to 17 oz per acre of Roundup Original Max or 19 oz Duramax or Durango DMA at the hard dough stage or less than 30% grain moisture. Ground or aerial application at 3 to 20 gal per acre carrier. Apply at least 14 days before harvest. Make only one application per year, do not apply a spot treatment and preharvest spray in the same crop area. Do not apply to seed crop as germination and seed vigor reduction may occur. Do not feed or graze livestock with treated vines and hay. Do not treat field (feed type) peas that are intended to be grown for livestock feed.

WEED CONTROL in CHICKPEAS (garbanzo beans)

Chickpea plants are short and have an open canopy. This allows weeds to be very competitive as they can grow above the crop. They are less able to suppress weeds compared to peas or lentils; therefore it is important to minimize weed problems before the crop is planted. The field's herbicide history is important to avoid crop injury from previous years' herbicides.

Chickpea should be planted only in fields which have few major weed problems, especially perennials such as quackgrass and Canada thistle. Early weed competition is more damaging to yield than later emerging weeds. Rotary hoeing and/or field cultivating in wider row spacings should be used as necessary. Avoid extensive damage to plants and cultivate when leaves and stems are dry to reduce spread of disease.

FAR-GO (triallate) ($13.80-16.55)

1.25 qt Far-go 4L or 12.5-15 lb Far-go 10G (1.25 or 1.25-1.5 lb ai)

PPI: For wild oat. Apply prior to seeding or before emergence. Garbanzo bean sprouts should not exceed 1/4" length. Apply prior to wild oat germination. Incorporate shallowly within 48 hours but do not disturb the seed. Apply lower rate for coarse and higher rate for fine textured soils. Do not graze livestock on treated crops.

TRIFLURALIN PRODUCTS (trifluralin)

Trifluralin is available in several brandname products including Treflan, Trilin, trifluralin and others. Formulation and use may vary. Follow directions for product used.

1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (.5-1 lb ai) ($2.35-9.10)

Grasses and some small-seeded broadleaf weeds such as pigweed and lambsquarters are controlled. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves.

PPI: Apply and incorporate in the spring before planting or in the fall from September 1 to freeze-up. Incorporate within 24 hours. Use lower rate on coarser and higher rate on finer soils or soil with higher organic matter. Use lower rate range in areas receiving less than 20 inches total annual rainfall or irrigation. Consult label for sensitive crops rotated in 12 months.

SONALAN (ethalfluralin) ($6.55-8.90)

1.5-2 pt Sonalan 3L or 5.5-7.5 lb Sonalan 10G (.55-.75 lb ai)

Controls certain grass and broadleaf weeds except groundcherry, nightshade, sunflower, cocklebur, and others.

PPI: Grasses and some broadleaf weeds. Use higher rates to control nightshade and seedling groundcherry. Apply and incorporate in the spring before planting or in the fall between October 1 and December 1 prior to spring planting in South Dakota, North Dakota, and Minnesota. Use the higher rates for fall application. Use lower rates on coarse soils and higher rates on fine soils. Consult label for sensitive crops rotated in 12 months. Use Sonalan rates of 3 to 4.5 pt per acre to control nightshade and groundcherry. Rotate only to crops listed on the label.

PENDIMETHALIN PRODUCTS (pendimethalin) ($3.95-14.90)

Pendimethalin is available in several brandname products, including Prowl, Prowl H_2O, Pendimax, Acumen, Stealth, and others. Formulation and use may vary. Follow directions for product used.

1.2-3.6 pt pendimethalin 3.3L (.5-1.5 lb ai)
2-3 pt Prowl H_2O 3.8L (.95-1.43 lb ai)

PPI: Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Doesn't control mustard, nightshade, smartweed, or large-seeded annual broadleaves. May be applied up to 45 days before planting. One inch rainfall or mechanical incorporation required prior to planting. Apply preplant and incorporate thoroughly within 7 days. Use lower rate on coarse and higher rate on the fine textured soils. Prowl H_2O may be applied 60 days prior to planting.

FALL: Supplemental labeling allows for fall application in several states including South Dakota. Apply Prowl 3.3EC or Prowl H_2O at 1.2 to 3.6 pts per acre based on soil type and organic matter and incorporate in late fall when soil temperatures are 45° F. or below, but before the ground freezes.

S-METOLACHLOR PRODUCTS ($14.25-29.20)

1-2 pt Dual II Magnum, Cinch, Brawl, Charger, Basic, Medal 7.6L (.95-1.9 lb ai)

PPI or ***PRE:*** For annual grass and some broadleaf weeds. Incorporation improves control. Refer to label for specific rate information regarding soil texture and organic matter. Use low rates on coarse soils with less than 3% OM and higher rates on fine soils over 3% OM. Do not cut for hay within 120 days following application.

SPARTAN (sulfentrazone) ($8.75-31.05)

2.25-8.0 oz Spartan 4F (.07-0.25 lb ai)

Spartan is a soil-applied herbicide with root and shoot activity. Spartan is used primarily for annual broadleaf weeds including pigweed, normal and ALS resistant kochia, and black nightshade. Fair to good control of wild buckwheat and lambsquarters is possible under favorable conditions. Activity on biennial wormwood has been reported. Crop tolerance is very good.

EPP, PPI, or ***PRE:*** Rates vary with soil texture, OM, and pH. Lower rate is for coarse soil with low OM and pH > 7.0. The high rate is suggested for heavy soil, especially if applied long before planting. Requires precipitation for activation. Minimum carrier is 10 gpa for ground equipment. Do not apply more than 8 oz per acre per year.

FALL: Do not mechanically incorporate or apply to frozen soil. Use a mid to high rate that is appropriate for your soil type. If weeds emerge prior to application, add glyphosate (e.g. Roundup) or paraquat (e.g. Gramoxone).

PURSUIT (imazethapyr) ($9.25-13.90)

2-3 oz Pursuit 2L or .72-1.08 oz Pursuit 70DG (.03-.045 lb ai)

PPI: For control of certain broadleaf weeds and some annual grasses. Apply 3 oz 2L or 1.08 oz 70DG preplant within 1 week of planting. Do not incorporate deeper than 3 inches. Allow 60 days between application and harvest.

PRE: Apply at a rate up to 3 oz 2L or 1.08 oz 70DG per acre immediately after or up to 3 days after planting. Pursuit may be applied in a tank-mix with a registered grass herbicide or applied preemergence following preplant incorporated application of a registered grass herbicide.

Do not make more than one application per year. Allow 60 days between application and harvest. Labeler assumes no risk for crop injury, loss, or damage when used on edible legume crops. The decision to use or not to use this product on edible legume crops is solely that of the grower.

OUTLOOK (dimethenamid-p) ($12.85-26.95)

10-21 oz Outlook or Establish 6L (.5-1 lb ai)

Chloroacetamide herbicide chemically related to Micro-Tech, Intrro, or Dual. Very good to excellent control of several annual grasses. Sandbur and wild proso millet are partially controlled. Fair to good control of certain annual broadleaves such as pigweed, waterhemp, or black nightshade.

OUTLOOK (Continued . . .)

Outlook rates of 16 to 21 oz 6L per acre are suggested for most situations. Minimum carrier is 2 gpa for ground or air. There are no crop rotation restrictions for the next season. Winter wheat can be planted 4 months after application. Do not graze or feed forage.

PRE, POST: Do not incorporate for garbanzo beans or lentils. Consult with your seed dealer for restrictions on specific varieties to avoid potential injury due to sensitivity to Outlook. Early postemergence application should be made at the first to third trifoliate leaf of dry beans. Emerged weeds are not controlled. Use Outlook at 12 fl oz per acre on coarse soils with CEC less than 5 or organic matter less than 1.5% for soil application to dry beans prior to crop emergence. May occasionally result in temporary spotting or browning of dry bean leaves. Garbanzo beans may be harvested 70 days after application.

TANK-MIXES

Tank-mix combinations control a broader spectrum of weeds than either product used separately. Refer to product label of tank-mix partner for specific restrictions.

Outlook 6L may be tank-mixed or applied sequentially in garbanzo beans with one or more of the following herbicides according to the specific tank-mixing label instructions: Basagran, Eptam, Far-go, Gramoxone Extra, Poast, Prowl, Pursuit, Roundup Ultra, Sonalan, and Treflan. The most restrictive labeling applies to tank-mixes. The following herbicide products may only be applied sequentially with Outlook 6L: Dual Magnum, Dual II Magnum, Micro-Tech or Intrro.

AIM (carfentrazone) ($3.15-13.45)

.5-2.0 oz Aim EC or EW (0.008-0.031 lb ai)

Aim is a contact herbicide often used to improve weed control with glyphosate (e.g. Roundup). It controls ALS or normal kochia, redroot pigweed, nightshade, and lambsquarters. Weeds should be small for best results, stressed or large weeds are affected less.

PREPLANT BURNDOWN: Rate is .5-1.0 oz Aim per acre. Apply alone or with other labeled herbicide tank-mix partners prior to planting or within 24 hours after planting. Coverage is essential for good control. May plant immediately after application. Do not apply more than 2 fl oz/A prior to planting or more than 4.1 oz/A during the growing season.

HOODED SPRAYER APPLICATIONS: Aim may be used at rates up to 2 fl oz per acre applied with hooded sprayers to control labeled weeds between the rows of dry bean, field pea, chickpea, and lentil. Hooded sprayers must be designed, adjusted, and operated in a manner to totally enclose the spray pattern and prevent any spray deposition to green stem tissue, foliage, blooms, or fruit of crop. Add NIS (0.25% v/v), COC (1-2% v/v), or MSO (1-2% v/v) and either a liquid nitrogen fertilizer (2-4% v/v) or AMS (2-4 lb/A).

HARVEST AID: Aim may be applied 1-2 fl oz per acre to dry bean, dry pea, chickpea, or lentil to defoliate and/or desiccate troublesome broadleaf weeds that may be present at harvest. Aim EW may be used alone or as a tank-mix with other harvest aids such as paraquat (e.g. Gramoxone), for a broader weed control spectrum. Minimum carrier is 10 gpa for ground (20 gpa recommended) or 5 gpa for aerial application. Use adjuvants recommended for hooded sprayer application, but MSO may be most effective. There are no preharvest intervals for vegetable legume crops. Application may be made when the crop is mature and the grain has begun to dry down (pods buckskin color and <30-40% green leaves remain).

POAST (sethoxydim) ($4.90-24.40)

.5-2.5 pt Poast 1.5L (.1-.5 lb ai)

POST: For annual and perennial grass control, does not control sedges. Refer to label for rates according to weed size and species. Maximum rate per application is 2.5 pt per acre and maximum per season is 4 qt per acre. Do not apply when air temperature exceeds 90° F. and relative humidity is 60% or greater. Use nonphytotoxic COC. Allow 30 days after application to harvest.

ASSURE II (quizalofop) ($5.75-13.75)

5-12 fl oz Assure II or Targa .88L (.035-.07 lb ai)

POST: Controls annual grasses and quackgrass. Must have 1 to 2 trifoliates. Maximum rate of Assure II is 24 oz per acre per season. Minimum carrier is 10 gpa for ground application; do not apply through irrigation systems. Use nonphytotoxic petroleum based COC at 4 qt/100 gal or NIS at 1 qt/100 gal. Do not graze or use treated foliage for livestock feed. Do not apply within 30 days of harvest. Allow 7 days between applications.

CLETHODIM PRODUCTS ($9.65-34.25)

6-16 oz Arrow, Clethodim, Shadow 2L or 9-32 oz Select Max 1L (.09-.24 lb a.i.)

POST: For control of annual grasses. Rates based on grass species and height. Use high rate for heavy grass pressure and/or when grasses are at maximum height. Do not apply within 30 days of harvest. Use NIS at 0.25% v/v. Do not apply more than 32 oz per acre per application or 64 oz per acre per season. For repeat applications, allow a minimum of a 14 days interval.

PARAQUAT PRODUCTS (paraquat) ($3.35-8.40)

0.8-1.3 pt paraquat 3L (.3-.48 lb ai)
1.2-2 pt Gramoxone Inteon (0.3-0.5 lb ai)

Paraquat is available in several brand name products including Gramoxone Inteon, Gramoxone Max, Firestorm, Parazone 3SL and others. Follow specific label directions for product used.

HARVEST AID: Apply when at least 80% of the pods are yellowing and mostly ripe. May apply as split application to improve vine coverage. Do not make more than two applications or exceed a total of 2 pt per acre 2.5L or 1.3 pt per acre for 3L product. Minimum carrier is 20 gpa for ground or 5 gpa for air. Add non-ionic spreader at 1 qt/100 gal spray mix. Do not harvest or graze treated fields for 7 days after spraying. Follow handling precautions, as paraquat is toxic when ingested. Restricted Use Pesticide.

GLYPHOSATE PRODUCTS (glyphosate)

Glyphosate is a non-selective, translocated, foliage-applied herbicide used in reduced tillage systems. Glyphosate is applied before planting up to emergence, as a spot treatment, or as a harvest-aid desiccant in certain situations.

Glyphosate is available in several products having different formulations and different amounts (lbs) of acid equivalent (ae) and active ingredient (ai). Examples include:

3 ae, 4 ai: Roundup Original (II) (RT), ClearOut 41 (Plus), Credit (Duo) (Duo Extra) (Extra), Glystar Plus (Original), Glyphomax (Plus), Honcho (Plus), Mirage (Plus), Cornerstone (Plus), Glyphos (X-Tra), Gly-4 (Plus), Buccaneer (Plus), Rattler (Plus), Glyphosate Original, Gly-Flo, Acquire, Glyphosate 41, and Glyphosate 4. ***3.75 ae, 5 ai:*** Roundup UltraMax RT, Roundup UltraMax. ***4 ae, 5.4 ai:*** GlyStar 5 and Roundup Custom. ***4.17 ae:*** Touchdown Total. ***4.5 ae, 5.5 ai:*** Roundup Original Max, Roundup UltraMax II, and Roundup WeatherMax. Some products require the addition of NIS; AMS products at the equivalent rate of 8.5 to 17 lb/100 gal are required for most formulations. Check crop use and application directions on the product being used.

8-32 oz glyphosate 3 lb ae (.19-.75 lb ae)	**($2.05-9.20)**
6.5-26 oz glyphosate 3.75 lb ae (.19-.75 lb ae)	**($2.40-9.60)**
6-24 oz glyphosate 4 lb ae (.19-.75 lb ae)	**($2.45-13.50)**
6-24 oz glyphosate 4.17 lb ae (.19-.75 lb ae)	**($2.75-13.50)**
5.4-21 oz glyphosate 4.5 lb ae (.19-.75 lb ae)	**($3.05-13.35)**

BURNDOWN: Weeds should be actively growing. Avoid tillage for one day after treating annual weeds and three to seven days for perennials. Some products contain adequate surfactant; others require NIS additive. AMS at 8.5 to 17 lb/100 gal is required. Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Use caution to avoid droplet drift to non-target crops. Follow tank cleanup procedures to avoid crop damage from equipment contamination. A number of glyphosate products are labeled in chickpea burndown, refer to label for specific rate information depending on product formulation and concentration.

SPOT TREATMENT: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage, and crop will be killed in treated areas. Allow a 14 day preharvest interval for spot treatment. Refer to specific glyphosate product labels for rates and precautions.

PREHARVEST: Supplemental labeling for South Dakota and other states allows for preharvest use of several glyphosate products, which include: Roundup Original Max, Roundup UltraMax II, RT Master II, Roundup WeatherMax, Duramax, Durango DMA, Credit, Credit Extra, and Glyphomax XRT. Apply up to 17 oz per acre of Roundup Original Max or 19 oz Duramax or Durango DMA at the hard dough stage or less than 30% grain moisture. Ground or aerial application at 3 to 20 gal per acre carrier. Apply at least 14 days before harvest. Make only one application per year, do not apply a spot treatment and preharvest spray on the same crop area. Do not apply to seed crop as germination and seed vigor reduction may occur. Do not feed or graze livestock with treated vine and hay or feed grain intended for livestock use.

WEED CONTROL in LENTIL

Lentils are a short crop with a sparse crop canopy, especially as seedlings. This makes it a poor competitor with most weeds. Yield losses due to weeds can be severe. Lentils are susceptible to weed problems that may not be important to other crops. Low growing weeds are very competitive and losses can be severe.

Harrowing or rotary hoeing after emergence is recommended only if there is a serious weed problem. Because of the slender early stem growth, the plants are easily damaged at this time. If harrowing or hoeing is planned, be sure to use the recommended seeding rates because the plant stand will be reduced slightly. Rotary hoeing is normally done 7 to 10 days after seeding.

FAR-GO (triallate) ($13.80-16.55)

1.25 qt Far-go 4L or 12.5-15 lb Far-go 10G (1.25 or 1.25-1.5 lb ai)

PPI: For wild oat. Apply up to 3 weeks before seeding or after seeding before sprouts are 1/4 inch long. Apply prior to wild oat germination. Incorporate shallowly within 48 hours, but do not disturb the seed. Apply lower rate for coarse and higher rate for fine textured soils. Do not graze livestock on treated crops.

TRIFLURALIN PRODUCTS (trifluralin)

Trifluralin is available in several brandname products including Treflan, Trilin, Trifluralin, and others. Formation and use may vary. Follow directions for product used.

1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (.5-1 lb ai) ($2.35-9.10)

PPI: Apply and incorporate in the spring before planting or in the fall from September 1 to freeze-up. Incorporate within 24 hours. Use lower rate on coarser and higher rate on fine soils or soils with higher organic matter. Use lower rate range in areas receiving less than 20 inches total annual rainfall or irrigation. Consult label for sensitive crops rotated in 12 months.

SONALAN (ethalfluralin) ($6.55-20.15)

1.5-4.5 pt Sonalan 3L or 5.5-17 lb Sonalan 10G (.55-.1.65 lb ai)

Grasses and some broadleaf weeds. Use higher rates to control nightshade and seedling groundcherry. Apply and incorporate in the spring before planting or in the fall between October 1 and December 1 prior to spring planting in South Dakota, North Dakota, and Minnesota. Use higher the rates for fall application. Use lower rates on coarse soils and higher rates on fine soils. Consult label for sensitive crops rotated in 12 months. Use Sonalan rates of 3 to 4.5 pt per acre to control nightshade and groundcherry. Rotate only to crops listed on the label.

PENDIMETHALIN PRODUCTS (pendimethalin) ($3.95-14.90)

Pendimethalin is available in several brandname products, including Prowl, Prowl H_2O, Pendimax, Acumen, and others. Formulation and use may vary. Follow directions for product used.

1.2-3.6 pt pendimethalin 3.3L (.5-1.5 lb ai)
1.5-3 pt Prowl H_2O 3.8L (.71-1.43 lb ai)

PPI: Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Doesn't control mustard, nightshade, smartweed, or large-seeded annual broadleaves. May be applied up to 45 days before planting. One inch rainfall or mechanical incorporation required prior to planting. For most annual grasses and certain broadleaf weeds. Apply preplant and incorporate thoroughly within 7 days of application. Use lower rate on coarse and higher rate on fine textured soils.

FALL: Supplemental labeling allows for fall application in several states including South Dakota. Apply Prowl 3.3EC or Prowl H_2O at 1.2 to 3.6 pts per acre based on soil type and organic matter and incorporate in late fall when soil temperatures are 45° F. or below, but before the ground freezes.

OUTLOOK (dimethenamid-p) ($12.85-26.95)

10-21 oz Outlook or Establish 6L (.5-1 lb ai)

Chloroacetamide herbicide chemically related to Micro-Tech, Intrro, or Dual. Very good to excellent control of several annual grasses. Sandbur and wild proso millet are partially controlled. Fair to good control of certain annual broadleaves such as pigweed, waterhemp, or black nightshade.

Outlook rates of 16 to 21 oz 6L per acre are suggested for most situations. Minimum carrier is 2 gpa for ground or air. There are no crop rotation restrictions for the next season. Winter wheat can be planted 4 months after application. Do not graze or feed forage.

OUTLOOK (Continued . . .)

PRE, POST: Do not incorporate for lentils or garbanzo beans. Labeled for use on lentils. Consult with your seed dealer for restrictions on specific varieties to avoid potential injury due to sensitivity. Early postemergence application should be made at the first to third trifoliate leaf of dry beans. Emerged weeds are not controlled. Use a maximum of 12 fl oz per acre on coarse soils with CEC less than 5 or organic matter less than 1.5% for soil application to dry beans prior to crop emergence. May occasionally result in temporary spotting or browning of crop leaves. Lentils may be harvested 70 days after application.

TANK-MIXES

Tank-mix combinations control a broader spectrum of weeds than either product used separately. Refer to product label of tank-mix partner for specific restrictions.

Outlook 6L may be tank-mixed or applied sequentially in lentils with one or more of the following herbicide products according to the specific tank-mixing label instructions: Basagran, Eptam, Far-go, Gramoxone Extra, Poast, Prowl, Pursuit, Roundup Ultra, Sonalan, and Treflan. The most restrictive labeling applies to tank-mixes. The following herbicide products may only be applied sequentially with Outlook 6L: Dual II Magnum, Micro-Tech or Intrro.

S-METOLACHLOR PRODUCTS ($14.25-29.20)

1-2 pt Dual II Magnum, Brawl, Charger, Basic 7.6L (.95-1.9 lb ai)

PPI or ***PRE:*** For annual grass and some broadleaf weeds. Incorporation improves control. Refer to label for specific rate information regarding soil texture and organic matter. Use low rates on coarse soils with less than 3% OM and higher rates on fine soils over 3% OM. Do not cut for hay within 120 days following application.

AIM (carfentrazone) ($3.15-13.45)

.5-2.0 oz Aim EC or EW (0.008-0.031 lb ai)

Aim is a contact herbicide often used to improve weed control with glyphosate (e.g. Roundup). It controls ALS or normal kochia, redroot pigweed, nightshade, and lambsquarters. Weeds should be small for best results, stressed or large weeds are affected less.

PREPLANT BURNDOWN: Rate is .5-1.0 oz Aim per acre. Apply alone or with other labeled herbicide tank-mix partners prior to planting or within 24 hours after planting. Coverage is essential for good control. May plant immediately after application. Do not apply more than 2 fl oz/A prior to planting or more than 4.1 oz/A during the growing season.

HOODED SPRAYER APPLICATIONS: Aim may be used at rates up to 2 fl oz per acre applied with hooded sprayers to control labeled weeds between the rows of dry bean, field pea, chickpea, and lentil. Hooded sprayers must be designed, adjusted, and operated in a manner to totally enclose the spray pattern and prevent any spray deposition to green stem tissue, foliage, blooms, or fruit of crop. Add NIS (0.25% v/v), COC (1-2% v/v), or MSO (1-2% v/v) and either a liquid nitrogen fertilizer (2-4% v/v) or AMS (2-4 lb/A).

HARVEST AID: Aim may be applied 1-2 fl oz per acre to dry bean, dry pea, chickpea, or lentil to defoliate and/or desiccate troublesome broadleaf weeds that may be present at harvest. Aim EW may be used alone or as a tank-mix with other harvest aids such as paraquat (e.g. Gramoxone), for a broader weed control spectrum. Minimum carrier is 10 gpa for ground (20 gpa recommended) or 5 gpa for aerial application. Use adjuvants recommended for hooded sprayer application, but MSO may be most effective. There are no preharvest intervals for vegetable legume crops. Application may be made when the crop is mature and the grain has begun to dry down (pods buckskin color and <30-40% green leaves remain).

SENCOR (metribuzin) ($4.35-8.65)

.25-.5 lb Sencor 75DF (.19-.38 lb ai)

Special 24(c) local needs labeling for South Dakota allows use on lentil. Sencor gives good to excellent control of small-seeded annual broadleaves and fair to good control of certain large-seeded broadleaves. Results in SDSU tests have been variable; best potential is for use as a partner with other herbicides. Do not apply more than .5 lb Sencor per acre per year. Crop injury may result under stress conditions caused by cold weather, low fertility, disease or insect damage, or if application is followed by heavy rain. Do not apply to Estin lentils. Do not use on coarse-textured soils, soils with less than 1.5% OM or clay knobs or poorly covered subsoils. Do not apply within 75 days of harvest. Do not graze or feed treated vines to livestock within 40 days after application. Overlapping may cause crop injury.

PRE: Apply .25 to .5 lb Sencor DF per acre prior to or after planting. Use higher rate for fine textured soils or fields with a history of high weed populations. Minimum carrier is 10 gpa for ground and 5 gpa for air. Do not apply on shallow seedings less than 2 inches deep.

SENCOR (Continued . . .)

POST: Apply .25 to .33 lb Sencor DF per acre when weeds are less than 2 inches tall and crop is less than 6 inches tall. Minimum carrier is 20 gpa for ground and 5 gpa for air. Do not exceed 40 psi for ground application. Temporary crop chlorosis may occur. Added risk of crop injury is possible if a postemergence application is made following preemergence application. Do not apply over very moist soils or on wet crop foliage. Do not apply within 3 days after periods of cool, wet, or cloudy weather. Do not apply within 24 hours of other pesticide treatments.

PURSUIT (imazethapyr) ($9.25-13.90)

2-3 oz Pursuit 2L or .72-1.08 oz Pursuit DG (.03-.045 lb ai)

PPI: For control of certain broadleaf weeds and some annual grasses. Apply 3 oz 2L or 1.08 oz 70DG preplant within 1 week of planting. Do not incorporate deeper than 3 inches.

PRE: Apply up to 3 oz per acre immediately after or up to 3 days after planting. Pursuit may be applied in a tank-mix with a registered grass herbicide or applied preemergence following a preplant incorporated application of a registered grass herbicide. Allow at least 60 days between application and harvest. Do not make more than one application per year.

Labeler assumes no risk for crop injury, loss, or damage when used on edible legume crops. The decision to use or not to use this product on edible legume crops is solely that of the grower.

ASSURE II (quizalofop) ($5.75-13.75)

5-12 oz Assure II or Targa .88L (.035-.07 lb ai)

POST: Annual grass and quackgrass from 2 to 6 inches tall. Apply with COC at 1% v/v or 1 gal/100 gal spray or NIS at 0.25% v/v or 1 qt/100 gal spray. Maximum use rate per season is 14 oz/acre. Do not apply within 60 days of harvest. Application intervals should be greater than 7 days apart to allow for regrowth.

POAST (sethoxydim) ($4.90-24.40)

.5-2.5 pt Poast 1.5L (.1-.5 lb ai)

POST: Annual grasses (2-4 inches). Requires COC additive. Apply to actively growing grasses. Do not graze or hay vines for livestock feed. Allow 50 days from application before harvest. Maximum rate per application is 2.5 pt per acre and maximum rate per season is 4 pt per acre.

CLETHODIM PRODUCTS ($6.40-34.25)

6-16 oz Shadow, Arrow 2L or 9-32 oz Select Max, Intensity One 1L (.09-.24 lb ai)

POST: For control of annual grasses. Rates based on grass species and height. Use high rate for heavy grass pressure and/or when grasses are at maximum height. Do not apply within 30 days of harvest. Use NIS at 0.25% v/v. Do not apply more than 32 oz per acre per application or 64 oz per acre per season of 1L formulation. For repeat applications allow a minimum of a 14 day interval.

PARAQUAT PRODUCTS (paraquat) ($3.35-8.40)

0.8-1.3 pt paraquat 3L (.3-.48 lb ai)
1.2-2 pt Gramoxone Inteon (0.3-0.5 lb ai)

Paraquat is available in several brand name products including Gramoxone Inteon, Gramoxone Max, Firestorm, Parazone 3SL and others. Follow specific label directions for product used.

HARVEST AID: Apply when at least 80% of the pods are yellowing and mostly ripe. May apply as split application to improve vine coverage. Do not make more than two applications or exceed a total of 2 pt per acre 2.5L or 1.3 pt per acre for 3L product. Minimum carrier is 20 gpa for ground or 5 gpa for air. Add non-ionic spreader at 1 qt/100 gal spray mix. Do not harvest or graze treated fields for 7 days after spraying. Follow handling precautions, as paraquat is toxic when ingested. Restricted Use Pesticide.

GLYPHOSATE PRODUCTS (glyphosate)

Glyphosate is a non-selective, translocated, foliage-applied herbicide used in reduced tillage systems. Glyphosate is applied before planting up to emergence, as a spot treatment, or as a harvest-aid desiccant in certain situations.

Glyphosate is available in several products having different formulations and different amounts (lbs) of acid equivalent (ae) and active ingredient **(**ai**)**. Examples include:

3 ae, 4 ai: Roundup Original (II) (RT), ClearOut 41 (Plus), Credit (Duo) (Duo Extra) (Extra), Glystar Plus (Original), Glyphomax (Plus), Honcho (Plus), Mirage (Plus), Cornerstone (Plus), Glyphos (X-Tra), Gly-4 (Plus), Buccaneer (Plus), Rattler (Plus), Glyphosate Original, Gly-Flo, Acquire, Glyphosate 41, and Glyphosate 4. ***3.75 ae, 5 ai:*** Roundup UltraMax RT, Roundup UltraMax. ***4 ae, 5.4 ai:*** GlyStar 5 and Roundup Custom. ***4.17 ae:*** Touchdown Total. ***4.5 ae, 5.5 ai:*** Roundup Original Max, Roundup UltraMax II, and Roundup WeatherMax. Some products require the addition of NIS; AMS products at the equivalent rate of 8.5 to 17 lb/100 gal are required for most formulations. Check crop use and application directions on the product being used.

8-32 oz glyphosate 3 lb ae (.19-.75 lb ae)	**($2.05-9.20)**
6.5-26 oz glyphosate 3.75 lb ae (.19-.75 lb ae)	**($2.40-9.60)**
6-24 oz glyphosate 4 lb ae (.19-.75 lb ae)	**($2.45-13.50)**
6-24 oz glyphosate 4.17 lb ae (.19-.75 lb ae)	**($2.75-13.50)**
5.4-21 oz glyphosate 4.5 lb ae (.19-.75 lb ae)	**($3.05-13.35)**

BURNDOWN: Weeds should be actively growing. Avoid tillage for one day after treating annual weeds and three to seven days for perennials. Some products contain adequate surfactant; others require NIS additive. AMS at 8.5 to 17 lb/100 gal is required. Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Use caution to avoid droplet drift to non-target crops. Follow tank cleanup procedures to avoid crop damage from equipment contamination. A number of glyphosate products are labeled.

SPOT TREATMENT: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage. Crop will be killed in treated areas. Allow a 14 day preharvest interval for spot treatment. Refer to specific glyphosate product label for rates, and precautions.

PREHARVEST: Supplemental labeling for South Dakota and other states allows for preharvest use of several glyphosate products, which include: Roundup Original Max, Roundup UltraMax II, RT Master II, Roundup WeatherMax, Duramax, Durango DMA, Credit, Credit Extra, and Glyphomax XRT. Apply up to 17 oz per acre of Roundup Original Max or 19 oz Duramax or Durango DMA at the hard dough stage or less than 30% grain moisture. Ground or aerial application at 3 to 20 gal per acre carrier. Apply at least 14 days before harvest. Make only one application per year, do not apply a spot treatment and preharvest spray on the same crop area. Do not apply to seed crop as germination and seed vigor reduction may occur. Do not feed or graze livestock with treated vines and hay or feed grain intended for livestock use.

WEED RESPONSE to HERBICIDES for PULSE CROPS

WEED RESPONSE:

Weed control percentages are intended as a guide for comparing alternatives. Percentages are estimated based on favorable conditions.

10, 9	Excellent.	90-99%	Usually over 90%.	Best choice for weed.
8,7	Good.	80-90%	Sometimes under 80%.	Usually satisfactory.
6	Fair.	70-80%	Sometimes under 70%.	Sometimes unsatisfactory.
5	Marginal.	50-70%	Seldom over 70%.	Seldom satisfactory.
4	Poor.	<50%	Usually under 50%.	Not effective.
0	None.		No control.	

	WEED RESPONSE																			
HERBICIDE	Black Nightshade	Wild Buckwheat	Canada Thistle	Common Cocklebur	Kochia	ALS Kochia	Common Lambsquarters	Wild Mustard	Redroot Pigweed	Prickly Lettuce	Common Ragweed	Russian Thistle	Pennsylvania Smartweed	Common Sunflower	Barnyardgrass	Green Foxtail	Yellow Foxtail	Quackgrass	Wild Oats	Volunteer Wheat
PPI/PRE:																				
Aim	7	6	4	6	7	7	6	8	7	6	6	7	5	6	0	0	0	0	0	0
Command	5	4	0	6	8	8	5	4	5	0	6	7	5	5	6	8	7	0	0	4
Dual II Magnum	7	4	0	0	4	4	4	0	7	4	4	5	4	0	8	9	8	0	4	4
Eptam	8	5	0	0	4	4	6	0	6	0	5	5	4	0	9	10	10	6	9	5
Far-go	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	9	0
Outlook	7	4	0	0	4	4	5	0	7	4	4	6	4	0	8	9	8	0	4	4
Micro-Tech or Intrro	7	4	0	0	4	4	5	0	7	4	4	6	4	0	8	9	8	0	4	4
Prowl	0	4	0	0	6	6	6	0	8	4	4	6	4	0	9	10	9	0	4	4
Pursuit	9	6	4	8	8	4	5	10	9	5	6	8	7	8	6	8	6	0	5	4
Sonalan	5	5	0	0	7	6	7	0	9	4	4	8	4	0	9	10	9	0	6	4
Spartan	8	5	0	4	8	8	7	0	9	0	4	6	6	0	4	5	4	0	0	4
Trifluralin	0	5	0	0	6	6	6	0	9	4	4	7	4	0	9	10	9	4	5	4
POST:																				
Assure II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10	10	9	9	10
Basagran	6	6	9	9	5	5	6	9	4	6	7	5	8	7	0	0	0	0	0	0
MCPB (sodium salt)	4	4	7	7	5	5	8	10	6	6	7	7	7	7	0	0	0	0	0	0
Poast	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	10	10	8	8	10
Raptor	9	7	0	8	8	4	7	10	9	5	6	9	9	8	7	9	7	0	4	4
Select Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	10	10	8	8	10

FS525PC: 1500 copies printed by CES at a cost of $0.80 each. May 2009