

# Crop Profile for Beans (Snap) in Delaware

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## Production Facts

- In 2002, 307,101 acres of snap beans were harvested in the United States. 197,602 of these acres were for processing (1).
- The value of US production in 2002 was approximately \$954,000,000 (2).
- In 2005, 2,000 acres of snap beans were planted for processing in Delaware (3).
- In 2005, 600 acres of snap beans were planted in Delaware for fresh market (4).
- The value of Delaware production in 2002 was approximately \$10,000,000 (3)

## Production Regions

Most snap bean production in Delaware is centered in Sussex County.

## Cultural Practices

Beans do well in warm weather and do not tolerate frost. Bean seed will not germinate below 55°F. Optimum soil temperature for germination is 70–75°F. Temperatures above 80°F and below 50°F slow growth.

Beans should be grown on fertile, light-to-medium texture, well drained soil. Heavy, poorly drained soils will result in losses from root rots. Uniform soil type and texture promotes uniform emergence, growth, and maturity, which is essential for machine harvest.

Beans grow best at pH 6.5 to 7.0. Optimum soil test levels are 150 pounds available P and 300 pounds available K per acre. P and K should be broadcast and plowed down prior to planting. Apply nitrogen at the rate of 40 pounds per acre in a band 2 inches to the side and 2 inches below the seed at planting.

Very dry bean seeds are subject to mechanical injury during handling and planting. When injured seeds are planted in cool soils, physiological diseases often occur. To avoid injury, expose bean seeds to the air for few days to raise the internal moisture levels.

Snap beans are planted from spring to late summer. Seeds are planted 1/2 to 1.5 inches deep, depending on soil moisture and temperature. They should be planted as shallow as possible as long as sufficient moisture is available. Beans can be planted in 18 to 40 inch rows, depending on harvest method -- 6 to 8 seeds per foot in 30 to 40 inch rows (70 pounds seed per acre) and 5 to 7 seeds per foot of row in 18 to 30 inch rows (90 pounds seed per acre).

All snap beans for processing and most for fresh market are harvested with mechanical harvesters. Processors require beans at different stages of maturity and will advise when crops grown for them are ready for harvest. For fresh market, beans are picked when the majority of pods have filled out. After harvest, beans must be kept cool (40 to 50F) and at 90% or more relative humidity to avoid wilting. Beans do not store well and should be moved to market as soon as possible.

### Worker Activities and Timing (5)

Planting – Fresh Market: April 10 to August 10; Processing: April 20 to August 10 (5).

Cultivation/ weed control – Weed control is accomplished primarily through use of herbicides (5).

Harvest – Fresh Market: June 20 to October 20; Processing: July 1 to October 20. All Snap beans are harvested mechanically.

## **Insect and Nematode Pests**

The following insect pests are known to attack snap beans in the mid-Atlantic area: seed corn maggot, thrips, potato leafhopper, spider mites, Mexican bean beetle, European corn borer, and corn earworm. The occurrence of economic levels of any one insect pest can vary from year to year depending on tillage practices, cover crops, planting date and weather factors. The following discussions are based on averages of the last 5 years of field observations.

### **Seed Corn Maggot**

This insect is primarily a pest of spring planted beans, It is primarily a problem during cool, wet growing seasons. Only a few maggots per seed or plant can significantly reduce stands. Maggots overwinter as puparium in the soil with flies emerging as early as late February. Eggs are laid in freshly plowed fields as well as at the base of overwintered spinach plants. Outbreaks are favored by planting into freshly plowed ground that is high in organic matter; freshly manured fields; and/or heavy crop residues (e.g. small grain covers) where tillage is delayed and/or surface residue is visible after tillage operations.

**Monitoring:** Scouting and applying rescue treatments after the damage is observed are ineffective. Management options must be applied to high-risk fields prior to planting.

**Controls:****Biological:** None Available

**Cultural:** The use of cultural management practices before planting is critical to reduce the potential for economic problems. A combination of the following cultural strategies can be used: (1) plow down cover crops at least 3-4 weeks before planting or transplanting, (2) completely bury cover crops or previous crop residue to reduce fly attraction to rotting organic matter on the soil surface, and (3) avoid the use of heavy manure applications close to planting.

**Chemical:**

- Thiamethoxam (Cruiser--1.28 oz 5FS/100 lbs of seed) – Commercial applied seed treatment
- diazinon--0.50 oz 50W/bu seed. Planter-box treatment. Existing stocks in the marketplace with old labels can be used as a planter box treatment.
- Chlorpyrifos (Lorsban--2 oz 50SL/100 lb seed.) Available only as a commercially-applied seed treatment.

### Thrips

This insect is also a pest of spring planted beans with peak populations generally occurring one month after planting. During hot, dry weather, feeding damage can result in yellow leaves, stunted plants, delayed maturity, and reduced yields.

**Monitoring :** Sample for thrips from plant emergence through bloom. Collect 5 leaves in each of 10 locations throughout the field and count the number per leaflet. Leaflets should be selected from the middle and top half of non-consecutive plants. An insecticide treatment may be needed if thrips populations exceed 6 per leaflet. If plants are drought stressed and other insects are present, the threshold may need to be reduced by one third to one half.

**Controls:****Biological:** None**Cultural:** None

**Chemical:** Soil insecticides are not recommended for thrips management in snap beans. When weather conditions are favorable for thrips outbreaks, foliar applications are often needed. Treatments should be applied if thrips are present from cotyledon stage to when the first true leaves are established and/or when first blossoms form. Snap beans generally mature in 60 days or less.

- Methomyl (Lannate LV) 1.5 - 3 pt/acre (1.5 pt/a = 1 day PHI; over 1.5 pt/a = 3 day PHI).
- Carbaryl (Sevin 80S ) 1.25 lb/acre
- Imidacloprid (Admire Pro) 7.0-10.5 fl oz 4.6F/A
- imidacloprid (Admire; generics available)--16-24 fl oz 2F/A.
- bifenthrin (Capture; generics available)--2.1-6.4 fl oz 2EC/A.
- spinosad (Entrust – 1.5-2 oz 80W).
- acephate (Orthene) --0.5-1.0 lb 97S/A
- gammacyhalothrin (Proaxis) --2.56-3.84 fl oz /A
- spinosad (Spintor)– 4.5-6 fl oz 2SC/A
- lambda-cyhalothrin (Warrior; generics available)--2.56-3.84 fl oz /A.

Note. Use of Sevin may result in mite population out-break. Do not use Sevin if mites are present.

### **Potato Leafhopper**

Plants appear yellow and stunted, with the typical "hopper burn" damage on the tips of the leaves. Both yields and plant maturity can be affected by leafhopper feeding from the seedling to pre-bud stage. Once pods are present, economic damage is less likely to occur.

**Monitoring:** Fields should be sampled for leafhopper adults and nymphs on a weekly basis from the seedling through the pod development stage. Treat only if the number of adults plus nymphs exceeds 100 per 20 sweeps during prebloom, 250 per 20 sweeps during bloom, or 500 per 20 sweeps during pod development.

**Controls:**

**Biological:** None

**Cultural:** None

**Chemical:**

- Admire Pro--7.0-10.5 fl oz 4.6F/A
- Imidacloprid (Admire; generics available)--16-24 fl oz 2F/A
- Asana XL --5.8-9.6 fl oz 0.66EC/A
- bifenthrin (Capture; generics available)--1.6-6.4 fl oz 2EC/A
- dimethoate--0.5-1 pt 4EC/A
- Lannate--0.75-3 pt LV/A
- Mustang MAX--2.72-4 oz/A
- Orthene--0.5-1.0 lb 97S/A.
- Proaxis--2.56-3.84 fl oz /A
- imidacloprid (foliar-Provado; generics available)--3.5 fl oz 1.6F/A

- Sevin--1.25 lb 80S/A
- lambda-cyhalothrin (Warrior; generics available)--2.56-3.84 fl oz /A

### **Spider Mites**

Spider mites can be a problem in snap beans, especially during hot, dry weather. Damage will first appear as a white stippling on the leaves with eventual plant death if economic levels go undetected. They are primarily found on the undersides of leaves making the leaves appear tan or yellow in color. Mites feed on the plant sap and can defoliate fields in a few weeks in hot, dry weather. Defoliated plants will produce poor yields and quality beans.

**Monitoring:** Since mite infestations can begin along field margins next to grassy areas, be sure to carefully sample these areas early in the season. Once populations explode in hot, dry weather, control is extremely difficult. Look for the early signs of white stippling at the base of the leaflets. Mites can be identified by shaking leaves onto a sheet of white paper and watching for moving specks or by using a hand lens to count the number of mites per leaflet. From early July through mid-August, examine 5 leaflets in 10 locations throughout a field for the presence of mites and feeding damage. A treatment should be applied when white stippling is first noticed and you find 20 or more mites per leaflet.

**Controls:**

**Biological:** None

**Cultural:** None

**Chemical:**

- bifenthrin (Capture; generics available)--5.12-6.4 fl oz 2EC/A
- Kelthane MF--1-3 pts EC/A

### **Mexican Bean Beetle**

This insect is the major defoliating pest of beans in the mid-Atlantic region. Adult beetles overwinter in hedgerows, ditch banks and woodlands near host crops. Adults become active in late April to mid-May. If overwintering populations are heavy, damage can occur in early-planted snap beans at plant emergence. In general, economic levels of the Mexican bean beetle (MBB) are not found before late July. Both adults and larvae can cause damage to beans. Feeding damage can reduce bean yields and pod quality if defoliation exceeds 10%, especially after bloom.

**Monitoring:** At plant emergence, sampling should begin on a weekly basis along field margins next to overwintering sites. When plants are small, examine the undersides of

all plants in 3 foot of row and count the number of adults and larvae and estimate the percent stand reduction or defoliation. Since populations of overwintered adults tend to occur in "hotspots", be sure to note the predominant life and the location of the infestation. When plants are larger, a sweep net or drop cloth should be used to assess the population. Before the first trifoliolate stage, a treatment should be considered if you find 6 or more beetles per row foot and no more than a 25% stand reduction. At the first to third trifoliolate, the treatment threshold is 2 or more beetles per plant and 20% defoliation. After the third trifoliolate and before the bud stage, treatment is suggested if defoliation exceeds 20 percent. From the bud stage until harvest, treat if defoliation exceeds 10% and populations are increasing.

### **Controls:**

**Biological:** On farms with a succession of bean plantings, the release of the parasite, *Pediobius foveolatus*, may provide effective control.

**Cultural Controls:** The use of an early planted trap crop for overwintered beetles has been effective in soybeans. A trap crop consisting of a mixture of snap beans and soybeans planted at least 3 weeks before the main crop will attract overwintering beetle. Beetles found in the trap crop could then be control by plowing under or spraying the trap crop with an insecticide. **However**, this system has only been demonstrated on soybeans. Growers/consultants have indicated that this would not be a practical option for commercial snap bean production.

### **Chemical:**

- Asana XL --2.9-5.8 fl oz 0.66EC/A
- azadirachtin (Azatin, Ecozin, Neemix) – (larvae only) Note: activity is enhanced when a pyrethrin is added.
- Mustang MAX--2.72 oz/A
- Orthene--0.5-1.0 lb 97S/A
- Lannate--0.75-3 pt LV/A
- Sevin--0.625-1.25 lb 80S/A
- lambda-cyhalothrin (Warrior; generics available)--1.92-3.20 fl oz/A

## European Corn Borer (ECB)

This insect is the major pest of snap beans mainly because larvae cause contamination problems. Larvae can cause economic yield loss; however, the contamination level is usually reached before this point. If egg hatch occurs before bloom, young larvae feed on the leaves for 7-10 days before boring into the stems. Since larvae do not pupate in the stems, older larvae emerge and bore into the pods. If egg hatch occurs at or after bloom, larvae of all sizes will bore directly into the pods.

**Monitoring:** Direct field sampling for ECB larvae is not practical because of the low tolerance level for pod damage. Recommended treatment schedules are based on the level of moth activity as determined by black light trap monitoring. For the most precise decisions, traps should be placed within one mile of each field. Traps should be serviced 3 times per week, preferably daily when moth activity increases. The most critical time for corn borer treatment occurs at the bud-early bloom and pin stages. After the pin spray, the following thresholds and spray intervals should be considered:

Number ECB Moths in BLT/ 5 Days	Spray Interval
Less than 10	No Spray
10 - 25	7 Day
26 - 50	6 Day
51 - 75	5 Day
76 - 250	4 Day
250 +	3 Day

**Controls:**

**Biological:** None

**Cultural:** None

**Chemical:**

- Asana XL --5.8-9.6 fl oz 0.66EC/A
- bifenthrin (Capture; generics available)--2.1-6.4 fl oz 2EC/A
- Entrust--1.0-2.0 oz 80W/A
- Lannate--1.5-3 pt LV/A
- Mustang MAX--2.72-4 oz/A
- Orthene--0.75-1.0 lb 97S/A
- Proaxis--2.56-3.84 fl oz /A
- SpinTor--3-6 fl oz 2SC/A
- lambda-cyhalothrin (Warrior; generics available)--2.56-3.84 fl oz /A

## Corn Earworm (CEW)

This insect is mainly a pest of late planted beans. In some years it is the predominant pest. In other years it is found at the same time and level as the ECB. Severe corn earworm infestations can result in significant yield loss but in recent years this insect has also caused contamination problems.

**Monitoring:** Although the standard drop cloth method is used for earworm detection in soybeans, this method may detect worms too late in snap beans and should only be used to detect small larvae. Black light traps, pheromone traps, and direct observation of moths in fields should be used to monitor moth activity. As a general guideline, sprays should be applied when black light trap catches exceed 20 per night. The spray interval will vary depending on corn borer moth activity and temperature. During periods of high temperatures, young larvae move directly to the pods. Since specific thresholds based on pheromone trap catches are not available, these traps are used to detect the first occurrence in a peak in moth activity.

### **Controls:**

**Biological:** None

**Cultural:** None

### **Chemical:**

- Asana XL (Snap beans only)--5.8-9.6 fl oz 0.66EC/A
- bifenthrin (Capture; generics available)--2.1-6.4 fl oz 2EC/A
- Lannate--1.5-3 pt LV/A
- Mustang MAX--2.72-4 fl oz/A
- Proaxis--2.56-3.84 fl oz /A
- lambda-cyhalothrin (Warrior; generics available)--2.56-3.84 fl oz /A

Table 1. REI, PHI and % crop treated

Insecticide	REI (hours)	PHI (days)	% Snap Bean Crop Treated
esvenvalerate (Asana XL)	12	3	<5%
azadirachtin	12	0	0%
<i>Bacillus thuringiensis</i>	4	0	<1%
bifenthrin(Capture)	12	3	30%
dimethoate	48	0	10%
Spinosad (Entrust)	4	3	<1%
imidacloprid (Admire/ Provado)	12	21/ 7	0%

Methoxyfenozide (Intrepid)	12	7	<1%
Dicofol (Kelthane MF)	12	21	<2%
Methomyl (Lannate)	48	3	15%
Insecticidal soap (M-Pede)	12	0	0%
lambda-cyhalothrin (Warrior)	24	7	20%
Zeta-cypermethrin (Mustang MAX)	12	1	20%
Acephate (Orthene)	24	14	30%
Gammacyhalothrin (Proaxis)	24	7	<5%
Carbaryl (Sevin)	12	3	0%
Spinosad (SpinTor)	4	3	<5%
Phorate (Thimet)	48	60	0%

### Nematodes

Use Mocap 15G at 13-20 lb/A (0.9 to 1.4 pound per 1000 linear feet of row) or Mocap 6EC at 1.33 to 2 quarts per acre. REI = 48 - 72 hrs. Apply in a 12-inch band on the row. Do not use as an in-furrow treatment. Races 1,3,5 and 9 of the soybean cyst nematode are present in soybeans in Delaware. Snap beans are susceptible. Growers who rotate snap beans with soybeans should be alert to the possibility of problems in infested fields. Soil sampling for SCN and root knot nematode is highly recommended.

## Diseases

### Anthracnose and Web Blight (*Rhizoctonia*)

Use western-grown seed and rotate to allow 2 years between bean plantings. When disease appears and environment favors development, use one of the following:

Azoxystrobin (Quadris--6.2-15.4 oz 2.08F/A Amistar--2-5 oz 80WDG/A), (rhizocotonia only). REI = 4 hrs. PHI = can apply day of harvest. 0-2% of crop treated.

Pyraclostrobin (Headline--6-9 fl oz 2.1EC/A ). REI = 12 hrs. PHI = 7 days. 0-2% of crop treated.

### Bacterial Blight

Use western-grown seed. Fixed copper (1 lb ai/A) is of some value in reducing spread where incidence is low. Rarely used.

### **Bean Rust (*Uromyces appendiculatus*)**

Rust is a problem only in late summer. Plant resistant varieties whenever possible. For susceptible varieties, spray when the disease first appears, and repeat every 7 days. 0-10% of the fall crop has one of the following fungicides applied:

Azoxystrobin (Quadris--6.2-15.4oz 2.08F/A or Amistar--2-5 oz 80WDG/A), (rhizocotonia only). REI = 4 hrs. PHI = can apply day of harvest.

Myclobutanil (Nova--4-5 oz 40W/A). REI = 24 hrs. PHI = can apply day of harvest.

Pyraclostrobin (Headline--6-9 fl oz 2.1EC/A). REI = 12 hrs. PHI = 7 days.

Chlorothalonil--2-4 pt 6F/A. REI = 48 hrs.

### **Soybean Rust (*Phakopsora pachyrhizi*)**

It has not been determined yet if soybean rust is going to be a production problem in the Mid-Atlantic area on snap bean. If soybean rust should threaten this crop, experience on soybean indicates that preventative applications are best.

Azoxystrobin (Quadris--6.2 fl oz 2.08F/A or Amistar--2 oz 80WDG/A). REI = 4 hrs. PHI = can apply day of harvest.

Pyraclostrobin (Headline--6-9 fl oz 2.1EC/A). REI = 12 hrs. PHI = 7 days.

Myclobutanil (Nova--4-5 oz 40W/A). REI = 24 hrs. PHI = can apply day of harvest.

### **Root Rots**

Rotate beans with nonlegume crops. Avoid poorly drained soils. Plow under previous crop residue rather than disking it. Root rot is caused by a complex of soilborne fungi including Rhizoctonia, Pythium and Fusarium. The primary fungus causing root rot in the mid-Atlantic region is Pythium. Pythium causes extensive damage in July and August during periods of warm, humid weather. Pythium can also cause extensive pod rot on snap beans. Select varieties that set high in the plant and use a close row spacing to avoid pod contact with the soil to reduce disease incidence. Apply one of the following at planting:

Ridomil Gold--0.5-1 pt 4E/A. Apply in a 7-inch band over the row at seeding. (for Pythium only). REI = 48 hrs. 10-25% of late planted acreage after July 4 th is treated.

To provide control of root rot caused by Pythium and Rhizoctonia, apply the following:

Ridomil Gold PC--12 oz 11G/1,000 foot of row. Adjust application equipment so that granules are uniformly applied in the furrow at planting. 10-25% of late planted acreage after July 4 th is treated.

To provide control of root rot caused by Rhizoctonia, apply the following in a band up to 7 inches wide:

Azoxystrobin (Quadris at 0.4-0.8 fl oz 2.08F/1000 ft of row or Amistar at 0.125-0.25 oz 80WDG/1000 ft of row.). REI = 4 hrs. PHI = can apply day of harvest. 0-10% of late planted acreage after July 4 th is treated.

### **Lima Bean Downy Mildew**

Races B, D, E, and F have been found in the mid-Atlantic area during the past 10 years. Race F was the predominant race detected on susceptible varieties in 2003 and 2004 and the only race detected in 2006. Use resistant varieties where possible. Conditions for disease are favorable when fields receive 1.2 inches or more of rain within 7 days and when the average daily temperature during this period is 78°F (25.6°C) or less. If a period of 90°F (32.2°C) occurs during this period, the cycle is broken, and an additional 7-day period with the above weather conditions is necessary to start infection. Periods of fog or heavy dew can lower the amount of rain necessary for infection to occur. Since environmental conditions vary from field to field and in different locations within a field, use the above information as a guideline. Fields that are not rotated and planted to susceptible varieties should be scouted regularly for disease occurrence. When weather conditions are favorable for disease or when disease is observed in the field, use the following:

Copper, fixed (Champ DP, KocideDF)--2 lb 58DE/A. REI = 24 hr. 50-75% of late planted crop is treated.

A Section 24 (c) registrations in DE is in effect for the use of Ridomil Gold/Copper (2lb/A). Phostrol also has a 24 (c) registration in DE. Only about 10% is treated unless weather is very favorable for infection and has occurred close-by then treated acres increases with Ridomil or Phostrol.

### **Lima Bean Pod Blight (*Phytophthora capsici*)**

Rotate away from other susceptible crops such as peppers, cucurbits, and tomatoes. Avoid heavy irrigations and irrigations at night. In fields with a history of *Phytophthora* blight on peppers and cucurbits, applications of a fixed copper fungicide every 7-10 days may be beneficial for control.

Copper, fixed--(Champ DP, Kocide DF)--2 lb 58DF/A. REI = 24 hr.  
Not used in DE.

### **White Mold (*Sclerotinia*) and Gray Mold (*Botrytis*)**

*Preplant:* For white mold only, the following biological fungicide has been tested in some states; however, limited information is available on effectiveness in the Mid-Atlantic region. Apply 3 to 4 months prior to the onset of disease to allow the active agent to reduce levels of sclerotia inoculum in the soil. Following application, incorporate to a depth of 1 to 2 inches but do not plow before seeding beans to avoid untreated sclerotia in lower soil layers from infesting the upper soil layer.

Contans--2-4 lb 5.3WG/A. Not used in DE.

*Post seeding:* Fungicide sprays are needed *only* when the soil has been wet for 6 to 10 days before bloom. For snap beans, a fungicide should be applied at 10-20% bloom. A second spray should be made 7-10 days after the first spray, if the soil remains wet and blossoms are still present. Use one of the following:

Boscalid (Endura--8-11 oz 70W/A.). REI = 12 hrs. PHI = 7 days.  
Endura--5 oz/A + thiophanate-methyl (0.7-1.05 lb/A active ingredient)

iprodione (Rovral--1.5-2 pts 4F/A). REI = 24 hrs. PHI = apply no later than peak bloom.

thiophanate-methyl (Topsin M--1.5-2 lb 70WP/A). REI = 12 hrs. PHI = 14 days.

thiophanate-methyl (Topsin M 11.2 oz 70WP) plus

chlorothalonil--1.5 pts 6F/A. REI = 48 hrs.

cyprodinil (Switch--11-14 oz/A 62.5WG). REI = 12 hrs. PHI = 7 days.

Switch--6-11 oz/A 62.5WG + thiophanate-methyl (0.7-1.05 lb/A active ingredient)

Some years most of the acreage will be treated in DE. In 2006 very little acreage was treated.

## Weeds

### No-Till

Very little no-till snap beans are grown in Delaware

### Preemergence

S-metolachlor--0.63-1.91 lb/A. Apply 0.66 to 2 pints per acre Dual Magnum 7.62E after seeding and before emergence. Tank-mix with Glyphomax Plus, Roundup Ultra Max 4SC, Touchdown, Gramoxone Max 3SC or Gramoxone Inteon 2SC to control emerged weeds. +85% of crop treated: REI = 24 hr.

Clomazone--0.094-0.188 lb/A. (See the following "clomazone" paragraph in conventional tillage). 5% of crop treated: REI = 12 hr.

Glyphosate--0.75-1.1 lb acid equivalent/A. Apply 1.6 to 2.4 pints per acre Roundup Ultra Max, 2 to 3 pints per acre Touchdown, or 2 to 3 pints per acre Glyphomax Plus after seeding and before emergence. Tank-mix with Dual Magnum 7.62E for residual weed control. Roundup Ultra Max 4SC controls many perennial weeds as well as annuals if applied when the weed is actively growing and has reached the stage of growth listed on the label. 95% of crop treated REI = 4 hr.

Paraquat--0.6-1 lb/A. Apply 2.4 to 4.0 pints per acre Gramoxone Inteon 2SC after seeding but before emergence, or as a split application before and after seeding to control emerged annual weeds. Do not exceed the maximum total labeled rate when using the split application. Tank-mix with Dual Magnum 7.62E for residual weed control. 5% of crop treated REI = 24 hr.

### Conventional Tillage

### Preplant Incorporated

EPTC--2.5-4 lb/A. Apply 3 to 4.5 pints Eptam 7E or 25 to 30 pounds of Eptam 10G. Useful for nutsedge control, annual grasses, and some broadleaf weeds. Incorporate by disking twice into 3 to 4 inches of soil immediately after application. Tank-mix with Treflan to improve control of common lambsquarters. Combining Eptam with Dual

Magnum may improve weed control but may increase the risk of crop injury when weather conditions are adverse. % of crop treated: <15%. REI = 12 hr.

Imazethapyr (lima beans)--0.024-0.047 lb/A. Apply 1.5 to 3 fluid ounces per acre Pursuit 2SC. Shallow, thorough incorporation improves consistency of performance when dry weather follows application. Primarily controls broadleaf weeds. Combine with another herbicide to control annual grasses. Pursuit residues persist in the soil after harvest and may affect following crops. DO NOT exceed 3 fluid ounces per acre of Pursuit 2SC at planting or make more than one application per acre per year. REI = 4 hr. 90 % crop treated.

S-metolachlor--0.63-1.91 lb/A. Apply 0.66 to 2 pints per acre Dual Magnum 7.62E. Incorporate 2 to 3 inches deep by disking twice with blades set 4 to 6 inches deep. Primarily controls annual grasses and nutsedge. % of crop treated: 85%+. REI = 24 hr.

Trifluralin--0.5-0.75 lb/A. Apply 1 to 1.5 pints per acre of Treflan 4E or 10 to 15 pounds per acre of Treflan 5G. Incorporate it into 2 to 3 inches of soil within 8 hours after application. Primarily controls annual grasses and a few broadleaf weeds. Treflan may be applied up to 4 weeks prior to planting. Do not use or reduce the rate used when cold, wet soil conditions are expected, or crop injury may result. % of crop treated: 50%. REI = 12 hr.

### **Preemergence**

Clomazone--0.094-0.188 lb/A. Apply 4 to 8 fluid ounces per acre Command 3ME to control annual grasses and many broadleaf weeds including common lambsquarter, velvetleaf, spurred anoda, and jimsonweed. Mustards, morningglory species, and pigweed species will not be controlled. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Combine with Dual Magnum 7.62E to control yellow nutsedge and pigweed. Some temporary crop injury (partial whitening of leaf or stem tissue) may be apparent after crop emergence. Complete recovery will occur from minor early injury without affecting yield or earliness. WARNING: Command spray or vapor drift may injure sensitive crops and other vegetation up to several hundred yards from the point of application. Do not apply when wind or weather conditions favor herbicide drift. Do not apply to fields adjacent to horticultural, fruit, vegetable, or other sensitive crops. Drift injury from offsite Command movement is extremely apparent; therefore, do not use Command on fields near sensitive locations. Herbicide residues may limit subsequent cropping options when Command is used for weed control in snap beans. % of crop treated: <5%. REI = 12 hr.

DCPA --6-10.5 lb/A. Apply 8 to 14 pints per acre Dacthal 6F. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. Results have been most consistent when used in fields with coarse-textured soils low in organic matter and when the application was followed by rainfall or irrigation. % of crop treated: <1%. REI = 12 hr.

Halosulfuron 0.024-0.047 lb/A--Apply 0.5 to 1.0 dry ounces of Sandea 75 DF preemergence to control or suppress yellow nutsedge and many annual broadleaf weeds Results have been most consistent when the application was followed by rainfall or irrigation. Use the lower rate on coarse-textured (sandy) soils low in organic matter, and the higher rate on fine-textured (silt and clay) soils. Observe a thirty (30) day preharvest interval (PHI). Do NOT apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. <10% of crop treated: 10%. REI = 12 hr.

S-metolachlor--0.63-1.91 lb/A. Apply 0.66 to 2 pints per acre Dual Magnum 7.62E. Primarily controls annual grasses and a few broadleaf weeds. % of crop treated: 85%. REI = 24 hr.

### **Postemergence**

Bentazon--0.5-1 lb/A. Apply 1 to 2 pints per acre Basagran 4SC when beans have fully expanded first trifoliolate leaves. Use lower rate to control common cocklebur, mustards, and jimsonweed and the higher rate to control yellow nutsedge, common lambsquarter, common ragweed, and Canada thistle. Temporary, pronounced crop injury may be observed that can result in delayed maturity. The use of oil concentrate may increase the risk and severity of crop injury. To reduce the risk of crop injury, omit additives or switch to a nonionic surfactant when weeds are small and soil moisture is adequate. Do not spray when temperatures are over 90oF (32.2oC). % of crop treated: 20%. REI = 24 hr. PHI = 30 days.

Fomesafen—0.125-0.188 lb/A. Apply 0.5 to 0.75 pints per acre of Reflex 2SC when snap beans have one to two fully expanded trifoliolate leaves. The recommended rate is lower than the labeled rate to reduce the risk of crop injury. Use the lower recommended rate when weeds are small or when plentiful soil moisture, high humidity, and warm cloudy weather cause “soft” growing conditions. Add nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray). Tank-mix with bentazon (Basagran) to improve the control of common lambsquarter. Observe labeled plantback restrictions. Do NOT apply to any field more than once every two years. % of crop treated: 90%.. REI = 24 hr. PHI = 30 days.

Halosulfuron--0.024-0.031 lb/A. Apply 0.5 dry ounces of Sandea 75 DF plus nonionic surfactant to be 0.25 percent of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control yellow nutsedge and certain annual broadleaf weeds. Applications should be sprayed when the crop has 2 to 3 trifoliolate leaves and

annual weeds are less than 2 inches tall. Treatments applied when beans are younger increases the risk of temporary stunting, and applications after the 3 trifoliate leaf stage increases the risk of a split set. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Occasionally, slight yellowing of the crop may be observed within a week of Sandea application. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. Observe a thirty (30) day preharvest interval (PHI). Do NOT apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. % of crop treated: 10%. REI = 12 hr.

Quizalofop-P-ethyl--0.04-0.08 lb/A. Apply 6 to 12 fluid ounces per acre Assure II/Targa 0.88EC postemergence to control most annual and perennial grasses. Add with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or nonionic surfactant to be 0.25 percent of the spray solution (1 quart per 100 gallons of spray solution). For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, and broadleaf weeds will not be controlled. Do not tank-mix with other pesticides unless labeled, as the risk of crop injury may be increased or reduced control of grasses may result. Observe a minimum preharvest interval of 15 days and apply no more than 14 fluid ounces per acre in one season. % of crop treated: 3%. REI = 12 hr.

Sethoxydim--0.2-0.3 lb/A. Apply 1 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within one week before or after Basagran or any other pesticide unless labeled. The risk of

crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 15 days and apply no more than 4 pints per acre in one season. % of crop treated: 5%. REI = 12 hr.

## **Postharvest**

Paraquat--0.6 lb/A. A Special Local-Needs 24(c) label has been approved for the use of Gramoxone Inteon 2SC for postharvest desiccation of the crop in Delaware. Apply 2.4 pints per acre Gramoxone Inteon 2SC as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. REI = 24 hr. <5% of crop is treated.

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