Crop Profile for Snap Beans in Virginia

Prepared June, 2001

General Production Information

- In 1999, 6,100 acres of snap beans were planted and 4,500 acres were harvested for the fresh market from approximately 280 farms in Virginia.
- The 1999 harvest was down 700 acres from 1998.
- Snap bean production in Virginia averaged 30 cwt./acre in 1999.
- A total of 13.5 million pounds of snap beans were produced within Virginia in 1999, valued at $2,565,000 or roughly $0.19/lb.
- All of the acreage reported in 1999 was grown for the fresh market.
- Virginia ranked 7th in the nation, accounting for 2.4% of the 1999 U.S. fresh market snap bean production.
- Additional snap bean acreage is grown within Virginia and contracted to large processing companies located out-of-state. The exact acreage cannot be released as a result of disclosure laws.

Production Regions:
The majority of the snap bean acreage is located on the Eastern Shore of Virginia in Accomack and Northampton counties. Snap beans are also produced to a smaller degree in southeastern Virginia within Chesapeake and Virginia Beach counties and in the southwestern counties of Carroll, Floyd, and Washington.
Cultural Practices

As indicated in the section on production regions found above, some snap beans are also produced in eastern and western Virginia. Although the growing conditions in eastern Virginia are similar to the Eastern Shore, those in western Virginia are quite different (i.e. soil types, varieties, harvest techniques). Given that the majority of snap beans are grown on the Eastern Shore, the cultural practices discussed below will reflect this region of Virginia.

Sandy loam soils such as Bojack and Munden are best suited for snap bean production on the eastern portions of Virginia. Soil pH should range from 6.0-6.4 with the optimum at 6.2. Phosphorus and potassium are broadcast as needed before planting. Nitrogen (60 lb./acre) is often applied in a band near the seeds at planting. Snap beans are planted in 30-36 inch rows following conventional tillage practices to incorporate these fertilizers.

Snap beans can be produced in two cropping cycles within eastern portions of Virginia. Spring snap beans are typically planted in Virginia from April 1 - May 15 and are usually machine harvested from June 10 - July 10. Fall snap beans are planted August 1 - 25 and are harvested from October 1 - 31. Snap bean varieties typically require 58 to 62 days to reach full maturity. Those recommended for fresh market production in Virginia include the green varieties Bronco, Hialeah, Magnum (flat), and Roma (Italian flat pod) and the wax variety Eureaka. Varieties differ in their pest resistance and yield potentials. All snap beans do well in warm weather and do not tolerate frost.

Most of the fields used for snap bean production on the Eastern Shore have irrigation capabilities. Under ideal conditions, snap beans will receive about 1 inch of rain per week during the growing season. If plants become droughted, irrigation is recommended to maintain optimum growth. Producers typically apply an average of 2 inches of irrigated water for spring planted and also again for fall planted snap beans.

Special Use Labels:
Section 18 Emergency and Special Local-Needs 24(c) Labels are used to supplement the chemical tools available to producers for pest control. Once the problem or gap in pest control has been identified specialists submit the proper documentation for these labels. Thus far, Extension Specialists have been successful in obtaining these labels, which must be applied for annually and are usually only valid for limited time intervals. Given the temporary nature of the emergency/special labels, compounds labeled in this manner were not included in chemical pest sections found below. Local extension offices will usually have the most current emergency/special label information. Without these, pest control in snap beans as well as other vegetable crops would be extremely difficult for producers.
Insect Pests

Insect descriptions found below were modified from information presented in Insects and Related Pests of Vegetables. Control recommendations were taken from the 2000 Commercial Vegetable Production Recommendations--Virginia.

Thrips are a serious pest of spring planted snaps whereas bean leaf beetle, corn earworm, and European corn borers are more common insect pests in fall snap beans. More detailed descriptions of these pests are found below. In addition, the Mexican bean beetle (*Epilachna varivestis*) may be a problem in wet years, the twospotted spider mite (*Tetranychus urticae*) in dry years and the seed corn maggot (*Hylemya platura*) in early plantings if conditions are cool and wet and organic matter is prevalent. Bean aphids (*Aphis fabae*), beet armyworms (*Spodoptera exigua*), cutworms (*Agrotis ipsilon, Peridroma saucia*, and *Feltia subterranea*), leafminers (*Liriomyza* spp.), stink bugs (*Acrosternum hilare* and *Euschistus servus*), tarnished plant bugs (*Lygus* spp.) and whiteflies are sporadic pests of snap beans and are not usually a problem in most fields in most years.

**Bean Leaf Beetle, *Cerotoma trifurcata***

Bean leaf beetle (BLB) adults damage snap beans by feeding on tender leaves and pod tissue, reducing the overall productivity of the plant. Adults are also known vectors of the bean pod mottle, cowpea mosaic, and southern bean mosaic viruses, which are actually more devastating than direct plant feeding. BLBs overwinter as adults in leaf litter and become active as temperatures increase in the spring. They migrate to legumes where they feed and mate. Following mating, the female lays her eggs in the soil at the base of the plants. Larvae hatch and feed on the roots before pupating in the soil to emerge as adults. There are normally two generations per year in Virginia. The second generation causes the greatest damage to fall snap beans.

**Monitoring:** Monitor snap bean plants for defoliation resulting from BLB feeding. Chemical treatment is recommended if defoliation exceeds 20% during prebloom or 10% during podding and there is a population potential for further defoliation.

**Chemical Control:** Apply insecticides during hatch or adult emergence when both eggs and pupae are present. *Capture 2EC, Lannate LV, Sevin XLR*, and *Asana XL* treatments will control BLB.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** No commercially effective controls are available.
**Corn Earworm, *Helicoverpa zea***

The corn earworm (CEW) also known as the soybean podworm, cotton bollworm and the tomato fruitworm is generally a problem in late planted beans around mid- to late-August (i.e. fall snap beans). Severe infestations can result in significant yield loss but may also cause contamination problems in machine harvested beans.

**Monitoring:** Blacklight and pheromone traps can be used to monitor moth flight and alert producers of peak moth activity. Treatment is recommended if CEW catches in local blacklight traps average 20 or more per night and most corn in the area is mature.

**Chemical Control:** Insecticides should be applied every five to seven days following the initial spray at the threshold recommended above.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** No commercially effective controls are available.

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**European Corn Borer, *Ostrinia nubilalis***

The European corn borer (ECB) is a major pest of fall snap beans in Virginia. The ECB feeds on the foliage and pods of snap beans and also bores into plant stems, reducing stability. As was true of CEW, ECB larvae can also cause contamination problems in addition to the damage done through feeding and tunneling. There are three to four generations of this pest per year in Virginia.

**Monitoring:** Blacklight and pheromone traps can be used to monitor moth flight and alert producers of peak moth activity. Treatment is recommended when trap catches of ECB moths average five or more per night. However, if trap averages have not reached this level, at the bud-early bloom and pin stages, sprays should still be applied.

**Chemical Control:** In general, insecticides should be applied on a 7-day schedule from the pin stage until harvest, which usually results in one to three applications per season.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** No commercially effective controls are available.
**Mexican Bean Beetle, *Epilachna varivestis***

The Mexican bean beetle (MBB) can be particularly devastating in wet years, but is not otherwise a problem in Virginia snap bean fields. If present MBB adults and larvae feed between the veins on the surface of leaves, resulting in a skeletonized network of tougher tissues. The remaining tissues eventually die and turn brown, reducing the ability of the plant to photosynthesize and thus be productive. There may be two to three generations per year in Virginia.

**Monitoring:** Monitor snap bean plants for defoliation resulting from MBB feeding. Chemical treatment is recommended if defoliation exceeds 20% during prebloom or 10% during podding and there is a population potential for further defoliation.

**Chemical Control:** Apply insecticides during hatch or adult emergence when both eggs and pupae are present. *Capture 2EC, Lannate LV, Sevin XLR,* and *Asana XL* treatments will control MBB infestations.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** No commercially effective controls are available.

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**Seed Corn Maggot, *Hylemya platura***

The seed corn maggot is most noted for its damage to sprouting seeds, particularly those planted early, which affects plant development. Adults emerge in the spring to feed and lay their eggs, preferably in moist, organically rich soils. Larvae or maggots hatch from the eggs and bore into seeds, cotyledons, or rotting crop debris. The maggots feed for one to three weeks before tunneling into the soil where they pupate for a period of about one to four weeks or for the duration of the winter. Multiple generations occur annually in Virginia.

**Monitoring:** Once seed corn maggot damage has been observed treatments are ineffective. Therefore, management options must be applied to high-risk fields prior to planting. High-risk fields can be defined as those having previous seed corn maggot infestations.

**Chemical Control:** Control is best achieved by using seed treatments such as *Thiram 65WP* plus *Chloroneb 65WP* or *Apron XS LS,* or a seed protectant containing diazinon or chlorpyrifos.

**Biological Control:** No current recommendations for commercial production.

**Cultural Control:** Several management practices can be used to reduce the potential for damage resulting from seed corn maggot infestations. These include plowing weeds or cover crops at least two weeks prior to planting, avoiding over-fertilization with manure, and plowing under crop debris.
immediately after harvest to prevent plant remnants.

**Thrips, Neohydrathrips variabilis**

Thrips are tiny, spindle-shaped insects that feed primarily within the developing unfolding leaflets of seedling snap bean plants within the first six to eight weeks after planting. Feeding results in leaf crinkling, reduced photosynthetic potential and plant stunting. If seasonal growing conditions are favorable, beans will outgrow early injury with no reduction in yield. However, snap bean producers in Virginia are particularly concerned with thrips feeding on flower buds and developing beans. This feeding will leave small brown scars rendering the beans unmarketable. Thrips may complete several generations per season in Virginia under favorable conditions.

**Monitoring:** Scout snap beans beginning at plant emergence and continue for approximately 6 weeks after planting.

**Chemical Control:** Insecticides may be applied at planting to help prevent thrips infestation. Alternatively, thrips populations can be monitored and if they are present from cotyledon stage to when the first true leaves are established and/or when first blossoms form, insecticide applications should be made (i.e. Orthene 97).

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Later spring planting often helps to reduce thrips pressure in snap beans. Thrips are not generally a problem in fall snap beans.

**Two-spotted Spider Mites, Tetranychus urticae**

Spider mites feed mainly on the undersides of the leaves, eventually causing them to turn brown and fall off. Typically mites are devastating in hot, dry seasons. Severe infestations may result in plant death. During the past several years, mite problems have become more numerous in Virginia.

**Monitoring:** Scout fields, especially areas that border roadsides or weedy edges. Examine both the upper and lower sides of the leaves and look for white stippling along the mid-rib and veins. Treatment should be made if stippling is noted and 20 mites per leaflet are present.

**Chemical Control:** Spot treatment of "hot spots" and areas along the edges of fields is recommended to control mite populations when problems are first noticed. Kelthane MF and Capture 2EC are excellent
Biological Control: Natural enemies and diseases often keep mite populations under control. However, spraying for CEW and other insect pests can disrupt beneficial populations and flare mites.

Cultural Control: Spider mites will readily move into snap beans when corn dries down or is harvested or if infested weedy borders are mowed. If possible, avoiding these activities until after snap beans are harvested may help prevent infestations.

Chemical Insect Control

The most recent pesticide use survey for snap beans grown in Virginia was completed in 1992. According to this report insecticides were used by 73.1% of producers on 4,223 treatment acres of snap beans grown in Virginia. However, producers vary in the types of insecticides they are applying therefore, anecdotal data was used to estimate insecticide usage on snap beans (see descriptions below).

- **acephate** (Orthene 75S) (Orthene 97)-PHI-14 days. Organophosphate. Widely used by producers at a rate of 0.50-1.00 lb. a.i./acre for control of ECB, MBB and thrips. Do not feed treated vines to livestock. Almost all of the snap bean acreage in Virginia is sprayed for thrips control. Acephate accounts for approximately 50% of the product used in this general application. REI-24 hours.

- **bifenthrin** (Capture 2EC)-PHI-3 days. Pyrethroid. Applied at a rate of 0.03-0.10 lb. a.i./acre for control of BLB, CEW, ECB, spider mites (higher rate), and thrips. Do not exceed 0.20 lb. a.i. per acre per season. Bifenthrin is typically applied twice during the growing season, first for early control BLB and then for later control of CEW. It was estimated that this chemical was used on 50% of the snap bean acreage during the 2000 growing season. However, usage could be increased or decreased depending on the pest pressure in a given year. REI-9 hours.

- **carbaryl** (Sevin 80S)-PHI-0 days. Carbamate. Applied at a rate of 0.55 lbs. a.i./acre for control of BLB and MBB and a higher rate of 1.00 lb. a.i./acre for thrips. Can cause mite populations to flare and therefore should not be used if they are present. Not used by producers to a great degree, but functional as a control option. REI-12 hours.

- **dicofol** (Kelthane MF)-PHI-7 days. Apply at a rate of 0.38-0.50 lb. a.i./acre for control of spider mites. Do not feed treated crops or crop residues to animals. Only used in the case of mite outbreaks, which are usually common during periods of hot, dry weather. REI-12 hours.

- **dimethoate** (Dimethoate 4EC)-PHI-0 days. Apply at a rate of 0.25-0.50 lb. a.i./acre for control of BLB and spider mites. Do not feed or ensile bean refuse to livestock from treated crops. As mentioned under acephate, almost all of the snap bean acreage in Virginia is sprayed for thrips. Dimethoate accounts for the remaining 50% of the product used in this application. REI-48 hours.

- **disulfoton** (Di-Syston 15G)-PHI-60 days. Organophosphate. Apply granules at planting at a rate of 0.05-0.10 lb. a.i./1,000 row ft. or 1.00-2.00 lb. a.i./acre for early season control of mites and
thrips, and a reduction in MBB injury. Do not place granules in contact with seed. Applications will generally last 4 to 6 weeks. Do not apply more than once per season. Not used by producers to a great degree, but functional as a control option. REI-48 hours.

- **esfenvalerate** (Asana XL)-PHI- 3 days. Pyrethroid. Applied at a rate of 0.015-0.03 lb. a.i./acre for control of MBB and at a higher rate of 0.03-0.05 lb. a.i./acre for CEW and ECB. Do not exceed 2.00 lb. a.i. per acre per season. Do not feed treated vines to livestock. The use of bifenthrin has caused a reduction in the use of esfenvalerate however it is still an important tool for producers to have available. REI-12 hours.

- **methomyl** (Lannate LV)-PHI-see label for restrictions. Organophosphate. Apply at a rate of 0.45-0.90 lb. a.i./acre for control of BLB, CEW, ECB, and MBB. Methomyl may be used by producers in certain years, especially for pests such as the beet armyworm, but is often replaced with bifenthrin. REI-48 hours.

- **methoxychlor** (Methoxychlor 2EC)-PHI-3 days. Diphenyl chloride. Apply at a rate of 1.00-3.00 lb. a.i./acre for control of BLB. Not used by producers to a great degree, but functional as a control option. REI-12 hours.

- **phorate** (Thimet 20G)-PHI-60 days. Organophosphate. Apply granules at planting at a rate of 0.06-0.08 lb. a.i./1,000 row ft. or 1.00-1.50 lb. a.i./acre for early season control of mites, seed maggots, thrips, and a reduction in MBB injury. Do not place granules in contact with seed. Applications will generally last 4 to 6 weeks. Do not graze or feed hay or forage to livestock. Do not make more than 3 applications per crop per season. Not used by producers to a great degree, but functional as a control option. REI-48 hours.

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**Diseases**

*Control recommendations were taken from the 2000 Commercial Vegetable Production Recommendations -- Virginia.*

The most troublesome diseases for Virginia snap bean producers over the last five years have been snap bean rust, root rots, and white mold. Weather conditions greatly affect the incidence of disease and certain conditions favor some more than others do. For the most part, proper management techniques, including preventative sprays, can greatly reduce disease problems. In addition to the most troublesome diseases, Anthracnose and bacterial blight may also damage snap beans in certain areas and under certain conditions. Occurrence of these diseases is rare, however and can usually be prevented by proper rotation and use of western-grown seed.

**Root Rot, Rhizoctonia spp., Pythium spp.**

Root rot is caused by a complex of soilborne fungi including *Pythium* and *Rhizoctonia.* *Pythium* is the
primary fungus causing root rot in the mid-Atlantic region. This disease thrives in moist, warm environments and causes extensive damage in the summer when these conditions are most common. *Rhizoctonia*, on the other hand, prefers the moist, cool environments common during fall plantings.

**Monitoring:** No thresholds have been established for snap beans.

**Chemical Control:** Treatment with either *Ridomil Gold* or *Ridomil Gold PC* is recommended at planting, especially during periods of humid, warm weather (see Chemical Disease Control section). In Virginia fungicide application for root rot is most often a standard practice.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Avoid continuous rotations of snap beans and areas or fields with poor drainage. Plow under previous crop residue rather than disk it into the soil. Alternate with non-legume crops.

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**Snap Bean Rust, Uromyces appendiculatus**

Snap bean rust is typically only a problem in late summer when warm, humid conditions may prevail. The fungus *Uromyces appendiculatus* attacks all aboveground green portions of the snap bean plant. First, white blisters form on the upper sides of the leaves followed by brown powdery spots and then finally black powdery spots on both the upper and lower portions of the leaves. In the case of a severe infection, many leaves die and the crop productivity is reduced. In addition, the appearance of rust on beans is unfavorable to consumers and can cause a lowered market price.

**Monitoring:** No thresholds have been established for snap beans.

**Chemical Control:** Treat beginning with disease appearance and repeat every 7 days.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** The use of resistant varieties is very common in areas where this disease is particularly troublesome.

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**White Mold, Sclerotinia sclerotiorum**

White mold is caused by the fungus, *Sclerotinia sclerotiorum*, which proliferates in moist conditions within the plant canopy. As the name suggests, white mold is composed of a mass of white mycelia that
can invade any part of the bean plant once it has colonized. Generally it is only a problem in narrow row plantings or in areas where airflow is limited, however if the foliage remains constantly wet (i.e. rain, dew, an/or irrigation practices) white mold will also develop. The wider row spacing (36 inches) found in Virginia typically helps to prevent incidence of this disease, however serious infestation may become established in wet years.

**Monitoring:** No thresholds have been established for spinach.

**Chemical Control:** Apply a preventative treatment when 70-80% of the plants have one or more blossoms. If environmental conditions continue to favor disease development a second application may be necessary, especially if blossoms are still present.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Good air circulation is important. Avoid close plantings if possible.

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**Chemical Disease Control**

As was the case with insecticide usage, the most recent pesticide usage data available was gathered in 1992. This report estimated that fungicides were used by 30.8% of producers on 892 treatment acres of snap beans grown in Virginia. Currently producers are using chemicals not included in the survey; therefore, anecdotal data was used to estimate insecticide usage for these products.

- **benomyl** (Benlate)-PHI-28 days. Apply at a rate of 0.75 lb. a.i./acre with surfactant for control of white mold. Benomyl was used by 19.2% of growers on 188 acres of surveyed acreage in 1992. Currently used only in the event of a white mold outbreak, however several other products are also recommended for white mold control (see below). REI-24 hours.
- **chlorothalonil** (Bravo) (Bravo 720) (Bravo Ultrext) (Terranil)-PHI-7 days. Apply at a rate of 2.25 lb. a.i./acre as soon as the snap bean rust has been noticed. Repeat application every 7 days as necessary. Do not use treated area for grazing or feed plant parts to livestock. In 1992, chlorothalonil was used by 15.4% of producers on 235 treatment acres. Current estimates suggest that chlorothalonil is used on 10-15% of the snap bean acreage in Virginia. Use may vary according to disease incidence and weather conditions. REI-48 hours.
- **iprodione** (Rovral)-PHI-0 days. Applied at a rate of 0.75-1.00 lb. a.i./acre with surfactant for control of white mold. As was true of benomyl, iprodione is used only if white mold is a problem. REI-12 hours.
- **metalaxyl** (Ridomil Gold) (Ridomil Gold PC)-Apply *Ridomil Gold* at a rate of 0.25-0.50 lb. a.i./acre in a 7-inch band over the row at seeding and *Ridomil Gold PC* at a rate of 0.08 lb. a.i./1,000 linear feet in-furrow at planting. Metalaxyl was used by 11.5% on 469 acres of the surveyed acreage in 1992. Metalaxyl is the only chemical included in this list which is routinely used by
many producers for control of root rot at planting. REI-48 hours.

- **thiophanate-methyl** (Topsin M)-PHI-28 days. Applied at a rate 1.30-1.70 lb. a.i./acre with surfactant for control of white mold. REI-12 hours.
- **vinclozolin** (Ronilan)-PHI-10 days. Applied at a rate of 0.50 lb. a.i./acre with surfactant for control of white mold. REI-72 hours.

**Nematodes**

*Control recommendations were taken from 2000 Commercial Vegetable Production Recommendations--Virginia.*

Races 1,3,5 and 9 of the soybean cyst nematode are present in soybeans in Virginia. Snap beans are susceptible; therefore, producers who rotate snap beans with soybeans should be alert to the possibility of nematode infestation.

**Monitoring:** Both diagnostic and predictive nematode assay programs in Virginia provide data to producers on the numbers and kinds of nematodes in soil along with recommendations for control. Soil samples for diagnostic assays are processed without charge to determine the cause of production problems during the growing season. Predictive nematode assays are done on samples collected after harvest. These samples are processed at a cost of $11 per sample, and must be collected in the fall no later than November 20.

**Chemical Control:** See *Chemical Nematode Control* section below.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Sanitation and good cultural practices are the best preventative measures against nematodes. Examples include obtaining nematode-free transplants and washing soil from machinery and tools before using them at different locations. Crop rotation with non-host crops to lower their population size is highly recommended in the event of nematode activity. This practice is the most widely used form of control among snap bean growers, even above chemical application.

**Chemical Nematode Control**

Several chemicals are currently available for nematode control, although this may change in the next few years. These include chloropicrin, dichloropropene, ethoprop, metam sodium, and methyl bromide. However, preventative practices such as those discussed above are often recommended rather than chemicals.
Weeds

Control recommendations were taken from 2000 Commercial Vegetable Production Recommendations--Virginia.

Herbicides currently labeled for control in snap beans work well on annual grasses and a few small seeded broadleaf weeds. However, producers in Virginia are faced with a multitude of additional broadleaf problems including cocklebur, common lambsquarter, mustards, smooth pigweed and spurred anoda, just to name a few. Section 18 Emergency and Special Local-Need 24(c) labels are often requested to help with problem weeds. During the 2000 snap bean season, for example, a Section 18 label was approved for the herbicide commonly known as Reflex. Reflex (fomesafen) was widely used on 70-80% of the snap bean acreage for postemergence broadleaf weed control. Without special labels, such as the one obtained for Reflex weed control in snap beans would be extremely difficult for producers.

Monitoring: Proper weed identification is an important part of effective weed control. Weeds observed in previous crops within a given field should be noted to aid in future herbicide decisions.

Chemical Control: See Chemical Weed Control section below.

Biological Control: No commercially effective controls are available.

Cultural Control: No commercially effective controls are available.

Chemical Weed Control*

The list below contains all of the fully labeled products available to producers for weed control in snap beans. Use estimates are also included based on anecdotal data. Table 1 lists the efficacy of herbicides recommended for use on snap beans.

- bentazon (Basagran 4SC)-Apply at a rate of 0.50-1.00 lb. a.i./acre when beans have fully expanded first trifoliolate leaves for broadleaf weed control. Use lower rates on common cocklebur, mustards, and jimsonweed and higher rates on yellow nutsedge, common lambsquarter, common ragweed and Canada thistle. Prior to the Section 18 labeling of fomesafen (Reflex), bentazon was the predominant choice for broadleaf weed control. However, Reflex does a much better job of controlling the troublesome broadleaf weeds. As a result, bentazon is currently used only on approximately 10% of the snap bean acreage in eastern Virginia. REI-12
hours.

- **EPTC (Eptam 7E) (Eptam 10G)**-Incorporate into the soil prior to planting at a rate of 2.50-4.00 lb. a.i./acre for good control of nutsedge, annual grasses and some broadleaf weeds. Used on less than 5% of the snap bean acreage in Virginia. If considered with pendimethalin (Prowl) and trifluralin (Treflan), the three combined would probably account for no more than 10% of the current herbicide usage. REI-12 hours.

- **pendimethalin (Prowl 3.3EC)**-Apply at a rate of 0.50-0.75 lb. a.i./acre up to 60 days prior to planting and incorporate within 7 days of application for control of annual grasses. Used currently on less than 5% of the snap bean acreage in Virginia. REI-24 hours.

- **quizalofop-P-ethyl (Assure II)**-Apply at a rate of 0.04-0.08 lb. a.i./acre to control most annual and perennial grasses. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, and broadleaf weeds will not be controlled. Used currently on no more than 5% of the Virginia snap bean acreage. REI-12 hours.

- **s-metolachlor (Dual Magnum 7.62E)**-As preplant application, use at a rate of 0.63-1.91 lb. a.i./acre primarily for control of annual grasses. Should be incorporated into 2-3 inches of soil by disking. Can also be applied as preemergence herbicide at same rate. Widely used currently on approximately 90% of the snap bean acreage in Virginia. REI-12 hours

- **sethoxydim (Poast 1.5EC)**-PHI-15 days. Postemergence herbicide used at a rate of 0.20-0.30 lbs. a.i./acre for control of annual grasses and certain perennial grasses. Repeat applications may be necessary for additional control of tough perennial grasses. Do not tank-mix with or apply within 2-3 days of any other pesticide unless labeled. Do not apply more than 0.75 lb. a.i./acre in one season. Approximately 10-20% of the snap bean acreage was treated with sethoxydim during the 2000 growing season. REI-12/24 hours.

- **trifluralin (Treflan 4E) (Treflan 5G)**-Apply prior to planting at a rate of 0.50-0.75 lb. a.i./acre for excellent control of grasses, except nutsedge. Must be incorporated into 2-3 inches of soil within 8 hours after application. Currently used on less than 5% of the snap bean acreage in Virginia. REI-12/24 hours.

*Section 18 Emergency Use Exemptions and 24(c) Special Local-Need label requests may be submitted to supplement the list above.

Herbicide performance is affected by weather, soil types, herbicide rate, weed pressure and other factors. These ratings indicate ONLY relative effectiveness in tests conducted by the University of Delaware, University of Maryland System, The Pennsylvania State University, Rutgers, The State University of New Jersey, and Virginia Polytechnic Institute and State University. Actual performance may be better or worse than indicated in this chart.

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