# Crop Profile for Beans (Dry) in New York

## General Production Information

New York produces approximately 494,000 cwt. (hundredweight) of edible dry beans on 35,000 acres for local, regional, and export markets. Major types include light and dark red kidney beans (62% of production) and black turtle soup beans (30%). Those beans marketed nationally are either processed into canned products or packaged for the dry pack market.

Weeds are the most important pests requiring annual control. Root rot diseases are widespread; control measures include fungicide seed treatments and cultural practices. White mold and bacterial blights are important diseases, but are mostly controlled through cultural practices. Insect damage is less frequent but can be significant. Without the registration of new, effective materials to replace them, the loss of EPTC, trifluralin, metolachlor, ethalfluralin or bentazon would have significant impacts on production and profitability. The availability of the herbicide fomesafen is a critical need for dry bean producers and processors in New York. In addition, producers must have an effective control for the seed maggot complex (chlorpyrifos or an effective alternative), control options for leafhoppers, and fungicide seed treatments for damping-off and root rot control.

Registration of new materials by the EPA, even those designated as "low risk", does not guarantee that NY growers will have immediate access to them. NYS Department of Environmental Conservation conducts their own in-depth reviews before registering new pesticides in NY, and may or may not register new materials for portions of or for the entire state.

**Basic Commodity Information**

**State Rank:** 10th

**% U.S. Production:** 2

**Acres Planted:** 35,000 (96-98 average)

**Acres Harvested:** 34,000 (96-98 average)

**Cash Value:** $11,648,000 (96-98 average)

**Commodity Destination:**

- **Dry Pack:** 40%
- **Processing (Canned):** 60%

**Yearly Production Costs:** $245 (estimated)

**Production Regions:** Dry beans are grown almost exclusively in Central (Ontario, Wayne, Yates, Onondaga, Schuyler, Seneca, Tompkins, Cayuga, Livingston, Oneida counties) and Western NY (Genesee, Monroe, Orleans, Wyoming, and Erie counties).

## Cultural Practices

Dry beans are not suited to heavy, poorly drained soils. Deep, fertile, light- to medium-textured soils are preferable. Bean seed is sensitive to chilling injury when planted in cold soil, and dry beans are typically planted between May 20 and June 20. Row spacing is usually 30 inches, with 4-6 plants per foot of row. Growers rotate dry beans with cereals and other crops for disease management, so that fields are only planted to beans every 3 to 4 years. Dry beans are not irrigated in New York. Most growers cultivate for weed control and to aerate the soil, but cultivation pulls stones to the soil surface which interfere with some types of harvesters. Dry beans reach physiological maturity from 90 to 115 days after planting, and are harvested soon after. Defoliants are used by many growers to assist in harvesting. All dry beans are mechanically harvested, typically at moisture contents of 16-20%. All varieties must be threshed and handled carefully to prevent damage to the bean seeds which becomes apparent in the canned product. Beans should be stored at less than 18% moisture, and mechanical dryers are sometimes used to bring harvested beans to this moisture range.

## Insect Pests

**Mexican Bean Beetle** (*Epilachna varivestis mulsant*)

**Frequency of Occurrence:** Mexican bean beetles (MBB) are sporadic pests in dry beans, often present but usually at levels below economic significance.

**Damage Caused:** Damage is confined to the leaves of the plants. Adult beetles and nymphs feed on leaf tissue between the veins, creating a skeletonized leaf.

**% Acres Affected:** 100% at risk; up to 75% affected per year.

**Pest Life Cycles:** This member of the lady beetle family overwinters as adults in New York under trash and other ground cover along hedgerows and protected areas. Beetles return to bean fields in June to feed and lay eggs. There are two generations per year.

**Timing of Control:** July and August.

**Yield Losses:** Up to 30% in severely infested fields, but this is not common.

**Regional Differences:** None.

**Cultural Control Practices:** Crop rotation can help suppress populations. Resistant varieties are not available.

**Biological Control Practices:** Natural enemies help control Mexican bean beetles. An imported parasitoid, *Pebiobus foveolatus,* has successfully managed these beetles, but must be reared and released.

**Post-Harvest Control Practices:** None.

**Insecticides for Mexican Bean Beetles, Potato Leaf Hoppers and Mites in Dry Beans:**

| Pesticide | % Trt. | Type of Appl. | Typical Rates lbs ai/acre | Timing | # of Appl. | PHI[1] days | REI hours |
|---|---|---|---|---|---|---|---|
| ***disulfoton*** *(Di-Syston)* | 18 | in-furrow | 1 | At planting | 1 | 90 | 48 |
| ***phorate*** *(Thimet)* | 11 | in-furrow | 1.2 | At planting | 1 | 90 | 72 |
| ***acephate*** *(Orthene)* | <5 | ground, foliar. | 0.75 | As needed up to pod fill. | 1 | 21 | 24 |
| ***carbaryl*** *(Sevin)* | 2 | ground, foliar. | 0.5-1.0 | As needed up to pod fill. | 1 | 21 | 12 |
| ***dimethoate*** *(Dimethoate)* | 8 | ground, foliar. | 0.25 | As needed up to pod fill. | 1 | 21 | 48 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***methyl parathion*** *(Penncap-M)* | <1 | ground, foliar | 0.5 | As needed up to pod fill. | 1 | 21 | 48 |
| ***methomyl*** *(Lannate)* | <1 | ground, foliar | 0.45 | As needed up to pod fill. | 1 | 21 | 48 |
| ***esfenvalerate*[2]** *(Asana)* | <1 | ground, foliar | 0.03 | As needed up to pod fill. | 1 | 21 | 12 |
| ***dicofol*[3]** *(Kelthane)* | <1 | ground, foliar | 0.38-0.5 | As needed up to pod fill. | 1 | 21 | 12 |

**1.** PHI on this and all tables indicates the typical number of days between application and harvest, not label PHIs.

**2.** Effective on MBB only.

**3.** Effective on mites only.

**Use in IPM Programs:** Use of foliar insecticides for MBB, potato leaf hopper (PLH), and mites is consistent with Cornell IPM recommendations. Thresholds have been established for most insect pests of dry beans.

**Use in Resistance Management:** None reported for any of the insect pests of dry beans.

**Efficacy Issues:** Soil-applied systemic insecticides may become ineffective by the time MBB and PLH are economic problems. However, in some years pressure from PLH can occur much earlier and be more severele than usual, warranting a soil-applied insecticide.

**Other Issues:** Esfenvalerate is one of the few (and the only effective) non-organophosphate insecticides labeled for foliar use in dry beans. It is labeled for use on MBB but not on PLH.

**Alternatives:** IR-4 is scheduled to run residue trials on abamectin in 1999; research would need to be conducted on the efficacy of this material on MBB.

**Potato Leafhopper** (*Empoasca fabae*)

**Frequency of Occurrence:** Common during hot dry growing seasons. Not always an economically important pest, but infestation and damage can be significant.

**Damage Caused:** Potato leafhopper (PLH) is a sucking insect, and both nymphs and adults remove plant sap directly from the vascular system in the leaf. In the feeding process, PLH injects a salivary toxin that causes injury to the plant. The damage resulting from feeding and the toxin is called "hopperburn" and is characterized by whitening of leaf veins within two days after feeding. Subsequently the whitened area becomes yellow, then turns brown and dies. If infestations occur at an early enough stage of crop growth, they can cause stunting and decreased yields. Infestations occurring after bloom usually do not affect yields. During pre-bloom, treatment is recommended at 2 nymphs per trifoliate leaf; on newly emerged beans, much lower populations may be damaging.

**% Acres Affected:** 100% at risk; up to 75% affected per year.

**Pest Life Cycles:** PLH is a migratory pest, coming from overwintering sites in the Gulf states and appearing first in NY in early June (sometimes as early as May). Adults are about 1/8 inch long, and nymphs are slightly smaller. The entire life cycle takes 28 days to complete.

**Timing of Control:** Emergence through bloom.

**Yield Losses:** Usually small, but in extreme infestations (early and high populations), can be up to 90%.

**Regional Differences:** Western counties tend to have higher PLH pressure than Central NY counties.

**Cultural Control Practices:** None.

**Biological Control Practices:** Although a variety of natural enemies of PLH have been reported, their impact on infestations is not well understood.

**Post-Harvest Control Practices:** None.

**Chemical Controls:** Acephate, carbaryl, dimethoate, methomyl, methyl parathion, phorate and disulfoton (all organophosphates) are labeled for use in dry beans. See "Mexican Bean Beetle" section for pesticide use patterns. Because of the ability of leafhoppers to rapidly reinfest a bean field from surrounding fields, producers have a need for an insecticide with some systemic activity for longer lasting control.

**Alternatives:** IR-4 is scheduled to run residue trials on abamectin in 1999. Although research needs to be conducted, it is unlikely that abamectin would effectively control PLH. While esfenvalerate is labeled for use on MBB, its usefulness in controlling PLH would also probably be limited. Lambda-cyhalothrin could possibly provide adequate control, but is not labeled for use in snap beans.

**<u>Seedcorn Maggot</u>** (*Delia platura and D. florilega*)

**Frequency of Occurrence:** Sporadic but potentially devastating when infestations occur.

**Damage Caused:** Larvae attack seeds and newly emerging seedlings. Infested seeds and other plant parts are hollowed out. Damaged plants are weak and may not develop. As a result, stands can be thinned, sometimes as high as 80%. In these cases, fields must be replanted or abandoned.

**% Acres Affected:** 100% at risk; up to 10% affected per year.

**Pest Life Cycles:** The seed maggot complex, composed of *Delia florilega* and *D. platura*, can damage beans and other large seeded vegetables. *D. platura* overwinters as a puparium from which a fly emerges in early spring. After mating, females lay eggs on newly planted seeds. After hatching, the small larvae bore into the seed or seedling and begin feeding. Damage is most likely in early plantings. The most destructive populations of seed maggots occur in May, and a second generation causes damage in late June and July.

**Timing of Control:** Seed treatment before planting.

**Yield Losses:** Up to 75% due to reduced stand.

**Regional Differences:** None.

**Cultural Control Practices:** Several cultural practices reduce the risk of seed maggot damage to beans, including avoiding planting into cool wet soils; avoiding planting in soils containing organic matter (manure, crop or weed residues) that was incorporated within two weeks before planting; and planting later in the season. Variability of spring weather can limit these options. Heavy rain and cool soil temperatures subsequent to planting aggravate the problem.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** None.

**Chemical Controls:**

| Pesticide | % Trt. | Type of Appl. | Typical Rates | Timing | # of Appl. | PHI days | REI hours |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***chlorpyrifos*** *(Lorsban)* | 95 | commercial seed treatment | 0.06 lbs ai/100 lbs seed; =0.05 lbs ai/acre | before planting | 1 | 50 | 12 |
| ***chlorpyrifos*** *(Lorsban)* | 5 | grower-applied slurry seed treatment | 0.06 lbs ai/100 lbs seed; =0.05 lbs ai/acre | before planting | 1 | 50 | 12 |
| ***phorate***[1] *(Thimet)* | 11 | in furrow, at planting | 0.45-0.9 lb ai/acre | at planting | 1 | 50 | 72 |
| ***diazinon*** *(Diazinon)* | <1 | planter box treatment | 0.5 oz/bushel seed | at planting | 1 | 50 | 24 |

**1.** Applied mostly for PLH control; see table in MBB section, above. This is usually placed beside the seed by producers, but in order to be effective against seed maggots it must be placed above the seed.

**Use in IPM Programs:** Cornell IPM recommendations call for the use of commercially treated or grower-treated seed.

**Use in Resistance Management:** None reported.

**Efficacy Issues:** The very low rates of chlorpyrifos used on bean seed in NY results in low risk of crop loss for producers and processors due to seedcorn maggot. Relying strictly on non-chemical control measures (timing of planting, site selection) could limit the dry bean acreage in the state. Cultural practices that are extremely beneficial for maintaining soil quality (e.g. cover cropping, crop rotation with high residue crops, manure applications, and spring plowing vs. fall plowing) would also be greatly limited on dry bean acreage. Phorate is only partially effective against seedcorn maggot.

**Alternatives:** Thiamethoxam (trade name Adage), a product under development by Novartis, may prove to be an effective alternative to chlorpyrifos seed treatment.

**Two-spotted Spider Mite** (*Tetranychus urticae*)

**Frequency of Occurrence:** Infrequent.

**Damage Caused:** Heavy infestations may cause leaves to drop. Damage is usually only seen in very hot, dry weather.

**% Acres Affected:** up to 20%

**Pest Life Cycles:** This mite has a wide host range. The adult mite is yellow to dark green with two to four black dorsal spots.

**Timing of Control:** From seedling emergence through bloom.

**Yield Losses:** Usually low; <10%

**Regional Differences:** None.

**Cultural Control Practices:** None.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** None.

**Chemical Controls:** See "Mexican Bean Beetle" section, above.

## Diseases

**Sclerotinia White Mold** (*Sclerotinia sclerotiorum*)

**Frequency of Occurrence:** Annually, except in the driest seasons.

**Damage Caused:** Infected pods become covered with white fungal growth and decay. As the fungus grows, hard, dark structures form among the fungal strands.

**% Acres Affected:** 100% at risk; up to 40% affected per year.

**Pest Life Cycles:** Sclerotia are produced among the white, cottony fungal strands on diseased plants. Sclerotia overwinter on or in the soil. Apothecia develop from sclerotia when the soil is wet for about ten days. Ascospores are released from apothecia and infect wet blossoms. The disease is spread to other parts of the plant from infected blossoms. Pods which touch the ground can be directly infected as well. White mold tends to develop in dense plant canopies. The disease tends to be worse in fields where leaves have mechanical damage or pesticide injury, and where dead leaves are on the ground. The fungus grows and produces spores on dead and living material. White mold tends to develop when the weather is warm and hot. The fungus has a wide host range on crops other than corn and small grains.

**Timing of Control:** at planting

**Yield Losses:** Can be up to 50%.

**Regional Differences:** Certain growing areas (e.g. Monroe and Genesee Counties) tend to have more problems than others.

**Cultural Control Practices:** If there is a field history of white mold, beans should not be preceded by a bean, tomato, potato, lettuce or crucifer crop. Grains and corn are good rotational crops. Avoid planting in shaded areas and in small fields surrounded by trees; do not plant in fields that drain poorly or have a history of severe white mold. Plant fields in the direction of prevailing winds to promote drying of the soil and reduce moisture in the plant canopy. Wider row spacings can help but these are often impractical. Avoid overfertilization.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** Incorporating crop residue after harvest can decrease inoculum levels.

**Other Issues:** Research on white mold is ongoing in NY (Dillard).

**Chemical Controls:** Benomyl, iprodione, and thiophanate-methyl are labeled for control of white mold in dry beans, but are almost never used. The long blossom period exhibited by dry beans would require a minimum of two applications for good control, and this is prohibitively expensive in this crop. Growers rely on cultural practices for control, and accept a certain amount of loss as inevitable.

**Alternatives:** Under research conditions, propiconazole and an experimental material, CGA173506, provided good to excellent control of white mold in snap beans, and may also in dry beans. Myclobutanil (Nova) may be effective on gray and white molds; IR-4 is scheduled to conduct residue trials on snap beans in 1999. Even if made available, growers may not use these alternatives because of their high cost relative to the value of the crop.

## Botrytis Gray Mold (*Botrytis cinerea*)

**Frequency of Occurrence:** Found sporadically, often at sub-economic levels.

**Damage Caused:** Gray mold develops in dense plant canopies when the weather is warm and moist. Infected pods become covered with fungal growth and decay.

**% Acres Affected:** 100% at risk; up to 10% affected per year.

**Pest Life Cycles:** Gray mold infections are caused by spores of the fungus *Botrytis cinerea* infecting blossoms and subsequently infecting pods that are in contact with the blossoms. Pods which touch the ground can be directly infected as well. Disease development is most rapid when temperatures are between 65-74º F and moisture is present during bloom.

The disease tends to be worse in fields where leaves have mechanical damage or pesticide injury, and where dead leaves are on the ground. The fungus grows and produces spores on dead and living material. The fungus can infect many species of plants and is known to develop resistance to fungicides.

**Timing of Control:** at planting.

**Yield Losses:** <5%

**Regional Differences:** Disease pressures tend to be higher in counties bordering Lake Ontario.

**Cultural Control Practices:** Cultural practices used to control white mold (see above section) help control gray mold as well.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** Incorporate infested debris immediately after harvest to hasten decomposition of the material.

**Chemical Controls:** None used.

**Root Rot and Damping-Off** (various species)

**Frequency of Occurrence:** Annually.

**Damage Caused:** Symptoms of this disease complex include poor seedling establishment, seedling death, uneven growth, yellow and premature defoliation. Roots of infected plants are reduced in size, discolored, and exhibit different degrees of decay. There is great variation in symptoms due to the different organisms involved, and weather and soil conditions.

**% Acres Affected:** 100%

**Pest Life Cycles:** Bean root rot in NY can be caused by Fusarium, Rhizoctonia, Thielaviopsis, Pythium (all fungi) and the lesion nematode *Pratylenchus* spp. These pathogens may infect beans singly or in combination. *Pythium ultimum* has a wide host range and can survive in soil for many years as oospores. It is most damaging to beans during cool wet weather. *Rhizoctonia solani* also has a wide host range, and survives in soil as hyphae, usually in association with host residues. The fungus also produces sclerotia. *Thielaviopsis basicola* and *Fusarium solani f. sp. phaseoli* both survive in soil for many years in the form of chlamydospores. Thielaviopsis has a wide host range, and causes the most damage under warm, wet conditions. The host range of Fusarium is much narrower, and this disease seems to do the most damage to plants already stressed by other factors. *Pratylenchus penetrans* survives as eggs or larvae and adult stages either in host plant roots or in soil, and has a wide host range. Like Fusarium, the lesion nematode probably causes the greatest amount of damage to plants under stress.

**Timing of Control:** Pre-plant.

**Yield Losses:** Up to 80% in severely affected fields. Usually the disease strikes certain areas of the field, resulting in numerous areas with poor growth.

**Regional Differences:** This disease is widespread in bean growing areas in upstate NY.

**Cultural Control Practices:** Because chemical controls are not usually cost effective (except for seed treatments), root rot is managed almost entirely through cultural practices. Growers are recommended to: rotate away from vegetables for at least two years; plant only into soils with good soil structure and free from compaction; avoid poorly drained fields; cover crop with small grains or grasses. Heavily infested fields should be planted shallow and late. Infected fields may benefit from a shallow cultivation not too close to the stems. Covering the lower stems with soil will promote further root formation and reduce root rot damage, but this can lead to foliar infections with Rhizoctonia.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** Crop debris should be plowed down to initiate decomposition.

**Other Issues:** Research on methods to control root rot and damping-off in dry beans is ongoing because the problem is so widespread (Abawi). Effective seed treatments are absolutely essential for limiting damping-off and hence producing dry beans profitably in NY on a commercial scale. The recent registrations of Maxim (fludioxonil) and Apron XL (mefenoxam) as seed treatments provide very useful tools for control of damping-off.

**Fungicide and Antibiotic Seed Treatments for Dry Beans:**

| Pesticide | % Trt. | Type of Appl. | Typical Rates | Timing | # of Appl. | PHI days | REI hours |
|---|---|---|---|---|---|---|---|
| ***metalaxyl***[1] *(Apron)* | 5 | commercial seed treatment | 0.5 lbs ai/100 lbs seed; =0.4 lbs ai/acre | before planting | 1 | 90 | NA |
| ***captan*** *(Captan)* | 95 | commercial seed treatment | 0.08 lbs ai/100 lbs seed; =0.08 lbs ai/acre | before planting | 1 | 90 | NA |
| ***chloroneb*** *(Demosan)* | 5 | commercial seed treatment | 0.19 lbs ai/100 lbs seed; =0.15 lbs ai/acre | before planting | 1 | 90 | NA |

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|---|---|---|---|---|---|---|---|
| ***streptomycin*[2]** *(Agri-Strep)* | 95 | commercial seed treatment | 0.06 lbs product/100 lbs seed; =0.05 lbs product/acre | before planting | 1 | 90 | NA |

**1.** The use of metalaxyl as a seed treatment is being phased out, to be replaced by mefenoxam seed treatment at a rate of 0.75 lbs ai/acre.

**2.** The use of streptomycin is primarily for control of seed-borne bacterial blight infections. See "Bacterial Blights", below.

**Use in IPM Programs:** Use is consistent with Cornell IPM recommendations.

**Use in Resistance Management:** None reported.

**Efficacy Issues:** Mefenoxam and metalaxyl are effective against Pythium and Phytophthora, and captan controls Rhizoctonia. Several soil applied fungicides are labeled (mefenoxam, PCNB) but are very expensive and so are never used on dry beans.

**Alternatives:** Maxim (fludioxonil) may be an effective replacement for captan, and mefenoxam is already replacing metalaxyl.

**Bacterial Blights** (*Xanthomonas campestris* and *Pseudomonas* spp.)

**Frequency of Occurrence:** Sporadic, but are usually found in some fields in all but the driest seasons.

**Damage Caused:** All three bacterial diseases cause lesions on leaves and pods of infected plants. Pod lesions can be sunken and brown (BBS), or reddish brown (common blight and halo blight), and render the crop unfit for consumption. Lesions can also cause pods to become misshapen. If infection occurs early, plant damage will also cause a decrease in pod set and size. Common blight and halo blight tend to cause greater economic damage in dry beans than bacterial brown spot.

**% Acres Affected:** 100% at risk; typically up to 15% affected per year.

**Pest Life Cycles:** Three bacterial diseases affect dry beans in NY: bacterial brown spot (BBS; *Pseudomonas syringae* pv. *syringae*), common blight (*Xanthomonas campestris*), and halo blight (*Pseudomonas syringae*). The primary source of inoculum of BBS seems to be infected crop debris, transferred mechanically or through irrigation to new fields. It can also be seedborne, but western-grown seed is minimally infected. Recent research has shown that low populations of the BBS bacterium survives epiphytically on the surface of bean and other plant leaves. Common blight can be spread from infected seed, crop residues, and possibly weeds. Infected seed is the most important source for halo blight. All three diseases are worse under wet conditions, and are easily spread by wind-driven rain, movement through wet fields, and through irrigation.

**Timing of Control:** Pre-plant (selection of seed source); and from bloom through pod set.

**Yield Losses:** Up to 40% in severely affected fields.

**Regional Differences:** None.

**Cultural Control Practices:** Use of western-grown, certified seed is one of the best control practices available. Also useful are destroying crop residues on the surface of the soil, limiting movement of people and machinery when fields are wet, crop rotation, and the selection of commercially available varieties with good tolerance to the diseases.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** None.

**Chemical Controls:** While fixed copper compounds are labeled for use on dry beans, they are typically used on <5% of the acreage, unless there is a serious outbreak. Streptomycin seed treatment is common; see table in "Root Rot and Damping –Off" section, above.

**Alternatives:** No obvious alternatives exist for streptomycin.

**Anthracnose** (*Colletotrichum lindemuthianum*)

**Frequency of Occurrence:** Sporadic.

**Damage Caused:** The fungus attacks and weakens seedlings and older plants. Infected plants have lower yields, and large reddish lesions form on the beans themselves, rendering them unusable.

**% Acres Affected:** 100% at risk; up to 5% affected per year.

**Pest Life Cycles:** This fungal pathogen overwinters on infected crop debris or in the soil. It can also be seed-borne. Several races of the pathogen exist.

**Timing of Control:** At planting.

**Yield Losses:** Can be up to 80% in severely affected fields.

**Regional Differences:** None.

**Cultural Control Practices:** Useful cultural practices include: crop rotation for a minimum of 2-3 years, planting in areas of good air and water drainage, planting only western-grown, certified seed, and selecting varieties with some tolerance to the disease. Since the fungus is spread in water, fields should not be entered when plants are wet.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** Incorporating infested debris immediately after harvest helps decrease inoculum for nearby or subsequent crops.

**Chemical Controls:** Although chlorothalonil and maneb are labeled for anthracnose control in dry beans, they are almost never used because of cost.

**Bean Viruses** (several)

**Frequency of Occurrence:** Sporadic. Rarely a problem.

**Damage Caused:** Symptoms range from stunted plants, mottled and malformed leaves and pods, to mosaic patterns on leaves.

**% Acres Affected:** up to 100%

**Pest Life Cycles:** Beans are subject to damage from bean common mosaic virus (BCMV), bean yellow mosaic virus (BYMV), clover yellow vein virus (CYVV) and cucumber mosaic virus. All are spread by a variety of common aphid species, and CMV and BCMV can be seedborne.

**Timing of Control:** Before planting.

**Yield Losses:** Usually minimal.

**Regional Differences:** None.

**Cultural Control Practices:** Some resistant varieties are available for BCMV. Use of certified, disease-free seed is critical. Elimination of weed hosts, especially in a zone surrounding bean fields, can lessen the risk of infection.

**Biological Control Practices:** Natural enemies can keep aphid populations low, thus minimizing spread of these viruses.

**Post-Harvest Control Practices:** None.

**Chemical Controls:** None available. Controlling virus infections by controlling aphid vectors is not effective.

# Weeds

**Broadleaf and Grass Weeds** (many species) and Defoliation

**Frequency of Occurrence:** Annually.

**Damage Caused:** Reduced yields from weed competition, and loss due to interference with harvesting equipment. Crops can become contaminated with weed plant parts (e.g. nightshade berries) during harvesting. Beans can also become stained by juices of weeds during harvesting.

**% Acres Affected:** 100%

**Pest Life Cycles:** A wide range of annual and perennial weed species is present in dry bean fields in NY. Some of the more common ones include redroot pigweed, common lambsquarters, common ragweed, velvetleaf, several nightshade species, mustards, hairy galinsoga, and various annual and perennial grasses.

**Timing of Control:** Preplant, at planting, and postemergence.

**Yield Losses:** Can be as high as 50% in severely affected fields.

**Regional Differences:** Weed species spectra can vary regionally, but weeds are a serious pest in all growing areas.

**Cultural Control Practices:** Rotation may be helpful in controlling problem weeds. Cultivation can be useful in bean weed control, although cultivation can interfere with some types of harvesting equipment. Banding of herbicides at planting is useful in bean production where cultivation is possible.

**Defoliation:** Defoliation (using an herbicide or defoliant to kill the above-ground portion of the bean plant) speeds harvest, a significant advantage in wet falls. Gramoxone kills weed escapes so they don’t interfere with harvest. Buyers report that the quality and marketability of beans is improved by defoliation because of better (lighter) color, less staining from weeds, and less seedcoat damage due to slower cylinder speeds used in defoliated fields.

**Biological Control Practices:** None.

**Post-Harvest Control Practices:** Application of herbicides and/or cultivation after harvest can be useful in controlling perennial weeds.

**Other Issues:** Considerable research is being conducted in dry bean weed control, mostly in the area of determining the strengths and weaknesses of new herbicide chemistries (Bellinder). Trials scheduled for 1999 will include halosulfuron (Permit), MON 37500 (sulfosulfuron), sulfentrazone (Authority), carfentrazone (Aim), imazamox (Raptor), cloransulam (Firstrate), flumetsulam (Python), and flufenacet.

The NY snap and dry bean industries recently communicated their great need for approval of a Section 18 request for the use of Reflex (fomesafen) as a post-emergence herbicide. This material is extremely effective on most problem weeds, even when used at lower than labeled rates. It plays a critical role in an IPM program. Postemergence as-needed applications can be based on field scouting; application rates are adjustable for weed species and weed growth stage; and fomesafen can be used in combination with bentazon for improved weed control at reduced rates for both materials. Fomesafen was available under Section 18 labels for five years prior to 1998, when the request was denied.

**Dry Bean Herbicides and Defoliants (without fomesafen*):**

| Pesticide | % Trt.[1] | Type of Appl. | Typical Rates<br>lbs ai/acre | Timing | # of Appl. | PHI<br>days | REI<br>hours |
|---|---|---|---|---|---|---|---|
| ***EPTC*** *(Eptam)* | 90 | soil incorporated | 3 | Pre-plant | 1 | 90 | 12 |
| ***trifluralin*** *(Treflan)* | 46 | soil incorporated | 0.5-0.75 | Pre-plant | 1 | 90 | 12 |
| ***metolachlor*** *(Dual)* | 50 | soil incorporated or pre-emergence | 1-2 | Preplant or pre-emergence | 1 | 90 | 12 |
| ***ethalfluralin*** *( Sonalan)* | 50 | soil incorporated | 0.65 | Preplant | 1 | 90 | 12 |
| ***glyphosate*** *( Round Up)* | 2 | ground | l | Before planting | 1 | 100 | 4 |
| ***sethoxydim*** *(Poast)* | 3 | ground | 0.28 | Postemergence, when grasses are actively growing . | 1 | 30 | 12 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***quizalofop p-ethyl***<br>*(Assure II)* | 1 | ground | 0.07 | Postemergence, when grasses are actively growing . | 1 | 30 | 12 |
| ***bentazon***<br>*(Basagran)* | 47 | ground | 1[2] | Postemergence, after beans have one fully expanded trifoliate | 1 | 30 | 12 |
| ***pendimethalin***<br>*(Prowl)* | 22 | soil incorporated | 0.825 | Preplant | 1 | 90 | 12 |
| ***clethodim***<br>*(Select)* | <1 | ground | 0.125 | Postemergence, when grasses are actively growing . | 1 | 30 | 12 |
| ***alachlor***<br>*(Lasso, Microtech)* | <1 | soil incorporated | 2.5 | Preplant | 1 | 90 | 12 |
| ***dimethenamid***<br>*(Frontier)* | <1 | soil incorporated, pre-emergence | 0.75-1.5 | Preplant | 1 | 65 | 12 |
| ***imazethapyr***<br>*(Pursuit)* | <1 | soil incorporated | 0.031-0.047 | Preplant | 1 | 90 | 4 |
| ***paraquat***<br>*(Gramoxone)* | 29 | ground | 0.4 | Applied 1-2 weeks before harvest as defoliant and herbicide. | 1 | 7 | 12 |
| ***sodium chlorate***<br>*(DeFol)* | 7 | ground | 1.5 | Applied 7-10 days before harvest as defoliant. | 1 | 7 | 12 |

**1.** % acreage treated and typical rates shown here reflect herbicide use when fomesafen is NOT available. Based on producers' estimates of herbicide use during years when Reflex WAS labeled under a Section 18 request, the availability of fomesafen would decrease the use of trifluralin to 42%, metolachlor to 46%, bentazon to 35%, and ethalfluralin to 40% of crop treated. Rates of bentazon, EPTC, trifluralin, and pendamethalin would also decrease.

**2.** Rates vary from 0.25 to 1 lb ai/acre, with the higher rate more typical when fomesafen is not available.

**Use in IPM Programs:** Use of each of these materials is consistent with Cornell IPM recommendations. Post-emergence materials (sethoxydim, quizalofop p-ethyl, bentazon, and clethodim) support the use of scouting and as-needed applications. Growers are beginning to adopt the use of low rate early applications of bentazon (as low as 0.25 lb ai/acre) under a 2(ee) recommendation.

**Use in Resistance Management:** None reported.

**Efficacy Issues:** The listed herbicides have different but overlapping spectra of species control (for complete information, see Reference #3). EPTC and trifluralin are generally effective on grasses and some broadleaves. EPTC is less effective in cold, wet soils or when heavy rains occur 1-2 days after spraying. The performance of trifluralin is adversely affected under dry soil conditions. Metolachlor controls many grasses as well as yellow nutsedge, but is weak on broadleaves. Surface applications work well, provided that rainfall occurs within a few days. Shallow incorporation is necessary under dry conditions, and also reduces risk of crop injury. Sethoxydim, clethodim and quizalofop p-ethyl are generally effective on annual and perennial grasses. Gylphosate is used for quackgrass control before crop planting. Pendimethalin is effective on velvetleaf, but is best when used in combination with EPTC. It must be incorporated shallowly. Despite the number of herbicides available to dry bean growers, control of problem weeds such as nightshades, mustards, ragweed, and velvetleaf remain very difficult without fomesafen.

**Alternatives:** The availability of fomesafen is a critical need for dry bean producers and processors in New York. Several alternative herbicides, including chloransulam, flumetsulam, imazamox, and sulfentrazone, are currently being tested. However, preliminary results indicate problems with crop tolerance, and none of these materials provides adequate control of the most problematic weeds in snap beans. Dry beans show reasonable tolerance to halosulfuron (Permit) in preliminary trials.

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6. Members of the New York State Dry Bean Advisory Committee, comprised of producers, processors,

consultants, researchers and Extension Educators, provided detailed information and perspectives on industry needs for this Crop Profile. Much of the information was drawn from a survey of key dry bean producers in the state (20 growers representing 15% of total state production). Drafts of this Crop Profile were also reviewed by a larger group of dry bean growers to ensure accuracy and completeness.

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