

# Beans (Snap)

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## Introduction

Snap Beans (green or wax) are a member of the Leguminosae (legume family). In the species *Phaseolus vulgaris*, are also dried beans which are harvested for baking beans. There are over 200 different types of beans originating in various parts of Central America which have been cultivated for over 7000 years. The plant may be a bush, a half runner or a pole bean. This crop is botanically described as an annual twining vine. Bean flowers are self-pollinated. Snap bean cultivars differ from dry bean cultivars by having thicker walled pods. These vary in color with green, yellow and purple being the ones most commonly grown. Commercial cultivars are mostly determinate (non-climbing). Flowers appear simultaneously and pods tend to mature together - an advantage for mechanical harvesting and where single heavy pickings are required for the fresh market. Some cultivars tend toward multiple branching and vining causing flowers and pods to develop over a period of time, allowing for several pickings. In 1894 the first string-less bean was introduced.

Snap Beans are adapted to both temperate and tropical areas where there is a greater frost free period than 50 days and soils are warm enough to allow seed germination. Beans are frosted at  $-1^{\circ}\text{C}$  to  $-2^{\circ}\text{C}$ . The minimum temperature for seed germination is  $15^{\circ}\text{C}$ , with a maximum of  $35^{\circ}\text{C}$  and an optimum range of  $15-30^{\circ}\text{C}$ . Seed rot is a problem at lower soil temperatures and is further aggravated by wet soils. Best crop growth occurs at  $18-23^{\circ}\text{C}$  with a minimum of  $10^{\circ}\text{C}$  and a maximum of  $32^{\circ}\text{C}$ . Beans do well under warm conditions and date of maturity can be reliably estimated using degree days above  $5^{\circ}\text{C}$ . Temperatures of  $32^{\circ}\text{C}$  will cause poor pod set. Snap beans are sensitive to soil moisture stress especially at the time of flowering.

Beans should be planted in well drained soils with good aeration and soil borne diseases have to be kept in check by good rotations. A range of soil textures are suitable to the crop but sandy loams are best suited for early crops and then loams for later production. The soil should be well supplied with organic matter. Organic soils are not recommended as they promote excessive vegetative growth. Avoid

growing on steep slopes since the crop does not offer much protection against soil erosion.

Snap Beans are available from late July to late September for both the fresh and processing markets. With tunnel house production this season could possibly be extended. Harvest is approximately two weeks after bloom.

An average yield for snap beans is 4400 kg per hectare. High yields vary from 6600-17,600 kg per hectare.

Snap beans are an important crop in the Atlantic Area mainly due to the processing industry. Relatively few beans are grown for fresh market use and most of this crop is picked by hand labor.

*Nutrient Content:* Good sources of Vitamin A, potassium and folate. Contains several other nutrients in small amounts. 250 mL (1 cup) contains 32 kilocalories.

## Crop Establishment

**Seed Treatment** – Chemical seed treatments should be used to protect seeds from maggots, wireworms and seed decay organisms. Seed treatment should not be done more than 3 months before sowing.

Inoculation of seed with nitrogen fixing bacteria should be done on "new" fields with the use of a dust containing the proper rhizobium bacteria.

Beans should be handled gently as cracked seed coats and cotyledons decreases germination and seedling vigor.

Beans with a dark colored seed coat are generally hardier and will germinate better in cold soil conditions.

**Seeding/planting** – Seeding should be delayed until the cold weather is past, the soil has warmed (to 15°C) and the danger of frost at emergence is past. Wet, cool weather will delay germination, causing decay of seeds and increasing injury to seedlings by maggots and root rot organisms.

In heavier soils, seeds should be seeded no deeper than 2.5cm, while in sandy soils up to 4 cm is preferable. Sow as shallow as soil moisture levels permit. Planting in wet soil must be avoided because crusting of the soil and seed rot may occur reducing germination and vigor.

### ***Typical Spacings and Plant Population Recommendations in Snap Beans***

Desired Row Spacing	Plants per Meter of Row	Approximate Seed Rate per Hectare
90-95	20 to 26	80 kg
45, 50 and 60	17 to 22	100 kg
20-25	10	110 kg
15 to 18	6 to 8	165 kg

Closer row spacings will result in increased yields. In some fields gray mold and white mold disease losses are greater with narrow rows. Wider row spacings are suggested for fresh market production for either mechanical harvesters or hand pick. Narrow rows should be used for processing beans when proper harvesters are available.

## Crop Management

**Cultivation** – pre-planting soil preparation and adequate herbicides are recommended so that cultivation of the bean crop is not necessary. Bean roots, although penetrating the soil for up to 1 1/2 meters, are located mainly in the top 20 cm of soil. If cultivation is necessary it should be early in the life of the crop and as shallow as possible. It should cease after bloom and never be done when the leaves are wet, because of the danger of disease spread.

## NUTRITION

ALL ADDITIONS OF LIME AND FERTILIZER OR MANURES SHOULD BE BASED ON RECOMMENDATIONS FROM A SOIL TEST.

Beans require a highly fertile soil but do not, however, respond rapidly to direct soil applications of fertilizer. Heavy applications of manure are not recommended for beans as there may be excessive vegetative growth and a higher risk of seed corn maggot injury.

**Lime** – Lime should be applied to maintain the soil pH in the range 6.0 - 6.8.

**Nitrogen** – Snap beans have a low requirement for nitrogen since it is a legume crop. If phosphorus and potash levels are high no nitrogen may be required. Side dressing of nitrogen is only recommended following heavy rains, if foliage suggests a nitrogen deficiency. Extra nitrogen may help alleviate yield reductions caused by bean root rots.

**Phosphorus** – Banded phosphorus is necessary at the time of seeding, even at high soil phosphorus levels.

**Potash** – This element is best broadcast and incorporated into the soil prior to planting either as muriate of potash or manure. If banding potash do not apply more than 60 kg per hectare of actual nitrogen and potash combined.

**Sulfur** – Application is suggested on sandy soils with low organic matter which have been intensively cropped (use gypsum).

**Magnesium** – Beans are sensitive to deficiency of magnesium so a fertilizer containing MgO should be used where magnesium deficiency is suspected.

**Micronutrients** – Beans are sensitive to excessive residues of boron especially on soils with a low pH (under 6). Zinc deficiencies may be a problem as it has been reported on other crops in the Atlantic area. Watch fields which are intensively cropped with low organic matter and not receiving applications of manure. Manganese deficiency is a problem when the pH is over 6.8. One or two foliar sprays of Magnesium Sulfate may be required to correct this problem. Use manganese sulfate at 1 kg of Mn per hectare in 1000 L of water per hectare (also use a spreader sticker).

**Application Method** – All fertilizer should be broadcast and disked in or (preferably) banded 5 cm below and 5 to 7 cm to the side of the seed row.

## Pests and Pest Control

### Weeds

There are several effective pre-plant incorporated, pre-emergence and post-emergence herbicides available for use on beans. Pre-emergence treatments provide good control of annual broadleaf weeds. When a heavy annual grass infestation is anticipated a pre-plant incorporated treatment should also be used. Post-emergence treatments are available for both grass and broadleaf weed control. The timing of post-emergence treatments is critical for the control of some species and control may be poor if applications are not properly timed. Care must be taken to avoid fields where residual herbicides from previous years persist in the soil as crop injury may occur.

### Diseases

#### Anthracnose (fungus) and Bacterial Blights

**Characteristics:** Signs of anthracnose usually appear on the lower leaf surface along veins which show a brick red to purplish red discoloration. Lesions may also appear on stems causing them to break. On the pods, the disease appears as small brown specks or rusty brown spots. As the spots enlarge, their centers become sunken and turn brown. Under humid conditions, masses of pinkish spores appear on the lesions. Seeds obtained from heavily infected pods show brown to light chocolate colored spots on the seed coat.

Symptoms of bacterial blight appear on leaves as water-soaked or pale green spots or groups of spots surrounded by a narrow or wide greenish yellow halo. The spots may turn brown and dry and leaves may shrivel and die. Water-soaked spots may appear on pods and combine to form blotches of reddish brown discoloration. Bacterial blight becomes progressively more severe as beans approach maturity.

**Control:** The causal organisms over winter in seed and plant debris. Do not use home-grown seed. Purchase disease-free snap bean seed. Practice a 3-year crop rotation. Do not cultivate or harvest when plants are wet. Applications of fixed copper will reduce the spread of bacterial blights. Rogue and destroy affected plants. Do not spread bean refuse or manure containing bean refuse on land intended for beans in the next three years.

#### Sclerotinia White Mold and Gray Mold (fungi)

**Characteristics:** Gray and white cottony mold which causes a watery soft rot on plants, bean pods and stems, in which, hard black bodies are produced. This disease spreads rapidly after harvest. Infection starts on the flowers and spreads from there to the other plant parts.

**Control:** Plant on well-drained soil not recently used for beans, lettuce, peas, tomatoes, carrots, parsnips, cucumbers, celery, or cabbage. Practice a 3-year rotation. Serious losses result when susceptible crops are grown for several consecutive years. Do not apply excess irrigation. Cultivate and pick when plants are dry. Avoid fields with a history of Sclerotinia. Plow plant refuse down immediately after harvest. Applications of fungicides may be applied during bloom.

#### Root Rot (fungus)

**Characteristics:** The taproot shows various surface discolorations of reddish brown or dark brown and smaller roots may be rotted away.

**Control:** Root Rot is caused by a complex of several soil borne organisms. It is present in every soil and nearly all plants have some degree of root rot. In seriously infected fields long rotations of 6 years or more are necessary. Bean refuse should always be placed in areas where beans will not be grown. Any bean refuse left on the field should be turned under deeply by fall plowing. Plant only on well drained, well fertilized soils.

### Common Mosaic and Yellow Mosaic (viruses)

**Characteristics:** Plants infected with mosaic show mottling and mosaic patterns in the leaves which appear as irregular light green areas mixed with dark green patches. The darker areas grow faster resulting in puckered leaves. Plants may also wilt and show dieback of tips and branches. Infected plants are dwarfed and produce only a few small pods.

**Control:** These seed-borne viruses are spread in the field by aphids. Grow mosaic resistant cultivars. Avoid planting beans next to sweet clover, red clover and gladioli from which aphids may spread mosaic.

## Insects

### Seed Corn Maggot

**Characteristics:** The adult seed corn maggot fly deposits her eggs in soil where there is an abundance of decaying vegetable matter, on the seed or plantlet. The larvae (maggot) of the seed corn maggot are 5mm long and pale in color. The damage is caused by the maggot burrowing into the seed, often destroying the germ. Damaged seed will either not germinate or produce a deformed plant.

**Control:** Plant seeds as shallow as needed in a well prepared seedbed. Early germination is necessary to get good plant stands and prevent injury. Later plants crops are not as susceptible to this pest. Avoid planting susceptible crops in fields very recently manured. Chemical seed treatment is essential. Good weather conditions are necessary to completely control the pest.

### Two Spotted Spider Mite

**Characteristics:** An occasional pest but when it does occur, can be serious. Leaves become speckled and then turn bronzed or brown. A fine webbing is produced on the underside of the leaves. The mites are microscopic in size. Usually this pest only becomes a problem under very hot dry weather conditions.

**Control:** A predator mite may help control the two-spotted spider mites, but may not control a severe outbreak successfully.

### European Corn Borer

**Characteristics:** European Corn Borer larvae overwinter in corn stubble. By July they have become moths that fly mostly at night. A single female lays eggs in small groups of 20 to 40 on the underside of host plant leaves. The larvae hatch within a week and enter the bean pods. Several pods will be damaged by a single larvae before it stops feeding. This pest has not become a serious problem in snap beans but damage to baking beans seeds is evident after harvest.

**Control:** Plow down corn stubble in the fall. Avoid planting beans after corn in rotation or adjacent to corn in the crop year.

SPECIFIC CHEMICAL CONTROLS FOR THE VARIOUS CROP PESTS DISCUSSED MAY BE FOUND IN THE APPLICABLE PEST MANAGEMENT GUIDES ON THE PERENNIA WEBSITE

## Harvesting and Handling

Snap beans are currently harvested by hand for the fresh market or by mechanical harvesters (i.e. multi-D type harvesters) for the processing market. The following is an example of processing grades.

Grade # 1 Green or wax Snap beans, sieve sizes of 1, 2, 3, & 4

Grade # 2 Green or wax Snap beans, sieve sizes of 5 +

Fresh market beans must be quickly moved from the field and cooled. These beans should be free of white mold as problems may develop during storage and transport of the crop.

## Storage and Conditioning

Snap beans can be held 8 to 10 days if necessary at a temperature of 7 to 10°C and a relative humidity of 85% to 90%. Chilling injury occurs at temperatures below 4°C and russetting will develop upon removal from storage.

## Bibliography

**This document was originally part of the Vegetable Production in Atlantic Canada Guide Produced by the APASCC Advisory Committee on Vegetable Production, it was reformatted and updated by Perennia in 2017.**

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