

Bush Snapbean Production in Miami-Dade County, Florida¹

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Situation

Miami-Dade County is the primary production region for fresh-market bush snapbeans with 57% or 21,204 acres of the Florida bean acreage season [U.S. Department of Agriculture (USDA), 2014]. Production costs vary from \$16.53 to \$21.87 per 30 lb. bushel or \$4,046 to \$4,711 per acre. Acceptable yields range from 185 to over 300 bushels per acre. The U.S.D.A standards for grades of snap beans describes U.S. Fancy grade as having similar variety characteristics, uniform size, being well formed, bright, clean, fresh, young and tender, firm, free from soft rot and insect,

disease or mechanical damage (USDA, 1990). Snapbeans produced in Miami-Dade County are sold nationwide for the fresh market starting just before Thanksgiving and continuing through the winter and spring months. Only a small percentage of the crop is destined for processing. Miami-Dade County has also historically produced pole beans, and while production practices are very similar to those for snapbeans, both production and harvesting costs are significantly higher. Acreage has declined precipitously as the market for pole beans has decreased, and so information specific to pole beans has not been included in this publication.

Varieties

Table 1. Major bush snapbean varieties currently grown in Miami-Dade County

Variety	Season	Color	Seed company
Bronco	Fall and spring	Dark green	Syngenta Co.
Caprice	Fall, winter, or spring	Dark green	Harris Moran Seed Co.
Prevail	Fall, winter, or spring	Grey green	Syngenta Co.
Thoroughbred	Winter	Light green	Seminis Vegetable Seeds, Inc.

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Soils, Land Preparation, and Planting

Snapbeans in Miami-Dade County are grown mainly on very gravelly loam soils (Krome or Chekika series) or on a mixture of very gravelly and marl soils (Figure 1). Although snapbeans were historically grown on marl soils, production has moved away from this soil type due to its lower elevation and tendency to flood for extended periods, especially during and after tropical rain events. Traditionally, beans have not been planted on raised beds. However, higher yields can be obtained when raised beds are used, especially on flood-prone soils and during the fall rainy season.

The planting season in Miami-Dade County extends from September to mid-March. The USDA Farm Service Agency recognizes three distinct planting periods for snapbeans grown in Miami-Dade County: fall (August 31 through October 31), winter (November 1 through January 15),



Figure 1. Snapbean production on calcareous, very gravelly loam soils in Miami-Dade County. Credit: Monica Ozores-Hampton

and spring (January 16 through March 15). A once-over harvest, either by hand or by machine, occurs 45 to 67 days after planting, depending on the variety and the season, with the winter crop taking longer than either the fall or spring crop. Bush beans are planted with 2–2.5 inches between plants, 30–36 inches between rows for fall and spring plantings, and 22–24 inches between rows for winter plantings.

Fertilizer

Calibrated soil tests for the calcareous soils of Miami-Dade County are not currently available. Since snapbeans are a very short season crop (45 to 67 days), it is important to provide adequate fertility levels early in the growing season, since late-applied corrective measures may occur too late to increase yield. Use plant tissue analysis to determine the composition and rates of fertilizers to apply. Tables 2 and 3 provide information regarding sampling time and fertilizer application rates based on the plant's nutrient status.

The total amount of fertilizer required in Miami-Dade County depends on the bean variety, the previous crop, and other environmental factors such as time of year. Time applications of fertilizers according to plant requirements and avoid applications, especially of nitrogen (N) and potassium (K), just prior to predicted heavy rainfall events. More N may be needed during the fall rainy season, especially after leaching rains. Additional phosphorus (P) is needed for the winter crop when soils are cooler and P is less available; lower amounts of N and K are required because plants grow slowly. More K is needed for the spring crop when temperatures are high and there is very little rainfall. Apply less fertilizer if a cover crop or organic soil amendment such as compost has been used. Foliar applications of magnesium nitrate, magnesium sulfate, or iron sulfate should be used if deficiency symptoms appear. Fertilization is not used on

Table 2. Values for macronutrients in snapbeans measured from the most recently matured whole leaf plus its petiole (MRM leaf) unless otherwise noted. (<http://edis.ifas.ufl.edu/ep081>)

Sampling time	Status	N	P	K	Ca	Mg	S
		------(%)-----					
First true leaf to bud break	Deficient	<3.0	<0.3	<2.0	<0.8	<0.25	<0.2
	Adequate	3.0–4.0	0.3–0.5	2.0–3.0	0.8–1.5	0.25–0.45	0.2–0.4
	High	>4.1	>0.5	>3.1	>1.6	>0.45	>0.4
Bud break to pin bean	Deficient	<3.0	<0.3	<2.0	<0.8	<0.25	<0.2
	Adequate	3.0–4.0	0.3–0.5	2.0–3.0	0.8–1.5	0.25–0.45	0.2–0.4
	High	>4.1	>0.5	>3.1	>1.6	>0.45	>0.4
Pin bean to harvest	Deficient	<2.5	<0.2	<1.5	<0.8	<0.25	<0.2
	Adequate	2.5–4.0	0.2–0.4	1.5–2.5	0.8–1.5	0.25–0.45	0.2–0.4
	High	>4.1	>0.4	>2.5	>1.5	>0.45	>0.4

Table 3. Values for micronutrients in snapbeans measured from the most recently matured whole leaf plus its petiole (MRM leaf) unless otherwise noted. (<http://edis.ifas.ufl.edu/ep081>)

Sampling time	Status	Fe	Mn	Zn	B	Cu	Mo
		------(ppm)-----					
First true leaf to budbreak	Deficient	<25	<20	<20	<15	<5	-
	Adequate	25–200	20–100	20–40	15–40	5–10	0.4
	High	>200	>100	>40	>40	>10	-
	Toxic	-	>1,000	-	>150	-	-
Budbreak to pin bean	Deficient	<25	<20	<20	<15	<5	-
	Adequate	25–200	20–100	20–40	15–40	5–10	0.4
	High	>200	>100	>40	>40	>10	-
	Toxic	-	>1,000	-	>150	-	-
Pin bean to harvest	Deficient	<25	<20	<20	<15	<5	-
	Adequate	25–200	20–100	20–40	15–40	5–10	0.4
	High	>200	>100	>40	>40	>10	-
	Toxic	-	>1,000	-	>150	-	-

snapbeans in Miami-Dade, though it might be possible with lateral move or center pivot systems.

Broadcast 90%–100% of the P and band up to half the N and K at planting. Use pre-plant fertilizers such as 4-4-8, 5-5-8, 6-3-12, 6-12-12, or similar formulas. Use liquid or dry N and K fertilizer for side dressings. Sidedress with N and minors (zinc and manganese) between the time the first true leaf has fully expanded and budbreak. Apply a low rate of P between budbreak and the pin bean stage (such as 10 lb of a liquid 10-52-10). Sidedress with K between the pin bean stage and harvest. Bean varieties bred under low nitrogen conditions develop more problems with postharvest breakdown if levels of N are too high.

Irrigation and Freeze Protection

Irrigation is applied to snapbeans using sprinkler systems such as lateral move/center pivot or big guns. Principles and practices of irrigation management are discussed in Chapter 3 of the *Vegetable Production Handbook for Florida* http://edis.ifas.ufl.edu/topic_vph.

Frost/Freeze Protection

Snapbeans are not resistant to frost. Freeze injury occurs when temperatures drop to 28°F for as few as 30–45 minutes. It is possible to use solid set irrigation for frost or freeze protection, but this method uses a high volume of water, with costs depending on the number of hours the crop is irrigated and the cost of the solid set system, which is only used for this purpose. In addition to the cost, there is a risk of increased disease incidence. These issues may outweigh the gains of providing frost protection, so this decision must be made carefully. Cold protection using a

solid set system also does not work well during an advective (windy) freeze, especially as wind speed increases, since the pattern shifts from roughly circular to a more oval shape, leaving more of a field unprotected. Refer to [Sprinkler Irrigation for Cold Protection \(pdf\)](#) for specific details about water applications using a solid set system for cold protection at different wind speeds and temperatures. Use the combination that produces 0.1 in of water per hour and clear, not cloudy, ice. Irrigation must continue until the ice melts the next morning. If irrigation is stopped prematurely, crop damage may be greater than if no irrigation had been used.

If a radiation (calm) freeze is predicted, irrigate the soil as early in the morning as possible on the day a cold weather event is predicted to begin, preferably early the day before. This will trap some heat in the soil and will provide a bit of protection for the snapbean crop as the heat is released. Plants must be dry before cold temperatures arrive or the damage levels will be higher than if nothing had been done. An alternative method of protection is to use a disc to cover newly emerging snapbeans with soil to protect them from freezing temperatures. Both of these methods only work if the coldest temperatures are of very short duration, less than two hours, and do not drop much below freezing since injury to the canopy and pods can occur even at 32°F if the duration is longer than two hours (Pates 2011).

Pest Management

Pest management recommendations change periodically due to changes in pesticide labels. For current recommendations, refer to Chapter 6, “Legumes,” of the *Vegetable Production Handbook for Florida*,

https://edis.ifas.ufl.edu/topic_vph, which is updated annually. The following information provides an overview of the most common insect and disease pests attacking snapbean in Miami-Dade County.

Insect Management

Currently all major insect pests except thrips can be controlled with currently registered insecticides; however, only a few of these pesticides are truly effective and all are expensive. Therefore, pay particular attention to timing and preventative measures to maximize efficacy and minimize costs. For general information about bean insect pests, including symptoms and photographs, refer to http://edis.ifas.ufl.edu/topic_legume_pest_insects and http://edis.ifas.ufl.edu/topic_vegetable_pest_insects. A list of insecticides labeled for either beans and/or the legume crop group in Florida can be found in Chapter 6 of the *Vegetable Production Handbook for Florida*, which is updated annually, http://edis.ifas.ufl.edu/topic_vph.

Snapbeans are attacked by various insect pests starting from planting and continuing through harvest. Although these pests occur during all growth stages, some cause economic damage at specific growth stages. For example:

- Wireworms are harmful at the seed germination stage; they eat seed contents and reduce crop stand and uniformity.
- Silverleaf whitefly causes growth retardation by transmitting Bean Golden Mosaic Virus (BGMV), especially at the early vegetative crop stage.
- Melon thrips infestations may cause significant damage at any time of growth up to harvest.

Most foliar insects prefer young leaves over older ones for oviposition and larval feeding:

- Bean weevil prefers the pod stage.
- Leafminers prefer young leaves for egg laying and larval development.
- Melon thrips are more abundant on older leaves than younger ones.

Insect pests on bean crops are best managed by detecting infestations as early as possible. Failure to detect insect pests in a timely manner can result in the need for higher rates or more frequent applications of chemical pesticides, which increases costs. Sometimes, failure to detect a pest at an early stage can cause total crop loss.

Place 2–4 sticky cards on all four sides of a field to detect pest arrival. Use yellow sticky traps for aphids and whiteflies and medium blue sticky traps for thrips. In addition, regularly monitor plants in the field to detect early infestations. Sample crops at multiple sites within a snapbean field three days/week. Each sample site should measure about 15 ft × 15 ft, with eight sample sites per acre. At each sample site, check one leaf per plant from 5–10 plants for different pests. Insects can also be found by gently tapping plant parts against a white board (12 in × 18 in); there is no need to remove the plant from the field, as this can be done while the plant is still in the ground. This method dislodges insects from the host plant parts without damaging the plants. Sticky cards can be used just on the field borders to trap adults. It is important to be able to identify key pest insects affecting beans.

Use appropriate management practices to minimize insect damage on beans:

- In some cases, such as the silverleaf whitefly, a systemic insecticide may need to be applied either at planting or immediately after emergence so the crop is protected when whiteflies attack the field.
- During the planting operation, use a drench application of a labeled systemic insecticide. This application method has the least deleterious effect on beneficial natural enemies.
- Two to three weeks after the drench application at planting, when the crop has emerged, use a foliar application.
- Scout fields regularly and schedule insecticide applications based on insect thresholds. Only treat insects with contact or short-residual insecticides when they are actually present.

If multiple applications of foliar insecticides are needed, do not use the same chemical, insecticide group, or mode of action to avoid resistance.

Disease Management

There are several diseases, including some major ones, which affect snapbeans in Miami-Dade County. These diseases are presented here according to the stage of plant growth at which they most often occur. Prevention is the most effective and least costly management strategy. For general information about bean diseases, including symptoms, please refer to EDIS publication PP209 at <http://edis.ifas.ufl.edu/vh055>. This publication includes a discussion of diseases of snapbean not found in PP209. A

list of fungicides and bactericides effective against specific diseases of beans and labeled for either beans and/or the legume crop group in Florida can be found in Chapter 6 of the *Vegetable Production Handbook for Florida*, which is updated annually, http://edis.ifas.ufl.edu/topic_vph.

A. Soil-borne Seedling Diseases

General

Since snapbean is susceptible to several soil-borne diseases, land selection is important. Choose well-drained fields that are free of low spots where water can accumulate. Select fields that have been used for crops that are less susceptible to diseases affecting legumes, since growing snapbeans on mulched, fumigated beds is cost prohibitive.

a. Pythium Root/Stem Rot and Damping-Off (*Pythium* spp.)

Pythium is a soilborne fungus that causes damping-off, which can rot bean seeds and seedlings anytime until the plant emerges. This disease is more severe under conditions of excess moisture, deep planting, and recent incorporation of plant material into the soil. *Pythium* diseases are most common early in the fall crop when the weather is still hot and rainy. However, high rates of *Pythium* rots can be seen any time there is wet weather and unprotected seed. In older plants, *Pythium* produces a root rot. Up to 15% of snapbean acreage may be affected by *Pythium* every year. Apply seed or in-furrow treatments to control *Pythium*.

b. Rhizoctonia Root and Stem Rot (*Rhizoctonia solani*)

Rhizoctonia is commonly found on snapbeans in Florida. It can cause stem lesions on seedlings before or after emergence. Infections of seedling stems are usually found near the soil surface. Older lesions can rot the outer part of the stem and cause the seedling to fall over. Disease development can occur over a wide range of soil types, pH, temperature, moisture, and fertility. Optimum soil temperatures for disease development range from 75°F to 85°F. Control of *Rhizoctonia* is difficult, so efforts are usually concentrated on tactics such as foliar fertilizers that contribute to rapid seedling growth. This minimizes the period when the plant is susceptible. Use in-furrow treatments with a registered fungicide to manage *Rhizoctonia*.

Rhizoctonia has the potential to occur every year, but it is more common shortly after a cold front has passed, because plants are weakened. It can also cause a rot on pods where they touch the ground. *Rhizoctonia* causes roughly 10% in annual yield losses, although individual fields may



Figure 2. Symptoms of root and stem rot of snap bean caused by *Rhizoctonia*
Credit: Shouan Zhang

experience up to 100% infection rates. Stand losses of up to 75% have also been reported.

Snapbean growers throughout the state try to rotate away from land where *Rhizoctonia* has built up, and grow on land that is farmed less often or rotated with less susceptible crops like sweet corn.

There are several cultural control tactics for *Rhizoctonia* rot: using disease-free, quality seed that will germinate quickly; avoiding deep seeding; planting when soil temperatures are optimal for rapid germination, 60°F–85°F; reducing the amount of plant debris on the soil surface; controlling soil insects and nematodes that wound the plants and are a point of disease entry; and avoiding overseeding. A major source of disease inoculum on snapbeans in Florida is undecomposed green matter in the soil. Wait 30 days after plowing or disking the previous crop in a double crop system to allow green matter to decompose.

B. Foliar Diseases

a. Bean Golden Mosaic Virus (BGMV)

Bean golden mosaic (BGMV), the most economically important viral disease of snapbeans in Florida, was first reported in 1993. From the first year of its appearance, the disease began causing severe damage to snapbean fields, particularly in Miami-Dade County, where the disease was first found following hurricane Andrew.

BGMV is a geminivirus that produces mottled leaves with light and dark green areas, and puckering in the darker areas. Leaf margins may curl downward and leaves may be completely malformed in susceptible varieties. The virus may also cause stunting of the bean plant and shedding of flowers, which can result in irregular pod set. Yield reductions are greatest when plants are infected early in the season. Pre-bloom infection can lead to losses of up to 90%. In addition, the disease causes pods to be deformed, reducing quality. Losses occur from severe reductions in both total and marketable yield. This disease has caused millions of dollars in losses to commercial snapbean growers in South Florida.



Figure 3. Symptoms of bean golden mosaic on snapbean
Credit: Shouan Zhang

BGMV is transmitted by the silverleaf whitefly, which can acquire the virus from an infected plant in as few as six minutes. The viruliferous whitefly is then able to infect healthy plants for a period of several days to several weeks. It is very important to do everything possible to reduce populations of viruliferous whiteflies, since viral diseases cannot be eradicated from infected plants. Refer to information about the silverleaf whitefly above.

BGMV is most severe when bean plants are at the seedling stage and when virus-carrying whiteflies are abundant. High temperatures contribute to higher whitefly populations, as well as more rapid disease development. Despite this, highest disease incidence in Miami-Dade County is in the spring, during the third crop, probably because of disease build-up.

b. White Mold (*Sclerotinia sclerotiorum*)

White mold, also called *Sclerotinia* rot of beans, is one of the important diseases of snapbeans during the cool

season in Florida. The period of heaviest disease pressure is between late December and January. It is a problem every winter, particularly in the Homestead area. The disease also occurs on a number of other commercial vegetable crops including potato, tomato, cabbage, celery, and lettuce, as well as wild hosts, including ragweed. Approximately 15% of snapbean acreage in Florida is affected by white mold.

Small, black resting structures (sclerotia) and a cottony, white mass (mycelium) are characteristic of the pathogen. Sclerotia are able to survive both in the soil and in crop debris between crop cycles, and they are the source of inoculum infesting individual fields every year. Sclerotia can also be transported from field to field by contaminated farm equipment. White mold in snapbeans usually appears after blossoming starts. The fungus enters senescent petals and from there moves into the plant, killing the stem above the infection point. The pathogen can also enter the plant through leaves or pods resting on the soil surface. This fungus prefers cool, moist weather. White mold is most severe at temperatures between 60°F–70°F. The disease spreads most readily under conditions of high humidity with dew formation. Reduced air circulation due to close plant spacing or weed growth increases the severity of the disease. Under sufficiently moist conditions, sclerotia in the soil produce infectious spores that are carried to host plants by splashing rain. Sprinkler irrigation may favor disease development. Poor drainage can also increase white mold problems. Timing of fungicidal applications is critical. Treatment must be made during the bloom period, which is when the fungus attacks senescing flower petals.

c. Rust (*Uromyces appendiculatus*)

Bean rust occurs every year on Florida snapbeans, but it is generally well controlled using resistant varieties and chemical sprays. The disease is most common during the cooler months and usually is not seen in South Florida between May and November. In Miami-Dade County, the disease appears first in January and continues to increase in severity until the season ends in April. Heavy dews during the cool months provide sufficient moisture for spores to germinate and penetrate host plants. Spore germination can occur between 50°F–77°F, but the optimal temperature range is 63.5°F–72.5°F.

Rust is a common disease on most types of snapbeans in Florida, but is especially severe on pole beans. Although it is easily managed on bush beans, virtually all pole beans are infected, since it is more difficult to achieve thorough coverage of the foliage. Symptoms appear within five days of infection, and spore production begins after another five

to ten days. Due to the short length of the disease cycle, timing of preventative fungicide applications is essential to achieve adequate control. If fungicide sprays are delayed until rust symptoms appear, economic losses may be severe. The bean rust fungus differs from other rust fungi in not requiring an alternate host to complete its life cycle.



Figure 4. Symptoms of bean rust of snap bean
Credit: Shouan Zhang

The first symptom of bean rust is the appearance of pale yellow spots on lower leaf surfaces. One or two days later, the round spots become raised and the leaf surface breaks, exposing pustules of red spores. These characteristic spore-producing pustules are primarily found on the lower leaf surface and occasionally on pods. If the disease is severe and pustules cover much of the leaf surface, premature leaf drop may occur. When leaves are severely affected before bloom, yield losses may be much greater than when the disease occurs after bloom. On susceptible bean varieties, pustules may be surrounded by yellow halos, while on resistant varieties only very small spots appear.

Although growers rely primarily on the application of protectant fungicides for rust control, one of the most essential management tactics for the disease is the prompt destruction of crop residues. Continuing rust development in fields after harvest is an important source of inoculum for newly planted snapbean fields.

The use of resistant varieties is an important management tool for bean rust, but 57 races of the rust fungus have been identified, leaving most bean varieties susceptible to at least one race of the fungus. Growers should plant varieties of bean resistant to the specific races of the fungus found in their area. However, new races commonly appear, complicating the use of resistant varieties.

d. Common Bacterial Blight (*Xanthomonas campestris* pv. *phaseoli*)

Although up to three bacterial diseases regularly affect snapbeans in the United States, common bacterial blight is the only bacterial disease of importance in Florida. It is an occasional disease that becomes more severe during the winter months in years of above average rainfall.

The bacterium is known to be seed-borne. When seeds are infected with bacterial blight, seedlings may die before or soon after emergence. Those that do survive, as well as the dead seedlings, are the source of inoculum for healthy plants. Under wet conditions, the bacteria can be spread by windblown rain, overhead irrigation, or mechanical means. When infected, older plants develop water-soaked spots that are more evident on the lower leaf surface. The spots later turn brown with a yellow halo. Large areas of dead tissue can result. Spots also develop on pods, starting out as water-soaked areas that later develop brick-colored borders. In some fields, pod infection is prevalent, while leaves are only slightly affected. Common blight bacteria can survive in the soil between growing seasons.

The use of disease-free seed is generally the most effective control for common bacterial blight. Additionally, since this bacterial disease is able to survive in soil, disease severity can be reduced by avoiding planting in infested fields for at least three years. The bacteria are easily spread throughout the field under wet conditions, so staying out of the field when plants are wet can also help manage this disease. To read more about common bacterial blight of beans, visit edis.ifas.ufl.edu/pp107.

C. Other Problems

a. Root-Knot Nematodes (*Meloidogyne* spp.)

Although three species of root-knot nematode can attack snapbeans, *Meloidogyne incognita* is the most common. Root-knot nematodes can cause severe stunting, yellowing, early defoliation, widespread development of root galls, and reductions in yield. Decreased root branching and root growth often lead to wilting. In addition, root rots can occur as a result of secondary fungal infections. When soil populations of root-knot nematodes are high at planting, seedlings may be stunted or killed, resulting in patchy stand establishment. Under lighter infestations, symptoms may not be obvious until later in the season. The clearest sign used to diagnose root-knot nematodes is the appearance of galls (swollen areas) on the roots of infected snapbean plants. Galls may be present as a few spherical swellings or

they may cover large areas as extended swellings. Growers need to be able to distinguish the difference between galling caused by root-knot nematodes and nodules associated with nitrogen fixation, since the latter are beneficial while the former are not.

Snapbeans are highly susceptible to root-knot nematodes. Populations can build quickly on the crop, which can potentially cause serious losses on any susceptible crops that follows beans. The damage threshold for root-knot nematodes on snapbeans is very low. Although a pre-plant treatment of the field with a granular nematicide is recommended if nematodes have been found in soil samples or in the previous crop, the cost of treatment is generally not cost effective. Yield losses of 50%–90% are often reported on snapbeans.

Factors such as nematode species, the initial population, snapbean cultivar and environmental conditions all determine how much damage the crop will experience. Damage from root-knot is usually greater during the fall season, when higher soil temperatures permit faster population buildup. However, if fields have experienced summer flooding, nematode populations are low at the start of the season.

b. Several Other Diseases That May Affect Snapbeans in South Florida

- halo blight (*Pseudomonas syringae* pv. *phaseolicola*)
- brown spot (*Pseudomonas syringae* pv. *syringae*)
- powdery mildew (*Erysiphe polygoni*) and Alternaria leaf spot (*Alternaria alternata*)
- anthracnose (*Colletotrichum lindemuthianum*)
- Fusarium disease (*Fusarium solani* f. sp. *phaseoli* and *Fusarium oxysporum* f. sp. *vasinfectum*)
- southern blight (*Sclerotium rolfsii*)
- Cercospora leaf blight (*Cercospora canescens* and *C. cruenta*)
- common bean mosaic virus
- bean yellow mosaic virus

For more information on each of these diseases, refer to PDMG-V3-33, <http://edis.ifas.ufl.edu/pdffiles/PG/PG04100.pdf>.

Cultural Control of Diseases

Plant spacing, both between plants in the row and between rows, is the most important component of cultural disease management for snapbeans in Florida. Wider spacing results in better air circulation, thereby decreasing moisture trapped on the plants, which in turn reduces disease severity. Studies in Miami-Dade County show that while decreasing between-row spacing can increase yields of some cultivars without increasing disease problems, reduced in-row spacing (between plants) can result in higher levels of disease, especially white mold. The most appropriate spacing for snapbean plants in terms of both yield and disease management has been found to be 3.5 to 4.5 inches within rows and 24 inches between rows, though this has not been widely adopted. These recommendations are most appropriate for winter snapbeans in Miami-Dade County growing from December to March. Many snapbean growers use a wider between-row spacing of 36 inches as a management strategy for white mold. An additional cultural control for white mold management includes turning the soil to a depth of at least 6 inches and flooding the field for five to six weeks during the summer to reduce the inoculum. Crop rotation is not an effective management strategy for white mold, because the fungus has a wide host range and its spores are airborne.

Weed Management

One of the most common weeds in bush bean is yellow and purple nutsedge. Nutsedge can be identified by its triangular stems and golden or purple seedheads. Nutsedge can be controlled by using mechanical, cultural, and chemical control methods. Cultivating the field multiple times provides control of the nutsedge. Cultivation should be at least 5 inches deep where the chains of tubers are located. The first cultivation will break apart the chains and induce growth, and a second and third cultivation will control the newly emerged plants. The cultivations should be approximately 4–8 weeks apart. Cultivation can be completed during the fallow period or between the crop rows. Cultivation during the fallow season may be replaced with an application of glyphosate. Glyphosate can translocate to the underground tubers unlike the other burndown herbicides.

An important, but often overlooked, cultural practice that provides weed control is crop spacing. Narrowing the in-row or between-row spacing of will form a denser crop canopy and shade the soil surface. Shading the soil surface will prevent seed germination of annual seeds and slow nutsedge growth.

Refer to the EDIS publication HS188, “Weed management in bean and pea (bush, pole, lima bean, English pea, and southern pea,” at <http://edis.ifas.ufl.edu/wg025> for more information. Note that Reflex is not registered in Miami-Dade County.

Use the lower rate of residual preemergence herbicides in soils in Miami-Dade County. Preemergence herbicides should be trialed on a small parcel of land before being applied to the entire field.

Herbicide control products for broadleaf weeds in the crop row include Basagran, Sandea, and Pursuit. All three of these herbicides control of pigweed and smartweed, and they provide moderate control of common lambsquarters.

Grass weeds that are actively growing can be controlled by Arrow/Intensity/Select Max, Fusilade, Assure II, and Poast. Perennial grasses such as bermuda grass will require two applications of the grass herbicide. These grass herbicides will not control nutsedge.

Harvest

The harvest season for snapbean in Miami-Dade County extends from November to the middle of April. Snapbeans are either harvested by hand or using a mechanical harvester. Mechanical harvesting is labor efficient but results in losses of 10%–15% of the pods. It also causes higher postharvest losses because of broken pod ends. Snapbean quality is based on several factors: yield, horticultural quality, adaptability, and market acceptability. Different recommended varieties of snapbeans are normally used by growers to overcome the environmental conditions found in the different production seasons. For example, beans grown during the winter tend to be shorter than those planted at other times, so care must be taken to select varieties that keep the pods from touching the ground as they mature. The USDA grade standards for snapbeans describes US Fancy grade as having similar variety characteristics, uniform size; being well formed, bright, clean, fresh, young and tender, firm; and being free from soft rot and insect, disease, and mechanical damage. Of these characteristics, the two most important to the Florida commercial snapbean industry are yield and color (deep green

pods). Each year new snapbean varieties are released to the market, but each new variety needs to be evaluated under Miami-Dade conditions to ensure it meets production and market standards.

Multiple Cropping/Rotation

Since snapbeans are a 45- to 67-day crop, three to four successive crops can be planted and harvested during the year. Snapbean is frequently rotated with squash, sweetpotato, cucumber, tomato, or eggplant. Rotation with sweet corn is also possible, but it is important to check for the compatibility of herbicides with crops planted before and after snapbeans. Rotations using successive crops of snapbeans should be avoided if at all possible.

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