Growing Green Beans Session 2

Nutrients, Pests, & Diseases

September 16, 2024

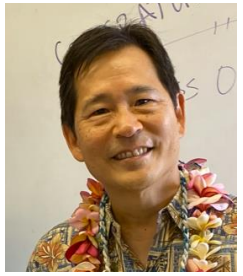
Download Presentation

UNIVERSITY of HAWAIʻI MASTER GARDENER
College of Tropical Agriculture & Human Resources

Who Are We?

Our objective is to help home gardeners produce food to feed your families by learning from each other.

UNIVERSITY of HAWAI'I MASTER GARDENER
College of Tropical Agriculture & Human Resources



Dana Matsunaga
Master Gardener Intern

Corinne Chung
Master Gardener Emeritus

Tina Lau
O'ahu Master Gardener Coordinator
Junior Extension Agent, UH CTAHR Faculty

Agenda - Bean Plant Problems And Solutions

- Introduction
- **Nutrient Deficiency** and Toxicity
- Break, Walk Through the Garden
- **Pests**
- **Diseases**

Did you plant your pole bean seeds?

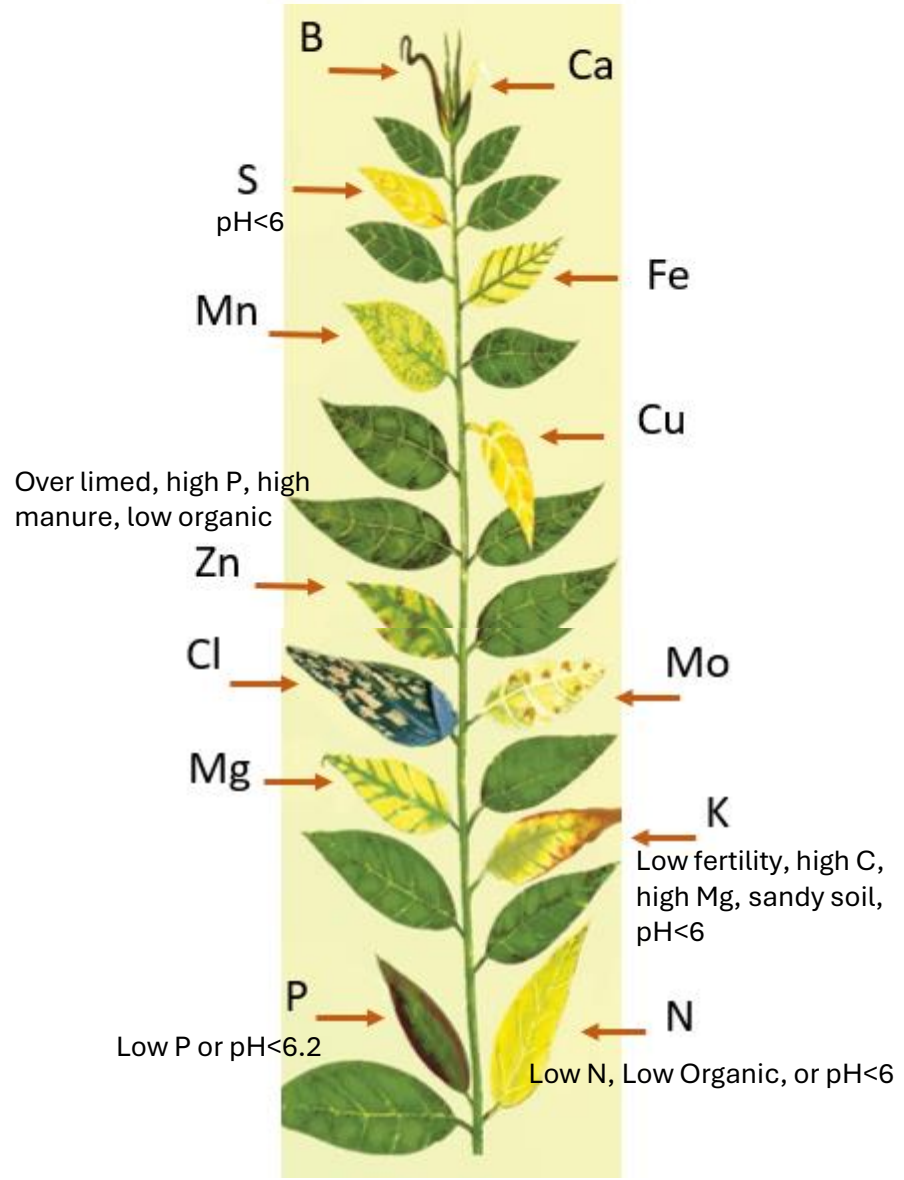
How is it going?

Session 1
Presentation

Leaves Show Nutrient Levels

Soybean Leaves

Ref 13: [Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)]



Ref 8: [Nutrient Deficiencies - MSU Extension Soil Fertility | Montana State University]

What To Do?

1. Test soil pH or lab test soil for nutrient levels
2. Look closely at plant and leaf color to check nutrient issues
3. Evaluate options – Fertilizers, amendments, water

Fertilizers	**Amendments**
• Organic or synthetic • Complete NPK, incomplete, or micronutrient • Slow release or immediate • Solid, granular, or water-soluble	• Compost • Manure and/or worm castings • Biochar • Leaves, kelp, alfalfa • Sand, lime, gypsum

Fertilizers Increase Nutrient Levels in Soil

Nutrient	Organic Fertilizers	Conventional Fertilizers
Complete N P K	Animal Manure	16-16-16 , 1 lbs per 10'x10' 10-20-20, 1.75 lbs per 10'x10'
Nitrogen, N	Fish Meal (~10%) Feather Meal (~12-13%) Chicken Manure (~3%)	Urea (46-0-0) Ammonium Sulfate (21-0-0) Calcium Nitrate (15-0-0)
Phosphorus, P	Bone Meal (~12-15%) Rock Phosphate (2-5%) Chicken Manure (2-3%)	TSP (0-45-0) DAP (18-46-0) 10-30-10
Potassium, K	Hardwood Ashes (0-1-3) Seaweed (1-0-4) Sulfate of Potash (0-0-50) K-Mag (0-0-22)	Muriate of Potash (0-0-60) Potassium Nitrate (13-0-46)
Ca, Mg, S, B, Cl, Co, Cu, Fe, Mn, Mo, Zn	Micronutrient blends	NPK fertilizer with Micronutrients

Not Product Endorsements

Ref 4: Richard Ebesu, "Home Garden Beans", May 2004, HGV-8, UH CTAHR, Dept of Plant and Env Protection Sciences

Ref 6: Presentation by Jonathan Deenik, UH CTAHR, Dept of Tropical Plant and Soil Sciences

Soil Amendment Improve Nutrient Uptake

Amendments	Adjust pH	Nutrient	Microbes	Org Matter	Structure	Moisture	Aeration	Compaction	Drainage	Toxicity
Peat Moss	✓ lower			✓	✓	✓				
Coco Coir				✓	✓	✓			✓	
Compost	✓ buffer	✓ many	✓ support	✓	✓	✓		✓	✓	
Manure		✓ many	✓ source	✓	✓	✓	✓			
Worm Casting		✓ many	✓ source	✓	✓	✓	✓			
Vermiculite					✓	✓	✓			
Perlite					✓		✓	✓	✓	
Dolomite	✓ raise	✓ Ca Mg			✓	✓	✓		✓	✓ Al Mn
Biochar	✓ raise	✓ retain	✓ support		✓	✓	✓	✓		
Lime	✓ raise	✓ Ca			✓	✓	✓		✓	✓ Al Mn
Ammonia Sulfate	✓ lower	✓ N S								
Elemental Sulfur	✓ lower	✓ S								
Wood Ash	✓ raise									
Wood Chips				✓	✓	✓	✓		✓	
Kelp			✓ source	✓	✓	✓	✓			
Comfrey		✓ N P K		✓	✓ roots	✓ leaves	✓ roots	✓ roots		
Leaf Mold				✓	✓	✓				
Gypsum		✓ S Ca			✓	✓	✓	✓	✓	✓ Na
Sand, Cinder					✓		✓	✓	✓	

Nitrogen (N) Deficiency

Deficiency	When it Occurs
Older leaves are pale green to yellow; stunted plants with few flowers and poorly filled pods.	Occurs in all soils, but especially in sandy soils or soils with low organic matter; can be induced by heavy rains or irrigation that cause leaching of nitrates. If soil pH is outside 6.0–8.0 range, N availability may be restricted.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Normal plant (left) and N-deficient plant (right)

Ref 15: Soybean Nitrogen Deficiency: Soil Factors and Plant Response | Purdue University Pest&Crop newsletter

Phosphorus (P) Deficiency

Deficiency	When it Occurs
Slow growth; small dark green leaves in upper part of plant; older leaves yellow then turn brown and senesce. Stunted plants with thin stems and short internodes. Flowers abort.	Occurs in soils with low pH or that have leached nutrients. P availability is very reduced in soils with pH below 6.2.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Normal plants (top) and P-deficient plants (bottom).

Ref 16: Mid-Season Soybean Phosphorus (P) Deficiency | NC State Extension Publications (ncsu.edu)

Potassium (K) Deficiency

Deficiency	When it Occurs
Symptoms mainly in young plants. Marginal chlorosis of older leaves which turns to yellow brown scorch in between the veins (sometimes resembling common bacterial blight, but without water-soaked appearance); leaf may curl downward while scorched margins curl upward; plants can be stunted with poor root systems, leading to collapse.	Occurs in soils with low fertility but high calcium and magnesium, especially sandy soils. K is less available in soils with pH below 6.0.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Normal plants (left) and K-deficient plants (right)

Ref 17: Mid-Season Soybean Potassium (K) Deficiency | NC State Extension Publications (ncsu.edu)

Magnesium (Mg) Deficiency

Deficiency	When it Occurs
Pale green plants with interveinal pale yellow mottling of the leaves followed by interveinal necrosis - or necrosis along the underside of the main veins in dry bean.	Symptoms appear first or are more severe on older and/or fully expanded leaves. Symptoms are localized on leaves.

Ref 18: Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)

Sulfur (S) Deficiency

Deficiency	When it Occurs
Uniform yellow chlorosis of leaves, similar to N deficiency.	Rare in beans—can occur in soils with pH below 6.0.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Normal plants (left) and S-deficient plants (right)

Ref 19: Mid-Season Soybean Sulfur (S) Deficiency | NC State Extension Publications (ncsu.edu)

Zinc (Zn) Deficiency

Deficiency	When it Occurs
Deformed, pale green younger leaves with yellow tips and margins, interveinal chlorosis, and development of necrotic areas with time; blossoms and pods may abort; dwarfed plants.	Occurs in soils with high pH (or acidic soils that have been 'over-limed' or have too much P). Can be worse under conditions of soil compaction, low organic matter, or too much manure or crop residue. The increased absorption of other nutrients can cause Zn deficiency, especially Fe.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Ref 20: Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)

Iron (Fe) Deficiency

Deficiency	When it Occurs
Yellowing, browning, green veins, plant stunting, and subsequent yield reduction.	Occurs in soils with pH greater than 7. Soil and environmental conditions of elevated salt concentrations, excess moisture, cool temperatures, and high soil nitrate, tend to increase iron deficiency chlorosis.

Ref 21: Iron Deficiency Chlorosis in Soybean | NDSU Agriculture

Boron (B) Deficiency

Deficiency	When it Occurs
Terminal buds and apical meristems die; witches' broom; thick, deformed primary leaves; interveinal chlorosis; swollen stems near nodes.	Rare in beans—occurs in soils with coarse textures, low organic matter, and high aluminum and iron hydroxide. It can also occur in alluvial soils with high pH, or in dry, neutral to alkaline soils under intense light.

Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Ref 22: Mid-Season Soybean Boron (B) Deficiency | NC State Extension Publications (ncsu.edu)

Boron (B) Toxicity

Toxicity	When it Occurs
Stunting, yellowing, necrosis.	Occurs with non-uniform applications of fertilizer or bands of fertilizer too close to seed, especially in dry weather; can also occur if beans follow a crop heavily fertilized with B, such as turnips. Boron toxicity is likely if dry beans are grown in the high-boron soils.

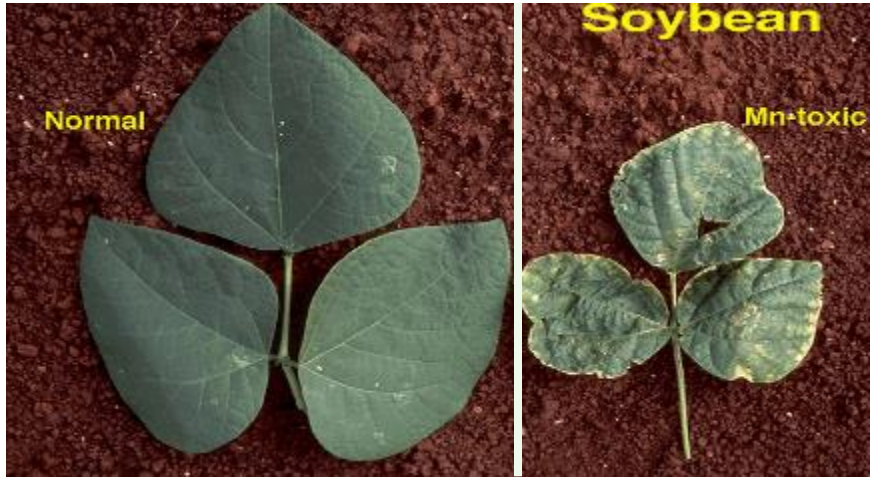
Ref 14: Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Ref 23: Soybean Micronutrient Management in Southeast Nebraska: Boron | CropWatch | University of Nebraska–Lincoln (unl.edu)

Manganese (Mn) Toxicity

Toxicity	When it Occurs
Stunted, crinkled, and chlorotic leaves.	Occurs in acidic pH or wet (anaerobic) conditions.

Ref 24: Rx for Soils and Crops (hawaii.edu)



Healthy Plant?

- What do you think?

Healthy Plant?

- What do you think?

Do You Have Any Nutrient Photos To Share?

- Submit photo files via text using your phone
- Let's help each other identify any nutrient deficiency or toxicity

- Helplines
  - Read references, click on links
  - Search using photo and keywords CTAHR or site:edu
  - Submit questions through E-mail to OahuMG@hawaii.edu
    - Include photos of entire plant, surrounding, and close-up of problem
  - In-person or phone 808-453-6055 on Wednesdays, 9:00 to 12 noon at UGC in Pearl City
  - In-person on Thursdays, 9:30 am to 12 noon at 2727 Woodlawn Dr., Manoa

References, Nutrients

13. Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)
14. Nutrient Deficiency and Toxicity / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM)
15. Soybean Nitrogen Deficiency: Soil Factors and Plant Response | Purdue University Pest&Crop newsletter
16. Mid-Season Soybean Phosphorus (P) Deficiency | NC State Extension Publications (ncsu.edu)
17. Mid-Season Soybean Potassium (K) Deficiency | NC State Extension Publications (ncsu.edu)
18. Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)
19. Mid-Season Soybean Sulfur (S) Deficiency | NC State Extension Publications (ncsu.edu)
20. Symptom Identification Key for Nutrient Deficiencies in Soybeans | CropWatch (unl.edu)
21. Iron Deficiency Chlorosis in Soybean | NDSU Agriculture
22. Mid-Season Soybean Boron (B) Deficiency | NC State Extension Publications (ncsu.edu)
23. Soybean Micronutrient Management in Southeast Nebraska: Boron | CropWatch | University of Nebraska–Lincoln (unl.edu)
24. Rx for Soils and Crops (hawaii.edu)


Break Time, Walk Through The Garden
Garden Safe
Slug & Snail Bait
Photo Taken on August 5, 2024
O'ahu Master Gard

Bean Plant Pests

Pods

Pod Borers: Infest inside pods 

Stink Bugs: Puncture pods 

Leaves

Chinese, Fuller Rose Beetle: Chew leaves 

Leaf Miners: Tunnel into leaves, white trails  

Aphids, Whiteflies, Mites: Suck plant sap   

Bean Fly: Lay eggs on leaves, maggots tunnel down stem 

Stems

Cutworm: Feeds on stem at night 

Slugs: Feeds on stem & leaves at night 

Ref 4: Richard Ebesu, “Home Garden Beans”, May 2004, HGV-8, UH CTAHR, Dept of Plant and Env Protection Sciences

What Can Be Done About Pests?

General, For All Pests

- Rotate crop plants
- Keep plants healthy
- Clean area of clutter and debris
- Monitor daily, look under leaves

Specific For Each Pest

• Crop selection • Clean area • Handpick • Bait, trap • Biological control	• Spray water • Insecticidal soap • Insecticidal oil • Biopesticide • Insecticide

Pest Control Examples

Not Product Endorsements

Insecticidal Soap

- Home_Remedies_table_04.19.13.pdf (hawaii.edu)
- Potassium salts of fatty acids

Biological Control

- Predators: lady beetle, lacewings, hover flies, minute pirate bugs
- Parasitoid wasps: Trichogrammatidae, Braconidae
- Pathogen: Bacillus Thuringiensis
- 2018 Farmscaping with Cover Crops or insectary plants.pdf (hawaii.edu)

Insecticidal Oil

- Home_Remedies_table_04.19.13.pdf (hawaii.edu)
- Mineral oil, Neem oil
- Insect Control: Horticultural Oils - 5.569 - Extension (colostate.edu)

Biopesticide

- Pyrethrin, Sulfur, Spinosad, Beauveria Bassiana Strain GHA
- Less Toxic Insecticides--UC IPM (ucanr.edu)

Bean Pod Borers

• Crop selection	• Spray water
• Clean area	• Insecticidal soap
✓Handpick	• Insecticidal oil
• Bait, trap	• Biopesticide
✓Biological control	• Insecticide

Lycaenid pod borer larva

Holes bored into bean pod

- Handpick or snip caterpillars with shears
- Natural enemies normally keep populations under control

- Ref 25: Managing Pests in Gardens: Vegetables: Invertebrates—Lycaenid pod borers (ucanr.edu)

Stinkbug

• Crop selection ✓Clean area ✓Handpick • Bait, trap ✓Biological control	• Spray water • Insecticidal soap • Insecticidal oil • Biopesticide • Insecticide

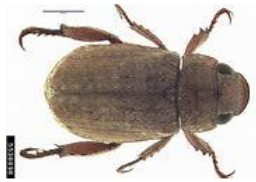
Photo: Oahu Master Gardener, UH CTAHR

- Handpick the bugs and eggs
- Eliminate groundcovers and weeds before stink bugs become abundant
- Insecticides not recommended. Damage does not become apparent until after plant tissues grow
- Parasites and general predators. See Protecting Natural Enemies and Pollinators

- Ref 26: Managing Pests in Gardens: Vegetables: Invertebrates—Stink bugs (ucanr.edu)

Chinese, Fuller Rose Beatle

✓Crop selection • Clean area • Handpick ✓Bait, trap • Biological control	• Spray water • Insecticidal soap • Insecticidal oil • Biopesticide • Insecticide



- Shine bright lights on plants for 2-3 hours after dusk, the rose beetle prime feeding time
- Rose beetle traps with dim light and soapy water

- Ref 27: Hawaii Master Gardener Program: FAQ

False Chinch Bug

✓Crop selection • Clean area • Handpick ✓Bait, trap • Biological control	✓Spray water • Insecticidal soap • Insecticidal oil • Biopesticide • Insecticide

- Low numbers do not need to be managed
- Usually, mass migration lasts only one week at most
- Water spray in cooler mornings or late evenings
- Water moat around garden also can reduce insect infestation

- Ref 28: Pests in Gardens and Landscape, False Chinch Bug, UC IPM (ucanr.edu)

Leafminer

✓Crop selection	• Spray water
• Clean area	• Insecticidal soap
✓Handpick	• Insecticidal oil
• Bait, trap	• Biopesticide
✓Biological control	• Insecticide

- Rarely require treatment
- Clip off and remove older infested leaves
- Kept under good control by natural parasites
- Insecticides are not very effective

- Ref 29: Managing Pests in Gardens: Vegetables: Invertebrates—Leafminers (ucanr.edu)

Aphid

✓Crop selection	✓Spray water
• Clean area	✓Insecticidal soap
• Handpick	✓Insecticidal oil
• Bait, trap	• Biopesticide
✓Biological control	• Insecticide

Photo: Oahu Master Gardener, UH CTAHR

- Washing off with water every few days
- Use of insecticidal soap. Repeat once a week for several weeks
- Spray under the leaves
- Control the ants with ant bait
- Wash off sooty mold from the leaves with mild soapy water

- Ref 30: Hawaii Master Gardener Program: FAQ

Okay or Bad?

Photo: Oahu Master Gardener, UH CTAHR

Ants

• Crop selection	• Spray water
✓Clean area	• Insecticidal soap
• Handpick	• Insecticidal oil
✓Bait, trap	• Biopesticide
• Biological control	• Insecticide

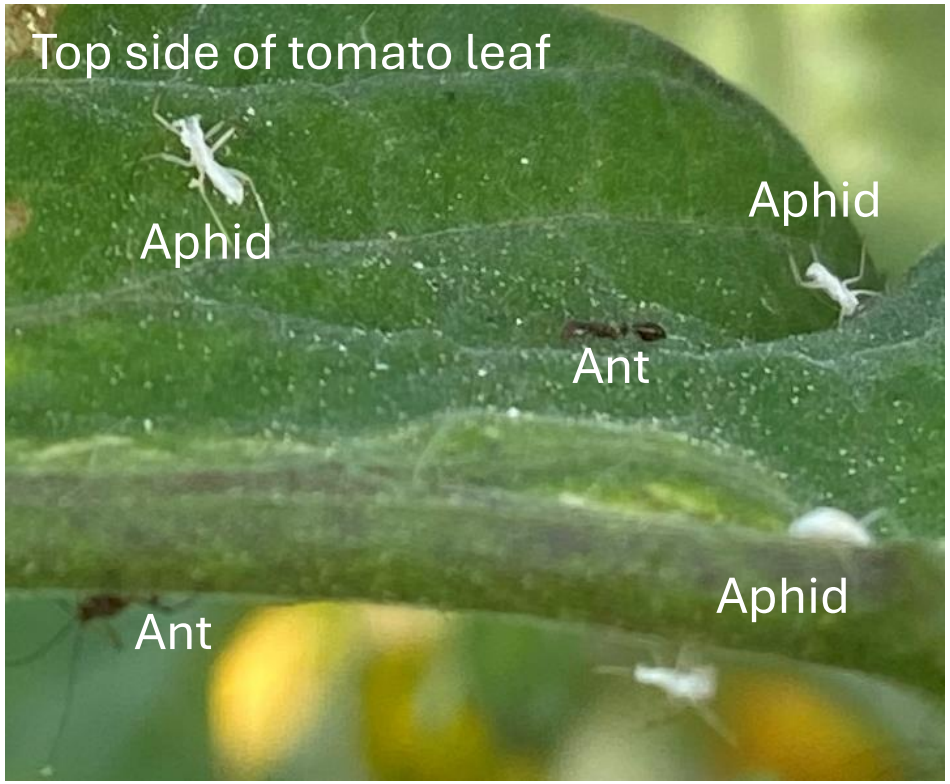


Photo: Oahu Master Gardener, UH CTAHR

- Long legged ants farm aphids for sweet and sticky honeydew secretions
- Tropical fire ant and little fire ants causes painful stings
- Clean area and set bait
  - Sugar-Boric-Acid-Bait-Ants.pdf (hawaii.edu)

- Ref 32: Dr. Jia-Wei Tay > Pest info > Ants (hawaii.edu)
- Ref 33: UHMG-home-recipes.pdf (hawaii.edu)

Whitefly

✓Crop selection	✓Spray water
• Clean area	✓Insecticidal soap
• Handpick	✓Insecticidal oil
• Bait, trap	• Biopesticide
✓Biological control	• Insecticide

- Wash whiteflies off with a strong spray of water
- On dry plant, apply insecticidal soap to the underside of the leaves. Repeat application 3-4 times
- Avoid broad spectrum insecticides
- Must control ants

- Ref 31: Hawaii Master Gardener Program: FAQ

Spider Mite

✓Crop selection	✓Spray water
✓Clean area	✓Insecticidal soap
• Handpick	✓Insecticidal oil
• Bait, trap	✓Biopesticide
✓Biological control	✓Insecticide

- Damaged leaves have stippling on the upper surface and a grayish webbing on the undersurface where most feeding takes place
- Keep fields, field margins, and irrigation ditches clean of weed hosts
- Reduce dust, such as the dust caused by driving on dirt roads
- Consider sprinkler irrigation

- Ref 34: Spider Mites / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

See The Spider Mite?

Photo: Oahu Master Gardener, UH CTAHR

- Which is bigger?
- Aphid or spider mite

Thrip

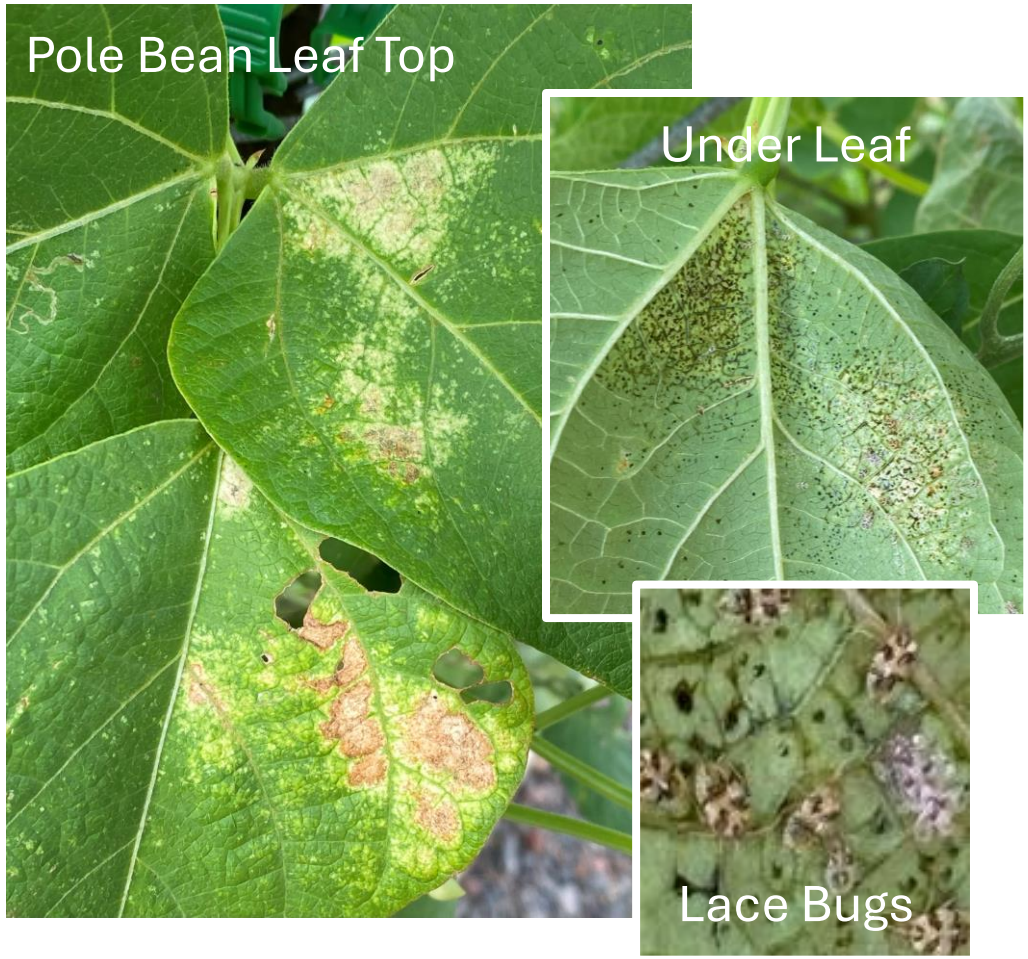
✓Crop selection	✓Spray water
✓Clean area	✓Insecticidal soap
• Handpick	✓Insecticidal oil
• Bait, trap	✓Biopesticide
✓Biological control	• Insecticide

- Brown, distorted leaf and seedling terminals
- Western flower thrips, Banana rust thrips, Hawaiian flower thrips, Bean thrips

- Ref 35: Hawaii Master Gardener Program: FAQ
- Ref 36: Thrips Management Guidelines--UC IPM (ucanr.edu)

Lace Bug

• Crop selection	✓Spray water
• Clean area	✓Insecticidal soap
✓Handpick	✓Insecticidal oil
• Bait, trap	✓Biopesticide
✓Biological control	• Insecticide



- Juvenile and adult stages causes leaf yellowing and potentially leaf die-back with high infestations
- Handpick off infected leaves
- Washing off with water every few days
- Use of insecticidal soap or oil. Repeat once a week for several weeks
- Spray on top and under leaves

- Ref 37: Lace Bugs Management Guidelines--UC IPM (ucanr.edu)

Bean Fly

• Crop selection	• Spray water
✓Clean area	• Insecticidal soap
• Handpick	• Insecticidal oil
• Bait, trap	• Biopesticide
• Biological control	✓Insecticide

Bean fly larva tunneling into the stem surface (top) compared with healthy stem

© J Wessels, Queensland Government

Adult bean fly

© J Wessels, Queensland Government

- Larval tunneling damages the plant's vascular tissue, reducing plant vigor
- Infestations can cause seedling death
- Areas are free of weed hosts, such as phasey bean and volunteer crop legumes
- Systemic pesticides, but might need to repeat sprays for heavy infestations

- Ref 38: Bean fly | Business Queensland

Cutworm

• Crop selection	• Spray water
• Clean area	• Insecticidal soap
• Handpick	• Insecticidal oil
✓Bait, trap	• Biopesticide
• Biological control	✓Insecticide

Photo: Colorado State University Extension

Photo: Penn State

- Treat if two or more larvae are found per row foot prior to the onset of pod damage
- Light traps and pheromone traps are used to monitor adult activity and provide useful information on the need for and timing of insecticide treatments

- Ref 39: Western Bean Cutworm: Characteristics and Management in Corn and Dry Beans – 5.538 - Extension (colostate.edu)
- Ref 40: Black Cutworm — Extension and Outreach — Department of Entomology (psu.edu)

Slug And Snail

✓Crop selection ✓Clean area ✓Handpick ✓Bait, trap • Biological control	• Spray water • Insecticidal soap • Insecticidal oil • Biopesticide • Insecticide

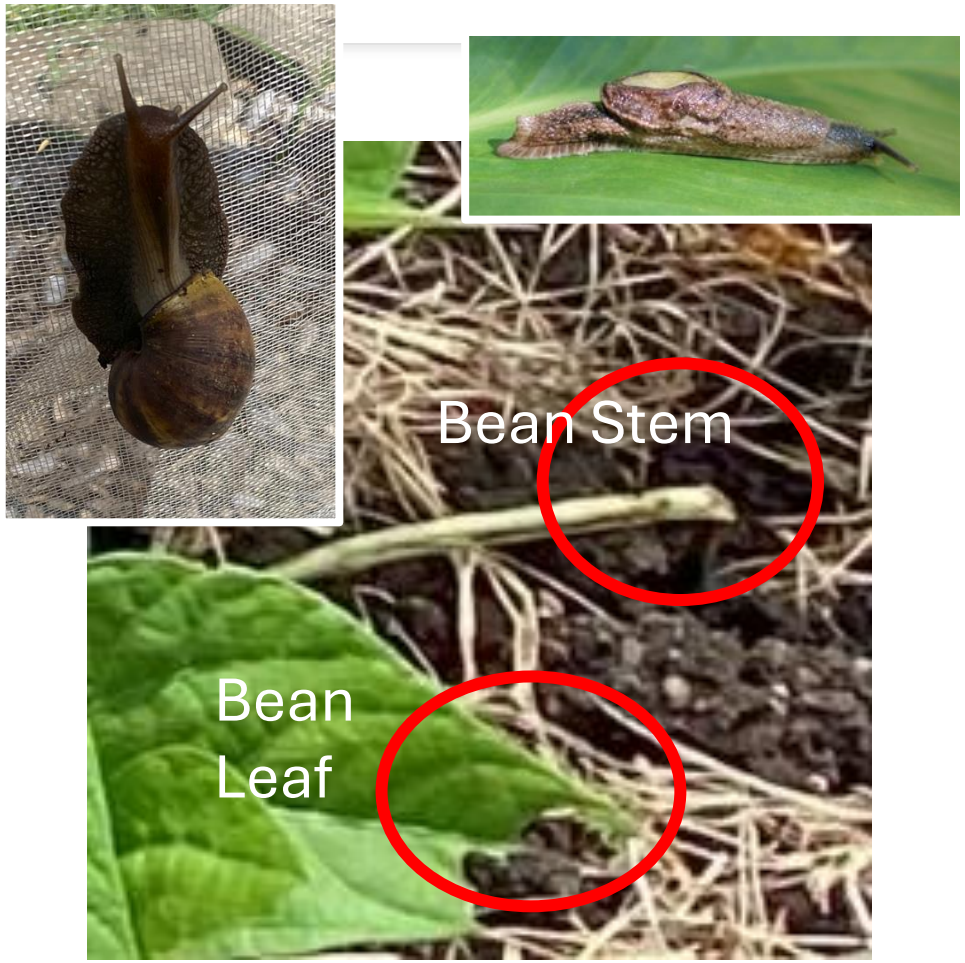


Photo: Oahu Master Gardener, UH CTAHR

- Check for snails/slugs under boards, cardboard, stones, weed cloth, dense ground covers, mulches, sheltered areas, soil crevices, and around trunks and weedy areas
- Search after dark and handpick. Saline solution
- Set traps
- Place bait late afternoon or evening in wet area

- Ref 41: Rat Lungworm Disease Awareness (youtube.com)
- Ref 42: V20-RatLungWorm-2017.pdf (hawaii.edu)

What Happened?

Pests on UGC Bean Plants

Companion Plants for Pole Bean

Plants Next To Pole Beans	Plants Away From Beans
✓Pest repelled by catnip, marigold, nasturtium, potato, rosemary	X Beets X Onions X Chives X Leeks X Garlic X Scallions X Sunflower X Peppers
✓Supports brassicas, corn, cucumber, eggplants, leafy greens, peas, radish	
✓Trellis from corn stalk and leaves	

Ref 43: Cornell University Companion Plant Guide

Grow Herbs For Pest Control

Herbs	Repel Pests
Basil	Aphids, Hornworm, Whitefly, Thrips
Calendula	Aphids, Flea Beetles, Hornworm, Nematodes
Chive	Aphids, Nematodes, Japanese Beetles, Spider Mites
Garlic	Aphids, Spider Mites
Marigold	Aphids, Thrips, Spider Mites
Mint (catnip)	Aphids, Ants, Flea Beetles
Nasturtium	Aphids, Whiteflies, Squash Bugs, Certain Beetles, Mosquitoes, Slugs, Flea beetles, Ground beetles
Onion	Aphids, Carrot Flies, Hornworm, Mites, Slugs
Radish	Flea Beetle, Cucumber Beetle
Sage	Carrot Fly, Cabbage Moth, Flea Beetles, Spider Mites
Thyme	Ants, Aphids, Armyworms, Grasshoppers, Leafhoppers, Wireworm, Whitefly

Herbs	Attract Beneficials
Cilantro	Ladybugs (Aphids, Whitefly), Parasitic Wasp (Hornworm), Colorado Potato Beetle
Dill	Ladybugs, Lacewings, and Hoverflies, but stunts tomato growth
Oregano	Lacewing, Ladybug, Pollinators
Parsley	Ladybugs (Aphids, Hornworm) Pollinators

Do You Have Any Pest Photos To Share?

- Submit photo files via text using your phone
- Let's help each other identify pests

- Helplines
  - Read references, click on links
  - Search using photo and keywords CTAHR or site:edu
  - Submit questions through E-mail to OahuMG@hawaii.edu
    - Include photos of entire plant, surrounding, and close-up of problem
  - In-person or phone 808-453-6055 on Wednesdays, 9:00 to 12 noon at UGC in Pearl City
  - In-person on Thursdays, 9:30 am to 12 noon at 2727 Woodlawn Dr., Manoa

References, Pests

25. Managing Pests in Gardens: Vegetables: Invertebrates—Lycaenid pod borers (ucanr.edu)
26. Managing Pests in Gardens: Vegetables: Invertebrates—Stink bugs (ucanr.edu)
27. Hawaii Master Gardener Program: FAQ, Chinese, Fuller Rose Beatle
28. Pests in Gardens and Landscape, False Chinch Bug, UC IPM (ucanr.edu)
29. Managing Pests in Gardens: Vegetables: Invertebrates—Leafminers (ucanr.edu)
30. Hawaii Master Gardener Program: FAQ, Aphid
31. Hawaii Master Gardener Program: FAQ, Whilefly
32. Dr. Jia-Wei Tay > Pest info > Ants (hawaii.edu)
33. UHMG-home-recipes.pdf (hawaii.edu)
34. Spider Mites / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)
35. Hawaii Master Gardener Program: FAQ, Thrips
36. Thrips Management Guidelines--UC IPM (ucanr.edu)
37. Lace Bugs Management Guidelines--UC IPM (ucanr.edu)
38. Bean fly | Business Queensland (business.qld.gov.au)
39. Western Bean Cutworm: Characteristics and Management in Corn and Dry Beans – 5.538 - Extension (colostate.edu)
40. Black Cutworm — Extension and Outreach — Department of Entomology (psu.edu)
41. Rat Lungworm Disease Awareness (youtube.com), Slugs
42. V20-RatLungWorm-2017.pdf (hawaii.edu), Slugs
43. Cornell University Companion Plant Guide

Bean Plant Diseases

Nematodes – Parasite on roots

Fusarium – Root fungus

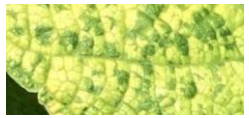
Powdery Mildew – Leaf

Rust – Leaf

Bacterial Blight – Leaf, bean pod

Halo Blight – Leaf, bean pod

Anthracnose – Leaf, bean pod



Bean Mosaic Virus – Entire plant

Ref 4: Richard Ebesu, “Home Garden Beans”, May 2004, HGV-8, UH CTAHR, Dept of Plant and Env Protection Sciences

What Can Be Done About Diseases?

General, For All Diseases

- Use certified seeds
- Plant resistant varieties, cultivars
- Rotate vegetable plants
- Prep soil correctly
- Keep plants healthy
- Clean area, do not drop leaves
- Clean and sterilize tools
- Keep leaves dry, water properly
- Address fungal issues promptly

Specific For Each Disease

• Seed, plant selection • Soil prep • Fertilize correctly • Clean area • Clean tools • Handpick, prune	• Airflow • Water properly • Fungal soap • Fungal oil • Biologic fungicide • Contact fungicide

Disease Control Examples

Not Product Endorsements

Fungal Soap

- Home_Remedies_table_04.19.13.pdf (hawaii.edu)
- UHMG-home-recipes.pdf (hawaii.edu)

Biological Control

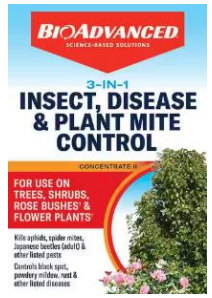
- Sulfur, Copper
- HomeFungicide.pdf (uga.edu)

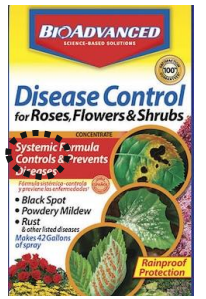
Fungal Oil

- Home_Remedies_table_04.19.13.pdf (hawaii.edu)
- Vegetable oil, Neem oil
- Insect Control: Horticultural Oils - 5.569 - Extension (colostate.edu)

Fungicide

- Myclobutanil, Chlorothalonil, tebuconazole
- Home Vegetable Garden Fungicides – Wisconsin Horticulture





Not for vegetable plants

Nematodes

✓Seed, plant selection	• Airflow
✓Soil prep	• Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	• Biologic fungicide
• Handpick, prune	• Contact fungicide

- Cause abnormal plant growth, stunted, discolored
- Avoid well-draining sandy soil with soil 77 to 86°F
- Till under large quantity of biomass, manure, compost, and organic matter (e.g. bean plants)
- Deep plowing and/or flooding
- Soil solarization for several weeks in hot weather
- Crop rotation and intercropping (e.g. marigolds)
- Plant resistant varieties and cultivars

Photo: Lima bean lines | UDaily (udel.edu)

- Ref 44: Plant-parasitic Nematodes and Their Management PD-15.pdf (hawaii.edu)
- Ref 45: Control of Root-Knot Nematodes in the Home Vegetable Garden | NC State Extension Publications (ncsu.edu)
- Ref 46: BeansPeasNematodeManagement.pdf (growables.org)
- Ref 47: V4-Wang-marigold.pdf (hawaii.edu)

Fusarium

✓Seed, plant selection	• Airflow
✓Soil prep	✓Water properly
✓Fertilize correctly	• Fungal soap
• Clean area	• Fungal oil
• Clean tools	• Biologic fungicide
• Handpick, prune	• Contact fungicide

- Avoid with correct soil preparation, drainage, plant spacing, and irrigation
- No effective fungicide
- Replace with fusarium resistant plant varieties

- Ref 48: Fusarium Root Rot of Common Beans - MSU Extension
- Ref 49: Managing Pests in Gardens: Diseases: Fusarium wilt—UC IPM (ucanr.edu)
- Photo Ref 50: Fusarium Wilt / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)

Powdery Mildew

• Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	✓Fungal soap
✓Clean area	✓Fungal oil
✓Clean tools	✓Biologic fungicide
✓Handpick, prune	• Contact fungicide

- Early detection and control is key
- Remove weeds
- Remove and destroy infected leaves or other plant parts
- Reduce humidity, watering
- Home remedies – soap, oil
- Many commercial products

Figure 2. Powdery mildew development on pole bean.
Credits: Qingren Wang, UF/IFAS

- Ref 51: Powdery Mildew of Garden Vegetables in Hawaii.pdf (hawaii.edu)
- Ref 52: Home_Remedies_table_04.19.13.pdf (hawaii.edu)
- Ref 53: BeansPowderyMildewManagement.pdf (growables.org)

Rust

• Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	✓Biologic fungicide
✓Handpick, prune	✓Contact fungicide

- Avoid cool, cloudy, humid weather areas
- Keep area clean of plant debris
- Do not wet leaves
- Crop rotation

Photo: Washington State University

- Ref 54: Bean: Rust | Hortsense | Washington State University (wsu.edu)
- Ref 55: Managing Pests in Gardens: Vegetables: Diseases: Bean rust—UC IPM (ucanr.edu)

Bacterial Brown Spots

✓Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	✓Biologic fungicide
✓Handpick, prune	✓Contact fungicide

- Can develop rapidly in high temperatures
- Do not save seeds
- Do not wet leaves/beans
- Do not touch plants/beans during/after rain
- Use copper-based fungicides (bacteria can develop resistance)
- Crop rotation, greater than 2 years

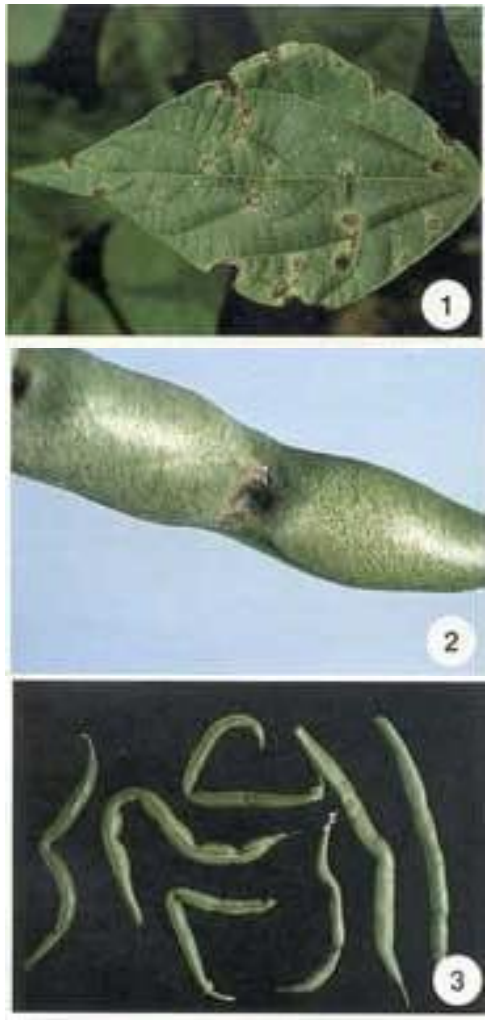


Photo: Cornell CALS

- Ref 56: https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
- Ref 57: Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC

Bacterial Blight

✓Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	✓Biologic fungicide
✓Handpick, prune	✓Contact fungicide

- Can develop rapidly in high temperatures
- Do not save seeds
- Do not wet leaves/beans
- Do not touch plants/beans during/after rain
- Use copper-based fungicides (bacteria can develop resistance)
- Crop rotation, greater than 2 years

Photo: Cornell CALS

- Ref 58: https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
- Ref 59: Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC

Halo Blight

✓Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	✓Biologic fungicide
✓Handpick, prune	✓Contact fungicide

- Can develop rapidly between 60 to 80°F
- Do not save seeds (bacteria can survives > 4 years in seeds)
- Do not wet leaves/beans
- Do not touch plants/beans during/after rain
- Use copper-based fungicides (bacteria can develop resistance)
- Crop rotation

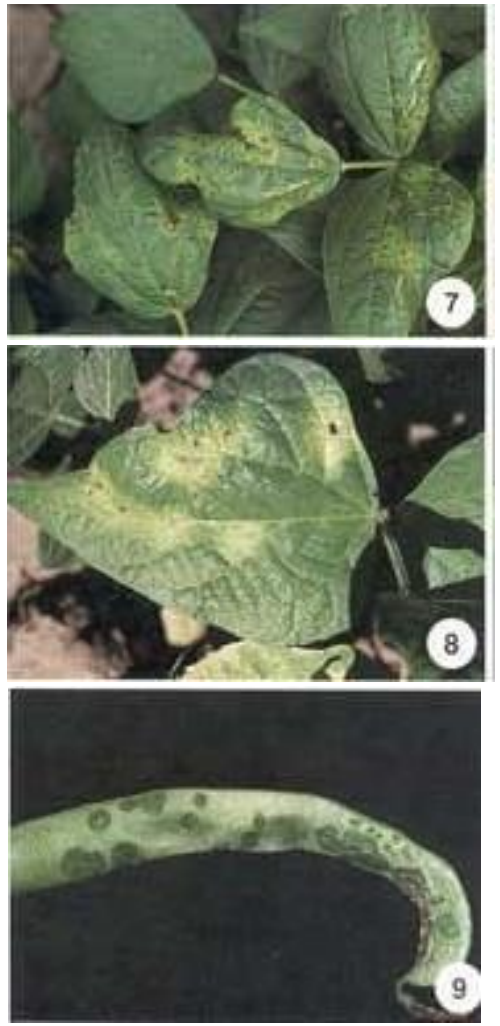


Photo: Cornell CALS

- Ref 60: https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
- Ref 61: Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC

Anthracnose

✓Seed, plant selection	✓Airflow
• Soil prep	✓Water properly
• Fertilize correctly	• Fungal soap
✓Clean area	• Fungal oil
✓Clean tools	• Biologic fungicide
✓Handpick, prune	✓Contact fungicide

- Do not save seeds if infected
- Do not wet leaves/beans
- Do not touch plants/beans during/after rain
- Plant resistant varieties
- Crop rotation, greater than 2 years

- Ref 62: Bean Anthracnose | Cornell Vegetables

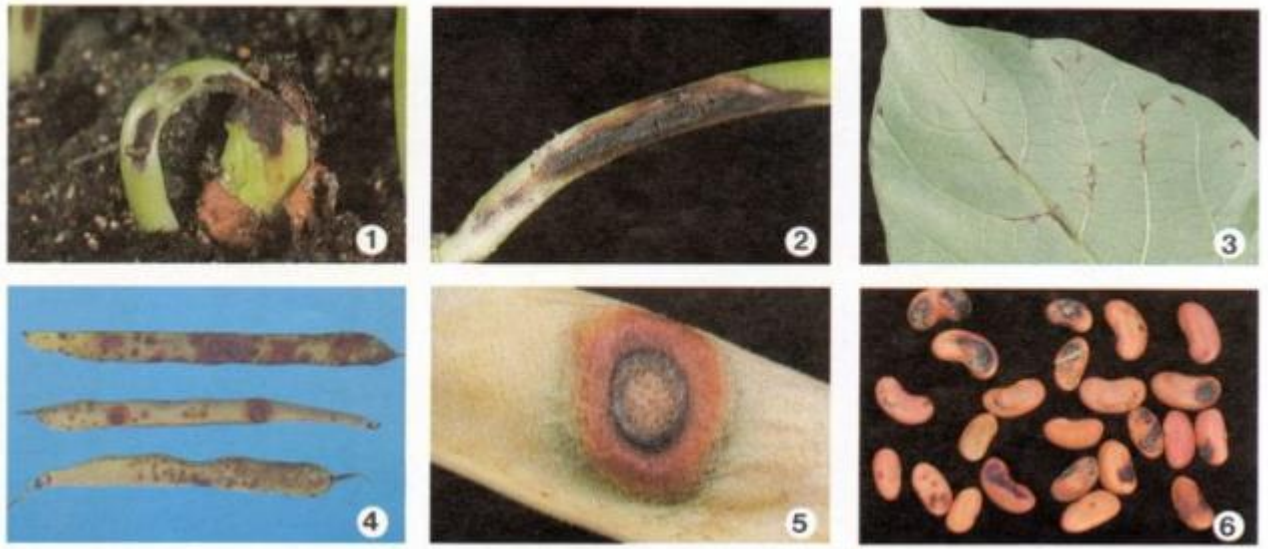


Photo: Cornell CALS

Bean Mosaic Virus

✓Seed, plant selection • Soil prep • Fertilize correctly • Clean area • Clean tools • Handpick, prune	• Airflow • Water properly • Fungal soap • Fungal oil • Biologic fungicide • Contact fungicide

- Spread by aphids
- Do not save seeds if infected
- Plant resistant varieties

- Ref 63: Bean Common Mosaic Virus | USU
- Ref 64: Virus Diseases of Snap and Dry Beans | Cornell Vegetables

Photo: Utah State University

Do You Have Any Disease Photos To Share?

- Submit photo files via text using your phone
- Let's help each other identify diseases

- Helplines
  - Read references, click on links
  - Search using photo and keywords CTAHR or site:edu
  - Submit questions through E-mail to OahuMG@hawaii.edu
    - Include photos of entire plant, surrounding, and close-up of problem
  - In-person or phone 808-453-6055 on Wednesdays, 9:00 to 12 noon at UGC in Pearl City
  - In-person on Thursdays, 9:30 am to 12 noon at 2727 Woodlawn Dr., Manoa

References, Diseases

44. Plant-parasitic Nematodes and Their Management PD-15.pdf (hawaii.edu)
45. Control of Root-Knot Nematodes in the Home Vegetable Garden | NC State Extension Publications (ncsu.edu)
46. BeansPeasNematodeManagement.pdf (growables.org)
47. V4-Wang-marigold.pdf (hawaii.edu)
48. Fusarium Root Rot of Common Beans - MSU Extension
49. Managing Pests in Gardens: Diseases: Fusarium wilt—UC IPM (ucanr.edu)
50. Fusarium Wilt / Dry Beans / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)
51. Powdery Mildew of Garden Vegetables in Hawaii.pdf (hawaii.edu)
52. Home_Remedies_table_04.19.13.pdf (hawaii.edu)
53. BeansPowderyMildewManagement.pdf (growables.org)
54. Bean: Rust | Hortsense | Washington State University (wsu.edu)
55. Managing Pests in Gardens: Vegetables: Diseases: Bean rust—UC IPM (ucanr.edu)
56. https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
57. Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC
58. https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
59. Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC
60. https://www.vegetables.cornell.edu/pest-management/disease-factsheets/bacterial-diseases-of-beans/
61. Bacterial Diseases of Beans | Plant Problems | Illinois Extension | UIUC
62. Bean Anthracnose | Cornell Vegetables
63. Bean Common Mosaic Virus | USU
64. Virus Diseases of Snap and Dry Beans | Cornell Vegetables

Summary: What Did We Learn

- Head-off potential problems
- Monitor your plants frequently to identify problems
- Look up treatments
- Take action appropriately

Summary

Questions

Helpline

- Submit questions through E-mail to OahuMG@hawaii.edu
  - Include photos of entire plant, surrounding, and close-up of problem
- Wednesdays, 9:00 to 12 noon, UGC in Pearl City, 808-453-6055
- Thursdays, 9:30 am to 12 noon, 2727 Woodlawn Dr, Manoa

Future Workshops

- Please share with your gardener friends
- Follow Oahu Master Gardeners Events and Tickets | Eventbrite