

Vegetable Disease Identification Lesson Plan

A Senior Project

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By

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Abstract

This purpose of this project is to provide a lesson plan and additional presentations for high school agriculture teachers. The lessons are based on vegetable disease identification. There are few high school agriculture departments that are teaching this material. This project provides an example lesson plan that can be used by the teacher if need be. By including numerous presentation slides the teacher can adapt the included lesson or create a new one that will fit their class and school site best.

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Chapter One

Introduction

High School agriculture students have various choices of which classes they would like to take in the program. There is a range from horticulture, agriculture mechanics and animal production. Horticulture classes can range from floral design, basic plant physiology, and labs that actually grow and take care of plants. These classes are usually centered on flowers, succulents, or small plants that can be grown in the garden. Rarely are there classes about the crops that are grown in the agriculture industry. The best way for the students to find out and explore the topic of agriculture crops and the diseases that affect them would be to do a Career Development Event (CDE) in this area. This project is designed to provide an option for teachers to teach this subject area in the classroom. With an example lab and lecture lesson plan; as well as PowerPoint slides, teachers would have an option to teach their students about agriculture crops and diseases that affect them.

Statement of the Problem

Agriculture education students have many opportunities to learn about the agriculture around us and put into practice what they learn in the classroom. In many cases students have many options to choose from in what area they would like to learn about. Some of these are floral design, vet science, agriculture science, agriculture mechanics, and much more. One section that is not seen covered very much is crop science and the diseases that affect the crops that we all eat and depend on. The problem is that there is no lesson and lab plans that could be used to teach students about crops and the diseases that affect them.

The Importance of the Project

The development of a lesson plan and lab plan for crop diseases would give teachers an option in teaching their upper horticulture classes about the diseases and the importance of being able to recognize these in the field. This is important especially for those students that are going to be going into crop production. It also gives students a wider knowledge in the area of agriculture. Students who want to compete in the Vegetable Crop Judging CDE would also have a guide in preparing for the competition. This lesson plan would be extremely beneficial to teachers who would like to teach this subject or have students who compete in the CDE.

Purpose(s) of the Project

The purpose of the project is to create a lesson plan and lab plan to educate upper horticulture or crop classes on diseases of agricultural crops. The lesson plans here include tomato, cucurbit, cauliflower, and onion diseases.

Objectives of the Project

The objectives to accomplish the purposes of this project are:

1. To educate students in the upper agriculture classes about different agricultural crops in their area and the diseases that affect them.
2. For students to be able to recognize these diseases in the field and how to deal with these diseases in the field.

Definition of Important Terms

Listed below is a review of terms that will be, or have been, used throughout this project:

- FFA: Future Farmers of America. This is an organization that is based around agriculture education and helps students develop as leaders in the industry. The organization also helps in exploration of agriculture careers.
- CDE: Career Development Event. “Help students develop the abilities to think critically, communicate clearly, and perform effectively in a competitive job market.” (National FFA Organization)
- Agriculture Education: “Agricultural Education prepares students for successful careers and a lifetime of informed choices in the global agriculture, food, fiber and natural resources systems.”(National FFA Organization)

Summary

This project is designed to give teachers an example lesson that could be used to teach their students about agricultural crops and the diseases that can affect them. The lab portion of this lab is designed to help students be able to recognize these diseases when walking in a field. Many students do not get the opportunity to learn about this subject because it is one that is not common to a high school agriculture department. This would give teachers the option of teaching this unique course.

This collection of information will also be a basis for the Vegetable Crop Judging CDE. This would give a guide for those students to prepare for their competition. Having this information will help in making the process of learning the information necessary that much quicker for not only the students but as well the teacher or coach of the team. Overall, this information would benefit the students in the agriculture program in many ways.

Chapter Two

Review of Literature

In creating a lesson plan it is important to know what the students need to be learning and what is truly important for them to know. One of the best ways that this can be achieved is by using the backward design method of creating a lesson plan. In “Understanding by Design” by Wiggins and McTighe (2005) backward design is defined as “an approach to designing a curriculum or unit that begins with the end in mind and designs toward the end” (pg 338). This design will help create a lesson that will be most effective in the classroom.

Creating a Lesson

When planning my lesson plans, it is important to strive to make sure that the students will truly understand what the objective of the class is. It is important to make sure that they can take the ideas that we cover in each class and use them effectively in other lessons and classes. To accomplish this, using backwards design to break down the standards into big ideas and essential questions is the best option. These big ideas and essential questions will help students have a better understanding of the lesson than just factual knowledge of the lesson (Wiggins & McTighe, 2005).

Another aspect to focus on when creating a lesson plan is the possibility of activities in the lesson. If so, make sure that the activities will enhance the understanding that the students will have and that they will be able to take the material they have learned and apply it. This method of lesson planning will help a teacher to not fall into the expert blind spot trap by just covering information (Wiggins & McTighe, 2005). The activity should enhance the student’s true understanding.

The teacher should also take into consideration what category of assessments I will need to use to measure the students' progress. Make sure to be aware that the assessments planned measure the achievement of the students and what they have learned (Popham, 2005). Students will need to have some knowledge base of the information but also need to be able to apply the information they have received to an activity such as a lab. It is also helpful to include assessment other than that of the traditional paper and pen format (Popham, 2005). These non-traditional assessments will help to gauge what the students are really learning and what needs to be covered more in depth by the teacher.

Assessment

Assessments are more than just seeing where students are in the learning process. It is a way for a teacher to check themselves. Based on student's assessments, the teacher can better understand how they are doing with teaching students the material. This is really only one of seven reasons why teachers should assess students (Popham, 2005, p. 13-19). These seven reasons to assess students are to determine student's strengths and weaknesses monitor their progress, assign grades, determine instructor's effectiveness; assessments help determine public perception of education effectiveness, students assessments are seen as a part of the teacher's evaluation, and clarify instructional intentions (Popham, 2005, p. 13-19).

It is very important to assess students in multiple ways, such as labs, activities, essays, and regular tests. By having multiple assessments teachers can get a better idea of what the students truly understand. Labs can be designed so that students must take the examples they were given in class and apply it in the field. The students should be able to recognize the

diseases present in a field. By using something different than just a multiple choice test, teachers can evaluate what the students are really learning.

Summary

It is important to create a lesson with the backward design method so that teachers can make sure the objectives are truly met. This will help with students having a true understanding of the material. By using different methods of assessments, teachers can better gauge how they are doing on making sure their students understand the material.

Chapter Three

Methods and Materials

The author conducted all the research for the vegetable disease presentations with the Agricultural Commissioner's Office. All research done for the presentations was done as an intern with the department. The author completed four sets of PowerPoint presentations on the diseases that affect vegetables. The slides were originally designed as training tools. The author also consulted those in the Commissioner's office for help with preparing the PowerPoint presentation slides.

The author shortened the slides so that they could be used in a lesson plan for a high school agriculture class. Once the slides had been shortened, the author created a lesson with lab for the onion PowerPoint presentation. In the lesson includes the presentation, the lesson plan, a lab activity, and a homework assignment. The lesson and lab could be adapted for any of the PowerPoint presentations.

The materials used are Power Point presentation, UC IPM to receive information on the plant diseases, lesson plan guide, and assessments created by the author.

Chapter Four

Results

Included in this chapter are the four sets of Power Point presentations, the complete lesson plan, lab write up, and homework assignment for the lesson plan.

Cauliflower PowerPoint Presentation

CAULIFLOWER DISEASES



Alternaria Leaf Spot

- At first, small dark specks will develop that will later grow into circular tan spots
- In right conditions, dark green spores may grow on spots
- Older infected leaves may feel papery and may tear. The infected area may fall out and have the shothole effect
- The disease favors wet conditions and is spread by wind and splashing water



Bacterial Blight



- The disease will start out as a small angular water soaked spot on leaf that is usually surrounded by yellow borders
- As the disease progresses the spots will grow together creating larger gray to tan colored spots
- The spots can be seen on both the top and the bottom of the leaves
- This disease is seed-borne and can be spread from plant to plant by sprinkler irrigation and rain

Bacterial Leaf Spot

- Starts as small dark water soaked spots on the leaves
- Older leaves will have tan and maybe even purple spots
- Leaf spots can be seen from both the top and the bottom of the leaves
- The disease may resemble Downy Mildew on transplants
- The disease is mostly seen in greenhouses
- The disease is spread by splashing water and is seed-borne



Downy Mildew

- At first lesions will appear yellow and as the disease progresses and become older they will turn tan
- In correct conditions, white fluffy fungus will develop on the underside of the leaves
- Blighted effects may occur due to numerous infection sites
- Internal infections will appear as black streaks on stems and flower branches
- This disease and the infection favor cool and moist weather



Sclerotinia Disease

- *S. minor* only infects stems and leaves in close contact with soil where brown necrotic areas will form. These areas will eventually become watery rots and collapse
- *S. sclerotiorum* does the same as *S. minor* but will also form tiny mushroom-like bodies which release aerial spores. This can affect the upper leaves and flowers and can cause rot to the tissues
- Can survive for years in the soil
- Wet soil conditions are favored for development



Verticillium Wilt



- Older and lower leaves will turn yellow and wilt
- As the plant matures the leaves will turn brown and drop off
- The xylem will turn black as well as the stems and roots
- The growth of the plant can be stunted
- This wilt affects more cauliflower on the coast
- The disease favors cooler soil temperatures and will be seen more in late summer and early fall

Cucurbit PowerPoint Presentation

CUCURBIT DISEASES



Angular Leaf Spot

- This disease is found mostly on the cucumber
- Gray to tan colored lesions can be found on the foliage of the plant
- The spots may have yellow halos around them
- The foliage may have a tattered pattern to it where dry tissue has fallen out
- The bacterium can survive on infected debris and seeds
- The disease can easily be spread by rain, sprinkler irrigation, workers, and machinery



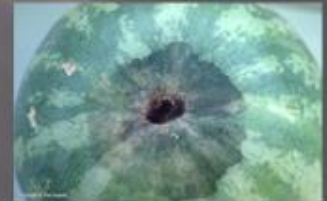
Cucumber Mosaic (CMV)

- The plant will develop a mosaic or mottled pattern on it with this disease. This pattern can be dark green with light green or yellow areas
- Growth of the plant will be stunted and there will be smaller leaves on the plant as well as fruit malformations
- The disease is spread through aphids and can be seed-borne

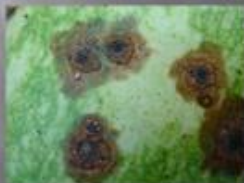


Stem End Rot of Watermelon

- The disease symptoms that will be first seen will be shriveling and dying of the stem
- Then there will be browning of area around the stem which will enlarge as the disease progresses
- Cut flesh will be softened and light brown
- Cut melon that is infected and exposed to air for a few hours will turn black
- The disease will increase in hot weather but slow in colder weather



Anthracnose



- This disease is on all cucurbits except for seedless watermelon
- Tan to black colored lesions appear on the leaf, fruit, and/ or stems
- This disease is seen mostly in greenhouse transplants
- This disease favors warmer weather and in those conditions will develop more quickly and will be found on the seed, plant residue debris, and volunteer plants

Bacterial Fruit Blotch

- This disease starts out as small water soaked marks and then turns into larger lesions that cover the upper surface of the fruit
- As time progresses the lesions will turn a reddish brown color and the fruit will develop cracks
- Eventually the fruit will rot
- This disease favors high temperatures and humidity



Onion PowerPoint Presentation

ONION DISEASES



Purple Blotch

- Leaf blades will have oval shaped tan and deep purple lesions
- Lesions can girdle and kill leaves and seed stems
- Yellow streak extends from both sides of the lesion along the blade. These will eventually turn brown.
- In the desert this disease favors dew and in other regions, foggy areas
- Spores are airborne



Downy Mildew

- Older leaves will have fine, furry, grayish white and purple growth growing on the surface
- The tissue under the growth is pale green, yellow and will eventually collapse
- Large circular yellowish clumps of infected plant may be the first sign of the disease



Pink Root

- Infected roots will first turn pink and will darken to red and purple. They eventually will shrivel, turn black, and die
- The coloring may extend to the scales of the bulb but will be confined to the roots and outer scales
- New roots may also become infected but the plant will not usually die
- The disease persists in the soil indefinitely. The longer the root is in the field, the more destructive the disease



Onion Smudge

- Disease affects the scales and lower un-thickened leaves (neck of bulb)
- Will stay mostly concentrated to the top layer of scales, but in wet conditions fungus will grow on all layers
- Leaves may have necrotic areas
- Stomata can produce spore bearing structures that are distinguishable with a hand lens



Rust

- Reddish/dull orange oval shaped pustules develop on the leaf blade
- The lesions may appear darker in the season because of black teliospores that develop in the pustules
- Leaves that are heavily influenced will turn yellow and fall off prematurely
- When the plant is severely affected, bulb size and quality will be reduced



Tomato PowerPoint Presentation

TOMATO DISEASES



Anthracnose

- Happens to ripe or overripe fruit
- Will occur on the stems, leaves, and roots
- Depressed, circular lesions will appear on ripe fruit that will later turn tan with black specks
- Root infection will be evident after the fruit has ripened
- The infected root will be completely rotted
- During wet weather, masses of salmon colored spores may appear



Bacterial Spot



- Disease appears on seedlings and mature plants
- Severe defoliation may occur if seedlings are infected
- Leaf spots start yellow and turn dark and can be raised
- Fruit spots will enlarge and scab
- The disease exists in crop debris, volunteer tomatoes and weed hosts and is also seed-borne
- The disease favors high humidity

Tomato Mosaic Tobamovirus (ToMV)



- Leaves of the plant will have light to dark green mottling, be distorted and stunted. They also will have a fernlike appearance with dark green raised areas
- Fruit production may be reduced with this disease
- Ripe fruit will have browning on the fruit wall and yellow blotches and necrotic spots may appear on green or ripe fruit
- This disease is influenced by environmental conditions

Pith Necrosis



- This disease affects mature tomatoes and is usually seen when first fruit is close to mature green
- The pith has brown discoloration and necrosis which leads to hollowing of the stem. This coloration will also extend up the whole plant
- A gray or dark brown lesions may appear on the stem surface
- Adventitious roots will appear on the stem where the pith is affected

Tomato Spotted Wilt Virus



- Young leaves will exhibit bronzing on the upper side and will later develop necrotic spots
- The leaves may cup backward and tip dieback may occur
- Ripe fruit will exhibit chlorotic and blotched spots with concentrated rings
- Green fruit has slightly raised areas with some rings
- The disease is spread by thrips

Tomato Black Ring Virus



- Plant growth and vigor may be impaired
- When infected by nematodes, the disease appears as patches of poor growth
- Leaves may have ring spots and chlorotic mottling
- Symptoms will be most obvious in spring

Lesson Plan with Assessments

Lesson Plan: “Plant Diseases: What is going on with my Onions?”

60 Minutes

Standards Addressed/Established Goals:

- California Agriculture Basic Core
 - CLF 364: Damage Caused by Plant Pests
 - CLF 365: Plant Disease Identification

Understandings:

- Students will understand that a plant disease can affect a fruit and a crop in different ways.
 - A crop could be affected but the fruit may not always show symptoms.
- Students will be able to identify these diseases based on the presentation.

Essential Questions:

- How does knowing what is happening with one plant beneficial to knowing what is happening with your entire crop?
- How is it possible that a plant will be affected with a disease but the disease isn't seen on the fruit?

Assessments:

The following assessments will be used to measure the student's level of understanding:

- A disease identification worksheet
- Lab Write Up of field observations
- Discussion about plant disease and its effects on crops
- Reviewing what has been covered and applying to questions in written form

Instructional Strategies and Learning Tasks

1. (10 min) Warm Up

- a. Write a response to the question on the board in your notebook.
 - i. “Based on our discussion yesterday, how does knowing what is happening with one plant beneficial to knowing what is happening with your entire crop?”
 - ii. The class will discuss after students have finished writing in their notebooks.

2. (10 min) Introduction

- a. State objective: Students will understand that a plant disease can affect a fruit and a crop in different ways.
- b. Ask students how they may think this can happen.
- c. Inform students that we will be going out in the onion field to look at the plants and decide if we have any diseases on our crop. Also that we will be evaluating the plants based on the diseases in the lecture slide.
- d. Tell them to use the information they know about diseases based on their readings to determine if the plants have a disease.
- e. Go through PowerPoint with step by step directions for the lab.

3. (25 min) Activity

- a. Students will be placed in groups and given a block of the onion field to observe and analyze.
 - b. Students will be given a worksheet to fill out their observations.
 - c. Students will be reminded to keep in mind how a crop can be affected with a disease but the fruit not show signs.
 - d. Class heads out to fields and makes observations of the field.
 - e. Students will cut open or have the teacher cut open their onion and look at any symptoms of diseases and note them on their lab write up.
4. **(10 min) Debrief of Observations/ Hand Out Homework**
- a. Students will share with the class what they have found in the field
 - b. Students will discuss why a crop/plant may show signs of a problem but not the fruit. (A disease can affect a plant and little symptoms can be seen in the fruit, Students can give examples of these diseases based on lecture.)
 - c. After discussion, we will transition into identification of plants diseases.
 - d. Students will be handed the homework assignment and it will be explained. Students will be able to use PowerPoint notes from the previous day to complete homework.
 - e. With the remaining time students will finish the lab activity sheet as their exit activity, and begin working on the homework.
5. **(5 min) Closure**
- a. Reflect back on the two essential questions and check that students understand the objective for the day.
 - b. Ask students to think about their warm up question as we will discuss this more with our other crops

ELD and Other Special Needs Strategies

Support for English Language Learners:

- Lecture PowerPoint has multiple pictures of the diseases. This will help the students to know what the disease looks like without even needing to know the description given.
- The PowerPoint presentation with direction for the lab will have step by step directions along with pictures that will help the students understand what they need to accomplish.
- When in the field, place students who are ELL and work together well in the same groups so that they could help each other work through worksheets and questions.
- Walking around will allow the students to ask questions about any confusions they may have.

Principles of Universal Design for Learning & Elements of Differentiated Instruction:

- Throughout the lesson students are using multiple ways to show they understand the material. These include discussion, writing, and observations.
- Students are presented with a PowerPoint that has images and descriptions of the diseases. This will help all students learn the information.

- Even though there is a PowerPoint presented the students will be able to apply the information they learn in the lab activity. This helps students who are hands on learners grasp the concepts.
- The lab allows all students to have a visual and experience what some of the disease will look like.
- The PowerPoint presentation with direction for the lab will have step by step directions along with pictures that will help the students understand what they need to accomplish.

Resources/ Materials Needed:

- Onion Disease PowerPoint
- Lab Directions PowerPoint
- Lab Activity/Worksheet-Field Observations of an Onion Field
- Plant Disease Identification Homework Sheet

Homework/Assignment for Next Class:

- Finish Plant Disease Identification page
- Look over/reflect on warm up question

Name:
Date:
Period:

Plant Identification Homework

Use the Power Point notes to identify the diseases pictured. You may use another source if need be. Make sure to answer all questions completely.

1. Name the disease seen to the side. What are two symptoms that you can use to identify this disease? How is this disease formed?



2. Name the disease seen to the side. What are two symptoms that you can use to identify this disease? How is this disease formed?



3. Name the disease seen to the side. What are two symptoms that you can use to identify this disease? How is this disease formed?



4. Name the disease seen to the side. What are two symptoms that you can use to identify this disease? How is this disease formed?



Name:

Date:

Group Number:

Field Observations of Onion Field

In class we have gone over some Onion diseases. We have discussed how to ID them and what they can do to the plant. It is now time to put your knowledge of these diseases to practice in the field. Your group will observe your section of onions and decide if the crop is diseased and what the disease may be. Refer to your Power Point notes if need be. If you see some disease, pull the onion bulb up to see if that portion of the plant is affected.

You will need to bring a sample of a diseased plant to the classroom to cut open.

Answer the following questions based on what you saw in the field! Have fun!

1. Describe how your sections of the onion field appear. (Hint: look at the whole section not a piece of it)

2. List any diseases that are present in your section of onions.

1.

2.

3.

4.

5.

6.

7.

8.

3. Did you see any plants that were affected with a disease but the bulb was not? Why do you think that is?

4. Cut open the sample you took from the field. Are there any symptoms of a disease? What could this disease be?

Summary

The above slides are of the most common diseases that may be seen. There are many more that could be included if the teacher would like to. Presentations were kept short due to the lab activity. The teacher could include as many diseases as they feel necessary.

The lesson plan and lab activity could also be altered to the presentation being presented. Instead of using the onion presentation, any of the other three could be used in the same lesson plan with simple changes to the lesson.

Chapter Five

Conclusion and Recommendations

Conclusion

This project was designed to serve as a guide to teachers and students on identifying vegetable diseases. It was designed to be used in a horticulture classroom setting where the students could still get hands on experience in the field. This field could be at the school site or that of a local farmer. By reaching out to a local farmer students can see what types of diseases are really being dealt with in the industry. This also creates a relationship between the agriculture program and the farmer. This is extremely helpful when the program may need help with another activity.

Even though the project was designed for a classroom setting, these presentations could be used to help students prepare for the Vegetable Crop Judging CDE. This information is also helpful in preparing for the contest. Since the information is already compiled in presentations already it will be that much easier for the teacher to give the students studying materials.

Recommendations

It is recommended that the included PowerPoint presentations, lesson plans, and assessments be used in a high school agriculture horticulture classroom. It is recommended that the program have crops or greenhouses or a connection with a local farmer. Though, this lesson can be adapted to whatever the site has access to.

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