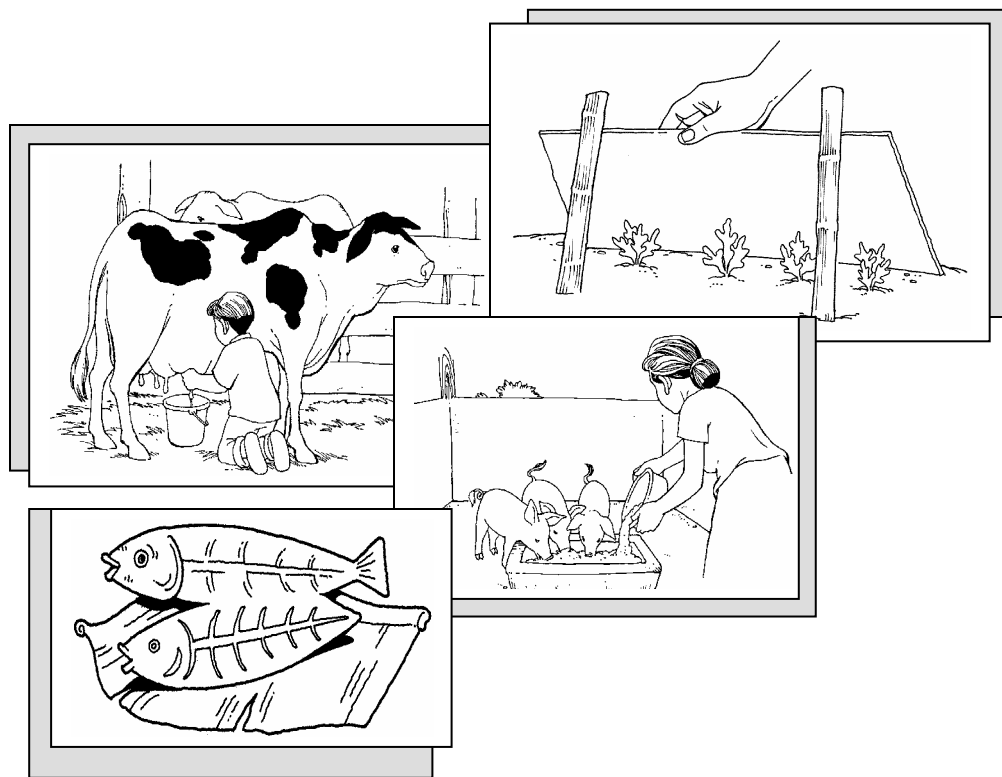


# PROJECT EASE

Effective and Affordable Secondary Education

TECHNOLOGY AND LIVELIHOOD EDUCATION

Agriculture and Fishery Arts



MODULE 1

BUREAU OF SECONDARY EDUCATION

Department of Education  
DepEd Complex, Meralco Avenue  
Pasig City



# *Plant Production First Year*

## *Module 1*

### *Starting a Garden in a Smarter Way*



#### *What this module is about*

Good day! Are you ready to start your day in a more productive way? If yes, good! If not, think twice. I am sure you would like to contribute something good to your family. You may be thinking how? Well, you could grow vegetables in your backyard. This way, you can contribute to the food needs of your family in your own little way.

Vegetable gardening is not an easy task. It needs proper care to produce good yield. Have you ever thought why some farmers produce good quality vegetables in their farm? Were you able to see healthy growing pechay, mustard, kangkong, upo, patola, and cucumber in your local market? What have you noticed in their physical appearance compared to your own harvest in school? You want to find out their secrets? Prepare yourself because this module will help you find out the secrets of producing good quality vegetables.



#### *What to learn from this module*

This module will teach you how to start producing your own vegetable garden. Specifically, this will enable you to:

1. explain the value of using good seeds;
2. discuss the proper selection of seeds;
3. describe how seeds are stored for future use;
4. differentiate the methods of testing seeds;
5. compute percentage of germination of seeds.



#### *How to learn from this module*

1. Read the title first. Do you have in mind what the title means to you? Are you excited to scan the pages of this module and start learning?

2. After reading the introduction, go through the expected skills you are to learn from this module. Always refer to these objectives as you read and perform tasks in the different learning activities in this module. This way, you can check if you're following the right tract to attain the objectives of this module.
3. Next, work on the Pretest. Do your best to accomplish what is asked of you. Do not worry about getting a low score. Just go on and do your best.
4. After working on the Pretest, accomplish all the activities in this module to check how well you fared.
5. Finally, answer the posttest to check if you really comprehend what you read. Check if your answers are correct in the answer key provided at the end of this module. Certainly, you are expected to score higher than the pretest.



## PRETEST

Write the letter of the correct answer in your notebook.

1. Why is the use of immature fruits not advisable as seed material?
  - a. Immature seeds are weak.
  - b. Its embryo rots easily.
  - c. Its embryo has not fully developed.
  - d. Seeds are infected with diseases.
2. The following are good reasons in using good seeds when planting crops, except one.
  - a. Higher yield
  - b. Resistance to diseases
  - c. High percentage germination
  - d. Aromatic when ripe or about to be harvested
3. When seeds are sown in the seedbox and it germinates, it is described as
  - a. Maturity
  - b. True to type
  - c. Damage-free
  - d. Viability
4. The following are reliable suppliers of seeds, except
  - a. Bureau of Plant Industry
  - b. Department of Agriculture
  - c. Ambulant vendors
  - d. Commercial seed distributors
5. Which of the following materials is not a good desiccant for seed storing?
  - a. Dry ash
  - b. Dry charcoal
  - c. Toasted white rice

- d. River sand
6. It is not advisable to allow the seeds to come in contact with the soil when drying because
- a. contamination will be high
  - b. germination rate will be affected
  - c. moisture content will rise
  - d. embryo will die
7. A method of seed testing wherein a moist tissue paper and a plate is used.
- a. plate
  - b. dish
  - c. ragdoll
  - d. seedbox
8. The ragdoll method is done through the use of
- a. a filter paper and a dish
  - b. a cheesecloth and a stick
  - c. soil and a seedbox
  - d. a tin can and water
9. Alex sow 75 seeds of okra on a seedbox. After two days, 70 seeds have sprouted. What is the percentage germination of the seeds sown?
- a. 91%
  - b. 92%
  - c. 93%
  - d. 94%
10. Which of the following seeds is advisable to store after testing?
- a. Seeds which were tested once and got an above 50 % seed germination.
  - b. Seeds which were tested twice and resulted a seed germination rate of above average 50%.
  - c. Seeds which were tested once and got a seed germination rate below 50%.
  - d. Seeds which were tested twice and resulted a germination rate of below 50 %.

## Lesson 1

### The Value of Using Good Seeds

You learned in your elementary agriculture that plants can reproduce through seeds. Seed is a baby plant or embryo inside a protective covering called testa or seed coat. The embryo is usually the product of the fertilization of the egg cell by one of the two male nuclei from a pollen tube. The seed coat originates from the mother plant.

The young plant inside the seed is very delicate. If we are going to compare healthy plants to healthy babies, usually healthy babies become healthy children and adults and become productive. Likewise, healthy seeds grow healthy, produce quality yield and benefit growers. If you use seeds which are not of good quality, you will only be creating problems because these seeds are sometimes immature, contaminated, and worse, the embryo is dead.

#### Activity 1

Analyze the situation below, then answer the questions that follow.

Kenneth is a first year student. He has a project in vegetable production. He bought a pack of pechay seeds from an ambulant vendor who sells ornamental plants and fertilizers. When he sowed the pechay seeds in a seedbox, he was surprised that only few of the seeds germinated.

Questions:

1. What do you think are the reasons why only few seeds germinated?
2. If you're in that situation, are you going to buy seeds from anyone who approached you? Why?
3. Could you still plant the seeds that germinated. Justify your answer.

You might be wondering why it is not advisable to buy seeds from an unreliable source. Seeds that are sold by ambulant vendors are not registered and certified. These seeds are prone to contamination and adverse environmental condition that can kill the embryo inside the seed. To assure you of good quality seed materials, you must look for a reliable source.

Here are some tips when finding good seeds.

1. Buy seeds from a reliable source. There are government agencies specializing in seed certification and distribution. These are the Department of Agriculture, Bureau of Plant Industry, and Agricultural Colleges and Universities as well as commercial seed distributors importing hybrid seeds from other countries.
2. Look carefully on the physical appearance of the seeds. Find if there are blemishes or stains in the seed coat, molds and holes caused by insects or egg of insects. These seeds might introduce a new pest or disease and are, therefore, unfit for planting. Clean the seeds and remove diseased or infected one.

3. Determine the vigor of the seeds. Observe its speed and uniformity of germination. You can soak the seeds in water. Those that float are weak. Weak seeds do not survive when used as planting materials.
4. Make sure that seeds are the right one. Read the label as stated. This can help you in determining the characteristics of the seed.
5. Select those without contaminants such as dirt, stones, and leaves. These foreign materials can lower seed quality.
6. Do not use seeds with foul odor, watery and shiny. These are dead, contaminated or low in percentage of germination



Self-check:

Check (✓), if the statement explains the value of using good seeds and (✗), if it is not.

- \_\_\_\_\_ 1. Money spent in buying seed materials are wasted.
- \_\_\_\_\_ 2. Buy seeds anywhere.
- \_\_\_\_\_ 3. Seed materials used must be free from weed seeds.
- \_\_\_\_\_ 4. Less problem in maintenance since quality seeds start healthy.
- \_\_\_\_\_ 5. Determine the physical appearance of seeds.

## Lesson 2

### Proper Selection of Seeds

Now that you have already learned the value of using good seeds it is best to know how to properly select good seed materials for planting or storing purposes. This is a difficult task especially if your farm or project area is far from available supply of good seeds.

#### Activity 2

Read the situations below and find out how proper selection of seeds is done.

##### A. Eager Robert



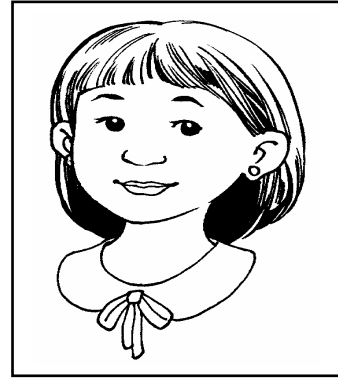
Robert is new in vegetable production. He is eager to start his new project since he has an area to use and he has available imported seeds given by his uncle.

- Do you think he will succeed in his project? Why?

## B. Saver Rosa

Rosa wants to start a vegetable garden. She wanted to save money in buying seed materials. She thought that the money saved from buying seeds will be used for fertilizers instead. To save more money every planting season, she planned of growing some vegetables on her farm for seed purposes.

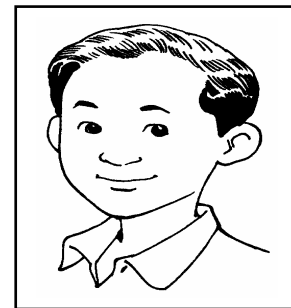
- Do you think it is a sound idea? Can you cite some of its advantages?



## C. Wiser Alex

Alex wants to start his farm project but instead of buying seed materials from those who sells quality one, he plans to buy seeds from the local market where seeds are intended for food preparation. He plans to buy one kilogram of bean seeds which costs less than those in the Bureau of Plant Industry.

- Is the source of his seed materials good or not?
- What will happen to the seeds that he bought if planted on his farm?



Note that in the three situations, you do not have to be in a hurry to start a project without considering the most important factor. That is finding good seed materials.

To guide you in finding quality seeds, here are some factors to consider:

1. Viability - This is the capability of the seeds to germinate when sown in seedbed or seedbox. Seedlings should appear to be strong and healthy.
2. Maturity - Matured seeds taken from matured fruits will assure you that embryo in seeds are fully developed. Over matured seeds are not advisable because it might be infected with pests and diseases. On the other hand, seeds that are immature will not produce good seedlings and usually do not germinate.
3. Seed storage - There are seeds whose viability and rate of germination decrease after storing for a long time. This is due to some factors such as seed type, quality and storage conditions and length of time.
4. True to type - Seeds acquired or bought should be free from other type of seed plants.
5. Free from seed-borne diseases- Check if the seeds have blemishes or stains where insect eggs, fungus or bacteria thrives.
6. Damage free -Seeds that are cracked and deformed should not be used.

7. Free from foreign materials or weed seeds - Seeds to be used must be clean or free any type of contaminants such as dirt, stones, leaves, weed seeds and others. These are low quality seeds.

If you wish to grow vegetables for seed purposes, you may do so. This will help you save money at the same time choose the type of vegetable to plant. If you are not yet accustomed to identifying maturity in plants, here are some tips to determine if seeds are mature.

- a. The fruit of squash, watermelon, and melon has a hollow sound when knocked.
- b. The color of tomatoes and pepper changes from green to red; from violet to yellow in eggplant.
- b. Shattering of pods in legumes.
- c. Fruit is disconnected from the branch as in squash, watermelon and melon.
- d. Number of days of plant growth depending upon your familiarity of the type of plants grown.

There are also seeds which you can buy from commercial seed distributors which are called **hybrid**. Hybrid seeds are product of cross and pollinating plants with outstanding characteristics. Characteristics such as resistant to pests and diseases, quality of fruits and others. These are more expensive considering its type and source, than the seeds distributed by different government agencies.



Self-check:

Match the factors to consider in finding quality seeds in Column A to their descriptions in Column B. Write the letter of the correct answer in your notebook.

- | A               | B   |
|-----------------|---|
| 1. Maturity     | a. The capacity of the seeds to germinate.                                  |
| 2. Damage free  | b. Matured seeds taken from matures fruits lead to fully developed embryo.  |
| 3. Seed storage | c. Seeds acquired or brought should be free from other type of seed plants. |
| 4. Viability    | d. Seeds that are cracked should not be used.                               |
| 5. True type    | e. Seeds viability decrease after soaking for a long time.                  |



## Lesson 3

### Storing Seeds for Future Use

Cost of seed materials is one of the areas of expense in plant production. To save money intended for seed materials, you should learn to grow plants with outstanding characteristics and have the seeds as your planting materials for the next cropping season. In this manner, you will be able to increase your income due to your savings. Moreover, if the quality of the seeds taken from your garden is good and outstanding, you can store it for future use.

#### Seed Extraction and Cleaning

If you are interested in gathering matured seeds from your vegetable farm, it is important to know the condition of the fruit and seeds that will be harvested. This way, you will be able to collect seeds from the garden to be used as planting materials for your next cropping season or store it for future use.

1. Seeds coming from wet and fleshy fruit. The seeds are attached firmly to the flesh. You can use a knife or hand to extract them, then they are subject to fermentation or soaked in water for two days. Seeds that float are thrown and those that are sunken are washed and dried. Example: Melon and Papaya.
2. Dry seeds. These are obtained or extracted from dried fruit or pod. Put the seeds inside a sack or net bag and pound them. Pounding inside a sack or a net bag will prevent the seeds from shattering or scattering outside. Do not harvest these seeds if it is raining or early morning when there is still dew. Example: Pechay and Cabbage.
3. Dry seeds from fleshy fruit. You can dry the fruit first before extracting the seeds. Example: Hot pepper.

#### Activity 3

Classify the seeds of the vegetable plants below using the given table. Do this activity in your notebook.

eggplant	hot pepper	okra	pole sitao
cabbage	peas	cucumber	mungo
tomato	cowpea	squash	hyacinth bean
pigeon pea	onion	ampalaya	

Wet seeds from Flesh fruit	Dry seeds flesh fruits	Dried seeds from

Here are pointers to remember when drying seeds:

1. Do not allow the seeds to come in contact with the soil when drying. Microorganisms present in the soil will lower the quality of the seeds.
2. Use sack, winnowing basket or mat when drying. These materials allow air to pass through, giving fast and even drying of seeds.
3. Do not dry seeds rapidly under the heat of the sun. Air dry the seeds first in a shady area for one to two days before sun-drying. Dry only the seeds under the sun before 11:00 am and after 2:00 pm when the heat of the sun is not so intense because this condition can kill the embryo inside the seed.
4. Spread the seeds thinly and turn them occasionally at least four to five times a day to make drying fast and even.
5. Cover the seeds when it rains or before the night sets in and take them indoors to prevent their moisture content from increasing.

### Storing Seeds

After extracting and drying the seeds, you may plant some of your seeds or you may store them for future use. In storing seeds for the next cropping season, you may choose any of the following procedures.

#### A. Storing Using Desiccants

Here are the steps in storing seeds using desiccants:

1. Prepare a container (bottle, tin can) with a tight cover.
2. Place a desiccant (dry charcoal, dry ash toasted white rice or lime) at the bottom of the container.
3. Place a cardboard after the desiccant material. Remember to punch holes on it.
4. Place the seed on top of the cardboard or put them inside a paper envelop and label them.
5. Replace the desiccant each time you open it.

#### B. Temperature Storing

1. Place seeds inside a bottle or a sealed jar.
2. Place the jar or bottle in a low or cold temperature (not freezing) of your refrigerator. If refrigerator or air-conditioning equipment is absent, you may choose a cold place (near the river, under trees, underground, inside a clay jar).
3. Be sure seeds will not get wet.

Remember that life of seeds doubles when the moisture content is lowered by 1% or when the storage temperature is lowered by 5%.

Example:

If the storage life of a seed with 14% moisture content is two years, its storage life can be prolonged to four years if the moisture content of the seed is lowered to 13%.

If the expected life of the seed is three years in a storage room with a temperature of 15°C, its life can be prolonged to six years if the storage , temperature is lowered to 10°C.

If both the moisture content of the seed and storage temperature are lowered, the increase in the life of the seed is greater.

Now, try to work on the activity below. Check if you fully understand what you just read.

#### Activity 4

Choose the right materials to use in storing seeds. Place a check on the blank space before each material if you think it is needed. Use your notebook.

<input type="checkbox"/> Bottle	<input type="checkbox"/> Dye	<input type="checkbox"/> Chalk
<input type="checkbox"/> Kettle	<input type="checkbox"/> Seeds	<input type="checkbox"/> Tissue
<input type="checkbox"/> Sand	<input type="checkbox"/> Cardboard	<input type="checkbox"/> Cotton
<input type="checkbox"/> Metal Cover	<input type="checkbox"/> Paper	<input type="checkbox"/> Label
<input type="checkbox"/> Charcoal		



Self-check:

A. Place a ✓ if the statement is referring to the ways of storing seeds for future use and ✗, if it is not.

- 1. Do not allow the seeds to come in contact with soil when drying.
- 2. Use a kitchen fork to extract seeds that are attached firmly to the flesh.
- 3. Dry seedbox before storing.
- 4. Use sack or mat when drying.
- 5. Cover the seeds when it rains or before the night sets in.

B. Arrange the steps below in storing seeds. Write 1 in the box of the procedure that should go first, 2 for the second, and so on.

- 1. Replace desiccant each time the container is opened.
- 2. Place a cardboard with holes after the charcoal.
- 3. Label the seeds with its name, date of harvest, date stored, date of germination and the percentage of germination.
- 4. Get a bottle with tightly metal closed cover.
- 5. Place a dry charcoal at the bottom of the bottle.
- 6. Place the seeds inside a sachet and put it inside then seal it.

Did you get all the answers correct? Very good! You may now move on to the next lesson.

## Lesson 4

### Methods of Testing Seeds

Now, that you already know how to store seeds, it is important that you should also learn to test the viability of the seeds before storing it. In this way, you will have the idea that seeds acquired are of good quality.

Perform the activities below to know the different methods of testing seeds.

#### Activity 5

Dish Method

- a. Prepare 50 bean seeds and a seedbox.
- b. Sow the seeds in a shallow furrow of the seedbox. Water them.
- c. Bring the seedbox to an area in the school nursery.
- d. Visit the seedbox the following day.

Answer the following questions based on your observations:

1. What happened to the seeds in the seedbox?
2. How many seeds have sprouted?
3. How many did not ?

#### Activity 6

Plate Method

- a. Collect 30 mungo seeds.
- b. Prepare a plate and a tissue paper.
- c. Moisten the tissue on the plate and arrange the seed on it. Cover it with another moist tissue.
- d. Observe what will happen to the seeds the next day.

Answer these questions:

1. What happened to the seeds on the plate ?
2. Do you think the method used is applicable to seed testing? Why?

#### Activity 7

Ragdoll Method

- a. Prepare a cheesecloth, stick and 100 seeds of radish.
- b. Arrange the seeds on a damp cheesecloth.
- c. Roll the cheesecloth on a stick and water it.
- d. Place it in the nursery where sunlight is not present. Water it everyday but do not flood it.
- e. Open it after two days.

Questions:

1. What happened to the radish seeds?
2. How many seeds germinated?
3. How many did not?



Self-check:

Differentiate ragdoll method from plate method.

## Lesson 5

### Percentage of Germination

Now, that you have germinated seeds using the methods discussed from the previous lesson, you may now compute the percentage of germination.

In obtaining percentage of germination, you will be able to determine whether the seeds acquired or bought are of good quality or not. Percentage of germination is computed using the given formula:

$$\% \text{ germination} = \frac{\text{number of normal seedlings}}{\text{total number of seeds sown/germinated}} \times 100$$

To understand this better, perform the activity below.

#### Activity 8

The class of Mr. Danilo Bains harvested matured eggplant fruits to be used as seed materials for the next cropping season. The seeds were tested first before storing. Using the ragdoll method, the class sown 150 seeds. After three days, 122 seeds germinated.

1. What is the percentage germination of the seeds sown?
2. Considering the number of seeds that germinated, are the seeds good for storing?
3. Why?

The more seeds tested for percentage germination, the more accurate the percentage germination will be. If possible, replicate testing and use 50 or more seeds. Do not store or plant seeds if their percentage germination is lower than 50%. These seeds will usually produce weak seedlings and will deteriorate rapidly, if stored.



Self-check:

Analyze the situation below then compute the percentage of germination of seeds used.

Mang Elias germinated 190 seeds of radish using the ragdoll method. After three days, he saw 150 seeds germinated. What is the percentage germination of the seeds?



### LET'S SUMMARIZE

- ❖ The value of using good seeds produce quality yield and benefit growers.
- ❖ Factors to consider in selecting good seeds are as follows: viability, maturity, seed storage, true type, free from seed-borne-disease, damage free, free from foreign materials or weed seeds.
- ❖ Seeds with high moisture content are more susceptible to physical damage during processing.
- ❖ Percentage of germination is computed using this formula:

$$\% \text{ germination} = \frac{\text{number of normal seedlings}}{\text{total number of seeds sown / germinated}} \times 100$$



### POSTTEST

Choose the correct answer by encircling the letter.

1. Embryo or young plant inside the seed are not fully developed in
  - a. evergreen fruits
  - b. immature fruits
  - c. mature fruits
  - d. over matured fruits
  
2. It is highly recommended to use good seeds when planting crop in order to produce
  - a. lower yield
  - b. unsatisfactory yield
  - c. satisfactory yield
  - d. higher yield
  
3. Viability means the ability of the seeds to
  - a. germinate
  - b. make food
  - c. absorb water
  - d. respond to light

4. It is best to buy seeds from government agencies because they are
  - a. good promoter
  - b. business oriented
  - c. reliable source
  - d. financed by big time suppliers
  
5. Dry ash and charcoal are good desiccant materials for seed storing because they can
  - a. promote growth
  - b. absorb moisture
  - c. eliminate diseases
  - d. repel insects
  
6. Contamination is high when seeds dried come in contact with
  - a. cloth
  - b. soil
  - c. dew
  - d. heat
  
7. Dish method of testing seed viability is done through the use of
  - a. soil and a seedbox
  - b. cheesecloth and a stick
  - c. plate and a tissue paper
  - d. soil and recycled materials
  
8. Using cheesecloth, stick and water is a method of seed testing called
  - a. plate
  - b. dish
  - c. ragdoll
  - d. seedbox
  
9. Danilo sowed 150 seeds of radish in a seedbed. After three days he saw 120 seeds germinated. What is the percentage germination of the radish seeds?
  - a. 60%
  - b. 70%
  - c. 80%
  - d. 90%
  
10. What is the percentage germination rate of seeds good for storing?
  - a. Those that were tested twice with 40% germination rate.
  - b. Those that were tested once with 60% germination rate.
  - c. Those that were tested twice with 60% germination rate.
  - d. Those that were tested once with 70% germination rate.



## ANSWER KEY

### Pretest

1. c
2. d
3. d
4. c
5. d
6. a
7. a
8. b
9. c
10. b

### Lesson 1: Activity 1

1. Seeds bought came from an unreliable source.
2. No, because money spent in buying seeds will be wasted.
3. No, plants will not grow healthy.

### Lesson 1: Self-check

1. ✗
2. ✗
3. ✓
4. ✓
5. ✓

### Lesson 2: Activity 2

- A. 1. No  
2. Because the seeds might not fit with the climatic condition of the country.
- B. 1. Yes  
2. She can save money intended for buying seeds.
- C. 1. No  
2. There is a great possibility that seeds will not germinate because it was exposed to severe environmental condition.

### Lesson 2: Self-check

1. b
2. d
3. e
4. a
5. c



### Lesson 3: Activity 3

Wet seeds from fleshy fruit	Dry seeds	Dried seeds from fleshy fruits
eggplant cucumber tomato ampalaya squash	cabbage peas cow pea hyacinth bean pole sitao pigeon pea mungo onion	hot pepper okra

### Lesson 3: Activity 4

1. charcoal
2. seeds
3. cardboard
4. label
5. metal cover
6. bottle

### Lesson 3: Self -check

- A.
1. ✓
  2. ✗
  3. ✗
  4. ✓
  5. ✓

- B.
1. 6
  2. 3
  3. 5
  4. 1
  5. 2
  6. 4

### Lesson 4: Self check:

In ragdoll method, seeds are placed on a moist rag rolled over a stick. It is submerged to a pail of water and allowed to sprout in a cool place. Plate method, on the other hand, a moist tissue is placed on a plate and seeds are allowed to sprout on it.

### Lesson 5: Activity 8

1. 81%
2. Yes

3. Because the percentage of germination reached the above 50% requirement.

Lesson 5: Self -check:

1. 78.94% or 79%

Posttest

1. b

2. d

3. a

4. c

5. b

6. b

7. a

8. c

9. c

10. c