Denver Urban Gardens School Garden and Nutrition Curriculum

Introducing the Seed

Lesson

Goals

This lesson lays the foundation for understand the connection between the seeds that we plant and the plant that grows from the seed.

Objectives

Students will to identify different parts of a plant inside of a bean seed and determine if their onion seeds are viable.

Standards

Science: Life Science

GR.2-S.2-GLE.1
GR.2-S.2-GLE.2
GR.3-S.2-GLE.1
GR.4-S.2-GLE.3
GR.5-S.2-GLE.1

Total Time – 60 minutes (plus 10 minutes a day for the following week)

Did you know?

Even if a seed is planted upside down, the seedling always grows right-way up. Plants can sense gravity.

The largest seed in the world is the double coconut (Coco de Mer). It can measure up to 50cm (1.6ft) around the middle.

Materials

- Large bean seeds soaked overnight (limas work great)
- Magnifying glasses
- Copies of "A trip inside a bean seed" (end of lesson)
- Onion seeds (enough for each student or group to have 10 seeds each)
- Paper towels
- Ziploc bags

Background for Teachers

The seed is made up of three main parts: embryo, endosperm and seed coat. The embryo is basically a miniature plant. The endosperm is the built-in food supply, which is made up of proteins, carbohydrates or fats. The testa (seed coat) is the hard out covering, which protects the seed from disease and insects. It also prevents water from entering the seed, which would initiate the germination process before the proper time.

Germination is the resumption of active embryo growth. Prior to any visual signs of growth the seed must absorb water through the testa. When the seed is ready to germinate, water is taken in through the micropyle, which is a tiny hole in the testa. In addition, the seed must be in the proper environmental conditions; that is, exposed to oxygen, favorable temperatures, and for some correct light. The radicle (embryonic root) is the first part of the seedling to emerge from the micropyle. It will develop into the primary root from which root like hairs and lateral roots will develop. The next part to emerge is the embryonic shoot (plumule), from which the first seed leaves called cotyledons develop. The embryonic stem above the point of attachment of the cotyledon(s) is the epicotyl. The embryonic stem below the point of attachment of the cotyledon(s)

is the hypocotyl. The seed leaves (cotyledons) encase the embryo and are usually different in shape from the leaves that the mature plant will produce. After cotyledons have exhausted their supply of food, the first true leaves appear and the cotyledons wither and die. Plants producing one cotyledon fall into the group of monocotyledons or monocots, which includes grasses and corn. Plants producing two seed leaves are called dicotyledons or dicots, which includes beans and squash.

Method

Introduction (10 minutes)

1. Tell the class that you can hold 250 onions in your hand. How is this possible? After letting them problem solve, show the class the onion seeds.

2. Have a discussion with the class about seeds (what are they, what do they need to grow, where do you find them, etc).

3. Review the term *germination* (when the seed begins to grow) and what is needed for germination.

Activity (35 minutes)

1. Pass out the copies of "A trip inside a bean seed" and review the various parts and their purposes.
    a. Seed Coat – Provides protection for the seeds.
    b. Embryonic Root – First part of the seed to grow and will turn into the root.
    c. Cotyledon – First set of "leaves" to emerge and provides nutrients for the tiny plant. They look unlike the rest of the leaves that will emerge.
    d. First Leaves – These are the first true leaves and emerge after the cotyledons.

2. Once the class understands the different parts of the seed, demonstrate how to dissect the bean seed. A document reader can be helpful here so the class can easily see how to dissect and the parts they are looking for.

3. To dissect the bean, carefully remove the seed coat with your fingernails. Then separate the two halves (cotyledons). Inside you should find the tiny first leaves and the embryonic root.

4. Pass out a bean seed and magnifying glass to each student or pair. Have them carefully dissect the bean and find the various parts.

5. Walk around and make sure all of the students understand the various parts of the bean seed before moving on to the second half of the activity.

6. Explain that the class will now get to germinate seeds to figure out if they are viable.

7. Pass out a moist paper towel folded into quarters and 10 onion seeds to each group. Have the students place the seeds evenly on one edge of the towel. Roll up the towel and place in a plastic bag. Label with the date and seed variety.

8. Once a day for the next week, have the class gently remove and unroll their towel. Blow on the seeds to give them some carbon dioxide. While the towel is unrolled, have the students record

the number of seeds that are germinated and note any changes in appearance.

9. Seeds are viable if 60% or more germinate within 5-7 days. Below 50% germination, seeds are considered non-viable. Have students do the math to figure out if their seeds are viable.

Snack & Conclusion (15 minutes)

1. Review with the class the different parts of the seed. Have the class choose one part and write in their journal its name and purpose.

2. Have a seed-based snack such as the Black Bean Dip below. Make sure to clearly discuss which parts of the snack are seeds (black beans, cumin, coriander and pumpkin seeds).

Assessment Tools

- Participation
- Germination observation chart
- Math calculations on germination rate

Possible Modifications and Extensions

- Consider doing only the dissection of the seed or germination test and use the other half of the class to plant seeds for the classroom grow lab.
- Make connections to what types of foods are seeds and why they are so healthy for us (high in protein, healthy fats and many nutrients).
- Compare germination rates between seeds from different years or different varieties.

Black Bean Dip and Pumpkin Seed Garnish

- 2 cans cooked black beans
- 1 bunch cilantro
- 1/2 red onion
- 1 jalapeno
- 1 Tbsp cumin
- 1/2 Tbsp ground coriander
- 1/2 lime, juiced
- salt and pepper to taste
- 1 cup pumpkin seeds
- 1 Tbsp honey
- 1 oz lime juice
- cayenne to taste
- tortilla chips or crackers

Preparation (10 minutes): Put cilantro (without the stems), red onion and jalapeno into a food processor. Pulse until roughly chopped. Remove and set aside. Pulse the black beans in food processor until semi-smooth. Add the cumin, coriander, lime juice and jalapeno mixture. Pulse and season to taste with salt and pepper. For the pumpkin seed garnish, whisk honey and lime juice until combined. Sprinkle with cayenne to taste and toss with the pumpkin seeds. Sprinkle the pumpkin seeds on top of the bean dip and serve with crackers or tortilla chips.

Source

Recipe courtesy of Corey Ferguson

A TRIP INSIDE A BEAN SEED