# Chocolate from a Plant?

**Chocolate Tree, Calamondin Orange Tree, Lime Tree**
**K-2nd grade**
**Math & Science**
NGSS & Common Core Standards Met:
**1-LS1-1, 2-PS1-1, 2-LS4-1, MP.2, K.MD.A.2. MP.4, K.CC, W.1.8, SL.1.1, 2-PS1-1, 2.MD.D.10**

## INTRODUCTION

**Essential Question:**

How does a plant or tree produce seeds and how are they useful to humans? What are some different names used to identify seeds?

**Background Knowledge:**

**Chocolate** is processed from the seeds of the cacao pods, which are the fruit of the Cacao tree.

- The white flowers on the tree grow directly out of the bark
- The tree grows best near the equator and is indigenous to Mexico and the Amazon River Basin (it may be helpful to show students a map). The tree grows in very warm climates near the equator.
- The tree has a special pollinator called the midge.
    - The pollinator is so small that it is also called a 'no-see-um'.
    - This pollinator lives in the soil around the tree.
    - When these trees are transplanted without some of the soil underneath, the flowers will not be pollinated and the tree will never produce fruit.
- It takes 3-5 years for the tree to produce any fruit.
- The tree has to be harvested by hand.
- The tree is never climbed as not to destroy the delicate flowers on the trunk.
- It takes 5-8 months for the fruit to ripen.
- Only 3 out of every 1000 flowers are pollinated, fertilized, and produce fruit. Only 0.3% (less than 1%) of the flowers on each tree will produce fruit that can be processed into chocolate.
- The flavor of the chocolate comes from the roasting process.
- The beans produce chocolate liquor, which can be separated into cocoa butter and cocoa powder.
- The unprocessed seeds are quite bitter tasting.

**Calamondin Orange** is a small sour citrus fruit that looks similar to a tangerine, and is used to flavor a variety of foods and drinks.

- The tree most commonly grows in tropical and sub-tropical climates and is primarily found in the Philippines.
- The fruit can be used as a substitute for a lime and can be used to make a lemonade type beverage.
- Each fruit contains about 8-12 seeds.
- Even though the fruit itself can be very sour, the peel is sweet.
- It is a staple of Asian cuisine as a fish seasoning.
- The fruit is used for its essential oil (calamansi oil), and as a natural medicine for

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insect bites, cough and cold, acne, an antidote for poison, abscesses, and as a natural anti-inflammatory.
- It is also an ingredient in a number of hair care and skin care products.
- The peel is edible, but it is very thin, so fruit must be hand-picked to prevent the skin tearing.
- In the US, the tree is grown mainly for ornamental purposes.
- The tree can also be grown as a houseplant.
- Once planted, it takes 1-2 years for the tree to begin to produce fruit.

## PRE-VISIT ACTIVITIES

**Science** – Where do seeds come from?
Display a picture of fruit. Discuss with the students how the fruit is grown. Identify the different parts of a fruit bearing plant (roots, leaves, stems, flowers, fruits, and seeds). Ensure students understand that seeds are formed inside of the fruit. Ask students about some of the common fruit that we eat, and how they think those fruit grow. Ensure that they understand that these fruit come from plants and trees and not the grocery store. Talk to students about how we eat watermelon from plants/vines, and peaches, oranges, cherries, apples, and chocolate from trees. Discuss the different ways we use seeds (process them, eat them raw, replanting them, etc.) Let students know that even though they are all seeds, we call them different things based on the type of fruit (i.e. the seed inside of peach is called a pit).
Check for understanding:
1. Have students color a picture to identify different parts of the plant. Have students identify plant parts by writing the name next to the appropriate part.
2. Give students chocolate chips to taste. Let students know that the chocolate chip actually comes from a Cacao tree; ask students if they can guess which part of the plant is processed to make the chocolate.

**Math** – Compare and contrast the number and size of seeds inside of an apple, a cherry, a pomegranate, a peach, a watermelon, and a cacao pod.
Display a cherry, an apple, a peach, a watermelon, and a cacao pod. You may use the actual fruit or pictures drawn or taken at scale. Ask students what we would find inside of each fruit if we were to cut them open. Have students make inferences to the amount of seeds in each and talk about whether they think the seeds will be the same size or not. Ask them to explain their reasoning.
*Note: Cacao pods may be difficult to find, as they are a tropical fruit and are found mainly in tropical regions.

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In groups, give students the seeds from each of the fruit mentioned above. Have the students sort and identify them. Give kids the seeds from a cacao pod and have them compare and contrast to the other fruit. Buttons can be substituted for seeds. Students will put the seeds on top of the picture of the corresponding fruit.

Modifications for smaller children:
Instead of having children count seeds, which can be cumbersome or time consuming for a small child, have children cut out a picture of 200 watermelon seeds, 1 cherry pit, 1 peach pit, 40 cacao seeds, 10 apple seeds, and 8 orange seeds.

Have seeds already sorted for them, provide them with a picture of the fruit and the seed and ask them to put the seeds top of that picture. You can also have an example of the actual fruit in the classroom so that students may use their senses to observe. This will allow students to get an idea of the amount of seeds and the variance of the shape, color, size, and amount of seeds in different fruits.

Note: Although the number of seeds varies in most fruits, these are the average number of seeds that you would find in each. Remind students that a common misconception is that the size of the fruit determines the number of seeds and that is not necessarily true. Be sure the picture is to scale.

Check for understanding:

1. Have students graph the number of seeds that they counted for each item.
2. Have students organize pictures of fruits in order from the least amount of seeds to the greatest
3. Ask students: Is there a relationship between the amount of seeds inside the fruit and the size of the fruit? How about the size of the fruit and the size of the seed?

Grouping suggestions:

- Kindergarten students may complete the activity as a whole class or in two groups.
- 1st and 2nd grade students can work in groups of 4-5 or in pairs

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## VISIT/ EXPLORATION

**Sugar from the Sun, Children's Garden**

Chocolate Tree (Cacao Tree):

Visit the Chocolate tree.

- Recall
  - Remind students of the parts of the tree (roots, leaves, flowers, fruit, seeds)
  - Have students identify the parts of the tree that they can see.
  - Ask students about the parts of the tree that they cannot see.

Questions to ask:

- Sensory:
  - What do you observe about this tree?
    - Older students can write down their observations
    - A teacher can write down the observations of the younger students.
  - Do you see any fruit growing on the tree?
  - Where are the seeds? How many do you think there are?
  - What do you think the tree smells like? (Allow students to smell the leaves or flowers of the tree without removing anything from the tree)
  - What does the tree smell like?
  - If the tree and the fruit do not smell like chocolate, do you think it tastes like chocolate? How are smell and taste related?
  - What do you think has to happen to make the chocolate smell like chocolate?
  - Why doesn't the tree smell like chocolate?
  - What are those little white things that you see on the bark of the tree?
  - Do you notice anything special about the flowers and how they grow?
  - Do you notice anything special about the leaves?
  - What about the fruit?
- What do you think happens to make the fruit turn brown?
- How do you think they harvest the fruit from the tree?
- What do you think would happen if people climb this tree to get to the fruit?
- How do you think they keep the tree from getting too tall?
- Other than eating the fruit of the tree, can you think of anything else that we can use this tree for?

Go over the facts about the Cacao tree and processing chocolate.
Answer student questions at the tree.

Walk students through Sugar from the Sun, allowing them to explore the collection. The Calamondin Orange tree is on the south side of the room,

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Visit the Calamondin Orange tree.

- Recall
  - Remind students of the parts of the tree (roots, leaves, flowers, fruit, seeds)
  - Have students identify the parts of the tree that they can see.
  - Ask students about the parts of the tree that they cannot see.

Questions to ask:

- Sensory:
  - What do you observe about this tree?
    - Older students can write down their observations, a teacher can write down the observations of the younger students.
  - Do you see any fruit growing on the tree?
  - What do you think the tree smells like? (If possible, allow students to smell the leaves or flowers of the tree without removing anything from the tree)
  - What does the tree smell like?
  - What do you think the fruit smells or tastes like?
  - Why do you think this tree smells like an orange but the Cacao tree doesn't smell like chocolate?
  - Where are the flowers? Do they grow the same way as the flowers on the chocolate tree?
  - Do you notice anything special about the leaves?
  - What about the fruit?
- What do you think happens to make the fruit turn orange?
- How do you think they harvest the fruit from the tree?
- Other than eating the fruit of the tree, can you think of anything else that we can use from this tree?

Go over the facts about the **Calamondin Orange tree, and citrus trees**.
Answer student questions at the tree.

Optional:
Visit the Lime tree growing in the Children's Garden. Use the same potential questions asked at the Calamondin Orange tree. Go over the facts about the **Lime tree, and citrus trees**. Ask students to compare and contrast the two citrus trees. Answer student questions at the tree.

## RESOURCES

**Materials & Websites**

- Fruit: watermelon, peach, orange, apple, cherry, cacao pod. You may substitute actual

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fruit for pictures of the fruit, as long as the pictures are of the same scale.

- Seeds: 200 Watermelon seeds, 1 cherry pit, 1 peach pit, 40 cacao seeds, 10 apple seeds, and 8 orange seeds. You may substitute different sized or colored buttons for seeds.
- Graph paper for students to graph or organize their data
- Observation charts (one per student or group)
- Markers, crayons, or colored pencils

## POST-VISIT ACTIVITIES

- In groups, have students decide if they would rather have a Cacao Tree or Calamondin Orange Tree and why.
  - Have students draw a picture of the tree (and its fruit) that they have chosen. Label parts.
  - Students can either share their list or write two to three sentences about their choice,

## ASSESSMENT/ REFLECTION

Review the parts of a plant, the purpose and uses of seeds, and that the size and number of seeds vary by the type of fruit. Ask students about their observations and experiences at the Garfield Park Conservatory.