

Inherited Plant Traits

Wyoming Science, Mathematics

Objectives:

- Students will understand how traits are expressed in plants

Background:

Have you ever walked through a flower garden and noticed the many different sizes, shapes, colors and textures of flowers? These flowers contain the parts necessary for reproduction among their species. Flowers trade sweet nectar and protein-rich pollen in return for pollination service, provided by insects and other creatures. For many plants, the production of seeds, which are their offspring, depends on the transfer of pollen from one flower to another flower of the same kind. One pollinator, honey bees, have many little hairs on their bodies which collect pollen as the bees visit flowers. Some of this pollen brushes off as a bee visits other flowers. This process of pollination enables one parent to transfer information about its traits to the other parent, thus to their offspring.

Gregor Mendel was a monk in the 1800s. His work with pea plants showed how various traits of offspring were inherited from each of the parent plants. Sadly, no one seemed interested in what Mendel had discovered until around 1900, when three other scientists discovered the same thing. Since then, researchers have continued to build on what Mendel discovered about inherited traits.

Invitation to Learn:

1. Discuss the physical characteristics of a rock, a piece of paper and a pair of scissors.
2. Pass out the “Rock, Paper, Scissors” Recording Chart.
3. Have students play 10 rounds of “Rock, Paper, Scissors” and record the outcome of each round on the chart.
4. Discuss the frequency of each outcome (rock, paper or scissors), asking which item had the highest frequency and which had the lowest.
5. Discuss with students the information that like “Rock, Paper, Scissors,” parent organisms randomly pass on their traits to their offspring and some traits are more frequently seen based on their interaction with other traits (just like when a paper trait covers a rock trait in the game, or a rock smashes scissors). However, unlike the game, parents cannot control which traits they pass on to each offspring.
6. Tell students that in the next activity they will be making potential offspring from two parent plants based on certain inherited traits.



Standards

Science

Life Systems: 1.2, 1.4, 1.6
Science As Inquiry:
2.1, 2.2, 2.3

Science

5th Grade:

Data Analysis & Probability:
5.1, 5.2, 5.3

6th Grade:

Data Analysis & Probability:
5.1, 5.2

Materials

- Templates for plant parts
- Dark green construction paper
- Light green construction paper
- Red construction paper
- White construction paper
- Yellow construction paper
- Orange construction paper
- Four containers labeled “flower,” “center,” “stem,” and “leaf”
- Plant Parent 1 cards—one for each student
- Plant Trait Key—over head
- List cont. on page #2

Estimated Time

60 Minutes

Grades 5-6

materials:

- Six colors of glitter—red, gold, blue, silver, green and magenta
- Chenille stems cut into 3-inch pieces- one piece for each student
- Crayons, colored pencils or colored markers—red, yellow, light green and dark green
- “Rock, Paper, Scissors” Recording Chart, one worksheet for each pair of students

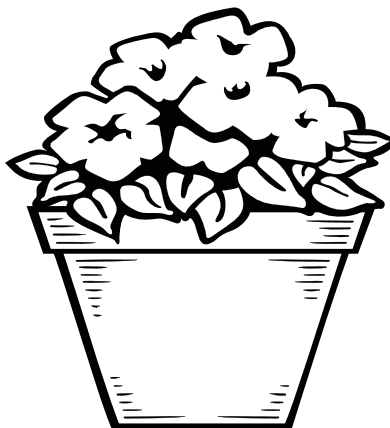
Activity Procedures:

Activity A:

Preparation needed before activity

Run off the templates of plant parts on card stock of the appropriate colors and cut out each part. Prepare enough templates for each student to have one petal, center, stem and leaf.

1. **Teaching Tip:** The plant parts can easily be created using a die-cut machine, available in many schools.
2. Place each different plant part template into separate boxes labeled “flower,” “stem,” “center,” and “leaf.”
3. Assemble the two parent plants and glue them onto backing paper. Parent 1: red petals, orange center, long stem, 2 light green leaves Parent 2: white petals, yellow center, short stem, 2 dark green leaves
4. Show students the two parent plants and discuss the observable traits of each.
5. Tell students that they are going to create individual offspring that might come from these two parent plants.
6. Have each student randomly pick a plant part template from each box.
7. Have students cut out each plant part from construction paper, using the templates as guides; have them cut out two leaves, a center, stem and petals.
8. Have students assemble and glue their plant offspring.
9. Have students post their offspring and discuss the results.
10. For example, ask students:
 - Are any two offspring exactly the same?
 - What similarities and differences do they see among the offspring?
 - Do any traits seem to appear more frequently among the offspring? Any less frequently?



Activity B:

Preparation needed before activity

1. Make copies of the Plant Parent 1 Cards and cut them apart. Prepare one card for each student.
2. Cut the chenille stems into 2-inch segments, one piece for each student.
3. Place the following eight piles of mixed glitter on small paper plates—leave about 12 inches between each plate.
 - Red, blue and green
 - Red, silver and green
 - Red, blue and magenta
 - Red, silver and magenta
 - Gold, blue and green
 - Gold, silver and green
 - Gold, blue and magenta
 - Gold, silver and magenta
4. Pass out one Plant Parent 1 card to each student. Explain that the card represents one of the parents of a plant offspring and that each color on the card represents one trait which that parent will pass on to the offspring.
5. Pass out one chenille stem piece to each student. Tell students that they are going to become pollinators. The chenille stems represent the hairy legs of a bee and the glitter piles represent the flowers of different second parents for the plant offspring.
6. Have students bend the chenille stems into “bee legs.” (A right angle bend near one end).
7. Tell students they will visit one of the eight flowers (glitter piles) that will be the second parent to the offspring they are creating.
8. Have each student decide which flower to visit and place her or his “bee leg” into the pile of glitter.
9. Have students return to their desks and remove the glitter from the “legs” onto a sheet of paper. Have them identify which colors are present for Parent 2.
10. Explain that sometimes a trait that an offspring receives from a parent is not visible, even though the offspring carries the information for that trait.
11. Show students the Plant Trait Key which lists the trait that the offspring will show for each color (trait) received from Parent 1 and Parent 2.
12. Have students record the traits their offspring will show. Please note the Glitter Code listed at the top of the Plant
13. Trait Key: Only red and/or gold colors can determine the color of the petals; only blue and/or silver can determine the length of the stem; and only green and/or magenta can determine the color of the leaf. Example: If you had

vocabulary:

- *pollination*
- *offspring*
- *inherit*
- *probability*
- *outcome*
- *traits*

Red, Silver and Green listed from your Parent 1 card and you obtained the colors Gold, Silver and Magenta from your glitter pile (Parent 2) then your plant would have:

Red and Gold = Red Petals

Silver and Silver = Short Stem

Green and Magenta = Dark Green Leaves

14. Have students use the templates from Activity 1 to construct their offspring.
15. Discuss with the class the similarities and differences among the offspring and the frequencies of each visible trait.

Adaptations/Integration:

- Have the students design their own dominant and recessive features for the gene pool, perhaps adding some co-dominant traits for them to consider. Have them create the offspring with modeling clay.
- Display pictures of parent plants along with four different pictures of possible offspring. Have the students select which offspring is most appropriate based upon a list of dominant and recessive traits given by the instructor. Students should be able to justify their answer.

Lesson Adapted from California Agriculture in the Classroom.



Rock, Paper, Scissors Recording Chart

Round		Partner A		Partner B		Outcome (Rock, Paper Scissors)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Possible Outcomes:

* Rock dominates scissors

* Scissors dominates paper

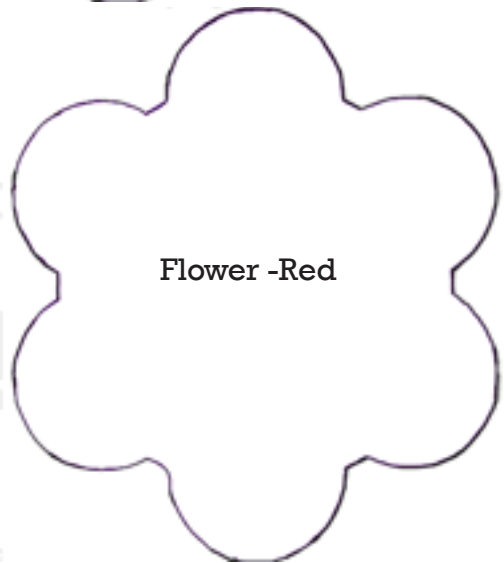
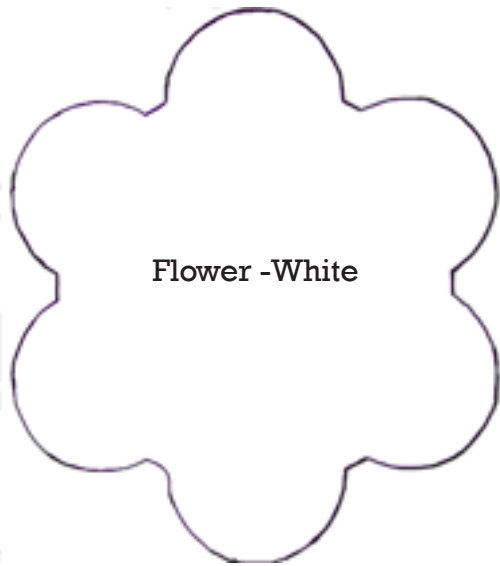
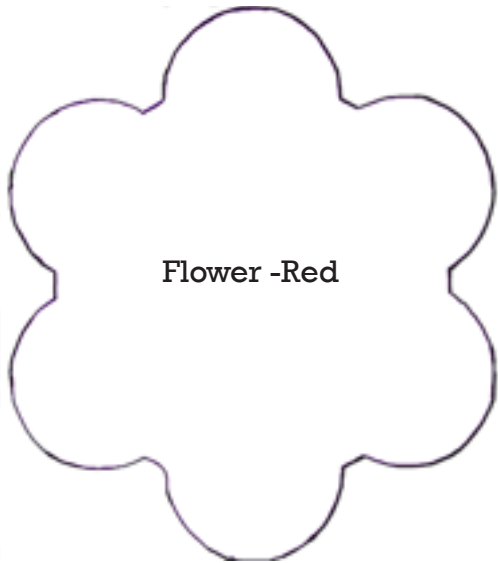
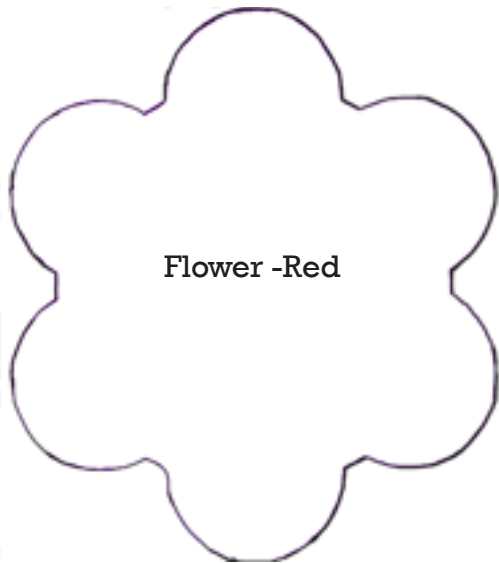
* Paper dominates rock

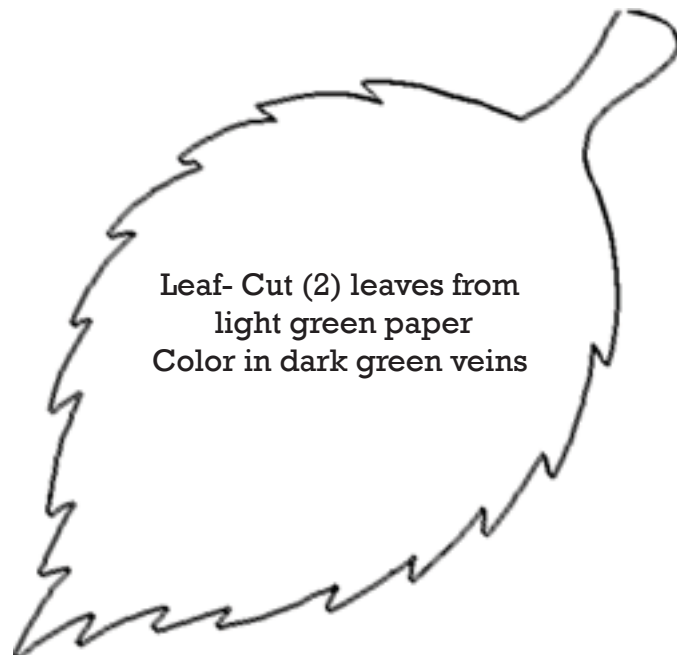
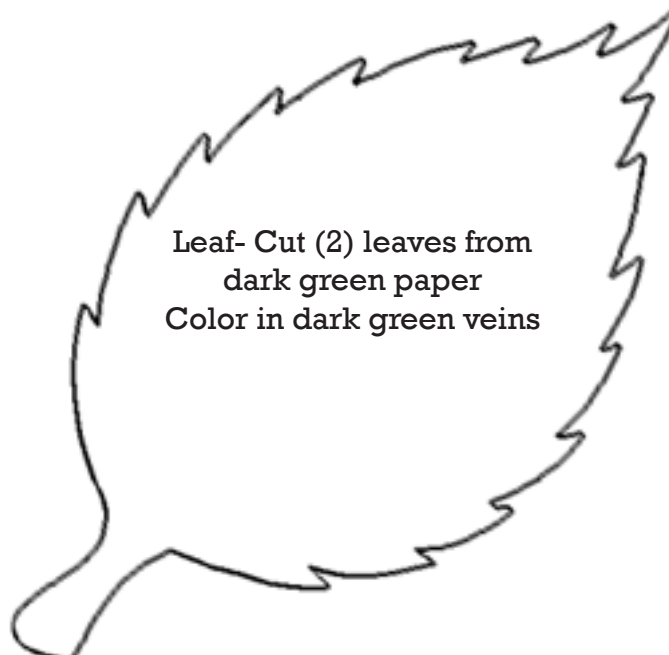
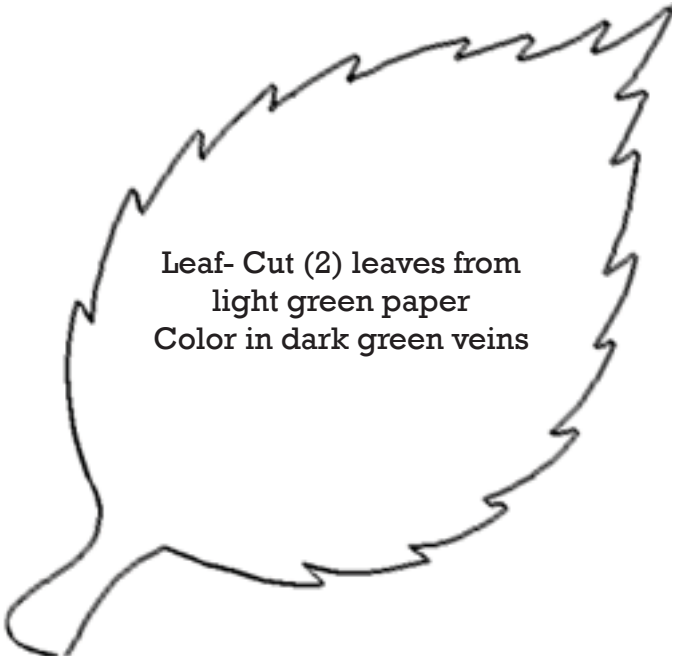
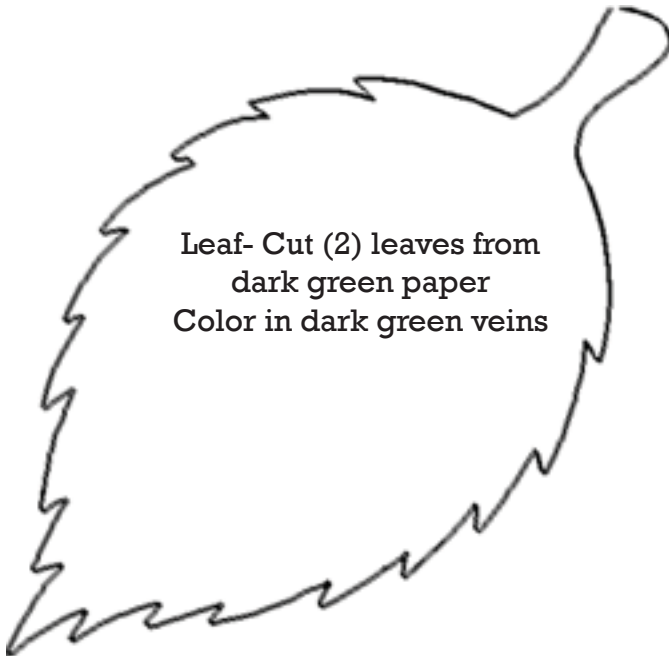
1) Which outcome was most common in your partnership?

2) Which outcome was the least common?

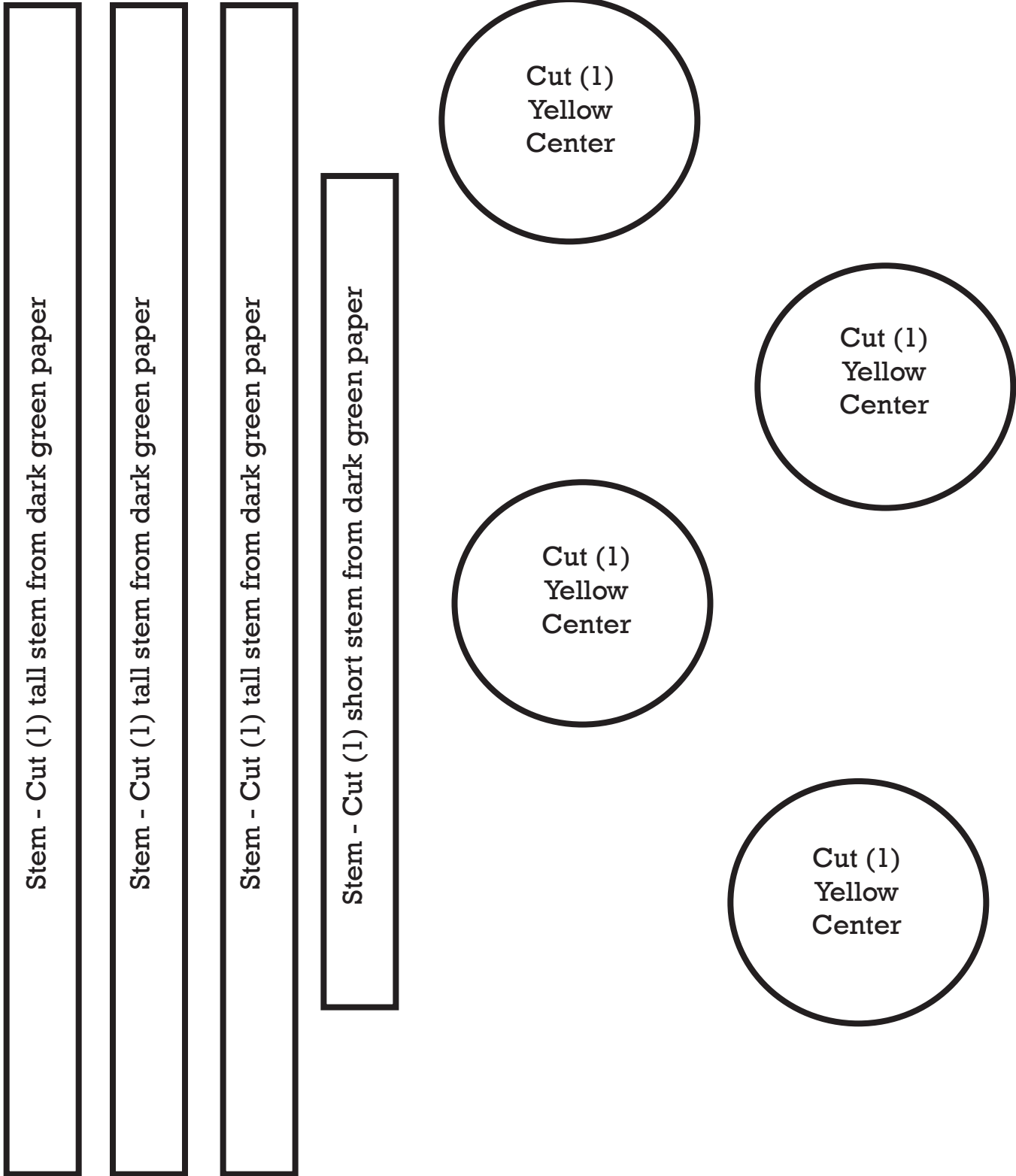
3) Were your results similar to the results of the class?

4) Describe one thing you learned about heredity by doing this activity?





This templates set is enough for four students to have a complete flower. In preparing for this activity make enough sets to accomodate each student. Try to keep the ratio of different flower parts as close to the templates as possible.



Parent 1 Cards For Inherited Plant Traits Activity 2

<p><u>Parent 1</u> Red Blue Green</p>	<p><u>Parent 1</u> Gold Blue Green</p>
<p><u>Parent 1</u> Red Silver Green</p>	<p><u>Parent 1</u> Gold Silver Green</p>
<p><u>Parent 1</u> Red Blue Magenta</p>	<p><u>Parent 1</u> Gold Blue Magenta</p>
<p><u>Parent 1</u> Red Silver Magenta</p>	<p><u>Parent 1</u> Gold Silver Magenta</p>

Plant Trait Key

Glitter Code: Red or Gold = Color of petal

Blue or Silver = length of stem

Green or Magenta = Color of Leaf

Plant 1 (Card)	Plant 2 (Glitter)	Visible Trait
Red	Red	Red Petals
Red	Gold	Red Petals
Gold	Red	Red Petals
Gold	Gold	White Petals
Blue	Blue	Tall Stem
Blue	Silver	Tall Stem
Silver	Blue	Tall Stem
Silver	Silver	Short Stem
Green	Green	Dark Green Leaves
Green	Magenta	Dark Green Leaves
Magenta	Green	Dark Green Leaves
Magenta	Magenta	Light Green Leaves