VARIABLE CHARACTERISTICS EXPRESSED THROUGH KAPOK SEEDS

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Kapok (*Ceiba pentandra*) are huge trees when fully grown. They can reach heights of up to 230 feet and diameters of up to 10 feet, with large buttresses coming out of the main trunk. The tree is easily recognized by its huge size and smooth greenish gray bark. Often times the trunk and the larger branches have thorns. The thorns protect the tree from animals that would eat its thin bark. The Kapok is also known as the Silk Cotton Tree because it produces pods full of cottony fiber with seeds embedded in it. The fiber acts like a flying magic carpet to transport the seeds. When the pods are ripe, they open and clumps of fiber and seed float away in the wind. In the past, this fiber was used to fill lifejackets, sleeping bags, pillows, and mattresses because it is very buoyant, lightweight elastic and does not mat under pressure. The Mayan Indians of Mexico and Guatemala consider it a sacred tree, and the kapok is the national tree of both Puerto Rico and Guatemala.

The three Kapok trees in the photos each have varying amounts of thorns on the trunk, a gradient that runs from thornless to very thorny. This is because the trees in the photos were all produced from seed.

There are two ways that plants reproduce themselves: sexually via pollination and seed, or asexually through slips, grafting, and root sprouts. Another word for asexual reproduction is cloning. Both methods occur in nature, and both have advantages and disadvantages.

Plants reproduce themselves sexually via flowers and the exchange of pollen. Pollinated flowers develop into a “fruit”, edible or not, that contain seeds. The resulting seeds, which are embryonic plants, combine the genes of both parents. In the same way that a child shares characteristics of both the mother and the father, seeds share characteristics of both the “mother” and “father” tree. Pollination or more literally, the exchange of genetic material, allows genes from both parents to be shuffled about in different ways and combinations.

Usually the resulting offspring look like a mix of both parents, but sometimes the offspring looks more like one parent than the other. Some characteristics are visible and some are invisible. The presence of thorns in kapok trees or their absence would be a visible trait, whereas resistance to a disease would be an invisible trait.

In the forest, this variability in individuals is an advantage for the species. If a disease comes around or there is a plague of leaf eating insects, not all the trees will die because some trees will be resistant or immune to the problem. Maybe thornless trees grow faster and produce seeds sooner because they do not have to dedicate energy and material to growing thorns. In a forest, reproduction by seed is advantageous. This variability of individuals allows the species to survive and prosper.

However, the variability produced by seed (and sexual reproduction) is not always desirable from a human perspective. For example, a farmer doesn’t want an avocado grove with one tree that produces a

few great tasting fruit, and a bunch of trees that either produces lots of small unsellable fruit or none at all. He or she wants avocado trees that uniformly produce a lot of good tasting fruit.

There are two ways to solve this problem. The farmer could collect seeds from the tree or trees that produce lots of good fruit, plant them, and wait a few years until the trees bear fruit. This is sexual reproduction. Or he could try to reproduce the trees asexually.

Asexual reproduction is the reproduction of one parent without the exchange or donation of other genetic material with another parent. The resulting "child" is an exact copy of the "mother "or "father" tree. The farmer could take cuttings of the branches and stick them in moist soil. If they sprout leaves and roots, he will have a clone of the parent tree. It will produce lots of good fruit. Another advantage of using a cutting or slip is that the new tree will produce fruit sooner than a tree grown from seed; say three years instead of twenty. Or most likely, the farmer will cut buds or branches from the productive trees and graft them into the living tissue of the unproductive trees. The new buds and branches will produce the same fruit as the tree they were cut from.

One might ask if asexual reproduction is so desirable from the production stand point, why is sexual reproduction still necessary? Well, those unproductive avocado trees might possess a desirable trait such as immunity to a disease, drought tolerance, or resistance to insect attack. They just might pass off these traits to the offspring of the productive trees when their pollen lands on the flowers of the productive trees. Also, the resulting exchange of genetic material permits the evolution of new species or varieties.

For example: an old story has the grapefruit magically appearing on the island of Barbados in the 18th century. There are two stories on how this came to be. One fine day, grape fruit started growing on an orange tree and people liked the fruits so much they started eating them, saving the seeds and growing new grapefruit trees. **This could be considered a naturally occurring mutation.** A more recent version of the story has the grape fruit being a naturally occurring hybrid between the sweet orange (*Citrus sinensis*) and the pomelo (*Citrus maxima*) another Citrus species. **The hybridization occurred via the exchange of pollen, that is to say sexual reproduction.** The story still occurs in Barbados and people still like grapefruit.

In conclusion, both sexual and asexual reproduction is necessary. Sexual reproduction provides variability and the opportunity to evolve and adapt to a changing environment over time. Asexual reproduction produces uniformity and allows for people to favor the production of desirable traits. Both methods permit species to survive.

Figure 1. Kapok trees: thornless, some thorns, very thorny.

Figure 2. Thornless Kapok tree

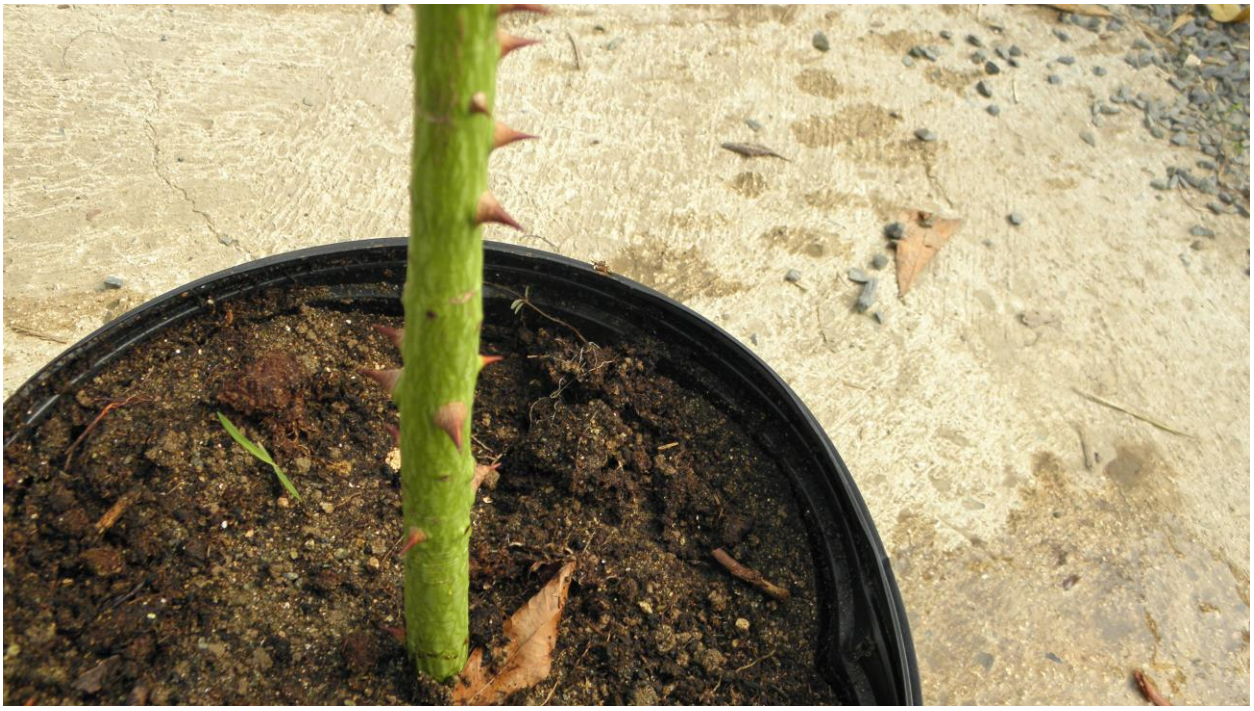

Figure 3. Kapok tree with some thorns.

Figure 4. Kapok tree with lots of very thick thorns.