• Seed Saving Class for Arvada Community Gardens

Presented by:
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Seeds to Savor Farm
Seedstosavor.farm

- Myths of Seed Saving
    - Seeds expire when the package says so
    - Saving seeds is illegal
    - Seed saving is too complicated
    - Hybrid seeds are sterile
    - Seeds from fruits/veggies I buy in the grocery store are sterile
    - It's easier to just go buy seeds ... Okay, this one might actually be true, but there are SO many reasons to save your own seeds, it is definitely worth the effort!!
- Overview of Plant Life Cycle
    - A seed is the offspring of its parent plant.
    - Germination begins the process. It is when the young seedling breaks free from the protective outer layer of the seed and begins to grow. First the embryonic root, called the radicle, emerges from the seed, reaching down into the soil for nutrients, water, and stability. Next the stem begins to grow upwards from the seed coat, and the true leaves emerge, unfurling towards the sun.
    - As the plant grows, it produces flowers, which get pollinated, thus producing seeds so the process can repeat itself.
- Seed Anatomy
    - What is a Seed?
        - A seed is a mature plant ovule, like a baby in a womb, comprised of an embryo, an endosperm, and a seed coat.
        - Simply put, a seed is the offspring of a plant which, under the right conditions, will become a plant itself.
    - A seed has a protective layer on the outside, called a seed coat
    - The embryo of the seed, nested inside of the seed coat, contains the growing points that will develop into roots, shoots, and leaves as the seed germinates.
        - The seed embryo also contains an embryonic root, called the radicle
        - Special leaves, called cotyledons, function as food-storing organs that help nourish the seedling throughout the early stages of its development before it is able to produce its own food through photosynthesis

    - The endosperm of a seed also supplies nutrition to the seed early on in its development
        - Its role in seed development depends on the plant species.
        - In some species, the endosperm is still present at seed maturity and continues to provide nutrition into the stage of seedling development.
        - In other species, the endosperm is depleted during seed development and is no longer present in the mature seed.
        - When the endosperm is depleted, early on in seed development, the cotyledons take over in providing nutrition to the developing seed.

- Plant Organs
    - At the most basic, a plant has leaf, stem, root, and reproductive structures. For the purposes of this talk, we are most concerned with the reproductive structures of flowering (angiosperm) plants.
    - Discussion of the reproductive structures of *Ranunculus glaberrimus*
        - Carpals produce ovules which contain female gametophytes. THey collectively form the gynoecium.
        - Two or more carpals that fuse together are called a pistil.
        - Stamens produce pollen grains containing the male gametophytes. They collectively form the androecium.
        - Petals are modified leaves that attract pollinators. Together all the petals of a flower are called a corolla
        - Sepals surround and protect the flower bud and, usually, the ovary.
    - Perfect flowers
        - Perfect flowers contain both male and female structures in each bud. The can reproduce asexually. Examples include: roses, lilies, apples, oranges, and carrots. They don't depend on another plant to reproduce
    - Imperfect Flowers
        - Contain either male or female sex organs.
            - Are the most common of the angiosperms.
            - Rely on cross pollination to reproduce.
                - Easiest to breed for specific characteristics.
- Why are Seeds Important?
    - Seeds are sometimes overlooked in their importance to our lives
    - Without seeds we wouldn't have plants
    - We often first think of food when we think about what plants provide, but we also use plants (and, therefore, seeds) for:
        - Shelter

        - Clothing
        - Medicine
        - Fuel
    - 60% of the world's diet is made up of 3 seeds
        - Rice
        - Maize
        - Wheat
    - What seeds do we eat regularly?
        - Peanuts, peanut butter
        - Baked goods
        - Cooking oils
        - Hummus
        - Nut butters and nut spreads
        - Chocolate
        - Coffee
        - Peas, beans and legumes
        - Beer (liquid bread)
        - .
        - .
        - .
    - Plants (and, therefore, seeds) provide the foundation for life in almost every ecosystem.
    - Everything humans eat, either directly or indirectly, comes from plants.
    - It is now easy to get seeds, but it wasn't always so. Seeds were harder to come by, and farmers had to save their own seeds to ensure a crop the next year.
    - Seed saving continues, but the tradition has become threatened by easy accessibility to seeds, among other factors.
    - Seed biodiversity is our best defense against pests and diseases and our best chance to create a resilient food system that can keep feeding us despite changes in climate and weather patterns.
    - Heirloom seeds, or seeds passed down for years, if not generations, are our connection to the past. Many seeds are passed down with stories, or recipes closely associated with that particular variety of plant.
- Seed Stories
    - An heirloom variety is one that has been grown and shared from generation to generation within a family or community.
    - Just like a piece of jewelry or art that is a family heirloom, heirloom seeds are valuable because of their histories and the way that they provide a connection to the generations of seed savers that came before them.
    - In the past 100 years, more than 80% of our seed biodiversity has been lost. There are many reasons for this:

        - Monoculture cultivation
            - Easier to grow a single variety
            - Use of broad spectrum vegetation killers in order to cultivate a single strain of crop
            - Plants bred for shipping rather than other traits like flavor
            - The seed monopolies held by Bayer/Monsanto, Syngenta/Chem China and Corteva
        - Food production moved from small, local farms and gardens to large, industrial farm complexes
        - The introduction of patented seeds, making saving some types of seeds illegal, and the farmer dependent upon a third party producer to obtain seeds for each year's crop
        - Easy availability of seeds without having to go through the bother of saving seeds each year
        - The urbanization of our communities.
    - When we save seeds that already have a story behind them, we get to feel connected to that story and also become a part of that story.
    - For many people, growing a variety that has a story behind it adds some value to that seed. It helps people feel connected to that seed, the people who have grown it before, and a long history of seed saving that spans back thousands of years.
    - It also adds a wider sense of purpose - when a seed has a story that you connect with, you are not only growing that variety to enjoy the food, but also to continue the tradition carried in that seed, and to add your own story to the seed's history and timeline.
    - A seed is a living connection between the past and the future.
- Preventing Cross Pollination
    - Isolation
        - Distance
            - Different plants have different distance isolation requirements, from 10 feet to almost a mile for the home gardener.
            - Isolation distance should be increased based on the rareness of the seed/plant.
        - Planting rotation
            - Planting crops that cross at different times to take advantage of the different flowering times.
                - Space plantings two weeks apart so the first plants are pollinated before the nest plant variety flowers.
        - Mechanical
            - Using physical barriers to prevent cross pollination.
                - Bagging flowers
                - Hand pollination

        - Coverings
            - High tunnels
            - Greenhouses
    - Isolation distances will vary depending on the garden and gardener.
- Seed Maturity
    - While growing crops for seed and growing crops for food have many similarities, there are a few key differences that require a little extra planning on the part of the seed saver.
        - The time it takes for a plant to mature enough to eat (Market maturity) vs.
        - How long it takes for a plant's seeds to mature. (Botanical maturity)
    - Some plants reach botanical maturity at the same time as market maturity
        - Tomatoes
        - Winter squash
        - Grains
    - Some plants reach botanical maturity after (sometimes long after) market maturity
        - Eggplants
        - Snap peas, which need to dry before harvest
        - Zucchini, which needs to form a shell
        - Cucumbers, which become yellow, and bitter when they reach botanical maturity
    - The difference between market and botanical maturity of a plant affects other factors that need to be considered before planting.
        - Seed packets often list days to maturity, but that timeframe is for market maturity. When a plant needs extra time to reach botanical maturity, you'll need to calculate your planting dates to ensure that your crops have enough time to reach seed maturity in the garden before a frost.
        - Crops grown for seed sometimes require extra space in the garden as they mature.
        - Crops sometimes require extra maintenance efforts.
- Dry Fruit Seed Preservation (beans, lettuce, radishes)
    - Will become drier and will transition in color and texture.
    - Will become harder
    - Mature seeds should not easily bend or dent
    - Require close observation as they will often burst out of a shell and spill on the ground, making seed collection more difficult.

    - Seeds from dry fruits should be harvested when they've had time to mature on the plant but before they've dropped their seeds to the ground.
- Wet Fruit (tomatoes, cucumbers, watermelon, eggplant)
    - Look at the fruit itself to judge the maturity of the seed, as the seeds are found inside the fruit.
    - Maturity indicators include changes in firmness (wet fruits tend to become softer) and changes in color.
    - The fruit generally becomes easier to detach from the plant when it's mature
    - Seed may become dry.
    - The fruit is often bigger, and develops drier flesh.
- Seed Storage depends upon how long you plan to store seeds. There are some basic considerations.
    - Ideal conditions are similar for all seeds.
        - Cool
        - Dry
        - Dark
    - The goal in storing seeds is to extend a seed's longevity - that is, the length of time that a seed can remain viable (ie. capable of germinating in the right conditions).
    - Most common vegetable crops can tolerate drying out and are capable of being stored for years.
    - To improve longevity of your seed lot:
        - Dry the seeds sufficiently before storing.
        - Remove as much chaff/plant debris as possible to prevent pathogens.
        - Harvest seeds at the right time (too soon and some seeds won't be viable).
    - **Drying seeds before storing is the most essential step to ensuring that seeds will be viable for seasons to come.**
        - Seeds with higher moisture content have higher respiration rates, use more stored resources, and age more rapidly.
        - Moisture encourages fungi and disease-causing pathogens.
        - After harvest, it's vital to reduce seed moisture as soon as possible.
            - Use fans to increase airflow.
            - Store in containers that do not trap moisture
                - Paper envelopes
                - Cloth bags
            - If possible, dry seeds in a climate-controlled room or a small space with a dehumidifier.

- When storing seeds at home, as long as seeds remain in a cool, dry, dark place, they should remain viable for two to six years depending on the species.
- Steady temperature is key to longevity.
- For short-term storage, open containers or gas-permeable containers (ie. paper or cloth/mesh materials) work well.
- Long-term storage usually involves storing seeds in a cold place, like a refrigerator or a freezer.
- Cold storage significantly increases longevity.
    - Sealed storage is the ideal container because the moisture level inside the container remains stable.
    - When using sealed, cold storage, reducing seed moisture content is extra important, as water in the seeds can freeze and form ice crystals (which negatively impacts viability).
    - When removing seeds from cold storage, it's essential to let the container reach room temperature before opening to prevent condensation from forming on the inside of the container.
- Seeds will remain dormant until conditions - warmth and moisture - are present.
- Some types of seeds require additional conditions to be met before they will germinate.
- Some seeds - like beans and okra - have hard seed coats that are impermeable to water, which provides a barrier to germination. When this is the case, germination can be aided by nicking the seed coat with a nail clipper or rubbing against sandpaper, which is called scarification.

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