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## SPROUTING SEEDS

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### I. OBJECTIVES:

- To observe germination in plants and compare monocotyledon versus dicotyledon germination.
- To learn how to supply oneself with a fresh source of vitamin C and other vitamins in midwinter.

### II. BACKGROUND:

Although a variety of fruits and vegetables is available in our grocery stores in midwinter, often these foods have traveled long distances, have been stored a long time, and/or have been treated with toxic chemicals or radiation to extend their shelf-life. Thus, they are no longer fresh and their content of vitamin C and other vitamins is often lower than that of freshly-picked produce. Sprouting seeds is a way to have "garden fresh" vegetables in a season when gardening is not otherwise practical (unless you happen to have a greenhouse) or as an addition to freshly-picked produce during gardening season. Exposure to sunlight during sprouting will increase the vitamin content of the sprouts, but for some varieties, may give them a stronger, slightly bitter flavor. Some sprouts, such as alfalfa, may be eaten raw in salads. Mung bean sprouts are a "standard" ingredient in stir fry and other Oriental recipes. Other sprouts, such as wheat or barley, may be chopped and added to bread dough before baking. Barley sprouts, by the way, are the source of the malt we used last quarter in our fermentation experiment.

### III. MATERIALS NEEDED:

- Two 1-qt. jars. Clear glass or plastic is preferable to tinted. Canning jars or mayonnaise jars work well.
- Lids or tops to fit the jars. These must let water through while retaining the seeds. Options include:
  - a piece of nylon stocking held in place with a rubberband (this will not let seed coats pass through, however,
  - a Mason jar ring fitted with a piece of non-corroding window screen instead of the sealing part of the lid, or
  - especially if you plan to sprout more seeds in the future, many stores, especially health food stores, have available a series of three (red, yellow, green) plastic lids with

### IV. PROCEDURE:

- Refer to the following chart to determine what amount of seeds to use to

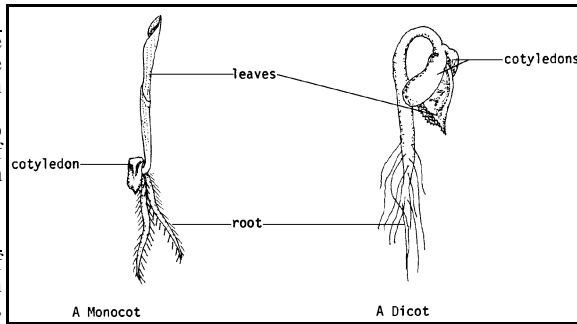


Figure 1. Monocot and Dicot

Flowering plants (the Angiosperms – **angio** = vessel, box, case; **sperma** = seed) can be divided into two subgroups: the Monocotyledons (**mono** = one; **cotyl** = cup, socket, cavity) and the Dicotyledons (**di** = two). Monocotyledons (or "monocots" for short) have one **cotyledon**, one nutrient-storage area, in their seeds and several fibrous roots. Examples of monocots are the various grains such as wheat, corn, barley, rice, millet, etc. When these seeds sprout, they will look similar to sprouting grass, another monocot. Dicotyledons, (or "dicots" for short) have two cotyledons, two nutrient-storage areas, in their seeds and usually one thicker taproot. Examples of dicots include a wide variety of plants such as peas and beans, nut trees such as almonds or walnuts, sunflower, radish, cabbage and a host of other plants. When these seeds sprout, they will look similar to a sprouting bean seedling (Figure 1).

differently-sized grids on top, specifically designed to fit on a standard wide-mouthed Mason jar for sprouting seeds.

- A small amount of two kinds of seeds to sprout. One of these should be a monocot and the other should be a dicot. Often these are available from health food stores and/or grocery stores. Do not use planting seed packets because these have usually been treated with fungicides and/or other toxic chemicals and are not meant to be eaten. If you get seeds from a feed mill, make sure they are untreated – you need edible (feed-grade) seeds. Some varieties of seeds from which to choose will also be available in the lab.

obtain 1 qt. of sprouts for each of the two types of seeds you have selected. Place this

amount of seeds in the jar with four (4) times as much water as seeds (for example, 1 T of seeds requires 4 T or 1/4 C of water).

- Let the seeds soak overnight at room temperature. Most seeds take around 8-12 hours, but larger seeds like garbanzo or soybeans may take up to 16 hours.

- In the morning, drain off the soaking water (which may be used to water your house plants).

- Rinse the sprouts as follows: Let the jar fill with tap water at about room temperature, swirl **gently**, and drain. This may be repeated if desired, especially with the larger seeds or if things start to smell bad. Please note: sprouts are somewhat fragile – do NOT shake the jar, or the sprouts will bruise or break. These are living organisms – treat with care and respect.

- After rinsing, turn the jar upside down and prop up at a slight angle (on a waterproof surface such as a plate or sink-top). This will provide proper drainage and ventilation.

- Repeat steps 4 and 5 at least twice daily (am and pm) for the number of days specified in the following chart. Note that wheat and other monocot sprouts should not look like grass. If you let them grow that long, the taste and texture are not very appetizing. To "stop" them at their peak, refrigerate them when they are the right length. Soybeans will need to be rinsed more often – at least 3-4 times a day – to prevent mold. Also, soybeans should be visually examined and all soft, broken, and rotten ones removed immediately as soybeans are the most susceptible to rotting of all the seeds. Any type of seeds may be rinsed more often if desired, and I have seen one source that suggested the seeds sprout/grow slightly faster if rinsed more

### V. DATA:

Take notes as you go along on procedures, how things look, etc. Draw pictures where useful including pictures of what your monocot and dicot sprouts look like. Pay attention to number of cotyledons and number of roots that are visible.

### VI. DISCUSSION:

In your discussion, include your thoughts on the following:

- Generally, how did your sprouts turn out? Could/should you have done anything differently to improve the results?
- What other kind(s) of sprouts do you think you might like to try to grow in the future and/or what other recipes with sprouts

often.

- Seeds such as alfalfa have hulls which will come off the seeds after a few days. If your mesh is of an appropriate diameter, these hulls can be washed through while the sprouts remain inside (the pre-made plastic lids are useful for this). These seed coats are not harmful, but many people like to remove them because doing so reduces the tendency for mold to develop.

- For some varieties, exposure to indirect sunlight the last day or two will help to develop desirable chlorophyll. Others turn more bitter if the chlorophyll is allowed to develop and must be grown in the dark. Check the chart.

- When your sprouts are suitably sprouted, they may be stored in their jar and lid in the refrigerator for up to a week or so. They may be freshened periodically by rinsing in cool water and draining well. If you have a frost-free refrigerator, periodic rinsing will help keep the sprouts from drying out. If possible, it may be helpful to store the jar upside down on a plate or saucer like when the seeds were sprouting.

- Bring your sprouts in for evaluation on the date indicated. Note that this means you must plan ahead and start the sprouts by such a time that they will be done by the due date.

- Enjoy your sprouts in salad, bread, stir fry, or other recipes.

- For those of you thinking about starting seedlings to set out in your garden, I have found that sprouting seeds in this manner results in a higher germination rate. I start the seeds like this, and when the root is 1/2 to 1 inch long, I plant them in the little starter pots.

as an ingredient might you like to try?

- How do you feel the cost, taste, and overall freshness of your sprouts compares with those available in the grocery store?
- Summarize the differences you noticed between monocot and dicot seeds before, during, and after germination (sprouting).

type of seed	dry seed measure for 1 qt	hulls – rinse away?	approx. growing time	length at harvest	other notes from various sources
alfalfa	1½-2 T (20-30 mL)	3rd or 4th day	4-5 days	½-1½ in (1.3-3.8 cm)	indirect sun 1-2 days before harvest to develop chlorophyll (turn jar so even on all sides) – raw in salads, etc. nutritious
mung bean	½ C (125 mL)	3rd or 4th day	3-4 days	½-2 in (1.3-5.1 cm)	grow in dark at slightly warmer temp – rinse: soak 1 min then drain – stir fry, etc. – cook briefly
hulled sunflower	2 C (500 mL)	(skins) 3rd or 4th day	2-3 days	not over ½ in (1.3 cm)	better if chlorophyll allowed to develop – in salad, spreads, etc.
garbanzo/chickpea	¾ C (185-190 mL)	none	3-5 days	½-1 in (1.3-2.5 cm)	combine with wheat for nutritious mixture – raw in salads – marinate for snack food – nutty flavor
radish	¼ C (60-65 mL)	3rd or 4th day	3-5 days	½-1½ in (1.3-3.8 cm)	allow to develop chlorophyll – may also turn reddish – raw in salads, etc. – spicy flavor
cabbage	⅓ C (80-85 mL)	3rd or 4th day	4-5 days	½-¾ in (1.3-1.9 cm)	allow to develop chlorophyll – spicy – sharp if too old – raw in salads
lentil	½ C (125 mL)	(skins) 3rd or 4th day	3-4 days	½-½ in (0.6-1.3 cm)	lose nutrition if grow longer – crisp – strong flavor so combine in salads, soups, etc.
soybean	1 C (250 mL)	none	3-5 days	½-1 in (1.3-2.5 cm)	extra rinses so don't rot – with cheese sauce, yogurt – casseroles & salads – steamed
black-eyed pea	1 C (250 mL)	none	3-4 days	¼-¾ in (0.6-1.9 cm)	allow ample room for expansion during soak – tastes like fresh peas in pod – raw in salads
wheat or barley	¾-1½ C depending on use	none	2-3 days or 4-7 days	¼-½ in (0.6-1.3 cm)	barley used to make malt for brewing, etc. – sweet taste – add to bread – wheat: short for salads, soups, casseroles – long for desserts & breads – use chopped – sweet taste
corn	?	none	like wheat?	¼-½ in (0.6-1.3 cm)	grind and add to cornbread or yeast-raised breads – fermented mash used to distill whiskey = sweet taste

Table 1. Sprouting Information for Various Seeds