

Appendix

Growing Successful Fast Plants

Dr. Paul H. Williams - September 23, 2001

I. Film Can Growing System (FCS)

Materials

- 4 black plastic film canisters
- 1 8 oz. clear plastic "deli" container
- 1 16 oz. clear plastic "deli" container
- 7.5 cm² capillary matting (Watermat[□])
- 15 x 0.5 cm capillary mat wick
- 4 0.5 x 2 cm "diamond" wicks
- 3/4 in. clear tape
- 2 x 12 in., black polyethylene plastic strips, cut from refuse bag
- 7.5 cm² black plastic sheet
- 3/16 in. drill bit
- 1 3/8 in, spur drill bit
- drill press
- "nail poke" = 1 1/2 in. finishing nail with head removed, forced with pliers or glued in drilled hole, in wood handle
- propane torch or candle
- sharp scissors/paper cutter/utility knife for cutting watermat
- 1 clear plastic lid for deli container
- circular (10 cm diameter) cardboard or plastic disc with 4 "X" marks to indicate where holes for film cans will be drilled

Preparation

- With a 1 3/8 in spur bit in a drill press, cut 4 equally spaced, 1 3/8 in. holes in the clear plastic deli container lid. This works best when the drill press is at low speed. To lessen lid breakage, the holes can be scored with the drill bit and removed with a scalpel.
- Drill a 3/16 in. hole in the bottom of each film can
- With "nail poke" heated in flame, melt 2, 1/2 x 1/8 in. slots opposite of each other near the edge of the bottom of the 8 oz. deli container. *This is the platform.*
- From Watermat[□], cut a 7.5 cm square, the 0.5 x 15 cm wick and 4, 2 x 0.5 cm diamond wicks.
- **The diamond wicks MUST be the INDICATED SIZE. Mis-sized wicks will not provide proper capillary action and THE PLANTS WILL DIE!**

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- With 3/4 in. clear tape, secure the 2 x 12 in. black plastic curtain around the outside bottom half of the 16 oz. deli container, leaving about a 0.5 in. vertical "window" to observe water level. *This is the nutrient solution reservoir; the black curtain prevents algal growth.*
- With a hot "nail poke", puncture an overflow hole in the reservoir side "window" at the level of the bottom of the nested platform (8 oz. container).
- With forceps, insert prewetted diamond wicks into each film can pot (FCP).
- Place the 7.5 cm² black plastic sheet in the bottom of the platform.
- Premoisten a 15 cm wick and 7.5 cm² capillary mat and insert wick through platform slot.
- Place mat on top of wick.
- Place platform in reservoir.
- **Make sure the reservoir is the right size for your needs. If you will not be actively tending the plants at least every two days, USE THE LARGER (2 L) RESERVOIR.**

II. Making Tools For Tending Fast Plants

Water Bottle

Materials

- 1 16, 20, or 24 oz. soda bottle
- "nail poke" = 1 1/2 in. finishing nail with head removed, forced with pliers or glued in drilled hole, in wood handle
- propane torch or candle

Construction

1. Heat "nail poke" in flame.
2. With hot "nail poke", melt a hole (approx. 1 mm diameter) in center of bottle cap.
3. Fill bottle with water and label (e.g. tap water, distilled water, etc.).

Nutrient Solutions

Standard Wisconsin Fast Plants nutrient solution uses Peters' Professional[□] All Purpose Plant Food, Soluble 20-20-20 (N-P-K) with micronutrients. 1/4 tsp. (1.2 g) Peters' per liter tap water provides a satisfactory hydroponic nutrient for Fast Plants throughout their life cycle and is referred to as "1 X P". (Other fertilizer brands with similar nutrients are satisfactory.) Store nutrient solution in the dark to prevent algal growth.

Fertilizer at the proper concentration is very important. DO NOT substitute tap or distilled water when Peters' solution is called for. THE PLANTS WILL NOT GROW WELL!

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III. Sowing Fast Plant Seed

Materials

- ® Film Can Growing System (FCS)
- ® 4 Film Can Pots with wicks (FCP)
- ® Peat lite growing medium
- ® Plastic spoon
- ® Plastic plant label, 0.5 x 6 cm.
- ® Permanent, extra-fine tip, marker pen
- ® Plastic bucket
- ® Water bottle

Preparation of planting medium

1. In a clean bucket, mix the peat lite well with your hands adding small amounts of water until the mixture is very slightly moist to feel and loose, *NEVER wet and heavy with water.*
2. With a spoon (or scoop), fill each film can overfull. Tap the can lightly on the side to settle the mixture, then scrape off the excess level with the rim of the FCP, *NEVER press the soil down. FCPs in which the soil is packed do not allow for proper root growth. PACKED SOIL = DEAD PLANTS.*
3. Place the FCP on the FCS and repeat until all 4 FCPs are filled.
4. With the water bottle, direct a stream of water to the soil in each film can until the water drains from the bottom of the can. During the watering, the soil level will recede about 0.5 cm from the rim of the FCP.
5. Sow 4-5 seeds, well spaced on the soil surface of each FCP.
6. Spoon fresh growing mix (or vermiculite) over the seeds, leveling the covering material to the rim of the FCP. *DO NOT press the soil down.*
7. Water the seed covering material well to establish capillary links between water in the soil and the reservoir.
8. Prepare a small plastic label, 0.5 x 6 cm. (These may be cut from plastic containers). Using an extra fine permanent marker, mark the label with:
 1. Kind of plant
 2. Date of sowing
 3. Your initials
10. Pour off excess water from the reservoir and replace it, filling the reservoir with 1 X Peters' nutrient solution.
11. Place the FCS in a Plant Light House (PLH).

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IV. Tending Fast Plants

Materials

- ® Plant Light House (PLH)
- ® 1 X Peters' nutrient solution
- ® scissors
- ® 8 or 10 in. bamboo skewers (stakes)
- ® 10 mm O.D. Tygon[□] tubing split rings
- ® spool #00 cotton thread

Tending

- ® PLH - light is continuously on. Tops of plants should be maintained 5-10 cm from light bulb; elevate FCSs with platform of boxes, blocks, etc.
- ® Maintain nutrient level in reservoir. Reservoir should be full before weekend.
- ® 2 - 4 days: seedlings emerge
- ® 5 -7 days: Thin to 3 well-spaced plants.
- ® 8 - 14 days: Stake plants that tend to flop over or are very tall. Use stakes and Tygon[□] split rings.
- ® As plants grow, they use more nutrient solution. Check reservoirs daily. The 16 oz. reservoir when full will sustain full-sized plants in 4 film cans for 3 - 4 days. *Note:* In dry climates or seasons of low relative humidity, plants will draw down more water when they are growing maximally (flowering time). To ensure adequate water for periods of 4 -5 days, place the Film Can Platform in a filled, deeper reservoir made by cutting a 2 L soda bottle 5 in. deep. Be sure to pull the wick out from the platform so that it extends to the bottom of the deeper reservoir. **YOU MUST CHECK THE NUTRIENT LEVEL IN THE RESERVOIR. IF THE RESERVOIR IS ALLOWED TO DRY OUT, THE PLANTS WILL DIE!**
- ® As plants get tall and top-heavy with seed, tie them in a group with cotton thread.
- ® Very occasionally, under very rapid growing conditions (optimal temperature, light, relative humidity and high nitrogen fertilizer), post flowering-stage plants exhibit shoot and pod tip browning and die back due to reduced calcium transport to the rapidly growing tissue. Adding supplementary calcium as 1 g Ca(NO₃)₂ per liter of Peters' nutrient solution at the beginning of flowering will prevent this "tip die back" condition.

Appendix

V. Pollinating

Making Bee Sticks

Materials

- ® Dry honey bees or bumble bees
- ® Duco[®] household glue, quick-drying
- ® Sharp, round toothpicks (bamboo are best)
- ® Styrofoam cup or block

Construction

1. Add a drop of glue to toothpick.
2. Hold bee on table between thumb and finger.
3. Push toothpick with glue into thorax (middle section) of bee.
4. Let bee stick dry overnight in Styrofoam.
5. To use as thorax only, remove wings, legs, head, and abdomen. Or use as a "whole bee" stick

Pollination

- ® Collect pollen on bee stick by rolling bee thorax over anthers of open flowers, note yellow pollen collecting on hair. Deposit pollen collected on bee stick to the stigmas of other flowers on other plants by touching or rolling bee stick over stigmas.
- ® Fast Plants are normally "self-incompatible", that is, each stigma prevents germination of its own pollen, but not the pollen of another plant.
- ® Mass pollination is the transfer randomly of pollen among flowers of selected plants.
Tip: When many plants (> 10 - 20) are interpollinated (massed) rather than a few (< 10), the genetic quality of the next generation's plants will be stronger.
- ® *Pollination Choices* - What plants will you select to pollinate (mate)? How many plants will you select to mate?
- ® Record in a notebook or on a pollination tag the number of plants mated in each mating group.

Matings and Symbols

- ® #1 X #2 = cross between 2 plants; in crosses the female is first.
- ® #3 s. #4 = sib. = cross between 2 members of the same family
- ® #5 = self pollination
- ® #6(10) x/m #7(12) = mass cross between 10 females and 12 males
- ® #8m(15) = intermated mass among 15 plants
- ® Terminate pollination by pinching off all unopened buds and side shoots.
- ® Record the last day of pollination. 20 days after the last pollination you can empty the reservoir to dry off the pods and seeds.

Appendix

VI. Harvesting Seed

Materials

- ® Brown paper bags
- ® Pencil
- ® Scissors
- ® Shallow plastic or metal pan
- ® Seed envelopes (coin envelopes)
- ® Ziplock bags
- ® Silica gel drying compound

Procedure

1. 20 days after the last pollination (if average PHL temperature is greater or equal to 22°C), remove reservoirs and allow FCP and plants to dry 3 - 7 days until pods are crisp and brown.
2. Cut plants off and place them in a labeled paper bag.
3. Staple bag shut. Break up the pods thoroughly by crushing them in the bag; seed will be released.
4. Pour seed and chaff into pan. Pick out stems and blow off chaff.
5. Recover clean seed in envelope.
6. Label envelope with seed name, date, etc.
7. Store envelopes in Ziplock bags (or sealed jars) with drying compound in cool or cold place.