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Planting Tobacco Seeds in the Greenhouse V.2

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¹Realizing Increased Photosynthetic Efficiency (RIPE)

1 Works for me

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SUBMIT TO PLOS ONE

ABSTRACT

Protocol for planting, germinating, and growing tobacco seedlings in the UIUC RIPE greenhouse. Has been verified on Petite Havana and Samson cultivars.

For additional information on growing tobacco for research purposes refer to UIUC RIPE greenhouse guide "Growing Tobacco (Nicotiana tabacum) under Greenhouse Conditions, RIPE Project UIUC Field and Greenhouse, 2020"

PROTOCOL CITATION

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WHAT'S NEW

*Updated to include a "Before start" to review applicable APHIS documentation before planting or planning an experiment that involves transgenic materials.

KEYWORDS

Tobacco, Greenhouse, Seeding, Germinating, Planting, Seedlings, Nicotiana tabacu, Petite Havana, Samsun

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GUIDELINES

Temperature

Tobacco's optimal temperature is 20-30°C with daytime temps between 23 - 26°C and nighttime temps between 20-23°C. During high humidity, high temperature days, greenhouse temperature cannot reach "ideal" growth temperatures due to limitations on evaporative coolers. Tobacco will still grow normally and produce seed outside of optimal temperature ranges. Watering frequency will need to be increased for plants to maintain vigor as temperatures increase.

Lighting

Natural lighting in a greenhouse can range anywhere from 0-2000 µmolm-2 s-1. Supplemental lighting can increase the photosynthetic photon flux densities (PPFD) on cloudy days or to extend day length. Even the most advanced lighting systems only reach 500 µmolm-2 s-1 unless mounted very close to the crop canopy. Tobacco grows best in high light but can still perform under shaded conditions.

Please Note The RIPE greenhouse is equipped with dual walled acrylic glazing and on clear summer days the PPFD is close to 2000 μ molm-2 s-1. Supplemental lighting is provided in all bays with 1000W high pressure sodium fixtures which provide around 400 μ molm-2 s-1 at the plant level. Daylength is set to 12 hours of supplemental light. If you want to grow a variety that is sensitive to daylength, we have a blackout tent with air circulation that can be used.

Day Length

Tobacco daylength requirements for flowering vary by variety. The experimental varieties Petite Havana NN and Samsun NN are day-neutral and will reach reproductive maturity regardless of the day/night cycle.

Humidity

Tobacco prefers high relative humidity between 60-80%.

Please Note Tobacco can grow in low humidity (30-40%). However, watering frequency is drastically increased under those conditions. In winter without a misting system and heat supplied by natural gas, the air dries very quickly.

Air Flow

Adequate air circulation between plants is required to reduce disease pressure. If your plants are all gently swaying in your growth space, you most likely have adequate airflow.

Please Note The RIPE greenhouse currently has two strong circulation fans in each bay, oriented at a downward angle providing circular airflow. For situations involving seedlings or close spacing we have installed a large oscillating fan in Bay 1 to increase airflow if necessary.

MATERIALS TEXT

- Azalea pot, 8" (Growers Solutions, 8az)
- Propogation tray, 20"L x 10"W, no holes (Better Grow Hydro <u>5630</u>)
- Humidity dome, 20"L x 10"W x 7" T, adjustable vented (Amazon, <u>YieldLab</u>)
- Soil, Berger BM6 HP Myco Organic Fertilized Peat Moss Mix (Hummert International 10121000)
- Pour boat, 4.75 x 7.75 x 1 in. (Fisher Scientific <u>08-732-118</u>)
- Drench nozzle, Fogg-IT, Super Fine: 1/2 gallon per minute @ 40 PSI (Hummert International <u>19195000</u>)
- Plastic plant label stakes (A.M. Leonard <u>VP-PS6</u>)
- Labelling tape (Fisher Scientific <u>15-959</u>) and sharpie (Fisher Scientific <u>19-166-600</u>) or laser printable labels for identifying pots (Part number dependent on type of laser printer used)

SAFETY WARNINGS

Annual Worker Protection Standard training required to work in greenhouse. Contact <u>UIUC ACES Plant Care Facility</u> Coordinator to arrange training.

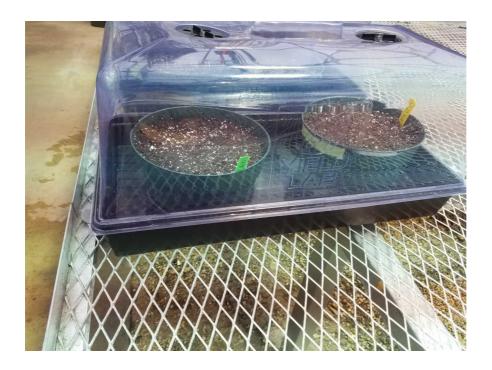
UIUC RIPE Greenhouse online training required to work in UIUC RIPE greenhouse. Contact <u>UIUC RIPE Greenhouse</u> <u>Manager</u> to arrange training.

BEFORE STARTING

Work with RIPE greenhouse to reserve space and materials approximately one month or more before planting.

If planting transgenic plants, review all USDA-APHIS requirements for the RIPE APHIS permit for handling transgenic materials before beginning any experiment.

1	Fill an 8" azalea pot completely full with Berger BM6 HP Myco Organic Fertilized Peat Moss Mix soil.
2	Tamp the soil down firmly with your hands. Trying to make as level of a surface as possible.
3	Using the super fine (0.5 GPM @ 40 PSI) fogg-IT drench nozzle, soak the soil until saturated to remove any air bubbles.
4	Tamp the soil lightly and relevel. If the soil settles more than about an inch, add additional soil and rewet. Do not overpack the soil.
	A level surface is important because tobacco seeds are tiny and round. If surface is not level, seeds will roll towards each other or the sides of the pot and cause overcrowding during germination.
5	Pour 50-300 seeds from stock vial into a pour boat. Using the pour boat, carefully sprinkle the seeds on top of the soil. Sprinkling them in a spiral shape starting on the outside and working in to ensure even coverage across the pot and even spacing of seeds. Seed 5 to 10x more seeds than will be transplanted. Do not cover seeds with soil.
	Nicotiana tabacum seed requires light in order to germinate. The seeds are very miniscule and need to be scattered on the soil surface in order to avoid being covered.
6	Label pot twice. Once with sharpie on a plastic stake in the pot and once on the exterior of the pot using a sharpie and labelling tape or a laser printed label.
	Laser printed labels are more robust. Handwritten sharpie labels tend to fade over the growing season.
7	Place azalea pots in a propagation tray with no drain holes.
8	Fill the tray with approximately 1 inch of water.
9	Cover with a humidity dome. Leave the vents on the humidity dome half open, half closed.





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Grow at ~~ § 23 ~ °C ~ , ~ ~ 60 ~ % ~ , 300-750PAR, and light cycle 12 hours on/12 hours off. Check daily and add water to keep tray filled with approximately 1" water.

Do not allow soil to dry out during germination. The water level can be maintained at 1" of water in the tray without any disease/damping off issues.

1w 4d



Transplant seedlings when they have one to two true leaves.

Seedling will be ready to transplant in approximately 10 to 14 days. Do not wait too long to transplant. The root system begins to develop rapidly after the first true leaves. When the true leaves first appear, there is typically one branch in the root system making it easy to remove from the initial media if care is taken. Damaging roots during transplant will drastically affect development and result in non-uniform plants.