Running a Production Nursery with a Conservation Focus in the Public Eye

Presented by Ashly Trask
Nursery Manager,
National Tropical Botanical Garden- Kaua'i

- Endangered Species capital of the world.
- Hawaii's T & E's making up 40% of the endangered taxa in the US.
- 90% endemic flora
- One full time staff person, one part-time (8 hours)
- ~150-350,000 plants and propagules at any given time. +1.2 million seeds '15.
- Volunteers and Interns 5 days per week
- Tours of up to 25 ppl, 6 days a week. 11 different tour guides.

- **Provide plants for McBryde and Allerton Gardens, both maintenance and duplication of existing collections, and installation of new trails and exhibits.**
- **Provide all plant material for Limahuli Garden and Preserve (both upper and lower). Appx. One flat bed truck per month. 10-15,000 plants/year.**
- **Grow plants for Biannual plant sales, arbor day, and various community giveaways (school groups, etc)**

- **Sent out over 20,000 plants to restoration sites (outside of the garden) in 2015.**
- **From riparian restoration to native bird nesting sites, and everything in between.**


ACE






2016 MIAMI

CHANGING PERSPECTIVES: PLANTING FOR THE FUTURE

2016 AMERICAN PUBLIC GARDENS ASSOCIATION ANNUAL CONFERENCE

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Malama Kaua'i
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- Met with ADA consultant to get recommendations on layout of nursery and bring entire operation up to ADA Compliance.
- Did a Voluntary Inspection (and annual follow up) with the Hawaii Department of Agriculture's Environmental Health Specialist to be certain that our pesticide storage, application, and training procedures were (and continue to be) up to both State and Federal Standards.
- Created an on-site binder with photos of volunteers as well as emergency contact information and medical history/medications that could be relevant in case of injury or incident.
- Maintain open and regular communication with other departments (education, tours, etc) coordinating visits to the nursery and pesticide applications.


Mahalo!
for leaving your slippas at home. Closed-toe shoes are required to work in the nursery.
-The Management
Safety First!
PPE (Personal Protective Equipment) available upon request.
LET'S KEEP SUBSTRATE BINS STERILE!
Weeds Found at the National Tropical Botanical Garden Nursery
Graceful Spurge
Scientific name: Euphorbia hypericifolia L.
Description: E. hypericifolia (graceful spurge) looks similar to the garden spurge but has no hair on the stem or leaves. The flowers are white or a pinkish white. The stem will emit a white, milky sap when broken. It is very similar to E. hyssopifolia with small taxonomical differences and will often be found growing in the same ar-
eas.
Propagation: By seed. Seep capsules explode, dispersing the seeds


Please!!
Measure out your Fertilizers and Soapy Water mixes accurately!
Even organic fertilizers and ordinary dish soap can cause a phytotoxic reaction in plants when improperly mixed or applied. When in doubt, read the label, or ASK ASHLY
Dilutions
Osmocote.....per pot: 4"= 1/4 tsp
1gl=1/2tsp
2gl and above = 1tsp
Bin = 1/2 cup
Worm Tea.....1 TBSP per watering can
Miracle Grow.....1 TBSP per watering can
Fish Emulsion.....1 TBSP per watering can
Bone Meal/Blood Meal.....no heavier than 1/2 tsp per pot (less is more!)
Soapy Water.....1/2 tsp per spray bottle
Neem Oil.....1/4 tsp per spray bottle
BE CAREFUL!!


Please transplant the plants below into 6" round pots (as shown)


PROPER TOOL CLEANING AND CARE
PEASE FOLLOW THESE SIMPLE INSTRUCTIONS TO PROLONG THE LIFE OF OUR TOOLS
Spray the surface of the tool with rubbing alcohol (located in a labeled bottle by the sink in propagation).
Scrub with a green scrubby or the green scrubby side of the sponge. Do not wet.
Wipe with a dry rag (located in the middle drawer under the sink).
Spray lightly with WD-40 (also located by the sink in propagation.)
At no time should the tool make contact with water.
Clean tools reduce the spread of pests and disease.


EMERGENCY
EYE
WASH
STATION
Emergency
Eye Wash
NORTH


QUARANTINE
ZONE
DO NOT MOVE OR
HANDLE PLANTS


20150354
Brighamia insignis (CAMPANULACEAE)
Mike Demotta; s.n.; 4/24/2015
Hawaii, Kauai, FI NTBG#90833.022. Origin:
Propagule
NATHAW
20150645
Unknown
NATHAW
PEP
E

Germination Requirements of Critically Endangered Native Hawaiian Plants

Kamalani Chock Jr.
Horticultural Department, National Tropical Botanical Garden
Lāwa'i, Hawai'i

Plant Extinction Prevention Program of Hawai'i

PLANT EXTINCTION PROVENTION PROGRAM (PEPP)

The Plant Extinction Prevention Program's (PEPP) is aimed in protecting Hawaii's endemic plants with populations amounting to fewer than 50 plants in the wild. The vulnerability of these plants is furthered by continual loss of habitat, loss of ecosystem services, and deleterious genetic determinants. PEPP focuses on managing wild populations, collecting seeds and establishing new populations in Hawai'i.

The National Tropical Botanical garden is profiled as a vital partner for the Plant Extinction Prevention Program. Much of the Kauai plant material collected by PEPP staff is sent to the National Tropical Botanical Garden's nursery for propagation and botanical research center for long-term storage.

Fig. 1: Counting of seeds PEPP seeds for plant database before transfer to Greenhouse

GERMINATION VARIABLES

- **Seed Viability**: A viable seed is one which is capable of germination under suitable conditions as long as dormancy is broken (i.e. scarification). Critically endangered plants are more susceptible to the occurence of non-viable seeds and inconsistent germination rates due to genetic phenomenons in small populations (i.e. bottleneck effect and inbreeding depression) (Rynear et al. 2012).
- **Moisture**: Dependability of soil moisture on seed germination differentiates with different species in different climates. Hawaii's vast amount of biomes gives rise to many microclimates and thus many PEPP species vary in moisture dependence for germination (McLaren and McDonald 2002). Substrate plays a large role in moistrue control during seed germination.
- **Light**: Light wavelength, occurrence, and intensity all contribute to seed germination success (Toole et al. 1956). PEPP species differ tremendously in life history and may prefer germinating under dense canopy or open direct sunlight.
- **Substrate**: With ex situ seed propogation comes the availability of a chosen substrate. Substrate can affect many other germination variables depending on the substrate's porosity, aggregation, and nutrient retaining abilities.
- **Temperature**: Ambient temperature can be affected by shade, substrate, and water availability. By maintaining these variables we can create an environment most suitable for PEPP seeds to germinate.

Fig. 2 : PEPP germination table

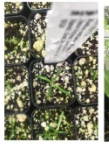

Fig. 3 : Transplanted *Kadua cookiana*

Fig. 4 : *Brighamia insignis* transplanted in 'Cool Room'

MATERIALS and METHODS

Daily counts of seed germs occured in early mornings post-irrigation. Germination table was organized chronologically by seeding date. Seed collection data is stored on National Tropical Botanical Garden's Nursery Inventory Control System (NICS) to maintain information that may explain specific germination patterns. Seed flats composed of volcanic cinder medium were set in a poly covered greenhouse ranging with temperatures from 60 - 80° F. Collected seed samples were evenly dispersed on seed flats. All seed flats data is collected for one year or until 100% germination rate is achieved. In the future complete data sets of seed germination rates can possibly be interpreted through one way analysis of variance (ANOVA) using the general linear method (GLM).

RESULTS

As the no sets of similar species have completed a complete germination cycle we can not post complete results but can make educated inferences based on qualitative patterns. From current data sets we can observe a general trend of certain Kaua'i PEPP plants experiencing a large spike and eventual plateau of germination over time (Fig. 4). We can also so observe certain specie's seed experiencing lower percentages of germination rates of other but cannot be concluded due to incomplete germination records (Fig. 5).

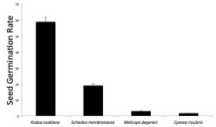

Fig. 4 Non statistical variance in seed germination rates between various PEPP plant species.

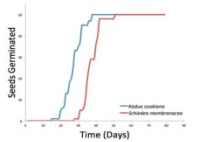

Fig. 5 Difference in germination patterns between two seed sets of different species.

CONCLUSION

Although the research is still in progress and statistical analyses unfinished, we can make qualitative observations of current data. Current data suggests that the majority of collected PEPP plants propagated under 'ideal' seed germinating conditions undergo quick spikes in germination and are highly variable in germination rates between the collected species.

FUTURE PROPAGATION

Once the germination trials are finished and statistical analyses are performed we can trace patterns of seed germination results to wild populations and see factors that may be causing unusual or inconsistent germination rates. Rare seeds consistently encounter seed viability problems because of lack of native pollinators, change in natural environment, and genetic effects of small populations.

Although ex situ propagation gives the most ideal variables for successful seed germination we must also observe in situ propagation or how the difference between the two propagation environments ultimately change species population health. The end goal of the PEPP program is to create self-sustainable populations of its species within the wild.

Lastly, by focusing on a single species within or between populations, we can better understand how wild environment affect the success of PEPP seed germination more intimately and cross examine the variables that affect seed propagation in order to create better nursery practices and broaden our understanding of how PEPP species propagate in the wild.

REFERENCES

1.Rynear, J., Peterson, C. L., Richardson, M. L. Variables influencing germination and initial survival of two critically endangered plants : *Warea amplexifolia* and *Lupinis aridorum*. 2013. *Botany* 90:323-326.

2.McLaren, K. P., Mcdonald, M. A. The effect of moisture and shade on seed germination and survival in a tropical dry forest in Jamaica. 2003. *Forest Ecology and Management*. 183: 61-75.

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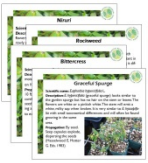
Nursery Internship Projects

By Randy Umetsu
(Fall-Spring 2015-2016)

Weed Identification

With the weed identification project I sought to create a catalogue of weeds common to the nursery to be used as a resource for the many volunteers that come through the nursery.After many months of weeding and familiarizing myself with the different weeds, I identified a total of 12 common weeds and compiled them into a set of handheld cards complete with their respective scientific name, common name, description, and means of propagation.

Card Example: Garden Spurge



Scientific name: *Euphorbia hirta* L.
Description: *E. hirta* (garden spurge) is an invasive weed widespread in tropical and subtropical regions and naturalized on Kauai. This upright annual is identifiable by its hairy stem and leaves. It stem will emit a white, milky sap when broken.
Propagation: By seed. Seeds dispersed mechanically and have also been known to be transported by ants

Quarantine zone

For this project I set up a quarantine area to separate and treat plants affected by disease in the nursery. In addition to making a sign designate the table as a quarantine zone, I created a template for a report to document the condition and treatments for the plants.

Schiedea kauaiensis

This collection of *Schiedea kauaiensis* was the first to be treated in the newly established quarantine zone. Endemic to Kauai and critically endangered, *Schiedea kauaiensis* in the nursery are constantly battling a number of pests.This particular group was infested with scales and ants, and they showed symptoms of chlorosis, leaf curl, and sooty mold. I applied principles of integrated pest management to assess the plants and developed a treatment plan under the guidance of Nursery Manger Ashly.

Native Plants

For this semester's internship project, I am researching native plants to create a brochure or flyers with information on their favorable characteristics that would make them attractive as landscaping plants as well as their cultural significance in Hawai'i.

'Ilima

Sida fallax, known commonly in Hawaiian as 'Ilima, is indigenous to Kaua'i as well as the greater Hawaiian island chain. Early Hawaiians used 'Ilima in their housing, cooking, lei making, and medicine, so it had a variety of uses in early cultural practices. For example, thousands of flowers were used in the lei 'ilī', which was reserved for royalty because of its resemblance to the yellow-feathered royal capes. In addition to its cultural significance, the 'Ilima can offer new uses in landscaping. The tall, upright *Sida fallax* is quite attractive as a screen or accent plant, but can also be used as a container plant, hedge, or specimen plant. It produces showy flowers ranging in color from yellow, orange, and red and bloom year round. It can be found naturally in a variety of different environments, such as rocky and sandy coasts, and a number soil conditions. Its diverse growing environments and tolerance to drought, wind, salt spray, and heat make it a very versatile plant for landscape use.

Air Layering at NTBG

With a focus on endangered species in the Hawaiian environment

In collaboration with Kauai Community College
Giselle Bryant – Nursery Intern 2015-2016

Background

Due to the introduction non-native organism and other environmental factors, native Hawaiian flora are highly susceptible to becoming endangered and/or extinct. Air layering is a propagation method that exposes a plants cambium layer, and with the application of hormones and a suitable environment, initiates the growth of adventitious roots. This technique is critical to species that are weakened or otherwise unable to reproduce in their natural environment.

Current Species

- ***Melicope paniculata-***
  Hawaii Endemic
- ***Erythrina tahitensis*** –
  In collaboration with the San Diego Zoo
- ***E. megastophyla-***
- ***Flueggea neowawrarea-***
  Hawaii Endemic
- ***Garcinia mangostana***

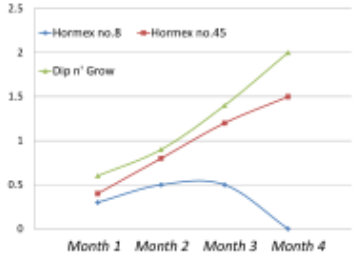
Methods and Materials

-Comparative hormone study on *M. paniculata*
a) IBA *Hormex no. 8*
b) IBA *Hormex no. 45*
c) IBA and NAA *Dip n' Grow*
-Weekly soap and water wash to treat Mealy bug infestation
-Monthly application of a 20-20-20 fertilizer

Comparative Study Results

Four months after the procedure-
a) Death most likely caused by rot
b) Moderate root development
c) Excellent root development

Root Development in CM/MM



Current & Potential Uses

I. Conservation efforts
II. Post natural disaster restoration
III. Preserving genetic material

Continued Work

NTBG has instilled in me a desire to continue working towards the preservation of Hawaii's endemic and endangered species. With the participation of KCC facilities, I will be performing tissue cultures on some of the PEPP species in NTBG's collection for my next internship project.

Forestry and Wildlife Hawaii

U.S. Fish & Wildlife Service
Department of the Interior

Department of Land and Natural Resources
State of Hawai'i

Plant Extinction Prevention Program of Hawai'i

Kāneiolouma

Mālama Kaua'i
'Aina Community Culture

GOFARM HAWAI'I







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