

Eragrostis variabilis PROPAGATION TRIAL

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Prepared by: David Duvauchelle – Natural Resource Specialist



Kawelu seedlings beginning to
damp-off 14 DAP

INTRODUCTION

Eragrostis variabilis, a lovegrass, is endemic to the Hawaiian island chain. It is a somewhat variable, tufted perennial grass which, under natural conditions in Hawaii, usually grows 1-3 feet tall by approximately 2 feet wide. More commonly known as kawelu, *E. variabilis* is a very drought tolerant plant that could potentially have many uses for conservation in Hawaii.

The Hoolehua Plant Materials Center (PMC) on Molokai has been producing kawelu seed on a large scale for the Kahoolawe Re-vegetation Project since 2002. Since then, it has been determined that kawelu seedlings are very susceptible to fungal disease problems at 14 to 21 days after planting. In the past, the application of supplemental fertilizers was sufficient enough to minimize the damping-off of seedlings. However, in a recent planting from December 2008 through February 2009, the damping-off of kawelu seedlings had become so bad that the entire planting was lost.

According to Alton Arakaki, a University of Hawaii Extension agent on Molokai, the damage may have been caused by a disease known as *Pythium* root rot, a common crop disease caused by a genus of organisms called "*Pythium*". These are commonly called water moulds. *Pythium* damping off is a very common problem in fields and greenhouses, where the organism kills newly emerged seedlings (Jarvis, 1992). This disease complex usually involves other pathogens such as *Phytophthora* and *Rhizoctonia*. *Pythium* wilt is caused by zoospore infection of older plants leading to biotrophic infections that become necrotrophic in response to colonization/reinfection pressures or environmental stress (Jarvis, 1992; Owen-Going, 2005; Owen-Going *et al.*, 2009), leading to minor or severe wilting caused by impeded root functioning (Jarvis, 1992; Bagnall, 2007).

METHOD

This study was conducted at the USDA / NRCS Plant Materials Center (PMC) Hoolehua Hawaii and was started on December 16, 2008. The seed utilized for this trial was harvested at the Hoolehua PMC in February 2006 and, at the time of the trial, had a germination rate of about 80%. Seeds were planted ¼ inch deep in 200-celled high-density plastic trays that measured 13 inches wide by 26 inches long. The trays were set on high-density polyvinyl nursery tables under a shade-house that provided 50% sunlight. Overhead-irrigation was controlled automatically and provided moisture everyday for 5 minutes each day.

To isolate the pathogen, samples of affected kawelu seedlings were sent to the University of Hawaii at Manoa Diagnostics Center for analysis. Unfortunately, the results obtained were inconclusive due to the fact that the diagnostics center received seedling samples in poor condition. Nevertheless, based on the assumption given by Alton Arakaki, two fungicides were selected for evaluation: APRON and CAPTAN. APRON is a seed-treatment applied before planting at a rate of 1 tsp. per 200 grams of seed and the active ingredient is 25% Metalaxyl: N-(2,6-dimethylphenyl)-N-(methoxyacetyl) alanine methyl ester. CAPTAN is a soil-drench treatment applied after planting at 2 pounds per 100 gallons of water at a rate of 15 gallons of spray per 1,000 square feet and the active ingredient is 48.9% N-Trichloromethylthio-4-cyclohexene-1,2-dicarbomixide.

In addition, [3] other factors that may contribute to the spread of a fungal disease were evaluated: (1) soil surface moisture; (2) nutrient availability; and (3) contaminated planting trays.

Soil Surface Moisture: Most fungi thrive in moist environments at the soil surface. The amount of moisture at the soil surface can be reduced by utilizing a planting medium with better drainage. This should hinder the growth of any fungus, consequently increasing the seedlings' chances of survivability. The planting medium used was Sunshine MIX1. To increase the drainage of this planting medium, perlite was added at a 1:1 ratio.

Nutrient Availability: Plants with low vigor have very little chance of survival against a disease. The addition of nutrients should increase the vigor of propagules, hence giving them more strength to withstand the effects of diseases that may develop. In this particular trial Miracle-Gro Lawn Food (36-6-6) was used and applied with a Miracle-Gro Garden Feeder at a rate of 1 tablespoon per gallon water.

Contaminated Planting Trays: Some types of fungi are seed borne, but many are found almost everywhere around us. Sterilizing the planting trays with Clorox may be sufficient enough to reduce the effects caused by a pathogen. Clorox was mixed with water at a 10:1 ratio and the trays were soaked in this solution for five minutes then air dried.

Experimental Design:

Treatment 1	Title: S-NFu-NF	Sunshine MIX1 – no fungicide – no fertilizer
Treatment 2	Title: S-NFu-NF-S	Sunshine MIX1 – no fungicide – no fertilizer – sterile tray
Treatment 3	Title: SP-NFu-F	Sunshine MIX1 – no fungicide – w/fertilizer
Treatment 4	Title: SP-NFu-F-S	Sunshine MIX1 – no fungicide – w/fertilizer – sterile tray
Treatment 5	Title: S-CFu-NF	Sunshine MIX1 – w/CAPTAN – no fertilizer
Treatment 6	Title: S-CFu-NF-S	Sunshine MIX1 – w/CAPTAN – no fertilizer – sterile tray
Treatment 7	Title: SP-CFu-F	Sunshine MIX1 – w/CAPTAN – w/fertilizer
Treatment 8	Title: SP-CFu-F-S	Sunshine MIX1 – w/CAPTAN – w/fertilizer – sterile tray
Treatment 9	Title: S-AFu-NF	Sunshine MIX1 – w/APRON – no fertilizer
Treatment 10	Title: S-AFu-NF-S	Sunshine MIX1 – w/APRON – no fertilizer – sterile tray
Treatment 11	Title: SP-AFu-F	Sunshine MIX1 – w/APRON – w/fertilizer
Treatment 12	Title: SP-AFu-F-S	Sunshine MIX1 – w/APRON – w/fertilizer – sterile tray
Treatment 13	Title: S-NFu-NF	Sunshine MIX1 w/perlite – no fungicide – no fertilizer
Treatment 14	Title: S-NFu-NF-S	Sunshine MIX1 w/perlite – no fungicide – no fertilizer – sterile tray
Treatment 15	Title: SP-NFu-F	Sunshine MIX1 w/perlite – no fungicide – w/fertilizer
Treatment 16	Title: SP-NFu-F-S	Sunshine MIX1 w/perlite – no fungicide – w/fertilizer – sterile tray
Treatment 17	Title: S-CFu-NF	Sunshine MIX1 w/perlite – w/CAPTAN – no fertilizer
Treatment 18	Title: S-CFu-NF-S	Sunshine MIX1 w/perlite – w/CAPTAN – no fertilizer – sterile tray
Treatment 19	Title: SP-CFu-F	Sunshine MIX1 w/perlite – w/CAPTAN – w/fertilizer
Treatment 20	Title: SP-CFu-F-S	Sunshine MIX1 w/perlite – w/CAPTAN – w/fertilizer – sterile tray
Treatment 21	Title: S-AFu-NF	Sunshine MIX1 w/perlite – w/APRON – no fertilizer
Treatment 22	Title: S-AFu-NF-S	Sunshine MIX1 w/perlite – w/APRON – no fertilizer – sterile tray
Treatment 23	Title: SP-AFu-F	Sunshine MIX1 w/perlite – w/APRON – w/fertilizer
Treatment 24	Title: SP-AFu-F-S	Sunshine MIX1 w/perlite – w/APRON – w/fertilizer – sterile tray

PLOT LAYOUT

Treatment 13	Treatment 14	Treatment 1	Treatment 2	Treatment 4	Treatment 3	Treatment 16	Treatment 15
Treatment 17	Treatment 18	Treatment 5	Treatment 6	Treatment 8	Treatment 7	Treatment 20	Treatment 19
Treatment 21	Treatment 22	Treatment 9	Treatment 10	Treatment 12	Treatment 11	Treatment 24	Treatment 23

Eragrostis variabilis Seedlings
53 Days After Planting



No Fungicide / No Fertilizer



No Fungicide with Fertilizer



CAPTAN / no Fertilizer



CAPTAN with Fertilizer



APRON / no Fertilizer



APRON with Fertilizer

FIELD NOTES

Date	DAP	Activity
12/16/2008	0	Trial Started - Planted seed
12/23/2008	7	Seedlings emerging
12/29/2008	13	Applied Fertilizer, some seedling beginning to damp-off
1/5/2009	21	Applied Fertilizer
1/12/2009	27	Applied Fertilizer
2/5/2009	53	Evaluated trial

RESULTS

This trial was performed to give a better understanding of how to reduce the mortality rate of kawelu seedlings caused by suspected fungal pathogens. Although the results of the trial were based purely on visual observations, the differences were quite clear.

The focus of this trial was to observe the effect that the application of fungicides may have on kawelu seedling mortality rate. The effects from the different fungicides were determined by the estimated percentage of mortality. Of the two fungicides that were applied, APRON appeared to be more effective in controlling the pathogen that was causing the damping-off of seedlings. Although the CAPTAN fungicide did not do as well as APRON, it did prove to be more effective than not applying any fungicide at all.

Of the four factors that were evaluated, the availability of nutrients appeared to have the most significant effect on seedling vigor. When comparing trays that received additional nutrients to trays that did not, the difference was obvious that seedlings that received supplemental nutrients had grown significantly taller and appeared to be more vigorous.

The sterilization of the planting trays with Clorox proved to be somewhat effective against the pathogen. There was a noticeable difference between trays that had been sterilized and those that had not. Sterilizing the trays proved beneficial for the trays with no fungicide and the trays with CAPTAN applied. On the other hand, when APRON fungicide was applied, there appeared to be no difference between the sterilized and non-sterilized planting trays.

The effect from the addition of perlite to the Sunshine MIX1 planting medium was the most surprising. It appeared that the addition of perlite had a detrimental effect on the kawelu seedlings. On the other hand, this effect was not apparent in the trays that were treated with APRON.

The trays that had the lowest mortality and healthiest seedlings were the ones that were treated with APRON and fertilized with Miracle-Gro.

CONCLUSION

According to the results obtained from this particular trial, a combination of certain factors can greatly decrease the mortality rate of *Eragrostis variabilis* seedlings. Of the two fungicides tested, APRON proved to control the pathogen best. Also, although there was no significant difference between the APRON treated trays that were sterilized and the APRON treated trays that were not sterilized, sterilizing the planting trays did show signs of controlling the unknown pathogens in the other trays. It would be a good practice to sterilize the planting trays in addition to treating the seeds with APRON to increase the seedlings chance of survivability. Furthermore, the soil medium should be well drained, but too much of a good thing can be bad. The results indicated that seedlings did better in Sunshine MIX1 without any additional perlite added. In addition, when a tray was treated with APRON, it did not matter if perlite was added or not, no differences could be seen. This may indicate that the additional perlite may enhance the spread of the pathogen in some way if no fungicide is applied. It is best to use just plain SUNSHINE MIX1. In conclusion, the recommended practice would be to sterilize trays with Clorox before planting, use a planting medium comparable to Sunshine MIX1, treat the seeds with APRON, and then fertilize weekly with Miracle-Gro.

In addition, there may have been a few factors which may have changed the outcome of the trial. First, it is uncertain that the potting mix that was utilized was completely sterile. Also, even though the differences between the trays were very clear, it would have been more statistically sound to have collected measurable data as apposed to visual observations.

It is still unknown where the fungus is originating from and it is almost impossible to track it. It is conclusive, though, that a fungus of some sort caused the damping off of the kawelu seedling. Because the APRON fungicide had such a positive effect on seedling health, the fungus in question may indeed be a pythium species. Fungi spores are everywhere. The only thing that can be done is to practice good nursery cleanliness by disinfecting trays and tables. Unfortunately, if the nursery is not an enclosed system, a completely sterile environment can be very difficult to achieve.

Damping off of young kawelu seedlings can be controlled with Apron fungicide. Please contact your local agricultural extension agent or county weed specialist to learn what may work best in your area. Always read the pesticide label and safety instructions for each control method. Trade names and control measures that are mentioned in this document to only provide specific information. USDA NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

REFERENCES

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