

Hoolehua Plant Materials Center FY-2011 Progress Report of Activities

P.O.Box 236, Hoolehua, Hawaii 96729, Tel:808-567-6885, Fax 808-567-6537, website:<http://www.pia.nrcs.usda.gov/plants>

Studies: Technology Development

Re-vegetation on Highly Degraded Sites with a Native Seed Mixture

Available information on native plant establishment using direct seeding methods is limited and done on a small scale. This type of technology development could be an alternative to the costly conventional method of reestablishment of native plant communities using live plant propagules. The Hoolehua PMC is currently testing the use of a native seed mixture to re-vegetate critically eroded arid lands at an off-center evaluation site located on Molokai Properties, Ltd. (MPL) land and under the stewardship of the Molokai Land Trust (MLT). The area is extremely dry, windy and low in fertility. The average precipitation is 15 inches a year. Native plants being tested include piligrass (*Heterpogon contortus*), kawelu (*Eragrostis variabilis*), aalii (*Dodonaea viscosa*), uhaloa (*Waltheria indica*), and *Achyranthes splendens*. Other species which could potentially be added to the mix include: ilima (*Sida fallax*), kookoolau (*Bidens mensezii*), and aweoweo (*Chenopodium oahuense*). All of these plants are very drought, as well as wind tolerant and are also able to thrive in poor soils. The study will investigate the effectiveness of native plant establishment under natural rainfall and direct seeding conditions utilizing various land preparation techniques, which include mulching, light ripping, and fertilizing. The success of direct seeding, utilizing a native seed mixture on a large scale, will have a huge impact with regards to the application of a conservation technique on the ground.



Off Center study site on West Molokai, HI



Kawika Duvauchelle spreading native seed

Studies: Technology Development

Heteropogon contortus, Piligrass, Refining Combining Harvesting Methods

The use of piligrass for both cultural and conservation use has been steadily increasing in current years. This commonly found native bunch grass is easily propagated and cultivated from seed and was the main thatching material for the construction of houses for early Polynesians. Unfortunately, there are no local large scale commercial producers of this beneficial grass. Compounding its availability is the difficulty involved in the harvesting and the post harvesting, cleaning of this grass. The tangled nature in which the seed and awns are formed makes it extremely difficult to process using conventional combining and cleaning methods. Hence, the difficulty to acquire clean seed makes it even more difficult for stakeholders to effectively use the seed for conservation purposes. To better promote the commercial use of this grass, a series of field test were initiated to try and effectively use a combine to harvest the seed. After three separate harvesting attempts, results have concluded that direct combining is indeed possible with piligrass, with minimal amount of clogging to the combine. Adjustments with combine cylinder speed, along with allowing larger quantity of bulk material to pass through the combine; produced seed that was able to be further cleaned with a seed and grain cleaner. Although piligrass seed cleaning has not been one hundred percent perfected, it has gotten to the point where end users can now more effectively use the seed for conservation purposes.



Harvested piligrass without being processed through a combine



Piligrass seed after direct combining from the field



Cleaned piligrass seeds

Studies: Technology Development - Cooperative Partnership with University of Hawaii

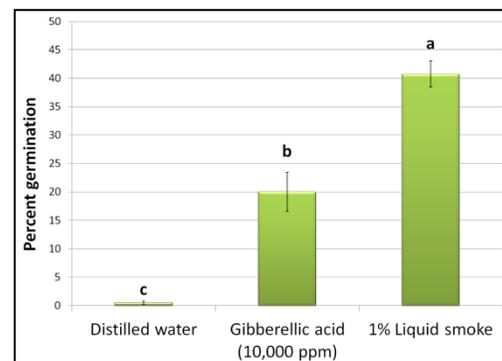
Improving Germination of Piligrass (*Heteropogon contortus*) Seeds Using Liquid Smoke Flavoring By Orville Baldos, UH at Manoa

Piligrass is a drought and fire adapted, native perennial bunchgrass that is increasingly being utilized for restoration and re-vegetation in Hawaii. In recent years, there has been growing interest in utilizing piligrass in a number of applications including landscaping, stream bank stabilization, roadside re-vegetation, buffer strip plantings, forage and biofuels.

While efforts are currently underway to expand its uses in Hawaii, piligrass seed production technologies remain largely undeveloped. Seed dormancy is one particular aspect that needs to be studied, since piligrass seeds require at least 6 months of dry after-ripening in order to obtain germination. To improve germination and immediate use of piligrass seeds, it is necessary to develop treatments to break seed dormancy. The use of smoke and aqueous smoke extracts has been shown to stimulate seed germination in a number of species. In this study, the effectiveness of liquid smoke flavoring on improving seed germination of 1 month old piligrass seeds was evaluated. Piligrass seeds were soaked for 15 minutes in distilled water, liquid smoke flavoring (1% v/v) and gibberellic acid (10,000 ppm). After soaking, the seeds were sown in petri-dishes lined with moistened filter paper and incubated at ambient conditions (22 °C). Percent germination after one month indicated that liquid smoke flavoring was the most effective soaking treatment for improving seed germination. Seeds soaked in 1% v/v liquid smoke flavoring exhibited 40.8% germination in contrast to 20.0% germination in 10,000 ppm gibberellic acid and 0.5% germination in distilled water.



Distilled water (left), 10,000 ppm gibberellic acid (center) and 1% liquid smoke (right) treatments 2 days after sowing. Seedlings produced in the gibberellic acid treatments exhibited elongated stems.



Percent germination of piligrass seeds 1 month after the soaking treatments were applied. Treatments followed by the same letters are not significantly different as determined by Tukey's range test at $P \leq 0.01$. Standard errors of the mean are presented.

Studies: Technology Development/Cooperative Partnership with University of Hawaii

The Response of Weeds and Cut Stems of the Native Hawaiian Grass *Sporobolus virginicus* (L.) Kunth to Two Forms and Two Rates of Oxadiazon Applied as a Component of a Hydro-mulch Cap in a Simulated Roadside Planting By Scott B. Lukas

United States Department of Transportation initiatives are calling for increased use of native plants for highway rights-of-way re-vegetation. In Hawaii, *Sporobolus virginicus* (a native coastal grass) has been identified as a useful species for roadside plantings. Plantings of *S. virginicus* can be accomplished by hydro-mulch capping of cut stems, however, weed management is essential for successful establishment. In this study, the efficacy and safety of the pre-emergence herbicide oxadiazon applied in the hydro-mulch cap over *S. virginicus* cut stems was evaluated in a trials repeated over two years. Oxadiazon in two forms, granule and suspension concentrate, was applied at 2.25 and 3.36 kg-ha⁻¹ ai. *S. virginicus* response was recorded as counts of new shoots, aboveground biomass and percent visual coverage. There were significantly greater counts of *S. virginicus* shoots, biomass and visual coverage found with the G form of oxadiazon, with no significant effect of application rate. Herbicide treatments with the G form of oxadiazon resulted in significantly less weed biomass than the suspension concentrate, with no significant effect of rate. Granular oxadiazon, in the hydro-mulch cap, can provide commercially acceptable weed control while maintaining high levels of rooting and plant vigor during the establishment period.



Graduate student Scott Lukas applying hydro-mulch cap on aki aki sprigs at Hoolehua PMC



Field demonstration of hydro-mulch cap on aki aki grass springs along H1 Freeway, Honolulu Hawaii

Studies: Plant Selection

Napiergrass x Pearl Millet Hybrid Bio-fuel Study

The rising cost of imported fossil fuel to Hawaii has sparked the renewed interest in the technical and economic feasibility of producing ethanol from lignocelluloses biomass. Supporting this effort, the Hoolehua PMC provided the University of Hawaii, Tropical Plant and Soil Science Department, as well as several private and research institutions with 17 accessions of a pearl millet x napiergrass hybrid cross developed at the Hoolehua PMC. The 17 accessions were part of a collection developed in the mid eighties as part of a forage and windbreak study. The cross between *Pennisetum purpureum* x *Pennisetum glaucum* was significant in that it produced a sterile seed variety of napiergrass. The sterile attribute plays an important role of not allowing it to become an invasive plant introduction to Hawaii, especially if it's utilized by sugar plantations, seeking an alternative crop for sugarcane replacement. The hybrid napiergrass is a very fast growing, high yielding, palatable perennial grass, which under ideal conditions can attain a height of 15-18 feet in one year.



Hybrid napiergrass increase planting 9-30-11



Hybrid napiergrass plots at 71 days after planting



Hybrid napiergrass 10 feet tall at 71 days



14 month old hybrid napiergrass, 15 feet tall

‘Tropic Sun’ sunn hemp. Going Commercial on Molokai, HI

The popularity of ‘Tropic Sun’ sunn hemp, *Crotalaria juncea* as a green manure cover crop has steadily been on the increase; however, the availability of this cultivar of sunn hemp has been somewhat sporadic. Hence, with low availability and increased demand of ‘Tropic Sun’, a local farmer on the island of Molokai in Hawaii, will be commercially producing this popular green manure crop. Molokai Seed Company is one of only two known producers of ‘Tropic Sun’. The other sunn hemp producer is on the island of Oahu, (Pioneer Seed Co.), which also works with the Oahu Resource Conservation Development (RC&D) Counsel. The Hoolehua PMC provided the foundation seed for Molokai Seed Company, with planting beginning in the fall of 2011. It is anticipated the first harvest of ‘Tropic Sun’ will be in April or May of 2012.



Farmer Brad of Molokai Seed Company standing in 6 week old 'Tropic Sun' field



8 week old 'Tropic Sun' stand

USDA People's Garden

The People's Garden at the Hoolehua Plant Materials Center, spear-headed by local high-school student Chelsea Sakamoto, has gained local, as well as state recognition. As her high school "Senior Project", Chelsea committed herself to the daunting task of coordinating the activities of this nationally recognized project. Chelsea had taken the lead in planting, maintaining, harvesting, and coordinating with local community organizations, such as Molokai Environmental Preservation Organization (MEPO), Molokai Food Bank, Maui Community College Farms, Ameri-Corps, local farmers and other community members. The produce harvested from the People's Garden, were donated to the Salvation Army which serviced (19) Food Bank pantries on Molokai. The People's Garden included taro, luau (taro) leaf, sweetpotato, different varieties of egg-plant, banana, and sweet corn. During her 10 month long service as a volunteer, the People's Garden produced 852 pounds of vegetables and 3601 pounds of bananas. Ms. Sakamoto's efforts of bringing awareness to agriculture and her desire to assisting the needy sector in her community was recognized and acknowledged by Congresswoman Mazie Hirono, as well as Lt. Governor, Brian Schatz, who visited the PMC People's Garden on December 8, 2010. Chelsea has since graduated and is attending Colorado State University and plans on getting a degree in civil/environmental engineering.



Lt Governor Brian Schatz, Chelsea Sakamoto and PMC staff at PMC People's Garden



Rows of taro, sweet potato and eggplant in People's Garden April 2011



Molokai High School student volunteers tend to and harvest eggplant



Molokai Environmental Preservation Organization, (MEPO) help harvest sweet potato

Throughout the Year Visitors/Tours



Hawaiian Immersion students receive instructions from Kawika Duvauchelle on plant evaluation



Plant Materials Quality Assurance Review team tour PMC, L-R David Duvauchelle, NRCS; Phil Bauer, ARS; Jim Briggs, NRCS; John Englert, NRCS; Ramona Garner, NRCS; and Tony Ingersoll, NRCS



Kamehameha Grade School students help harvest eggplant from People's Garden



Congressional Representatives for Senator Daniel Inouye visit PMC

Volunteers



Summer Americorps workers Puna Kawamae, Jon Brito, and Misty Mollena



People's Garden volunteers, Chelsea, Brandon and Jake

Who We Are

The Hoolehua Plant Materials Center is located on the island of Molokai and situated on the fertile agricultural plains of Ho'olehua. It is one of 27 Plant Materials Centers located throughout the United States. The island of Molokai is 27 miles long and 11 miles wide (261 square miles) and the fifth largest island in the Hawaiian chain. The Center is responsible for servicing the plant conservation resource needs of the Pacific Island Area, which includes the State of Hawaii, Guam, Northern Mariana Islands, The Federated States of Micronesia, The Republic of Palau, The Republic of the Marshall Islands and American Samoa.

The Hawaii Plant Materials Program

Controlling erosion, enhancing and protecting our natural resource base through the use of plant materials, is our main mission. To do this and be consistent with the USDA objectives and NRCS Strategic Plans, the Plant Materials Program develops tests and transfers effective state of the art plant science technology, so as to meet stakeholders and conservation resource needs.

Pacific Island Area – East Area

Plant Materials Priority Needs

1. Pasture and Hay Planting (Forage and Biomass Planting)
2. Cover Crop
3. Conservation Cover
4. Mulching
5. Tree/Shrub Establishment
6. Critical Area Planting
7. Hedgerow Planting
8. Windbreak/ Shelterbelt Establishment
9. Grassed Waterway
10. Restoration and Management of Rare or Declining Habitats



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