STUDIES ON THE REVEGETATION OF COGONGRASS INFESTED HABITATS WITH NATIVE GRASS SPECIES FOLLOWING HERBICIDAL TREATMENT

By

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INTRODUCTION
Serious problem on rangelands, pastures, roadsides, forests, wildlife refuges and national parks.
Cogongrass in Different Months

January

February

March

April

August

December
Objectives

- Greenhouse evaluation of native grass species for the suppression of cogongrass
- Evaluate the performance of four native grass species for the revegetation of imazapyr and glyphosate treated *in situ* cogongrass infested forest land
- Determine the most effective time for introducing planting materials into an imazapyr sprayed southern pine forest soil environment
- Identify and select native grass species plant genotypes with high levels of tolerance to imazapyr *in situ* plots
- Provide the extent to which vegetational species will continue to prevent the reinvasion of forestlands by cogongrass
Materials and Methods

- Three studies:
  - Greenhouse Studies; 2005 – 2007; Completed
  - First Field Studies; 2007 – 2009; Completed
  - Second Field Studies; 2010 – 2014; Ongoing
Overall objective

- To determine if native grass species could suppress the growth of cogongrass in greenhouse conditions.

Specific objectives

- To evaluate the effects of native grass species on rhizome production by cogongrass.
- To estimate shoot dry weight of cogongrass, maidencane, switchgrass and muhlygrass grown individually and in combination.
- To determine the tiller production of cogongrass maidencane, switchgrass and muhlygrass grown individually and in combination.
Materials and Methods

Cogongrass

Maidencane

Switchgrass

Muhlygrass
Materials and Methods

- Experimental design: - Randomized complete block design.
  - Eleven treatments
  - Four replications
- Transplanted from tubetts into 5 liter pots in combination or alone in pots filled with a mix of 80% bark, 10% sand, and 10% peat.
- Plants fertilized with 1 Tbsp of Osmocote (10-6-12) per pot every four weeks.
Materials and Methods

- Cogongrass grown with native grass species
  - Cogongrass (C) only
  - Muhlygrass (M) only
  - Switchgrass (S) only
  - Citrus maidencane (A) only
  - Combinations: C + M; C + S; C + A; C + M + S; C + M + A; C + S + A; C + M + S + A
Objectives for First Field Studies: 2007 -2009

- To determine the survival rate of native grass spp. *in situ* for revegetation after treating naturally cogongrass infested areas with herbicides
- Monitor re-infestation of cogongrass into treated areas planted with native grass species
Materials and Methods for First Field Studies

- Experimental design: - Randomized complete block design.
  - Three treatments
    - Control (mowing)
    - Glyphosate
      - Has no soil activity
    - Imazapyr
      - Has soil activity
  - Three replications
Materials and Methods

- Treatment plot
  - 40 x 3 m strip,
  - 2 m border between strips
  - 1 x 1 m planting area; 8 per strip

- Native plants: planted 2 weeks after treatments were applied
T-0701-IN

Biological control of cogongrass with native species

FY07-10
Objectives for Second Field Studies: 2010 - 2014

- Evaluate the performance of four native grass species for the revegetation of imazapyr treated *in situ* cogongrass infested forest lands

- Determine the most effective time for introducing planting materials into an imazapyr sprayed southern pine forest soil environment

- Identify and select native grass species plant genotypes with high levels of tolerance to imazapyr *in situ* plots.

- Provide the extent to which vegetational species will continue to prevent the reinvasion of forestlands by cogongrass
Materials and Methods for Second Field Studies

- Current Studies are being conducted at four different locations across Florida
Florida Native Grasses

Maidencane

Muhlygrass

Switchgrass
RESULTS AND DISCUSSION

- Greenhouse Studies
- First Field Studies
- Second Field Studies: on going.
Pots with Rhizomes of cogongrass and native grass species

- Cogongrass alone
- Cogon-Switch
- Cogon-Muhly
- Cogon-Maiden
- Cogon-Muhly-Maiden-Switch
Impact of Switchgrass on Cogongrass Tiller Production

C = 3.85x - 18.14; $R^2 = 0.86$

S = 0.64x + 5.77; $R^2 = 0.50$

Cs = 2.73 - 8.18; $R^2 = 0.86$

Sc = 0.50x + 3.59

$R^2 = 0.50$
Impact of maidencane on the production of tillers by cogongrass

\[ C = 3.85x - 18.14; \quad R^2 = 0.86 \]
\[ A = 1.25x - 2.84; \quad R^2 = 0.67 \]
\[ Ca = 2.10x - 2.79; \quad R^2 = 0.81 \]
\[ Ac = 1.04x + 0.34; \quad R^2 = 0.71 \]
Impact of Maidencane on Cogongrass Tiller Production

C = 3.85x - 18.14; R² = 0.86
A = 1.25x - 2.84; R² = 0.67
Ca = 2.10x - 2.79; R² = 0.81
Ac = 1.04x + 0.34; R² = 0.71
Aboveground Biomass

A.

Cogongrass aboveground biomass

Sampling Period

B.

Switchgrass aboveground biomass

Sampling Period

C.

Maidencane aboveground biomass

Sampling Period

D.

Muhlygrass aboveground biomass

Sampling Period
Belowground Biomass

**A**
- Cogongrass belowground biomass
- Sampling period: 6 wks, 12 wks, 18 wks, 24 wks
- Bar graphs showing biomass for different treatments labeled as C, CS, CA, CM, CSA, CSM, CAM, CSAM.

**B**
- Switchgrass belowground biomass
- Sampling period: 6 wks, 12 wks, 18 wks, 24 wks
- Bar graphs showing biomass for different treatments labeled as S, CS, CSA, CSM, CSAM.

**C**
- Maidencane belowground biomass
- Sampling period: 6 wks, 12 wks, 18 wks, 24 wks
- Bar graphs showing biomass for different treatments labeled as A, CA, CSA, CAM, CSAM.

**D**
- Muhlygrass belowground biomass
- Sampling period: 6 wks, 12 wks, 18 wks, 24 wks
- Bar graphs showing biomass for different treatments labeled as M, CM, CSA, CAM, CSAM.
Results for the First Field Studies

- Field view 12 months after planting

1. Mowing
2. Imazapyr
3. Glyphosate
4. Glyphosate
Species Survival following Herbicidal Treatment

**Maidencane Survival (%)**
- **Control (mowed)**
- Glyphosate
- Imazapyr

**Sampling period**
- Nov. 2007
- Feb. 2008
- May. 2008
- Aug. 2008

**Muhlygrass Survival (%)**
- **Control (mowed)**
- Glyphosate
- Imazapyr

**Sampling period**
- Nov. 2007
- Feb. 2008
- May. 2008
- Aug. 2008

**Switchgrass Survival (%)**
- **Control (mowed)**
- Glyphosate
- Imazapyr

**Sampling period**
- Nov. 2007
- Feb. 2008
- May. 2008
- Aug. 2008

**Total Survival Rate (%)**
- **Control (mowed)**
- Glyphosate
- Imazapyr

**Sampling period**
- Nov. 2007
- Feb. 2008
- May. 2008
- Aug. 2008
Additional Treatment Effects

Native species survival per treatment

Cogongrass re-infestation per treatment
Species Establishment 12 Months after Planting on Tram Road in Tallahassee.

- Maidencane: < 20% survival. Soil moisture content could have been the drawback, because it need high soil moisture during establishment.
- Muhlygrass: Up to 93% survival.
- Switchgrass: Up to 78% survival.
- Species establishment was the key success to the first study; hence muhlygrass and switchgrass could be the recommended species for Tallahassee, Florida. Results from Brooksville, Florida are yet to be analyzed.
CONCLUDING REMARKS
Will Native Grasses Effectively out Compete Cogongrass?
Why is Cogongrass so invasive??

- Seed Dispersal
- Genotypic variation of individual plants
- Aggressive rhizomes
- High water use efficiency!!!
- C$_4$ pant species with high photosynthetic efficiency
Plant competition provides environmentally sustainable means of controlling cogongrass.

An integrated approach of some herbicide and immediate revegetation with native grass species like citrus maidencane, broomsedge, switch grass or muhly grass will be the most economically beneficial approach for the ecological restoration of cogongrass infested sites. Studies are continuing.
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THANK YOU
and Questions???

FAMU COGONGRASS WEBSITE
http://www.aboutcogongrass.org
(currently being updated)

Georgia COGONGRASS WEBSITE
http://www.cogongrass.org