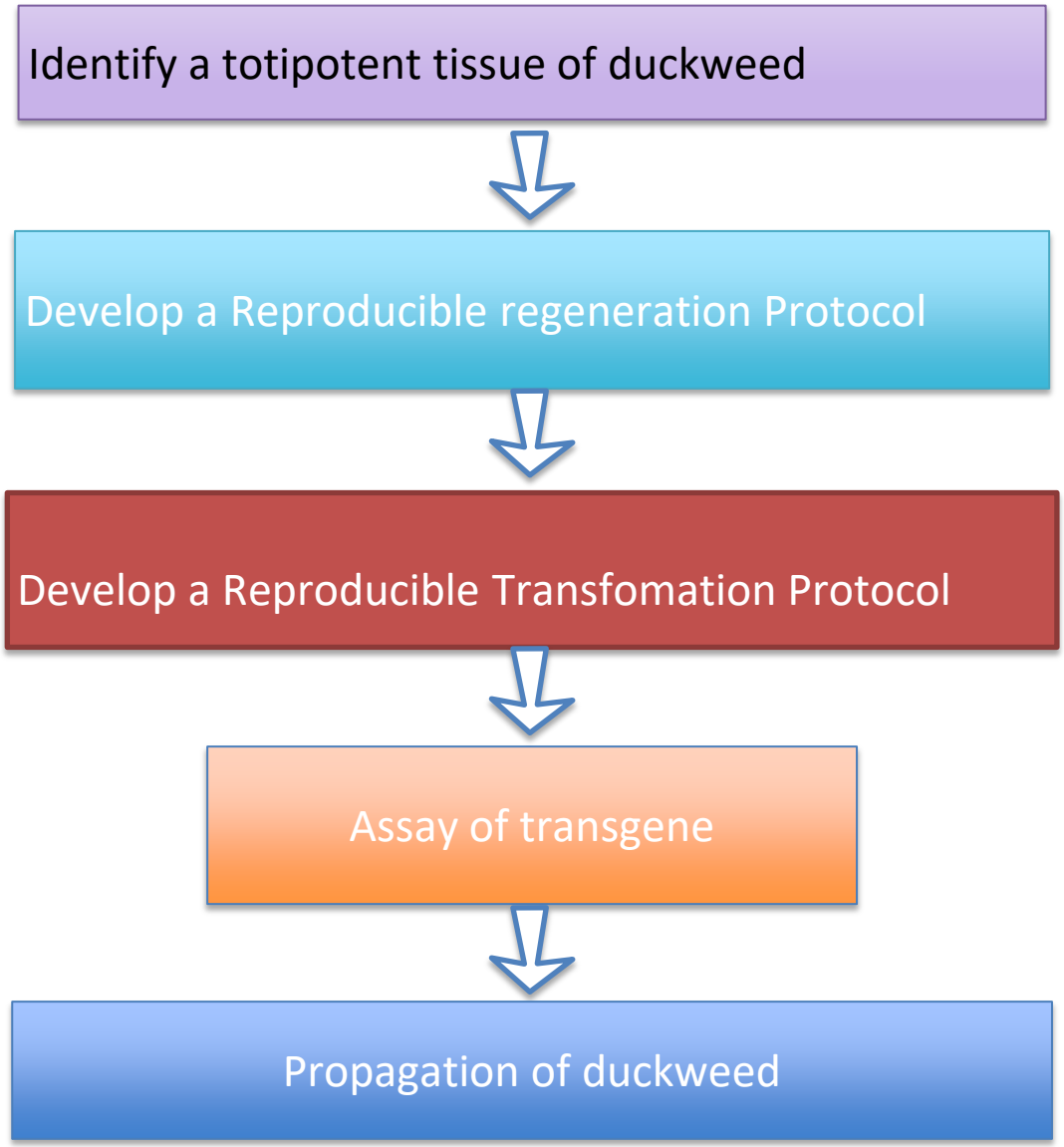
Developing a Duck Weed Transformation Platform for Mass Production of Food and Feed

John Muoma(Ph.D)

Host: Prof. Jo Messing

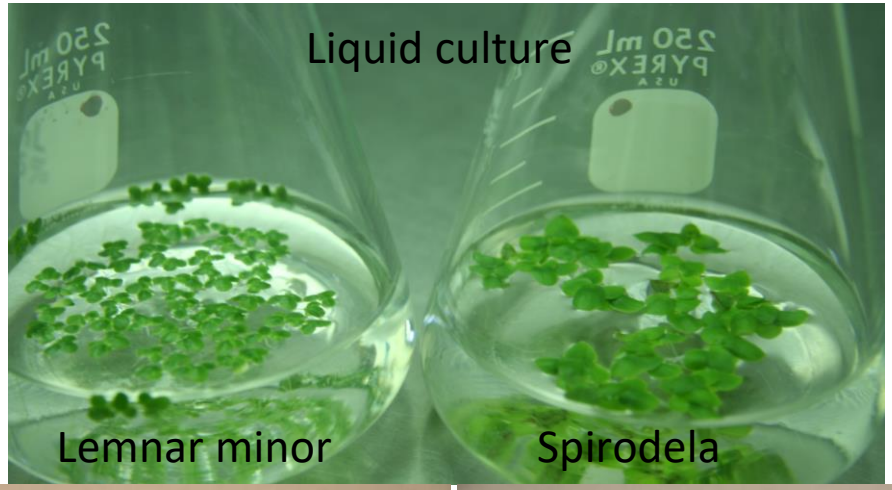
Procedure


Identify a totipotent tissue of duckweed
Develop a Reproducible regeneration Protocol
Develop a Reproducible Transfomation Protocol
Assay of transgene
Propagation of duckweed

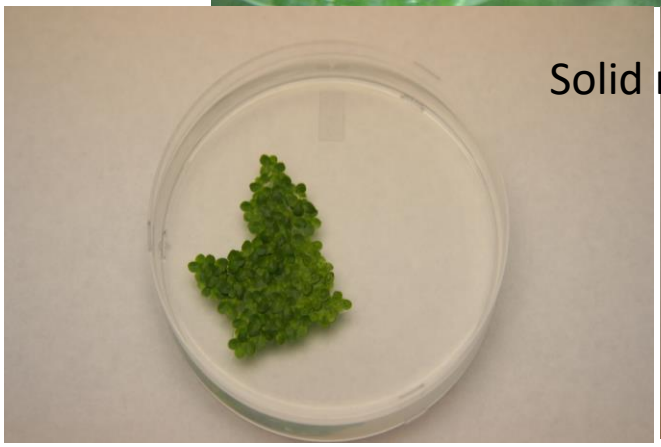
Introduction/Regeneration of Duck weed

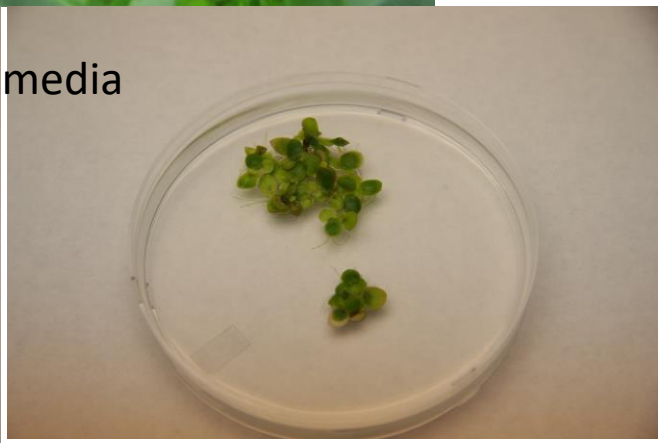
- Duck weed belongs to family of Lemnacea, a free floating monocot found in fresh water (Landolt 1986a)
- Its grouped in 5 genera
  - Spirodela
  - Landotia
  - Lemna
  - Wolffiela
  - Wolffia
- Spirodela polyrriza ww123-8403 and Lemna minor ww313-9223 are types of duck weed whose tissue culture protocol had not yet to been established
- AIM: To develop a repeatable regeneration and transformation protocol of the two species of duck weed

Grow Duck weed

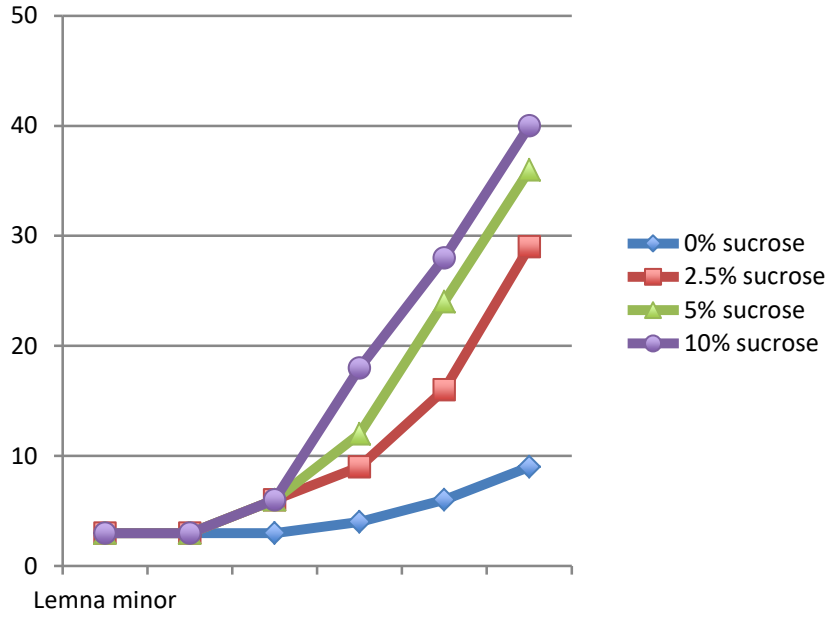


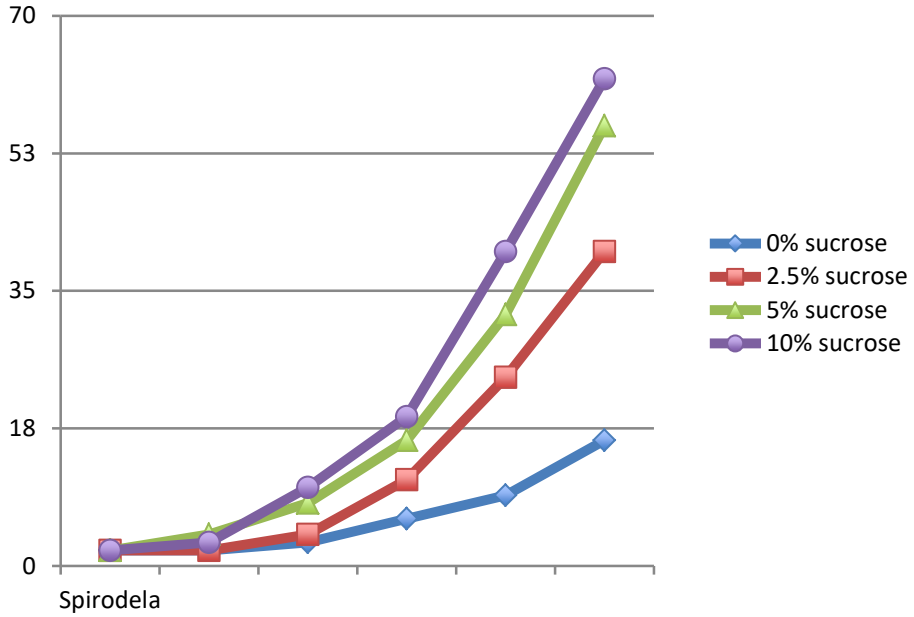
Solid media



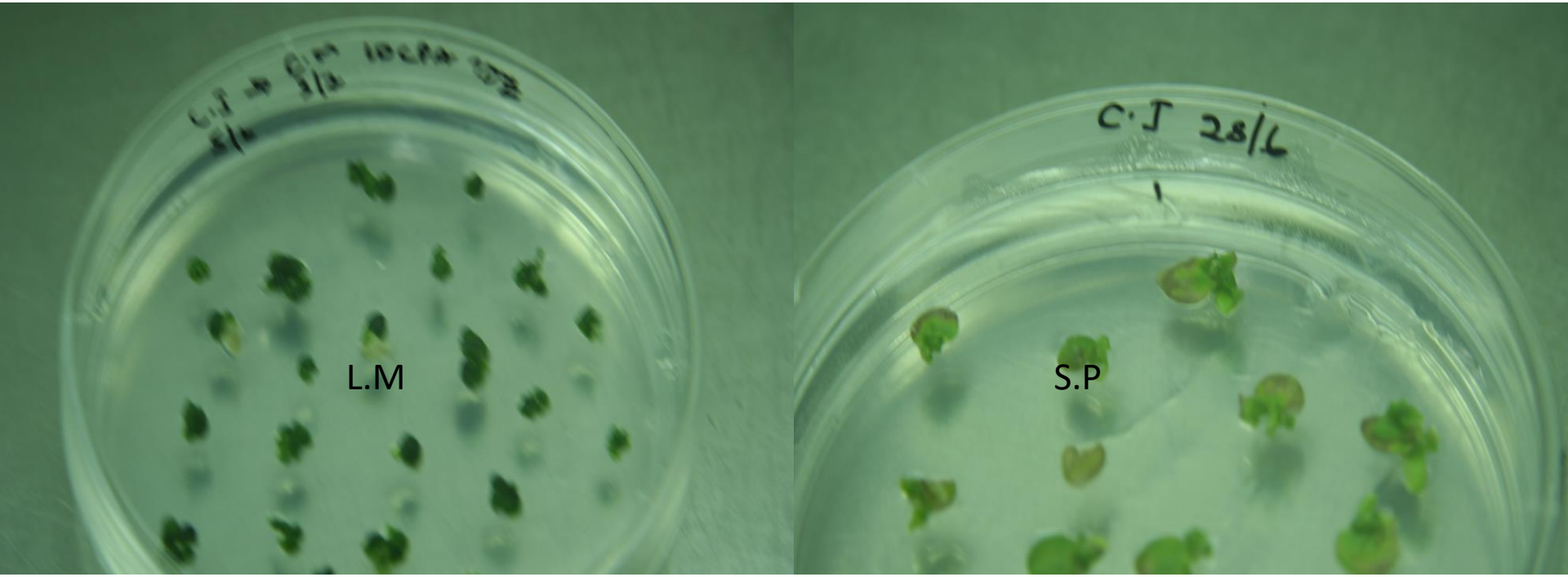


Growth pattern of the two species on half strength Schenk Hildebrandt (SH) media+ 0,2.5,5 and 10g sucrose





Callus induction

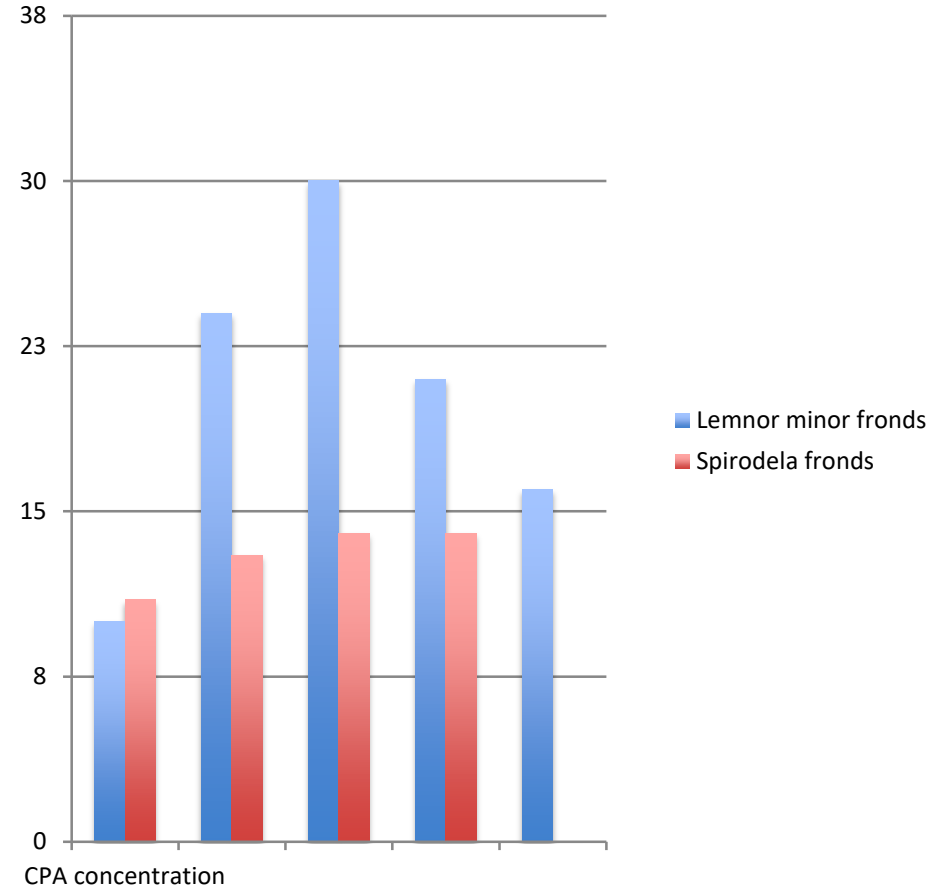


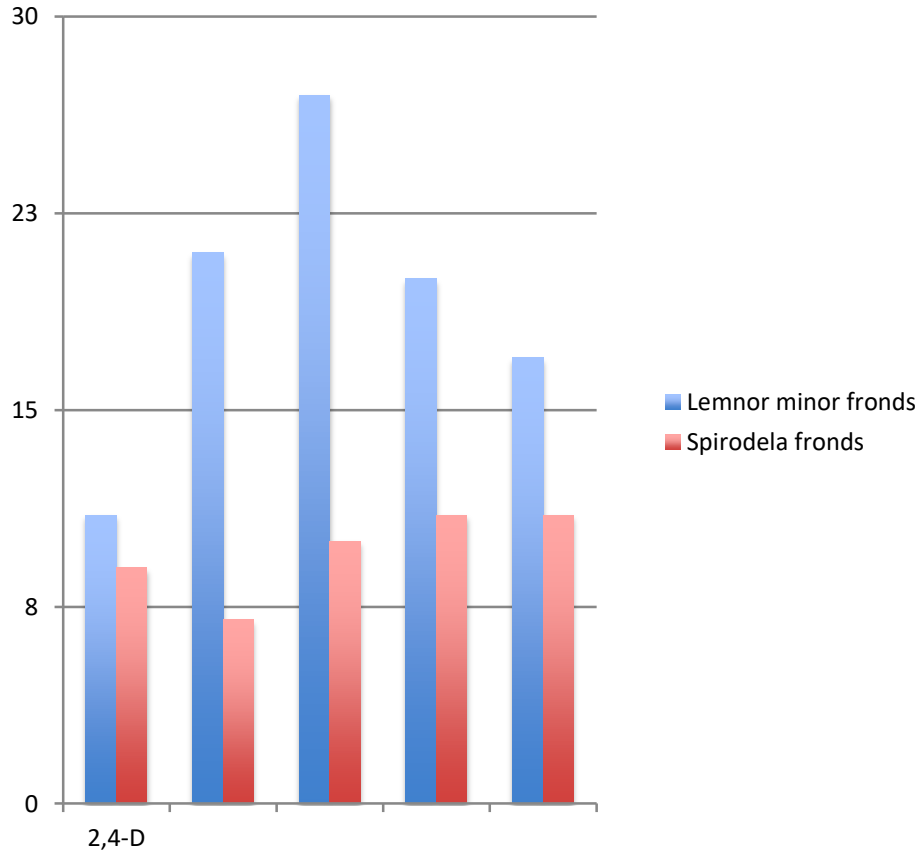
Callus induction

Callus induction

- J.Li et al 2004 used (Mc WP) Mc Cown Woody Plant (5mg/l CPA+ BA), MS(15mg/ldicambia+2mg/l iP) and B5(50mg/l dicambia+2mg/l BA) media formulation on SP and L gibba but did not use Mc Cown WP on Lemna minor
- Mc WP media, titrated ρ-chlorophenoxyacetic acid CPA(5,7.5,10,15 and 20mg/l)+0.5(thidiazuron)TDZ and 2,4-D dichlorophynoxyacetic acid 1,1.5,2.0 and 2.5mg/l+0.5TDZ

CPA and 2,4D effect on callus induct'n

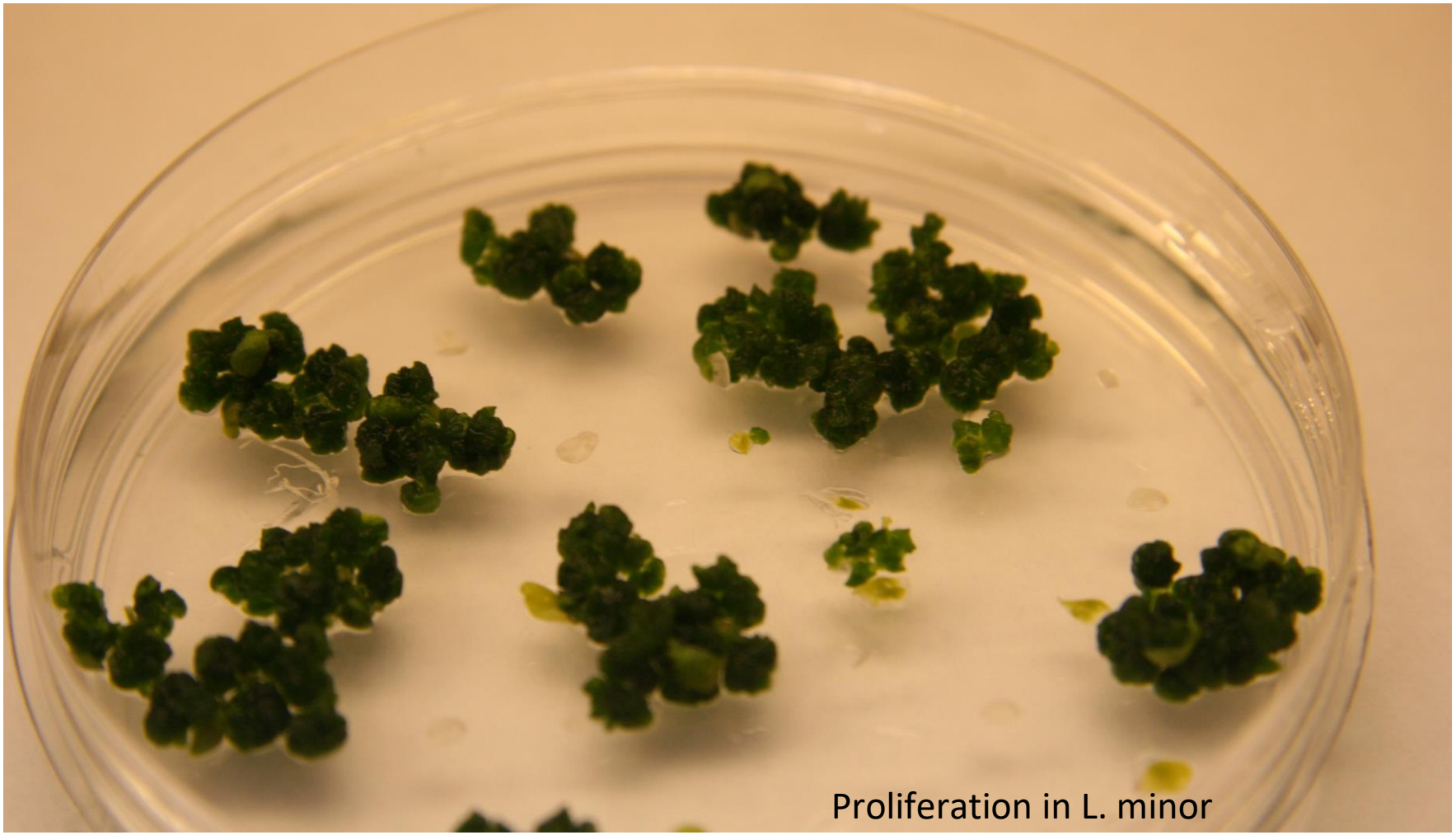




Callus maintenance

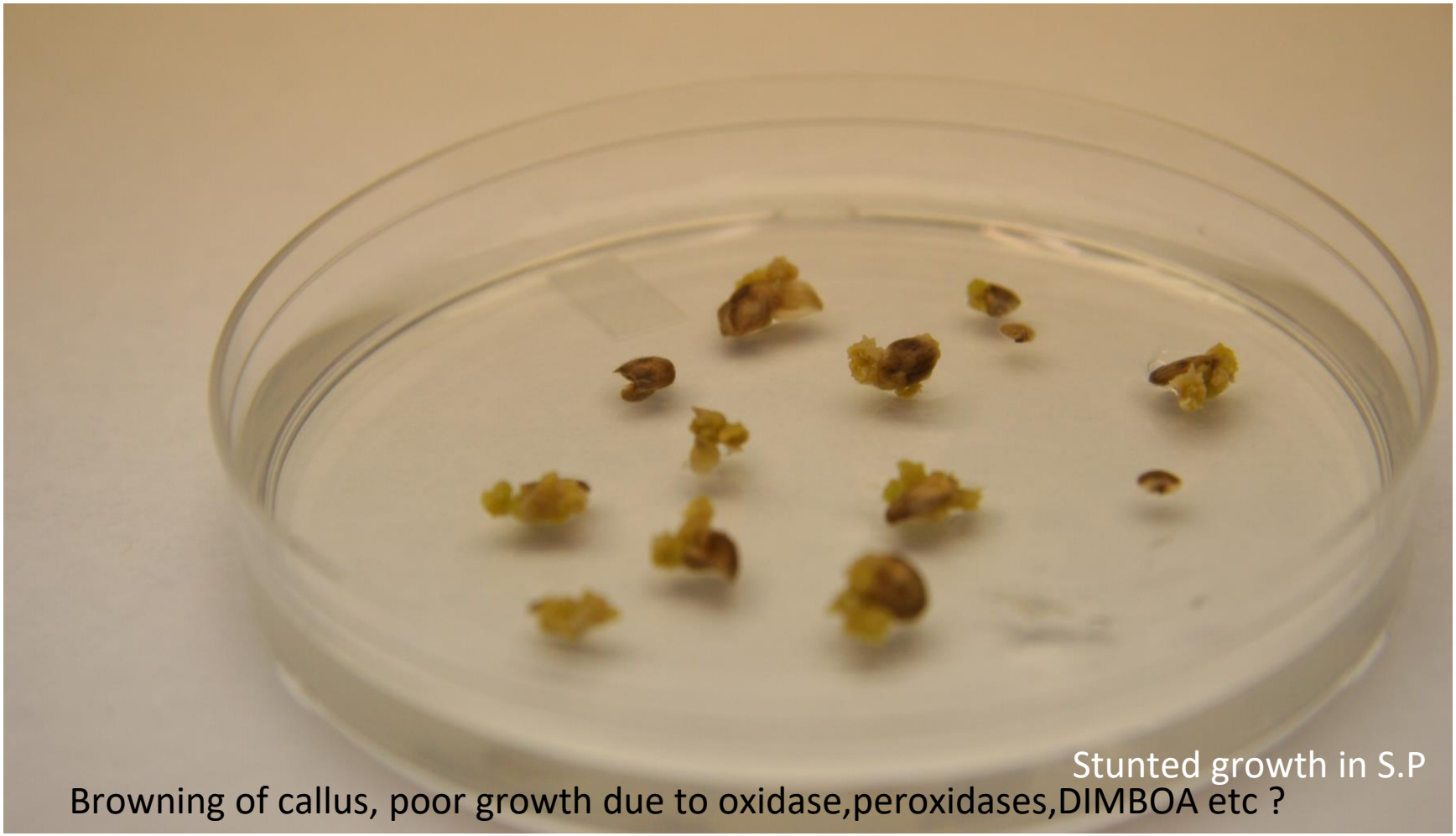
- S-orbital, sucrose and Mannose have been shown to influence callus maintenance in S.orligorrhiza, S punctata and L gibba var. Hurfeish.(J.Li et al.,2004)
- Using optimal concentration of hormones for induction plus titrating concentration of s-orbital, mannitol and sucrose

Callus maintenance/Proliferation

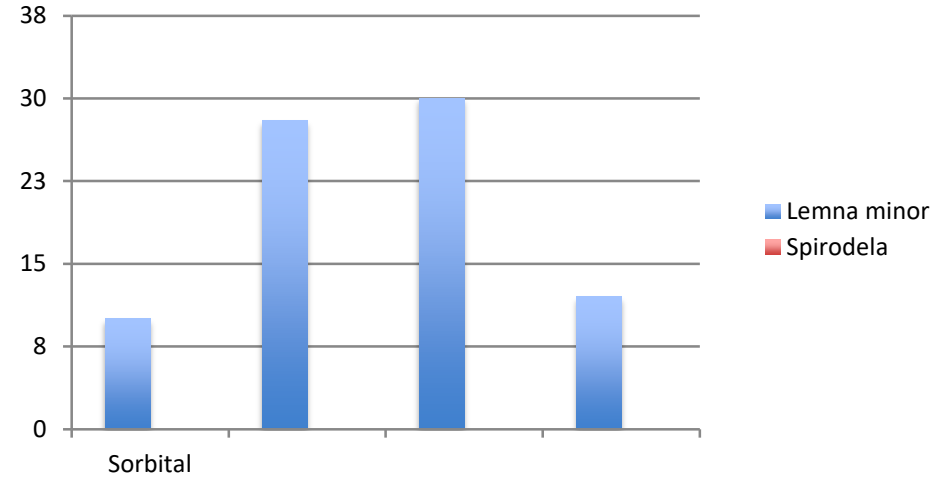


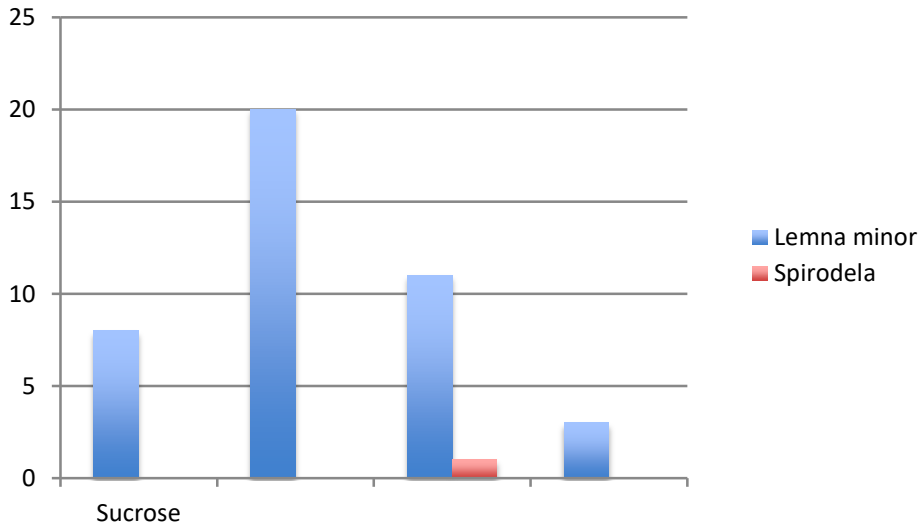
Proliferation in L. minor

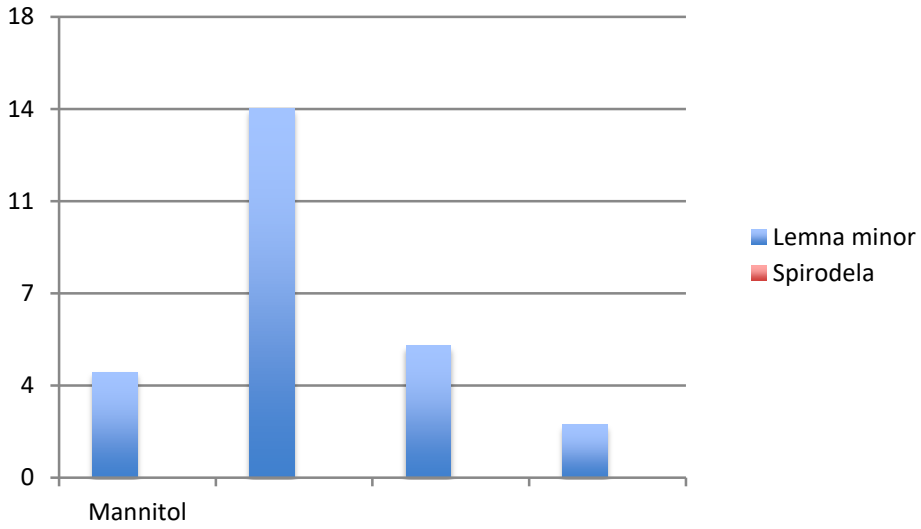
Callus maintenance/Proliferation



Callus proliferation



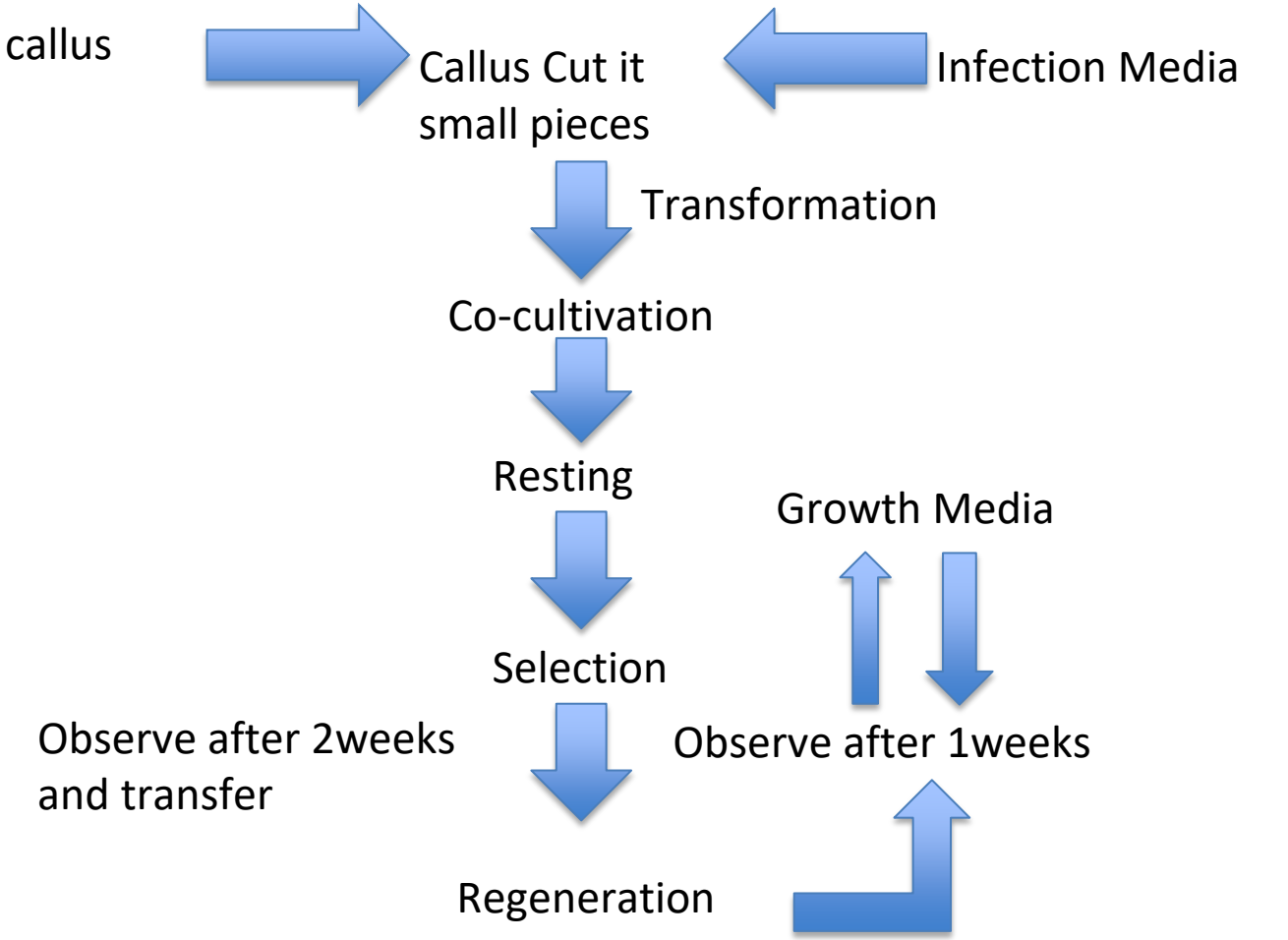




Lemnor minor 313 callus transformation

- The positive callus results set direction for Agrobacterium transformation of L.minor.
- J.Li et al.,2004, Ron vashu t al.,2007, Stomp Anne-marie EP20010967946 and Frame et al., 2002 guided the transformation protocol ref developed protocol

Agro-transformation/Selection/Regeneration

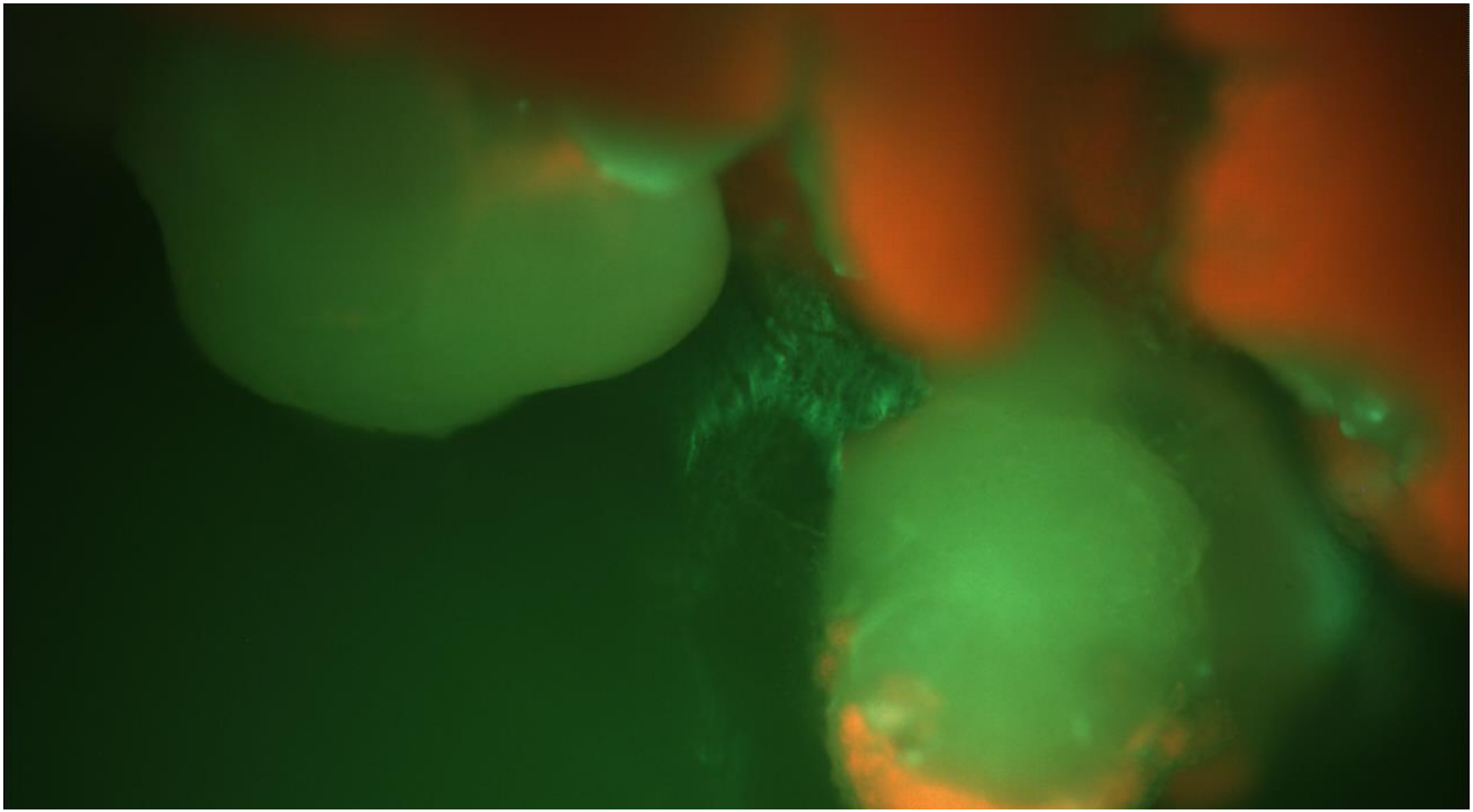


Modified from Frame etal.,2002,
Stomp Ann-marie and J.Li et al., 2004

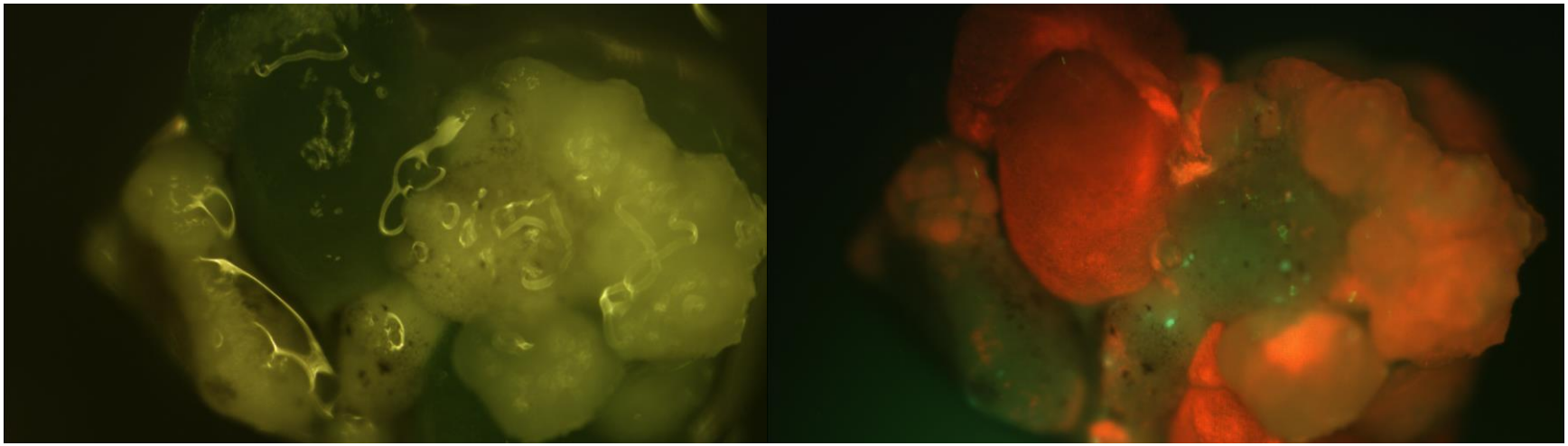
GFP Construct

Yongrui construct

Transformed duckweed callus expressing GFP

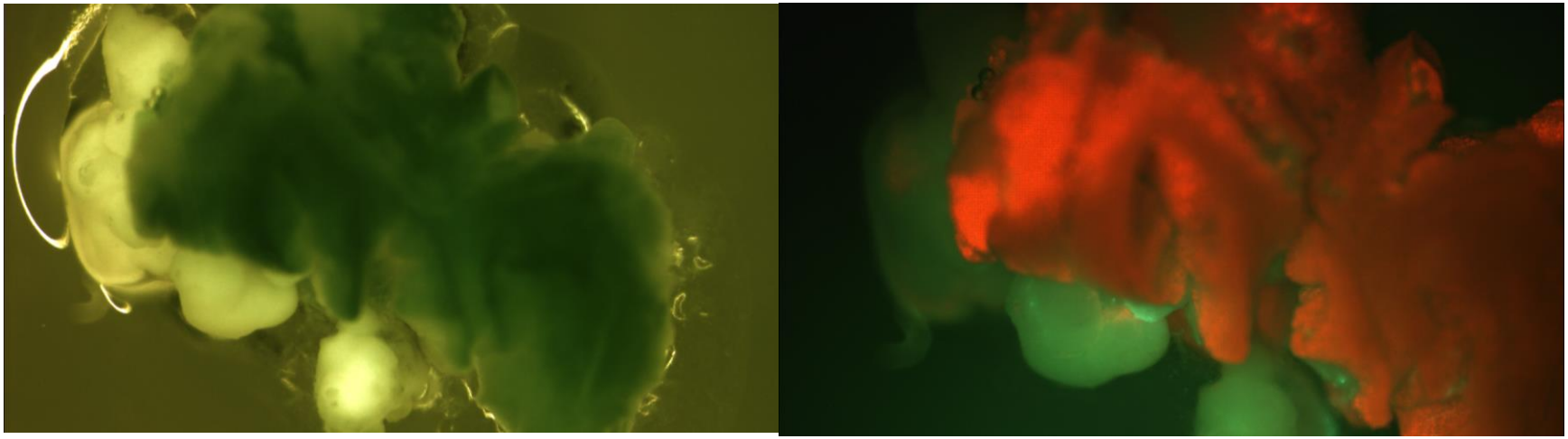


GFP positive on Selection



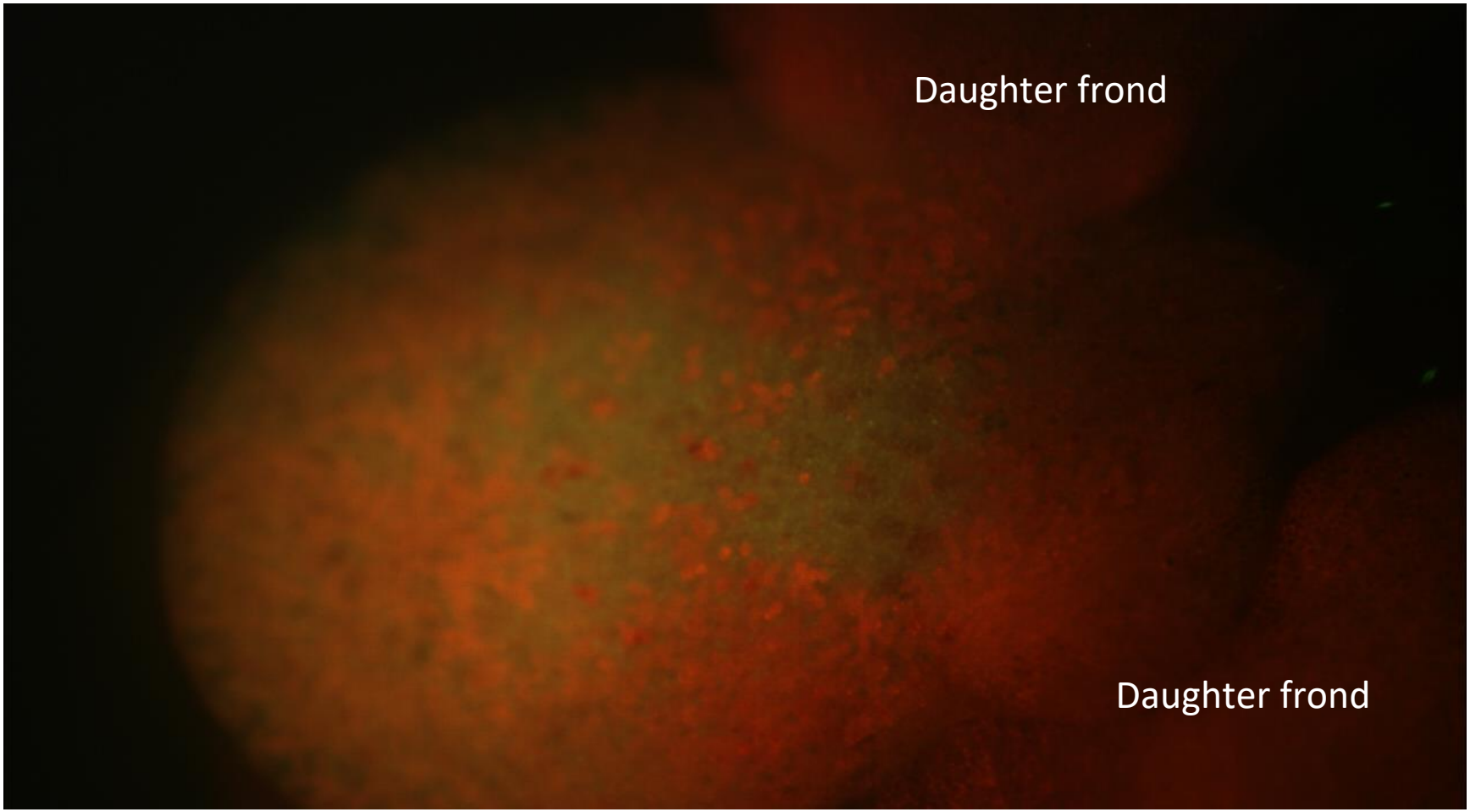
After 2 weeks on Selection

On Regeneration



After 2 weeks on regeneration media

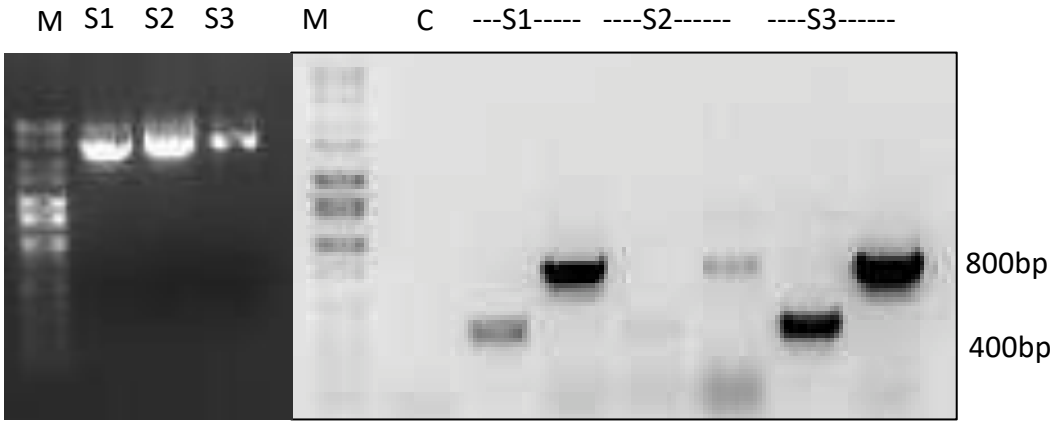
Transformed Duckweed



After 5 days on ½ Strength SH growth media

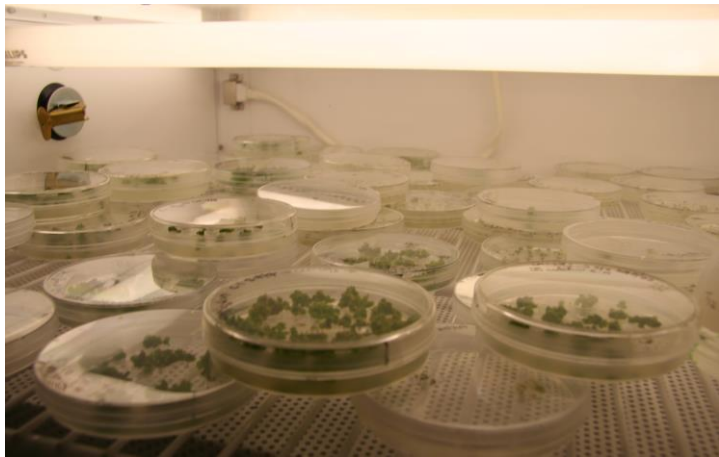
PCR results

Two sets of Primers encoding for different regions of the GFP cassette were used



Duck weed work

- Successful report
  - Regeneration efficiency of non transgenic Lemna minor 313 >95% observed
  - Transformation of >30 observed in some cases upto 60% in a plate
  - Transformation of regeneration of Lemna minor ww313-9332 achieved
  - Detected in daughter frond DNA by PCR.



Why Transform Duckweed?

- High turn over-Mass production of protein/essential aa supplements
- Easy to transform- direct/indirect methods possible
- Genome is sequenced- Research studies/track gene
- Possible model plant?

Absorption of Technology-Parabel Ltd UAE based Co. for Amino Acid Production

Parabel Completes the First Phase of Uganda Investment Project

Oct 30, 2013, 09:24 ET from Parabel, Inc.

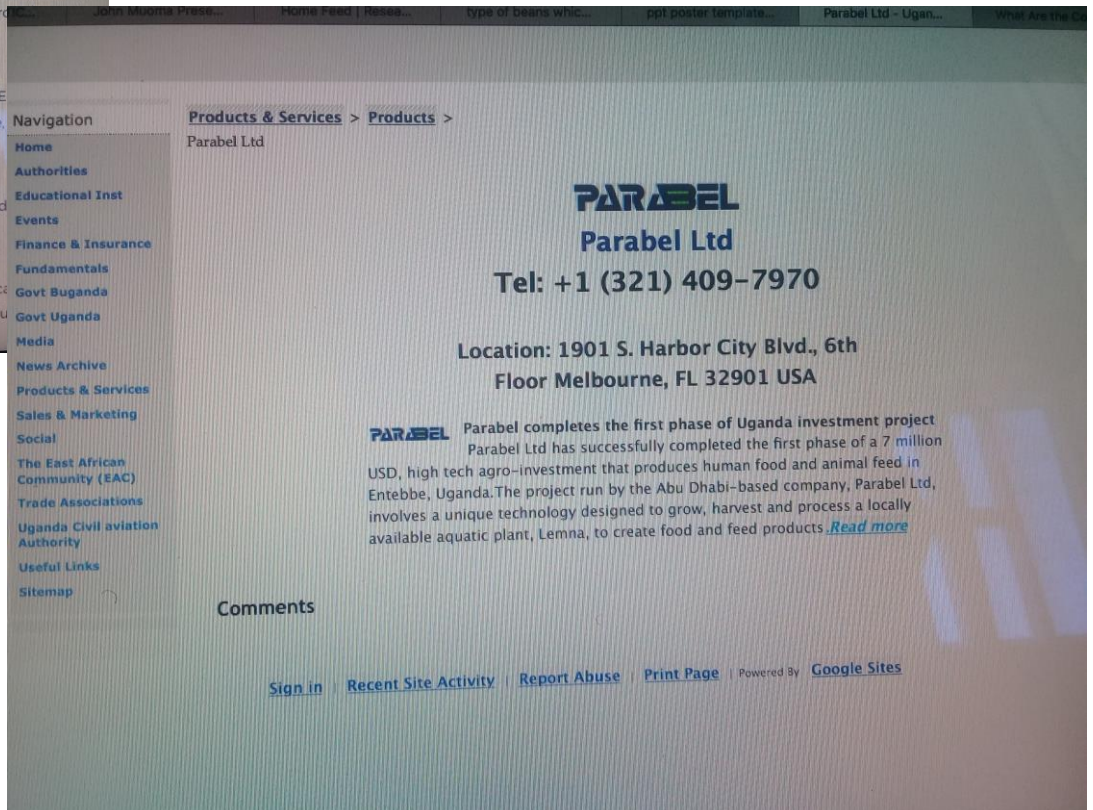
ABU DHABI, United Arab Emirates, Oct. 30, 2013 /PRNewswire/ -- Parabel Ltd has successfully completed the first phase of a 7 million USD, high tech agro-investment that produces human food and animal feed in Entebbe, Uganda.

The project run by the Abu Dhabi-based company, Parabel Ltd, involves a unique technology designed to gr... and process a locally available aquatic plant, Lemna, to create food and feed products.

This involved the large-scale growth and harvesting of local micro-crops in a demonstration facility outside E... International Airport. At the minister's follow-up visit, Hon Bright Rwamirama, State Minister for Agriculture, Industry and Fisheries, pledged government support for the project.

Parabel's technology is recognized as part of the solution to the food security crisis with global estimates ind... that food demand will outstrip current supply with 30% more food needed in the next 40 years.

The sustainably grown micro-crop is produced without using expensive farmland and minimizing use of loc... sources. It is not genetically modified and is harvested all year around by local workforce. The company's solu... production providing local workforce with opportunities.



Navigation

- Home
- Authorities
- Educational Inst
- Events
- Finance & Insurance
- Fundamentals
- Govt Buganda
- Govt Uganda
- Media
- News Archive
- Products & Services
- Sales & Marketing
- Social
- The East African Community (EAC)
- Trade Associations
- Uganda Civil aviation Authority
- Useful Links
- Sitemap

Products & Services > Products >

Parabel Ltd

PARABEL

Parabel Ltd

Tel: +1 (321) 409-7970

Location: 1901 S. Harbor City Blvd., 6th Floor Melbourne, FL 32901 USA

PARABEL **Parabel completes the first phase of Uganda investment project**

Parabel Ltd has successfully completed the first phase of a 7 million USD, high tech agro-investment that produces human food and animal feed in Entebbe, Uganda.The project run by the Abu Dhabi-based company, Parabel Ltd, involves a unique technology designed to grow, harvest and process a locally available aquatic plant, Lemna, to create food and feed products. *Read more*

Comments

Sign in | Recent Site Activity | Report Abuse | Print Page | Powered By Google Sites

Duckweed Lagoon of Parabel Ltd in UAE

Uganda President visit USD7M Project-2013

biosafety bill passed yesterday?

Harvesting of Duckweed

68% Protein- 50 times more than Soy

Natural advantages of duck weed?

- Like Water Hyacinth
  - Biofuel——bioethanol/biogas
  - Bioremediation
    - Sink of N, P, K and heavy metals
    - Nutrient recycle
      - Harvest and used as fodder
      - Compost manure

Thank You

Masinde Muliro University of Science and Technology

Waksman Institute of Microbiology
Rutgers University