
CID
Bio-Science
Inc.
Portable Instruments for Precision Plant Measurement


Novel Research Applying
Leaf Area Measurements

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Agenda:

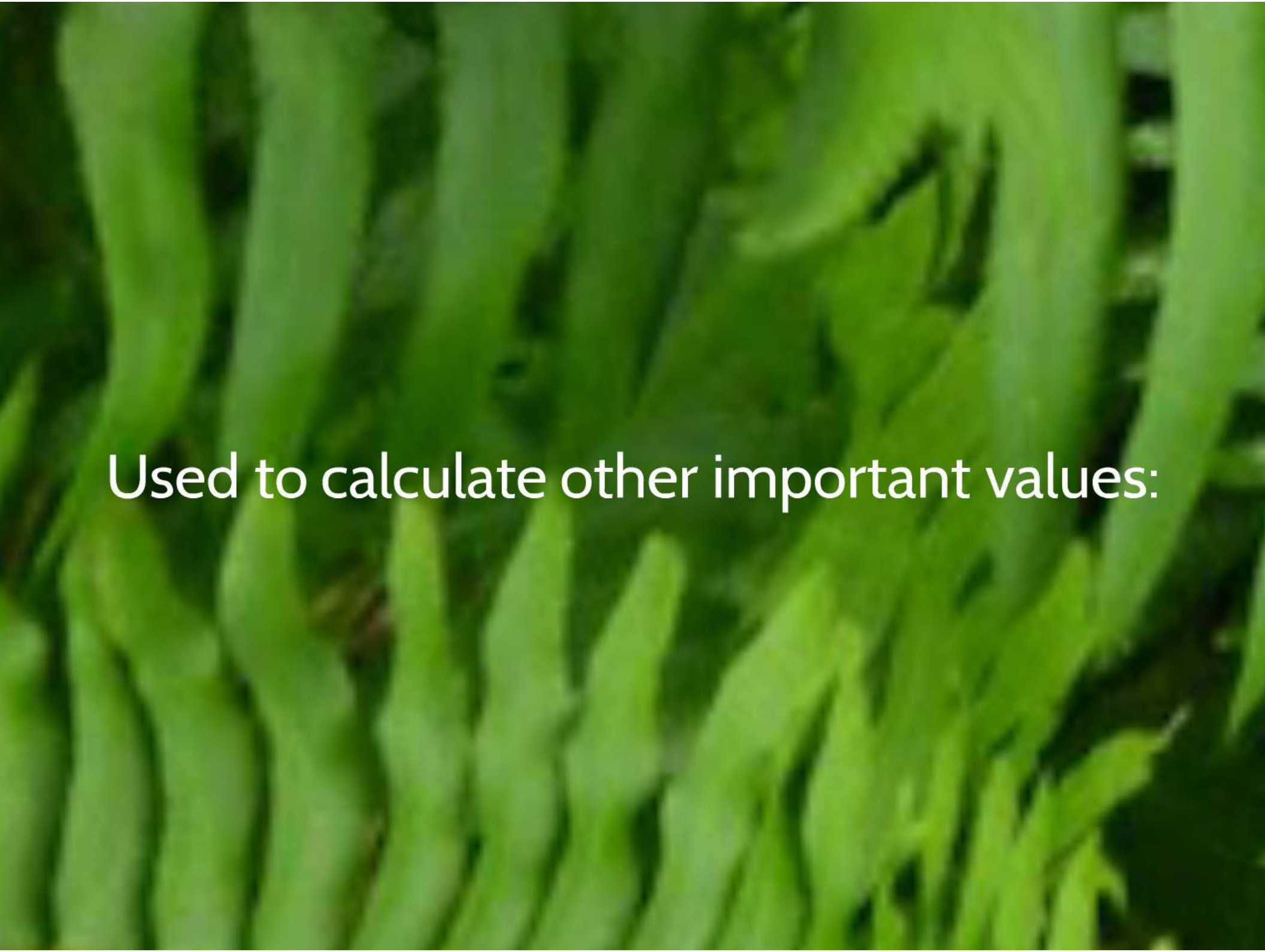
1.) Leaf Area Measurements
2.) CI-202 Portable Leaf Area Meter
3.) CI-203 Handheld Leaf Area Meter
4.) Case Study 1: Post-fire resprouts and the CI-202
5.) Case Study 2: Invasive mussels and the CI-202
6.) Case Study 3: Melon flies and the CI-203 with the CI-203CA

What is leaf area?

Measurement of the leaf width, length and perimeter

Why is **leaf area** important?


Important biometric variable
for characterizing plants


Used to calculate other important values:


• Leaf Area Index (LAI)
• Specific leaf area
• Leaf-level photosynthesis measurements

Who cares about leaf area?

Poll Question #1:

What do you study using leaf area measurements?

a.) Agronomy

b.) Ecology

c.) Plant pathology

d.) Climate change

d.) Other


Leaf area applications

Leaf area meters

CI-202

Portable Laser Leaf Area Meter

Great for these leaf types:

Delicate/fragile:

- America water-willow (*Justicia americana*)

Compound:

- Alfalfa (*Medicago sativa*)
- Soybean (*Glycine max*)
- Tomato (*Solanum lycopersicum*)
- forest mahogany (*Trichilia dregeana*)

Lobed at the base:

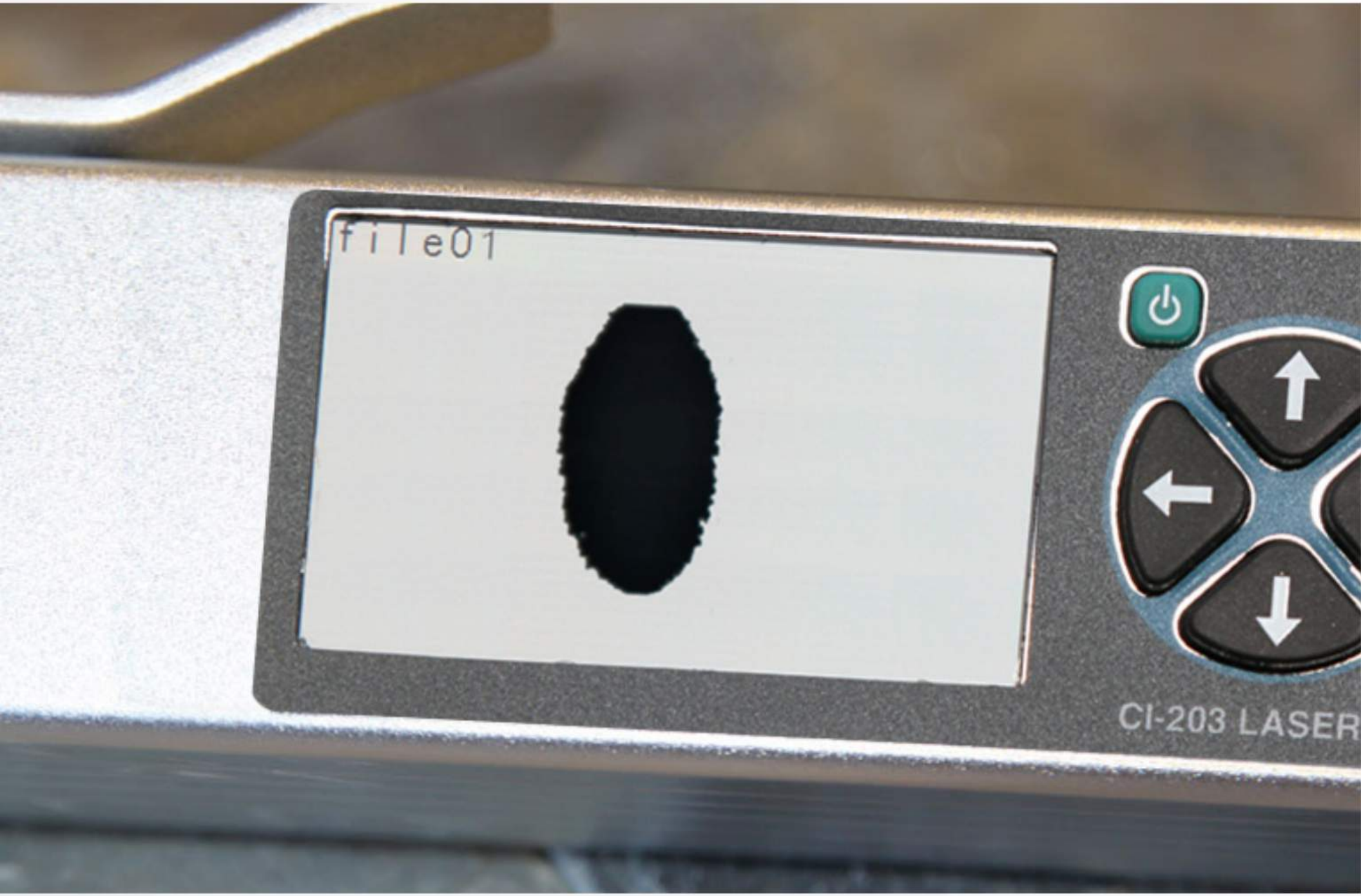
- Cotton (*Gossypium spp.*)

CI-203

Handheld Laser Leaf Area Meter

Great for these leaf types:

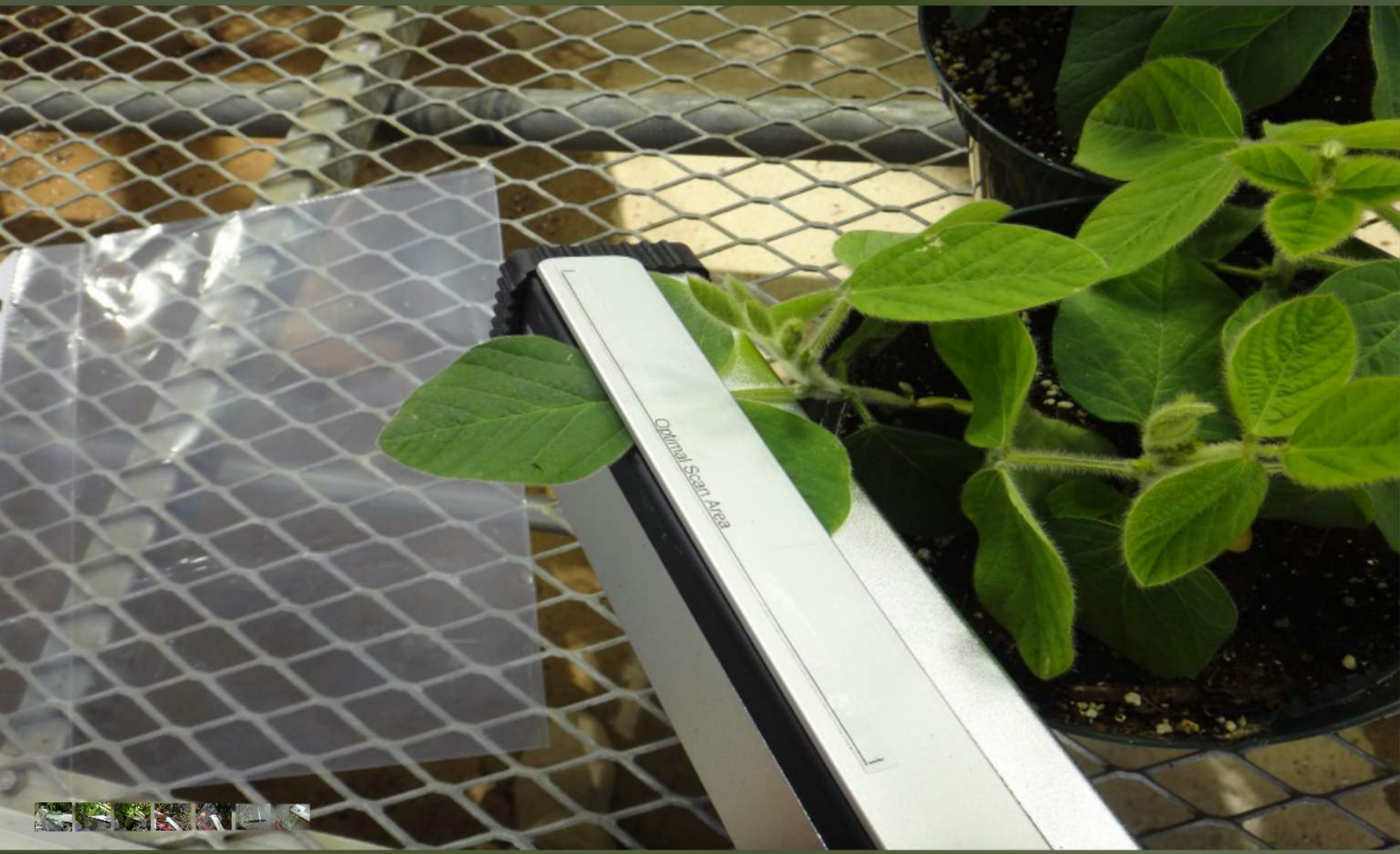
- Corn (*Zea mays*)
- Wheat (*Triticum spp.*)
- Tobacco (*Nicotiana spp.*)
- Rice (*Oryza sativa*)
- Sorghum (*Sorghum spp.*)
- NE Asian tree (*Populus cathayana*)


file01
CI-203 LASER


CID
CI-203 LASER AREA METER

The use of plastic covers to facilitate the measure of leaf areas

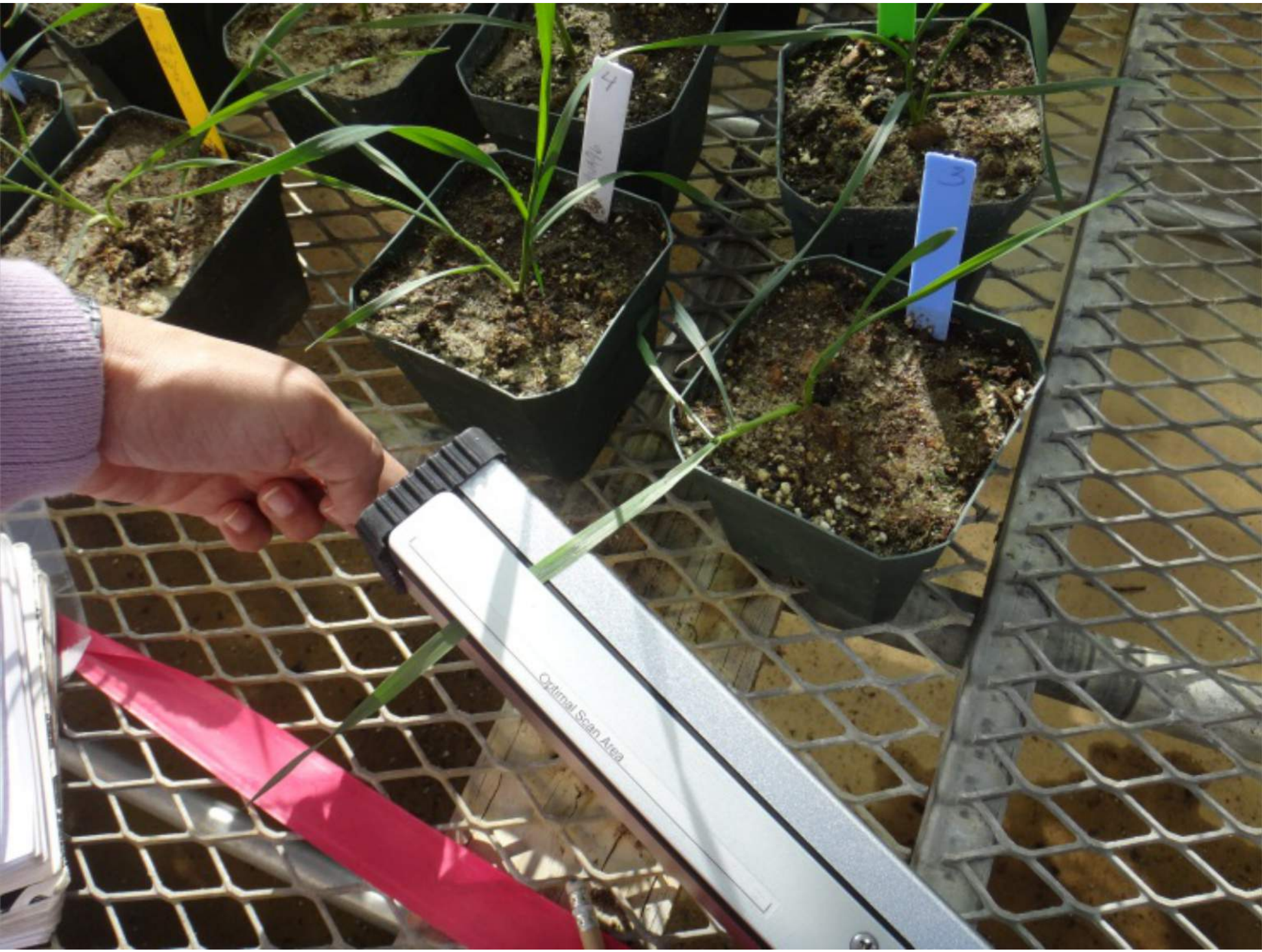

Optimal Scan Area

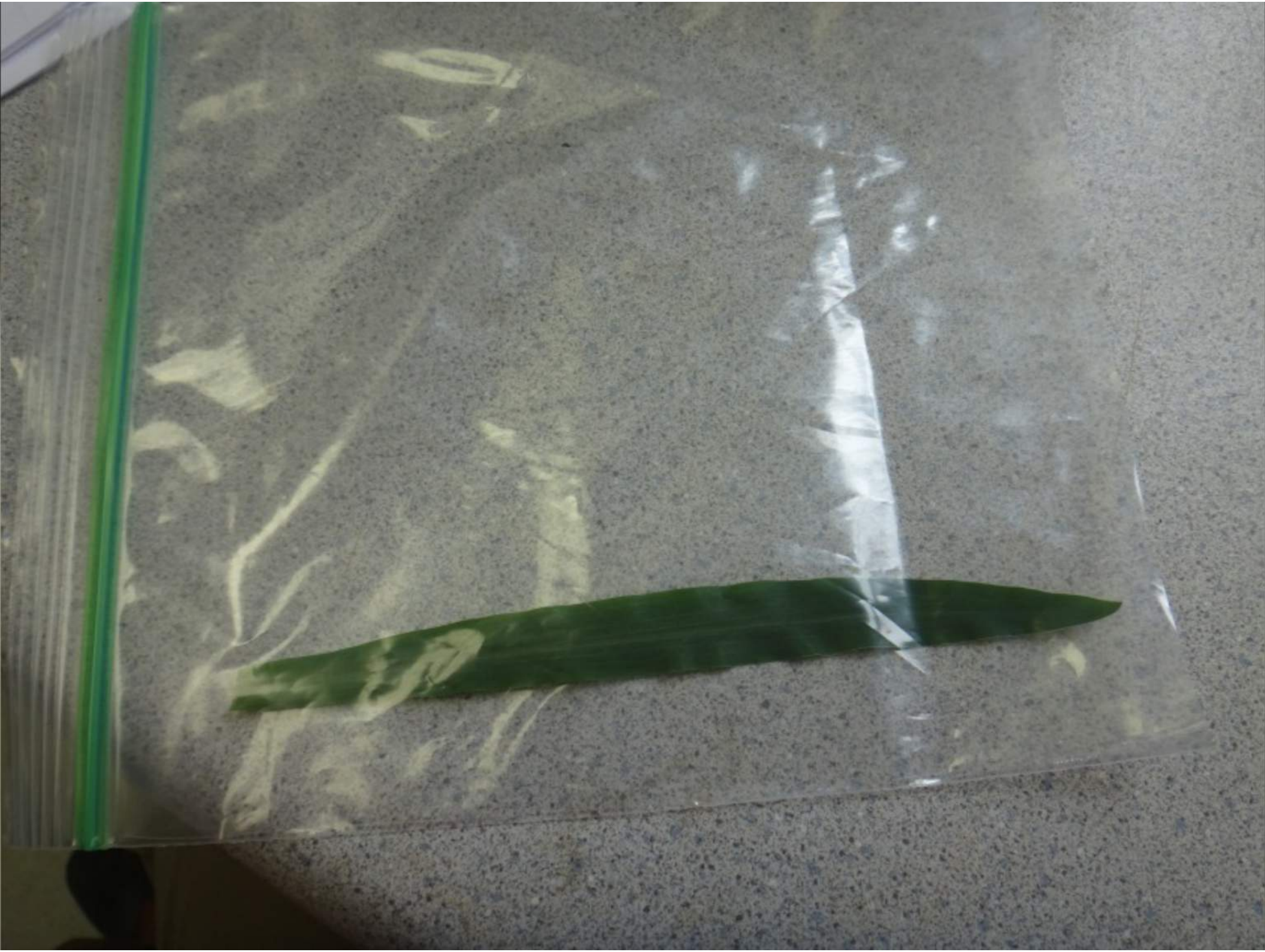

Optimal Scan Area


Optimal Scan Area


Optimal Scan Area


Optimal Scan Area


Optimal Scan Area




Optimal Scan Area

Table 1.Average leaf area of five different plants measures with and without a plastic cover

Plant	area (cm^2)		Pr>t*
	cover	no cover	
Fern	38.865 ± 2.68	38.329 ± 2.92	0.67
Wheat	7.876 ± 0.39	7.602 ± 0.34	0.11
Pepper	7.466 ± 0.31	7.432 ± 0.21	0.78
Tobacco	54.651 ± 0.56	54.182 ± 0.71	0.11
Soybean	30.452 ± 1.55	29.537 ± 1.21	0.15

* Results from t-test, to be considered significantly different pvalue<0.05

Wide range of **research applications**


CI-202 Publications (Since 1997):
Total: 114


CI-203 Publications (Since 1996):
Total: 188

Common **research** categories:

- Drought/water stress
- Climate change
- Growth/productivity, nutrient dynamics
- Phenotyping
- Other

Drought/water stress

Effect of moisture stress on photosynthetic characters and yield attributes of upland rice genotypes in Kymore plateau, Madhya Pradesh.
JNKVV Research Journal, volume 47 (1), page 37-41, 2013.
Khan, I.M., Tiwari, R.K. and O.P. Dhurve.

Evaluation of Irrigation Practices for Growth, Biomass Production, and Nutrient Partitioning in Eucalyptus camaldulensis Plants in Indian Dry Zone
Journal of Sustainable Forestry, volume 30, issue 6, August 2011
G Singh
DOI: 10.1080/10549811.2011.567377

Phosphorus Enhanced Establishment, Growth, Nutrient Uptake, and Productivity of Dalbergia sissoo Seedlings Maintained at Varying Soil Water Stress Levels in an Indian Arid Zone
J Sustainable For, volume 30, issue 6, pages 480-495, August 2011
Singh B, Singh G
DOI: 10.1080/10549811.2010.550256

An experimental facility for free air humidity manipulation (FAHM) can alter water flux through deciduous tree canopy
Environmental and Experimental Botany, volume 33, issue 4, November 2010
Priit Kuppera, JaakSobera, Arne Sellina, Krista Lohmusa, Arvo Tullusb, Olaf Raima, Kristina Lubenetsa, Ingmar Tulvaa, Veiko Urib, Martin Zobela, Olevi Kulla, Anu Sobera

Common **research** categories:

- Drought/water stress
- Climate change
- Growth/productivity, nutrient dynamics
- Phenotyping
- Other

Climate change

Effects of 3-year air warming on growth of two perennial grasses (Phragmites australis and Imperata cylindrica) in a coastal salt marsh reclaimed for agriculture.
Aquatic Botany, 2014.
Zhong, Q., Gong, J., Wang., K., Zhang, C.
DOI: http://dx.doi.org/10.1016/j.aquabot.2014.04.001

The effects of defoliation on carbon allocation: can carbon limitation reduce growth in favour of storage?
Tree Physiology, November 2013.
E.Wiley, S. Huepenbecker, B. Casper, & B.R. Helliker
DOI:10.1093/treephys/tpt093
Sex-related and stage-dependent source-to-sink transition in Populus cathayana grown at elevated CO2 and elevated temperature
Tree Physiol, volume 32, issue 11, pages 1325-1338, July 2012
Zhao H, Li Y, Zhang X, Korpelainen H, Li C
DOI: 10.1093/treephys/tps074

Carbon exchange in a freshwater marsh in the Sanjiang Plain, northeastern China
Journal of Forestry Research, volume 151, issue 8, pages 307-313, August 2011
Song C, Sun L, Huang Y, Wang Y, Wan Z
DOI: 10.1016/j.agrformet.2011.04.001

Interaction of CO2 enrichment and drought on growth, water use, and yield of broad bean (Vicia faba)
Environ Exp Bot, volume 43, issue 2, pages 131-139, April 2011
Wu C, Peng G, Zhang Y, Xu X, Korpelainen H, Berninger F, Li C
DOI: 10.1016/S0098-8472(99)00053-2

Common **research** categories:

- Drought/water stress
- Climate change
- Growth/productivity, nutrient dynamics
- Phenotyping
- Other

Growth/productivity, nutrient dynamics

Sexually different physiological responses of Populus cathayana to nitrogen and phosphorus deficiencies.
Tree Physiology, 2014.
Zhang, S., Jiang, H., Zhao, H., Korpelainen, H., Li., C.
DOI: 10.1093/treephys/tpu025

Airborne Hyperspectral Images and Ground-Level Optical Sensors As Assessment Tools for Maize Nitrogen Fertilization.
Remote Sensing, volume 6, 2014.
Quemada, M., Gabriel, J., Zarco-Tejada, P.
DOI: 10.3390/rs6042940
Sex-specific carbon and nitrogen partitioning under N deposition in Populus cathayana.
Trees, February 2014.
Chen, L., Dong, T., Duan, B.
DOI:10.1007/s00468-014-0992-3

EFFECTS OF UV-B ON PHOTOSYNTHETIC PARAMETERS, LIPID PEROXIDATION, FLAVONOIDS AND GROWTH TRAITS OF CONOCARPUS LANCIFOLIUS (ENGL.).
American Journal of Agricultural and Biological Sciences, Volume 9, Issue 1, pages 55-63, 2014.
Suleman, P., Redha, A., Afzal, M., Al-Hasan, R.
DOI: 10.3844/ajabssp.2014.55.63

Photosynthetic and growth responses of Populus clones Eridano and I-214 submitted to elevated Zn concentrations
J Geochem Explor: volume 123, pages 77-86, December 2012
Fernàndez J, Zacchini M, Fleck I
DOI: 10.1016/j.gexplo.2012.01.010

Common **research** categories:

- Drought/water stress
- Climate change
- Growth/productivity, nutrient dynamics
- Phenotyping
- Other

Phenotyping

Susceptibility to Melampsora Leaf Rust of Poplar Clones From Diverse Genetic Backgrounds: Effects on Photochemistry and Water Relations.
Journal of Plant Studies; Vol. 3, No. 2; 2014.
Georgina Elena, G., Fernàndez-Martínez, J., Zacchini, M., Moret, A., and I. Fleck
DOI: 10.5539/jps.v3n2p1

Elevated temperature may accelerate invasive expansion of the liana plant Ipomoea cairica
Weed Research, volume 51, issue 6, pages 574–580, December 2011
WANG R, ZENG R, PENG S, CHEN B, LIANG X, XIN X
DOI: 10.1111/j.1365-3180.2011.00884.x
Validation and dissection of quantitative trait loci for leaf traits in interval RM4923-RM402 on the short arm of rice chromosome 6
Journal of Genetics, volume 90, issue 1, pages 39-44, April 2011
SHEN B, YU WEID, DU JH, FAN YEY, WU JIR, ZHUANG J
DOI: 10.1007/s12041-011-0019-4

Physiological differences in Rhododendron calophytum seedlings regenerated in mineral soil or on fallen dead wood of different decaying stages
Plant Soil, volume 337, issues 1-2, pages 205-215, December 2010
Ran F, Wu C, Peng G, Korpelainen H, Li C
DOI: 10.1007/s11104-010-0517-9

Different growth sensitivity to enhanced UV-B radiation between male and female Populus cathayana
Tree Physiol, volume 30, issue 6, pages 1489-1498, November 2010
Xu X, Zhao H, Zhang X, Hänninen H, Korpelainen H, Li C
DOI: 10.1093/treephys/tpq094

Common **research** categories:

- Drought/water stress
- Climate change
- Growth/productivity, nutrient dynamics
- Phenotyping
- Other

Other

Coffee-leaf extract and phosphites on the curative control of powdery mildew in eucalyptus mini-stumps
Forest Pathology. Volume 43, Issue 4, pages 297–305, August 2013.
Da Silva, A., Rsende, M., de Souza, P., Silva, N., Silva, M. Vitorino, L.
DOI: 10.1111/efp.12030

Exophiala sp. LHL08 reprograms Cucumis sativus to higher growth under abiotic stresses
Physiologia Plantarum: volume 143, issue 4, pages 329–343, December 2011
Khan AL, Hamayun M, Ahmad N, Waqas M, Kang SM, Kim YH, Lee IJ
DOI: 10.1111/j.1399-3054.2011.01508.x

Leaf area index mapping in northern Canada
Int J Remote Sens: volume 32, issue 18, pages 5059-5076, July 2011
Abuelgasim AA, Leblanc SG
DOI: 10.1080/01431161.2010.494636

Leaf Traits and Histochemistry of Trichomes of Conocarpus Lancifolius a Combretaceae in Semi-Arid Conditions
American Journal of Plant Sciences, volume 2, pages 165-174, June 2011
Redha A, Al-Mansour N, Suleman P, Afzal M, Al-Hasan R
DOI: 10.4236/ajps.2011.22018

Poll Question #2:

Which style of leaf area meter is suitable for your research?

a.) CI-202 Portable Laser Leaf Area Meter

b.) CI-203 Handheld Laser Leaf Area Meter

c.) CI-203CA Conveyor Accessory

d.) All or combination of above

Case Study #1 (CI-202)

Size-dependent enhancement of water relations during post-fire resprouting

Jennifer Schafer, Bradley Breslow, Stephanie Hollingsworth, Matthew Hohmann, William Hoffmann.

Tree Physiology 34, 404-141, 2014
DOI: 10.1093/treephys/tpu015

Research conducted by the North Carolina State University and US Army Corps of Engineers


©2005 Jeffrey Pippen


Blue Huckleberry (*Gaylussacia frondosa*)
Jack Scheper ©2007 Floridata.com

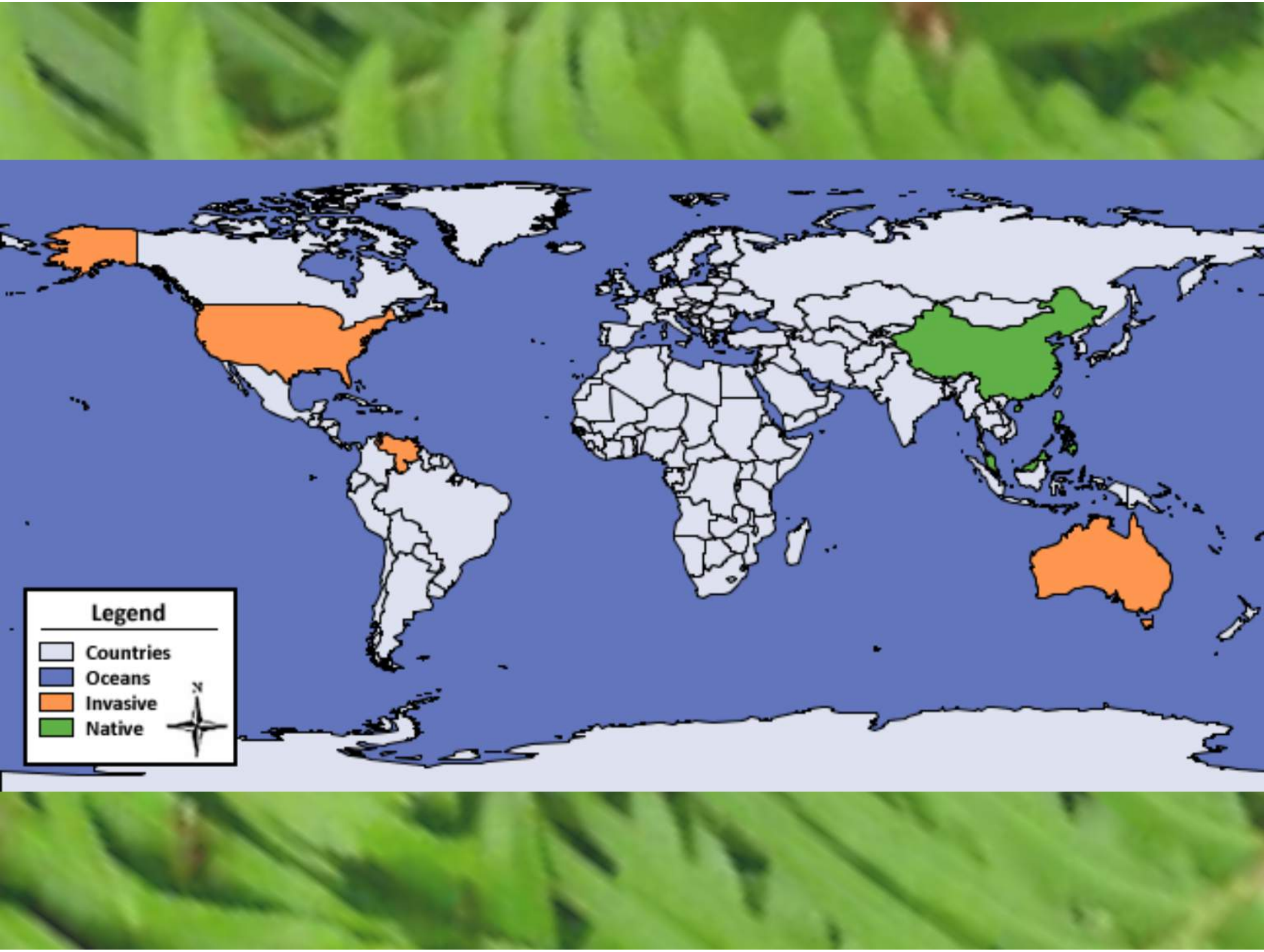

Case Study #2
(CI-202)

Recruitment preferences of non-native mussels: interaction between marine invasions and land-use changes

Matthew Gilg, Eric Hoffman, Kimberly Schneider , Josiah Ryabinov, Christine El-Khoury, Linda Walters

Journal of Molluscan Studies: volume 76 (4), 333-339, 2010
DOI:10.1093/mollus/eyq017

Research conducted by University of North Florida (Jacksonville) and University of Central Florida


Legend
Countries
Oceans
Invasive
Native
N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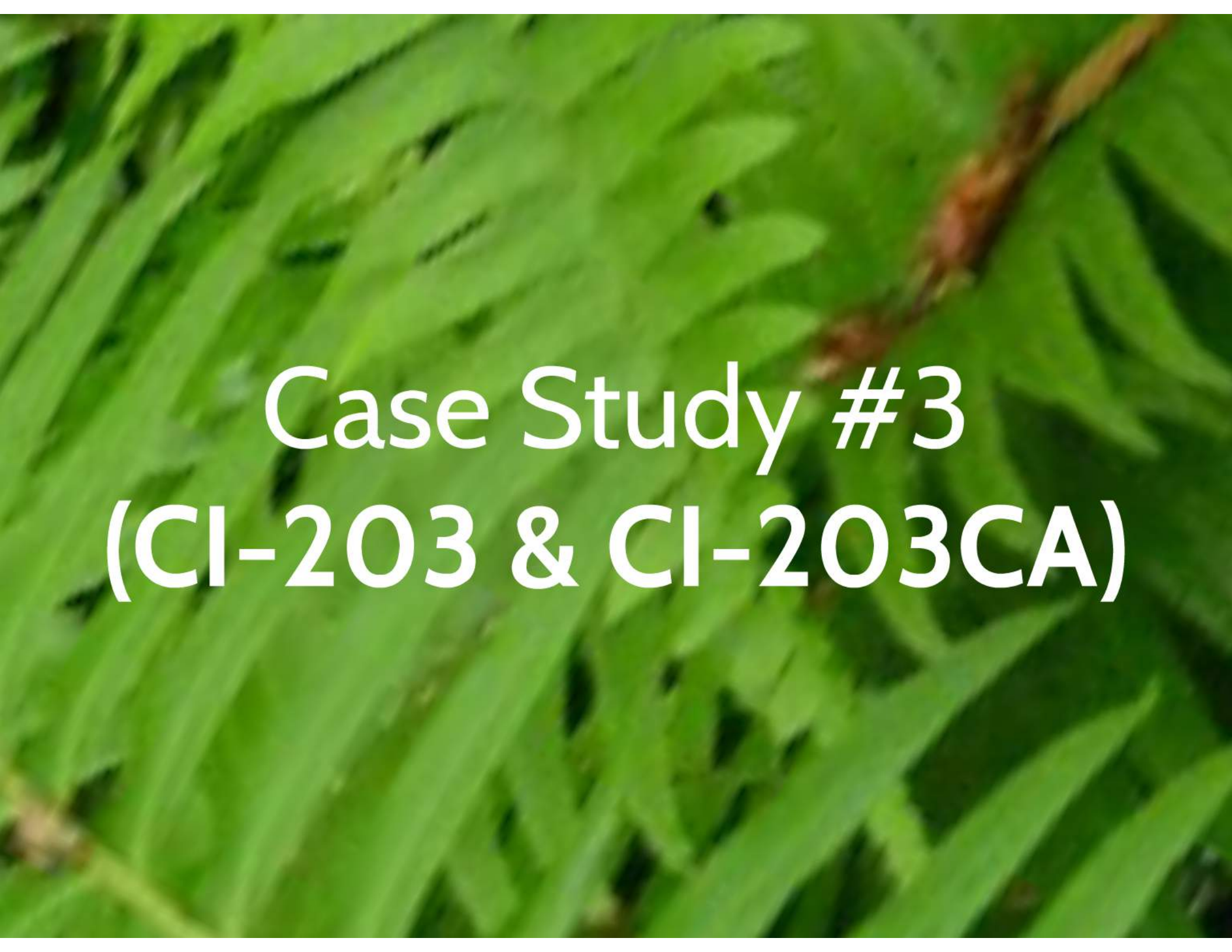
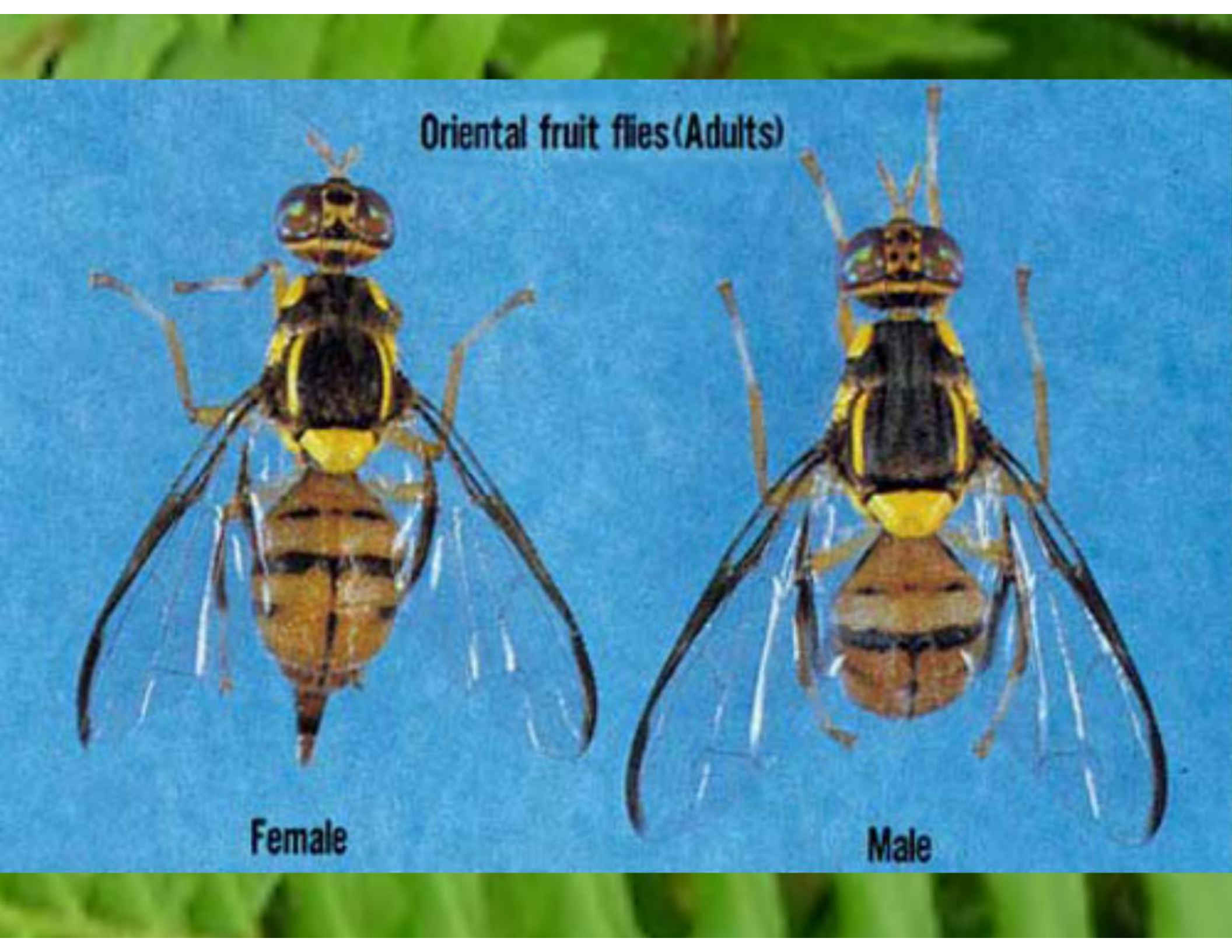

Case Study #3
(CI-203 & CI-203CA)

Assessment of Attractiveness of Cassava as a Roosting Plant for the Melon Fly, *Bactrocera cucurbitae*, and the Oriental Fruit Fly, *B. dorsalis*.

Grant McQuate

Journal of Insect Science, volume 11: 30, 2011.
DOI: 10.1673/031.011.0130

Research conducted by USDA, US Pacific Basin Agricultural Research Center, Hawaii


Oriental fruit flies (Adults)
Female
Male


28.06.2006 09:31

Review of Poll Questions #1 and #2

Thank you for attending!

Request an evaluation unit:
cid-inc.com/demo

Any questions?

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Portable Instruments for Precision Plant Measurement