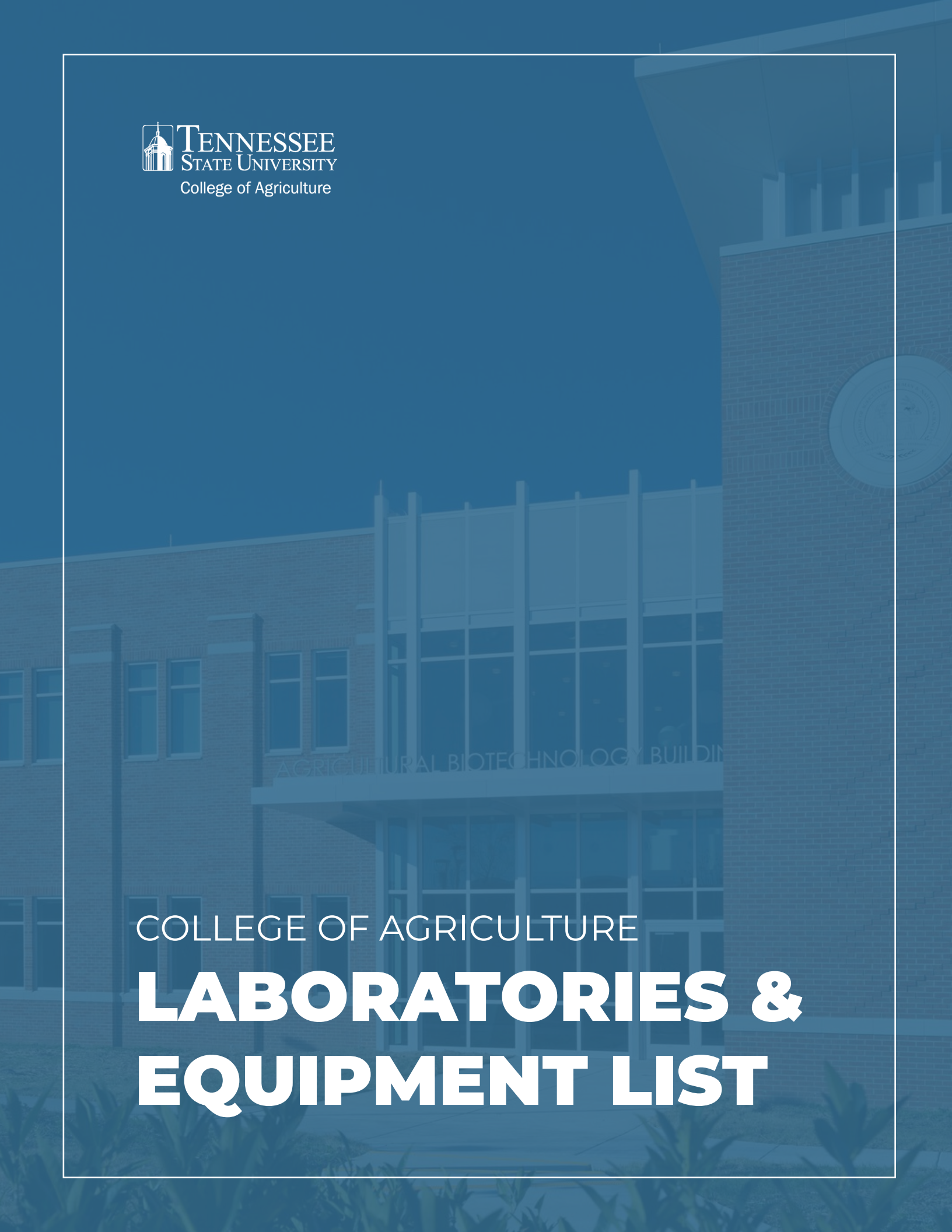


Tennessee State University
College of Agriculture

COLLEGE OF AGRICULTURE

LABORATORIES & EQUIPMENT LIST

Lab Name: Environmental Soil Chemistry Laboratory **Location:** Ag. Biotechnology Bldg.

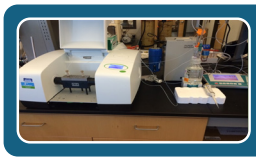
PI: Dr. Sudipta Rakshit Room #228 & #226

Technician: Dr. Jerzy Mierzwa

Instruments

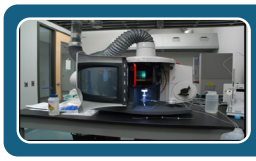
1. XRD Instrument MiniFlex 600 (Rigaku):

- Benchtop powdered X-ray diffractometer can be used to determine the mineralogical content of soil, sediments, and geological materials.
- Special accessory provides the advantage of conducting sample analyses in anaerobic condition.



2. Attenuated Total Reflectance Fourier Transform Infrared Spectrometer (ATR-FTIR) (Frontier, Perkin-Elmer):

- This IR spectrometer comes with advanced accessories by which one can conduct *in situ* flow cell experiments and record the spectra in real time.
- The instrument has also regular accessories in which one can measure freeze-dried samples or samples mixed in a KBr pellet.



3. Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) (Thermo, iCAP-7400):

- The ICP-OES is an essential instrument for measuring concentration of transition and heavy metals, metalloids, and some non metals (e.g. total P) in solutions.

4. UV-Visible Spectrophotometer (Perkin Elmer, Lambda 650):

- The UV-Visible spectrophotometer allows one to scan and quantify dissolved inorganic/organic compounds in a non-destructive way.
- This instrument is also accompanied with accessories that can scan solid samples. A flow cell attachment can also be constructed to measure fast reaction kinetics.

5. UV-Visible Spectrophotometer (Agilent, CARY 60):

- The UV-Visible spectrophotometer allows one to scan and quantify dissolved inorganic/organic compounds in a non-destructive way.
- This instrument is also equipped with a fiber optics probe.

6. Ion Chromatograph (IC) (Metrohm, IC Flex-930):

- The IC Flex 930 is a professional ion chromatograph. It is used for the determination of anions or polar substances with sequential suppression (which reduces background to a minimum).
- This instrument ensures the rapid and safe determination of anions and some polar substances in the parts per billion (ppb) to the percent range.

7. Freeze Dry System "Triad FreeZone" (Labconco):

- The instrument is for the automated freeze-drying of wet pastes and some liquids.
- Freeze-drying helps in forming consistent ground samples rather than dry-lumps.

8. Raman Spectrometer (Thermo Scientific, DXR 2):

- Raman spectroscopy is a kind of molecular spectroscopy complementary to FTIR spectroscopy (giving some additional information about molecular bands).
- Two lasers are available.

Lab Name: Bioenergy Laboratory & Precision and Sustainable Agriculture Laboratory

PI: Dr. Jason deKoff & Dr. Resham Thapa

Location:

Ag. Biotechnology Bldg. Room #223

Instruments

1. Fiber Analyzer, "Ancom 2000" (Ancom Technologies):

- Instrument for the fast determination of acid detergent fiber, neutral detergent fiber, and crude fiber for all feeds and forages.

2. CNS Analyzer (LECO CNS 928):

- Instrument for the measurement of elemental content (%) of carbon, nitrogen and sulfur in a wide range of solid sample (dry powder) matrices, sizes and concentrations, with very good precision and accuracy.

3. Automated Anion Analyzer ("SEAL" AA500):

- This is a top-of-the-line AutoAnalyzer (for analyzing of 3 anions). It uses segmented Flow Analysis principles to reduce inter-sample dispersion.
- All-in-one housing uses modular components to deliver a compact analyzer with more organization and more powerful control.

4. LC-MS/MS instrument (Shimadzu 8040):

- High-Performance Liquid Chromatograph (HPLC) combined with fast triple quadrupole mass spectrometer.
- A very robust and sensitive instrument for qualitative and quantitative analysis of organic compounds.

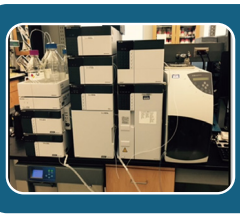
Lab Name: Food Biosciences Laboratory **Location:** Ag. Biotechnology Bldg.

PI: Dr. Ankit Patras Room #240

Instruments

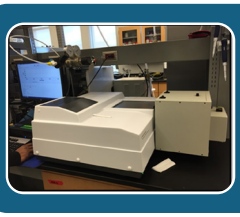
1. High Performance Liquid Chromatography (Agilent HP 1100):

- For identifying, quantifying and purifying the individual components of a complex food matrix.
- Equipped with photo-diode array UV/Visible absorption detector and an auto-sampler.



2. High Performance Liquid Chromatography (Shimadzu):

- High Performance Liquid Chromatography system for identifying, quantifying and purifying the individual components of a complex food matrix.
- Equipped with photo-diode array absorbance (UV) detector, electrochemical detector, evaporative light scattering detector, and a auto-sampler.



3. UV-Vis Spectrometer, "Cary-100" (Agilent) with "Labsphere DRA-CA-3300" accessory:

- Measurement of absorbance in Ultraviolet and Visible range of electromagnetic radiation allows for quantitative analysis of some organic compounds, anions and metal ions.
- The DRA accessory provides the means of measuring absorbance or transmission of opaque, turbid and reflecting substances.

4. UV Thin Film System:

- A flow-through UV system for irradiating fluids with high absorption and scattering properties.
- This system works in the flow-range of 40 to 700 mL/min and delivers a tight and precise UV dosage.

5. Ultrasound System:

- Pasteurize liquid foods using sound energy (1500 W, 20 KHz, 20 mm probe).
- This system is a flow-through reactor connected to a peristaltic pump and a chiller.

6. Gas Plasma System:

- Plasma generation system capable to disinfect food surfaces.
- Pure compressed air is the carrier gas for the plasma generation.

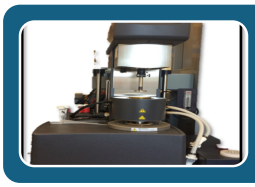
Lab Name: Food Biomaterials Laboratory

Location:

PI: Dr. Ying Wu

Ag. Biotechnology Bldg. Room #240

Instruments

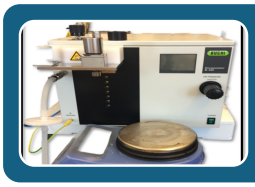


1. ARES-G2 Rheometer:

- This rheometer is the most advanced rotational rheometer for research and material development.
- It remains the only commercially available rheometer with a dedicated actuator for deformation control, Torque Rebalance Transducer (TRT), and Force Rebalance Transducer (FRT) for independent shear stress and normal stress measurements.

2. Mini Spray Dryer B-290 (Buchi):

- This easy-to-operate mini spray dryer is used to spray-dry and encapsulate bioactive ingredients, probiotics and flavors for controlled release, nutraceuticals, functional foods and pharmaceuticals.
- It is widely applied in food, feed and encapsulation of materials and nano-technology fields.



3. Encapsulator B-390 (Buchi):

- This system is used for controlled encapsulation of bio-actives and materials for innovative lab-scale R&D work. It is applied for mono layer or multilayer encapsulations, as well as single-core or multiple core encapsulates.
- It is simplistic and flexible operation enables application in a wide range of fields; pharmaceutical, food, feed, cosmetic, textiles and agricultural applications.

4. Zetasizer Nano ZS90:

- This system is for the measurement of particle size and molecular size at a 90 degree scattering angle using Dynamic Light Scattering, also with the ability to measure zeta potential and electrophoretic mobility using Laser Doppler Micro-Electrophoresis, and molecular weight using Static Light Scattering.
- The measurement range for particle size is 0.3 nm to 5 µm.

5. Viscotek TDA System (Malvern):

- This GPC/SEC chromatography system is integrated with Triple Detector Array (TDA) which incorporates RI, Light Scattering, Viscosity detectors. This system measures sample concentration, molecular weight (MW) and intrinsic viscosity.
- The TDA is ideal for characterizing synthetic and natural macromolecules.

6. Microfluidizer:

- This homogenization technology using fixed-geometry high shear interaction chamber, which converts pressure energy more efficiently into shear and impact forces, resulting in targeted nanoparticle size reduction with less sample temperature rise during processing.
- This is a bench-top equipment with capacity of treating 6 mL of sample per run.

7. Rapid Visco Analyser (RVA):

- The RVA is a cooking, stirring viscometer with ramped temperature and variable shear capability optimized for testing the viscous properties of starch, grain, flour and foods using international standard methods or tailor-made test routines.

Lab Name: Molecular Nutrition Laboratory

Location:

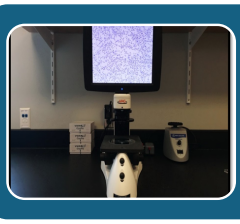
PI: Dr. Hongwei Si

Ag. Biotechnology Bldg. Room #234

Instruments

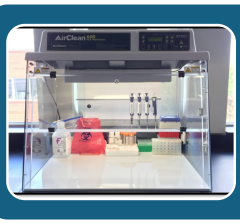
1. Microplate Reader "Synergy H-1":

- The multifunctional microplate reader can accommodate any plate type from 6 to 384 wells.
- This system supports top and bottom fluorescence intensity, UV-visible absorbance and high performance luminescence detection and it is extremely flexible, and easy to use for a wide range of assays.



2. Evos XL Core Imaging System:

- The EVOS® XL Core Imaging System is a digital, transmitted light, inverted imaging system for living cell and tissue culture applications and routine cell maintenance.
- Its color camera and high-quality optical system deliver high-definition images with exceptional ease.



3. RNA/DNA Workstation:

- AirClean System AC600 Series RNA/DNA Workstation are designed as application solutions for the manipulation and amplification of DNA and RNA.
- UVTect Microprocessor Controller maintains airflow to provide a clean Class 100 work area to reduce risk of sample contamination during DNA RNA amplification.

4. CO_2 incubator:

- This CO_2 incubator is used to cell culture. The incubator can maintains optimal temperature, humidity and carbon dioxide and oxygen content of the atmosphere inside.
- This incubator also can do a lot of experimental work in cell biology, microbiology and molecular biology.

Lab Name: Animal Biotechnology Laboratory

Location:

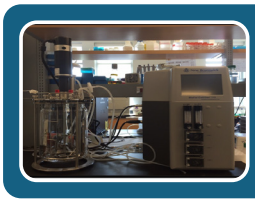
PI: Dr. Samuel Nahashon

Ag. Biotechnology Bldg. Room #124

Instruments

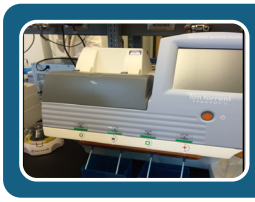
1. Gel Imaging System, Gel Logic 1500 (Kodak):

- The Kodak Gel Logic system offers high image quality and data acquisition for documenting and analyzing electrophoresis gels, and colorimetric blots and plates.



2. Benchtop Fermentation Bioreactor "Bio Flo/CelliGen 115 (New Brunswick):

- A versatile entry-level fermenter/ bioreactor ideally suited for a wide range of fermentation and cell culture laboratory experiments.



3. Personal Genome Machine (PGM) system "Ion Torrent" (Life Technologies):

- Very fast sequencing technology underlying the Personal Genome Machine exploits a well-characterized biochemical process.

4. DNA Sequencer "ABI 3100 Prism" (ABI):

- The Prism 3100 is a multi-color fluorescence based DNA analysis system with 16 capillaries operating in parallel.
- It offers high-quality data and efficient sample processing for the research laboratory.

5. UV-Vis Spectrophotometer DU 730 (Beckman):

- Good quality laboratory spectrophotometer, which allows for the measurement of light absorption in UV and Visible range.

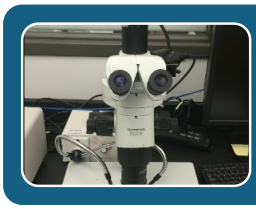
Lab Name: Plant Biotechnology Laboratory

PI: Dr. Suping Zhou

Location:

Ag. Biotechnology Bldg. Room #135

Instruments

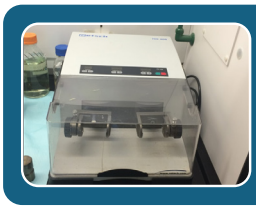


1. SZX16 optical microscope (Olympus):

- High quality optical microscope.

• Digital Microscope "Keyence VHX":

- Optical microscope with a digital camera and software.



2. (Micro) Ball Mill "MM 400" (Retsch):

- The mixer mill MM 400 is a versatile bench-top unit, which has been developed specially for dry, wet and cryogenic grinding of small amounts of sample. It can mix and homogenize powders and suspensions in seconds.
- It is also perfectly suitable for the disruption of biological cells as well as for DNA/RNA and protein extraction.

3. SpectraMax M5 plate reader (Molecular Devices):

- The instrument for quantifying biomolecules such as nucleic acids and proteins in plate format.

4. Leica CM1950 cryostat (Leica Biosystems):

- The Leica CM1950 clinical cryostat is a highly adaptable platform that can be tailor-made for each laboratory. For higher quality sectioning of plant/animal tissue.
- Innovation and human-oriented features provide a cryostat with a new level of performance.

5. ABI 7300 Real Time PCR (Applied Biosystems):

- 7300 Real-Time PCR System is an affordable platform for the detection and quantification of nucleic acid sequences that will not compromise your data quality or dye choice flexibility.
- The 7300 Real-Time PCR System combines thermal cycling, fluorescence detection, and application-specific software to measure the cycle-by-cycle accumulation of PCR products in a single-tube, homogeneous reaction.

Lab Name: Phytopathology Laboratory

Location:

PI: Dr. Margaret Mmbaga

Ag. Biotechnology Bldg. Room #125

Instruments

1. ENDURO™ GDS Gel Documentation System:

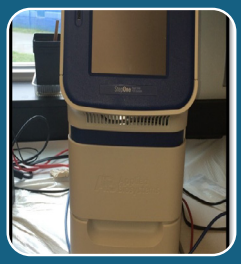
- The ENDURO™ GDS Gel Documentation System is state-of-the-art imaging system, which provides an incredible combination of performance and value.
- It is a perfect fit with the ENDURO™ Electrophoresis and Lab-Net Molecular Biology instruments.

2. Optical Microscope BX 41 (Olympus):

- High quality optical microscope.

• Optical Microscope DFC 295 (Leica):

- High quality optical microscope.



3. Real-time PCR Instrument AB Step-One (Applied Biosystems):

- Real-Time PCR System is a platform for the detection and quantification of nucleic acid sequences that will not compromise your data quality or dye choice flexibility.
- The system combines thermal cycling, fluorescence detection, and application-specific software to measure the cycle-by-cycle accumulation of PCR products in a single-tube, homogeneous reaction.

Lab Name: Legume Molecular Genetics Laboratory

PI: Dr. Sonali Roy

Location: Farrell-Westbrook Bldg. (GC-MS in Ag. Biotechnology Bldg. Room #125)

Instrument

1. Gas Chromatograph with Mass Spectrometer (GC-MS, from "Thermo"):

- Gas Chromatography – Mass Spectrometry (single quad) instrument for trace analysis of volatile organic compounds (qualitative and quantitative).
- The gas chromatograph module is also equipped with FID detector.

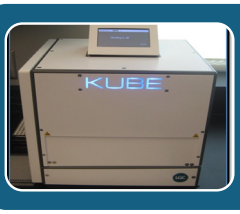
Lab Name: Plant Genetics and Genomics Laboratory **Location:**

PI: Dr. Matthew Blair Ag. Biotechnology Bldg. Room #238

Instruments

1. Hydrocycler (LGC):

- Using the classical method of water-bath PCR, this robotically controlled PCR amplification machine has four temperature control chambers for rapid cycling of 96, 384 or 1536 well / sample plates.



2. Plate Sealer "Kube":

- The Kube (LGC) heat sealer for 96 and 384 well plates operates on air pressure and seals plastic covers to PCR plates for amplification in the water bath.
- Plates are optically read by a spectrophotometer from the Omega Corporation.

3. Plate Reader, FluoStar Omega (BMG):

- For quantifying biomolecules such as nucleic acids and proteins, and measuring fluorescence based assays in plate format.

4. EpMotion Robot (Eppendorf):

- This robot is used for automated DNA extraction and for re-array of DNA samples in preparation for high-throughput PCR amplification.

Lab Name: Plant Genetics Laboratory

Location:

PI: Dr. Korsi Dumenyo

Lawson Hall CARP Bldg. Room #214

Instruments

1. Real-time PCR Instrument AB Step-One (Applied Biosystems):

- Real-Time PCR System is a platform for the detection and quantification of nucleic acid sequences that will not compromise your data quality or dye choice flexibility.
- The system combines thermal cycling, fluorescence detection, and application-specific software to measure the cycle-by-cycle accumulation of PCR products in a single-tube, homogeneous reaction.

2. Synergy H1, Hybrid Reader (Bio-Tek):

- A multi-mode plate reader for quantifying biomolecules such as nucleic acids and proteins, and measuring fluorescence based assays in plate format.

3. SONY Cell Sorter (SH800):

- It can separate specific cell populations from a mixture of cells.
- This allows users to study and manipulate cells for a variety of purposes.

Lab Name: Food Safety and Biosensors Laboratory **Location:**

PI: Dr. Fur Chi-Chen Lawson Hall CARP Bldg. Room #103

Instruments

1. Protein Analyzer, Protein Simple, "Simon":

- Protein Simple's Simon instrument uses capillary electrophoresis to fully automate the protein immunoblotting process.

2. Gel Reader "Chef III" Gel Reader (Bio Rad):

- This gel imaging system is designed to address multiplex fluorescent western blotting, chemiluminescence detection, and general *gel* documentation applications.

3. Synergy H1, Hybrid Reader (Bio-Tek):

- A multi-mode plate reader for quantifying biomolecules such as nucleic acids and proteins, and measuring fluorescence based assays in plate format.

Lab Name: Sensory Science Laboratory

Location:

PI: Dr. Chetan Sharma

Lawson Hall Basement

Instrument

1. Electronic Nose (E-Nose) instrument “Heracles” (Alpha MOS):

- “Heracles” is a highly sensitive gas chromatograph which can collect and analyze, and identify components, and make a statistical report whether they fit a previously determined “normal image”, i.e. giving a numerical value to what we usually detect with our nose.

Lab Name: Biogeochemistry and Climate Change Laboratory

Location: Farrell-Westbrook Bldg. Room #126

PI: Dr. Jianwei Li

Instruments

1. TOC/TN analyzer (Shimadzu):

- The TOC-L series of TOC/TN (Total Organic Carbon / Total Nitrogen) analyzer adopts the 680°C combustion catalytic oxidation method, maximizes both sensitivity and productivity, making them the ideal choice for monitoring water samples.
- Coupled with an auto-sampler, the analyzer provides efficient measurements of TOC and TN concentrations with high precision.

2. Piccaro *G2131-i* CO_2 Analyzer:

- The Piccaro Analyzer can be used to quantify the total CO_2 concentration and $\delta^{13}C$ of CO_2-C emitted from soil and litter materials.
- Special accessory provides the advantage of conducting continuous gas analyses in field condition.

3. FilterMax F5 Microplate Reader:

- FilterMax F5 Multi-Mode Microplate Reader has UV and visible absorbance, top and Bottom fluorescence intensity, glow luminescence, fluorescence polarization, and time-resolved fluorescence modes, plus temperature control, and linear and orbital shaking for programmable endpoint, kinetic, multiple wavelength, linear scan, and area measurements in well plates.
- It is used to quantify ten different extracellular enzyme activities in soils associated with C, N, and P acquisitions.

4. EGM-4 Environmental Gas Monitor:

- The EGM-4 Environmental Gas Monitor is a highly portable instrument for use in the lab and field. The EGM-4 is a compact, lightweight instrument with a rugged aluminum enclosure making it a very portable and durable product. The EGM-4 can be supplied with two bench, optimized for measurement ranges of CO_2 up to 30000 ppm.
- This instrument ensures the rapid and accurate determination of CO_2 efflux rate in the laboratory jar or from land surface in the field.

5. LI-8100A Automated Soil CO_2 Flux System:

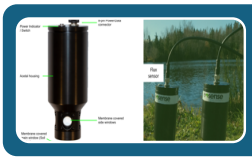
- The LI-8100A is an automated system that enables to conduct long-term CO_2 measurements over a study site using clear or opaque long-term chambers. The LI-8100A with a long-term chamber is ideal for assessing the temporal variability of CO_2 flux at a study site.
- The analyzer control unit contains an infrared gas analyzer and a connection panel to interface with long-term chambers, additional gas analyzers, and the LI-8150 multiplexer.

6. VELP CN 802 Carbon Nitrogen Elemental Analyzer:

- The CN 802 analyzer is a robust and flexible combustion analyzer, that works in accordance with official reference methods for the determination of carbon and nitrogen in many industrial sectors such as agriculture, environmental, food & feed and chemical.
- This instrument is used to measure and quantify Total Carbon – TC, Total Nitrogen – TN and C/N ratio in different soil samples.

7. EGM-5 Environmental Gas Monitor:

- The EGM-5 is a compact, lightweight instrument with a custom, rugged aluminum enclosure making it a very portable and durable product for demanding field CO_2 measurements. The EGM-5 also features a miniature, long-life air sampling pump that can be used for both dynamic and static measurements.
- Data can be recorded manually or automatically at user-selected intervals.



8. Eosense eosFD (Forced Diffusion) CO_2 Flux Sensors:

- The eosFD was designed for high temporal resolution monitoring of CO_2 flux across an area of interest. Each unit contains its own CO_2 sensor capable of logging data as rapidly as once per second.
- A deployed eosFD system is split into separate “Soil” and “Atmosphere” nodes that have been calibrated to use the soil and surface concentrations to estimate the soil flux rate. These nodes can be deployed in pairs for maximum accuracy or distributed over an atmospherically homogeneous area in order to characterize a broad area with comparatively few sensors.

Lab Name: Plant Nutrition Laboratory

Location:

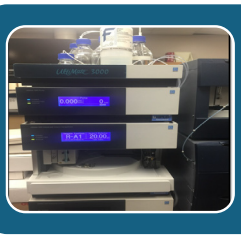
PI: Dr. Dharma Pitchay

Farrell-Westbrook Bldg. Room #125

Instruments

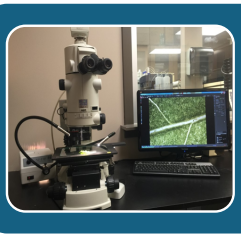
1. Ion Chromatography system IC-5000 (Dionex):

- The applications of ion chromatography include measurement of anion - nitrates, nitrites, chlorides, sulfates, phosphates, iodides etc. and cations, carbohydrates, organic acids, amino acids, proteins, peptides, oligonucleotides, carboxylates, polysaccharides, polyphosphates, fatty acids, metals, phenols, surfactants, ethanolamines, etc.
- The ion chromatography is used extensively in horticultural science, environmental, , life sciences, chemical, and food industries.



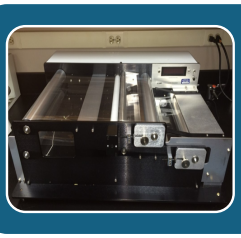
2. UHPLC (Ultra-High Pressure Liquid Chromatography) system UltiMate 3000 (Dionex):

- UHPLC is a specialized chromatographic method that runs faster, resolves better and uses less solvent than its cousin, HPLC uses. UHPLC accomplishes this by using higher pressure and a smaller column packed with smaller particles (usually less than 2 µm in diameter).



3. Multipurpose Epi-fluorescence zoom microscope with digital camera:

- Research requiring cellular level investigations of plant tissues. This new concept in zoom microscopes covers a wide range of magnifications, from 5x to 400x, all in a single microscope. It can continuously switch magnifications extending from macro to micro observation of the same specimen.
- The combined stereoscopic microscope with a wide field of view, a long working distance, and high-resolution images is critical for research.



4. Leaf Area Meter:

- Measurements of the leaf area of plants spans many scientific disciplines. Monitoring the distribution and changes of leaf area is important for assessing growth and vigor of vegetation.
- Knowing the leaf area is essential for studies involving photosynthesis, respiration and transpiration under organic and conventional growing conditions.

Lab Name: Food Safety Microbiology Laboratory **Location:**

PI: Dr. Agnes Kilonzo-Nthenge Farrell-Westbrook Bldg. Room #208

Instruments

1. CHEF Mapper XA Pulsed Field Electrophoresis System (Bio-Rad):

- The CHEF Mapper® system incorporates FIGE and AFIGE* technologies for resolution in the range of 100 bp to 10 Mb. The CHEF Mapper XA system also includes algorithms for deriving separation conditions.
- Each CHEF-Mapper XA system is supplied with a power module, embedded auto-algorithm for protocol optimization, interactive algorithm program disk, electrophoresis cell, cooling module, variable-speed pump, and accessory kit.

2. Cell Imaging System, EVOS XL:

- Cell Imaging System is for transmitted-light microscopy. The system allows colorimetric applications like H&E staining and immunohistochemistry.

3. Flash & Go automatic colony counter:

- Image analysis software that can read an entire Petri plate instantaneously. Once inserted in the colony counter, plates are illuminated with a sophisticated LED lighting system, next, a picture of them is taken with a high resolution camera. Instantly, the software detects colonies or haloes according to color and records a count or measure. It can be used in Phage plaque assays and Ames testing for enumeration.
- It can measure inhibition zones during antibiotic potency measures and antibiotic susceptibility testing (AST).

4. Eppendorf Mastercycler Nexus Gradient:

- It is a gradient thermal cycler supporting over 12 columns. It has a gradient range of 4-99°C with an aluminum thermal block and 96x 0.2 ml PCR tubes or 77x 0.5 ml PCR tubes or 1x 96 well PCR plate capacity. With a 1-20°C temperature control range and a gradient temperature range of 30-99°C.

5. AS-580 Anaerobic Chamber:

- The AS-580 Anaerobic Gloveless Chamber creates and maintains an anaerobic environment for the growth and cultivation of anaerobic organisms.
- The chamber allows the operator to work with the organisms inside of an oxygen-free environment and provides a method to bring samples in and out of the chamber via the pass-box.

6. Handheld Automated Cell Counter:

- Handheld Automated Cell Counter provides a fast and convenient method for counting cells or particles with a disposable sensor.
- The system utilizes the Coulter principle in a miniaturized, handheld, pipette-like format that allows rapid cell counting; what used to take 10 minutes now takes about 30 seconds.

Lab Name: Wildlife Ecology Laboratory

Location:

PI: Dr. William Sutton

Farrell-Westbrook Bldg. Room #127

Instrument

1. Applied Biosystems, "QuantStudio 5" PCR instrument:

- "QuantStudio 5" real-time PCR system is factory-calibrated for quick installation and immediate use. These systems detect differences in target quantity as low as 1.5-fold.

Lab Name: Forest Ecology Laboratory

Location:

PI: Dr. Sarah McCarthy-Neumann

Farrell-Westbrook Bldg. Room #121

Instruments

1. Fiber Analyzer, "Ancom 2000" (Ancom Technologies):

- For the fast determination of Acid Detergent Fiber, Neutral Detergent Fiber, and Crude Fiber for all feeds and forages.

2. DM IL Inverted Phase Contrast Microscope (Leica):

- This microscope is ideal for tissue culture, micromanipulation, documentation of immunostained specimens, and routine live cell examinations.

3. LAI 2200-C (LICOR):

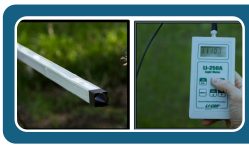
- Measures leaf area index (LAI) indirectly via paired sensors for above- and below-canopy comparison.
- Purchased within last year.

4. Sieve Cleaner, Ultrasonic (W.S. Tyler):

- Use this ultrasonic sieve cleaner to safely clean your 8" or 200-mm diameter sieves.

5. Bullet Blender Homogenizer (Next Advance):

- The Bullet Blender® Homogenizer enables you to homogenize, disrupt, or lyse 24 tissue or cell culture samples at a time.



6. Line Quantum Sensor (1-m length) and Portable Meter (LI-COR):

- The LI-191R Line Quantum Sensor measures PAR integrated over its 1-meter length. It is used to measure sunlight under a plant canopy, where the light field is non-uniform. The LI-250A is a portable meter that displays the output from any LI-COR light sensor. It shows instantaneous values or 15-second averages of values from a sensor.

7. Soil Coring Machine (Giddings Machine Co):

- Gas powered soil coring machine with connectors for taking soil cores that are 9-cm diameter and 30-cm or 46-cm in length.

8. ML3-ThetaProbe soil moisture sensor (Delta-T):

- measures within ± 1% soil moisture accuracy and logs data.

9. M350 Digital Soil Moisture Meter (System Water Solutions):

- Soil Moisture - Range: 0 to 100%. Accuracy: ±2%. Operating temperature: 40°F to 150°F.
- Probe length: 30".

Lab Name: Urban and Community Forestry Laboratory **Location:**

PI: Dr. Yujuan Chen Farrell-Westbrook Bldg. Room #121

Instrument

1. GeoChem Analyzer, model Z-903 (SciAps):

- Laser-Induced Breakdown Spectroscopy (LIBS) uses a laser pulse to create plasma on the sample surface and measure its elements. The Z-903 is the world's only handheld offering elemental micro-analysis in the field. Users may set up the raster to a grid pattern, using the 100 um laser spot size for elemental heat mapping spot-by-spot.

2. Hydraulic Conductivity meter "KSAT" (METER Group):

- The ASTM D2434-compliant KSAT is the only easy-to-use automated setup for taking saturated hydraulic conductivity measurements in the lab.
- In its simplest form, it's an instrument that uses both the falling head (automated) and constant head (non-automated) methods on a soil core.

3. Soil Particle Size Analyzer "PARIO" (METER Group):

- The PARIO uses automation to shrink the time and effort needed for soil particle size analysis. It calculates the particle size distribution by Stokes' law, with a range spanning from 2 µm to 63 µm, finally making it easy to obtain a complete particle size distribution curve, instead of just a few measurements at discrete time points. It allows for unattended, automated operation (with the exception of opening the valve after completion).

Lab Name: Plant Molecular Genetics and Breeding Laboratory

Location:
Farrell-Westbrook Bldg. Room #124

PI: Dr. Ali Taheri

Instruments

1. Gas Chromatograph (HP):

- Hewlett-Packard, 6890 Series GC system equipped with flame ionization detector.
- This system will be used for fatty acid profiling in seeds.

2. PCR machine – BioRad C1000 Thermal Cycler:

- Instrument for routine PCR tasks. It is equipped with 2x48 and 1x96 well block modules.

3. QIAcube (Qiagen):

- The QIAcube uses advanced technology to process spin columns, enabling seamless integration of automated, low-medium throughput sample preparation into the laboratory workflow. All steps in the purification procedure are fully automated.

4. epMotion 5070 (Eppendorf):

- This system enables us to perform automatic dispensing operations required for high-throughput screenings. It is supplied with a variety of dispensing tools which can be used to dispense quantities of liquid in the volume range from 1 µL to 1,000 µL.

5. Plate Reader AF2200 (Eppendorf):

- The Plate Reader AF2200 for quantifying biomolecules such as nucleic acids and proteins, and measuring fluorescence-based assays in a plate format.

6. NIR Spectrometer DA 7250:

- Near-Infrared (NIR) spectrometer for analyzing, e.g. moisture, oil, fatty acids, protein and other parameters in soybean seeds, meals and oil.

7. Tissue Lyser II:

- For medium- to high-throughput sample disruption for molecular analysis. The Tissue Lyser II simultaneously disrupts multiple biological samples through high-speed shaking in plastic tubes with stainless steel, tungsten carbide, or glass beads.
- Using the appropriate adapter set, up 192 samples can be processed at the same time.

8. Confocal Microscope (Leica, Stellaris 8):

- The Stellaris 8 confocal microscope is a cutting-edge imaging system designed for advanced biological research. This powerful and versatile tool enables researchers to explore the intricacies of biological systems with high sensitivity, resolution, and speed, capturing detailed images of cells and tissues.
- A key feature is its White Light Laser (WLL), providing a broad range of excitation wavelengths from 410 to 8500 nm, allowing for the use of a variety of fluorescent dyes. The Stellaris 8 also boasts Power HyD detectors for high photon detection efficiency and low noise, resulting in brighter and clearer images.

Lab Name: Bioremediation and Phytoremediation Laboratory

Location:
Farrell-Westbrook Bldg. Room #207

PI: Dr. Tom Byl

Instruments

1. Gas chromatograph "Agilent 6890N" with FID and ECD detectors:

- Gas chromatography (GC) is used for separating and analyzing compounds that can be vaporized without decomposition. Typical uses of GC include testing the purity of a particular substance, or separating the different components of a mixture.
- In some situations, GC may be helpful in identifying a compound. It can also be used for quantitative analysis.

2. Biolog Microstation 3™ with Plate Reader:

- A spectrophotometer for quantifying biomolecules such as nucleic acids and proteins in plate format.

Lab Name: Molecular Genetics and Biotechnology Laboratory

Location:
Farrell-Westbrook Bldg. Room #206

PI: Dr. Ahmad N. Aziz

Instruments

1. DNA Analyzer "LI-COR 4300" (Life Technologies):

- The 4300 System is a third generation instrument based on LI-COR's highly sensitive infrared fluorescence detection technology.

2. TC-412 PCR Machine (Techne):

- The instrument made for routine bioanalytical PCR (Polymerase Chain Reaction) tasks.

Lab Name: Animal Physiology and Genetics Laboratory

Location:
Farrell-Westbrook Bldg. Room #210

PI: Dr. Richard Browning, Jr.

Instruments

1. Gamma Counter Cobra II (Packard):

- The instrument for counting gamma emitters in biological samples. The gamma ray is detected after it has passed out of the vial and impinges on a crystal of NaI (TI) which is the actual scintillator.

2. AccuSkan FC (Fisher Scientific):

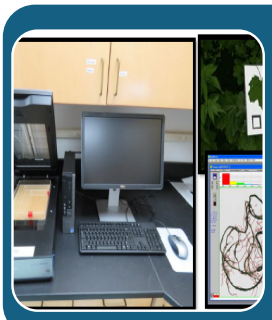
- A proven ELISA solution—AccuSkan FC and the Fisher Scientific AccuWash washer.
- The combination of the AccuSkan FC microplate photometer and the Accu-Wash microplate washer offers a convenient modular solution for routine and research ELISA applications.

Lab Name: Nursery Production and Sustainability Laboratory

PI: Dr. Anthony Witcher

Location:
Otis L. Floyd Nursery Research Center, McMinnville, Room #163

Instrument



1. Image Acquisition Hardware and Analysis Software (Regent Instruments Inc.):

- WinFOLIA - Designed for leaf area, morphology and disease analyses
- WinRHIZO - Designed for root measurement of washed roots. Morphology (length, area, volume...), topology, architecture and color analyses
- WinSEEDLE - Designed for needle and seed morphology and disease analyses

Lab Name: Woody Ornamental Plant Pathology Laboratory

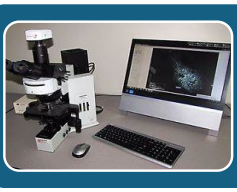
PI: Dr. Fulya Baysal-Gurel

Location:
Otis L. Floyd Nursery Research Center, McMinnville, Room #147 & #169

Instruments

1. Thermo Scientific™ Sorvall™ Legend™ X1 Centrifuge and Rotors:

- This centrifuge is a laboratory product designed to separate components by generation of Relative Centrifugal Force.
- It features a convenient 1L capacity.



2. Microscope-Model- BX50 Olympus (compound w/camera)

- A very good quality optical microscope.

3. CFX96 Touch™ Real-Time PCR Detection System:

- The CFX96™ Optical Reaction Module converts the C1000 Touch™ Thermal Cycler chassis into the powerful CFX96 Touch Real-Time PCR Detection System.
- This six-channel system combines advanced optical technology with precise thermal control to deliver sensitive, reliable detection. Quickly set up runs and monitor amplification traces in real time on the integrated LCD touch screen.

4. The iMark™ Microplate Absorbance Reader:

- Reader with a wavelength range of 400–750 nm, is an economical, high-performance solution for a wide range of applications, including immunoassays with colorimetric substrates, such as ELISA, and protein assays.

5. NanoDrop 2000 Spectrophotometer:

- Wide spectral range (190-840 nm) for measuring a variety of samples types: DNA, RNA and protein (in low volume samples).

6. The Gel Doc EZ system:

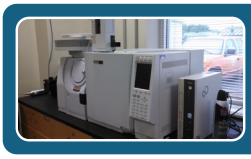
- It is a compact and automated gel imaging instrument designed to yield publication-quality images.

Lab Name: Insect Behavior and Chemical Ecology Laboratory

PI: Dr. Karla Addesso

Location:
Otis L. Floyd Nursery Research Center, McMinnville, Room #111

Instruments



1. Shimadzu QP2010 GC-MS:

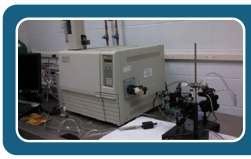
- Gas Chromatography – Mass Spectrometry instrument for analysis of small volatile organic compounds from soil, plants and insects.

2. Reveleris X2 Flash Chromatography System:

- An automated, multi-detection flash chromatography system for bulk separation and collection of bioactive compounds. The patented REVEALX™ detection technology triggers simultaneous fraction collection with advanced signal processing from up to four detector signals (3 UV + ELSD).

3. Epoch UV-Vis Spectrophotometer (BioTek):

- A compact, low maintenance microplate spectrophotometer with monochromator-base UV-Vis wavelength selection, 200 nm to 999 nm wavelength range and 6- to 384- microplate reading capability, controlled with the Gen5 Data Analysis software interface.



4. Electroantennographic Detector (EAD - Syntech):

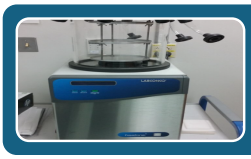
- This equipment is used to study the olfactory response of insects to plant or insect derived compounds by amplifying the electrical response of the insect antenna.
- Volatiles of interest may be introduced to the antenna via a puff system or GC.

5. "Oco Labs" Super C Benchtop Supercritical CO_2 Extractor:

- This is a quality engineered, benchtop supercritical fluid extractor (SFE). With a one ounce capacity and manual or automated pressure valve. The Super C is used for extraction of essential oils from plant material.

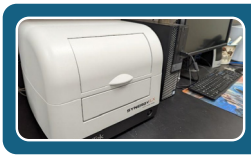
6. Potter Spray Tower:

- Suitable for studying the biological effects of chemicals both when applied as a direct spray on the organisms or as a residual film.
- Equipped with quickly detachable atomizers, pneumatically operated spray table and all air controls mounted on attached instrument panels. A pressure gauge is included.



7. Labconco Bench Top Freeze Dryer:

- Used to desiccate plant and animal tissue samples for further molecular or chemical analysis or to prepare soft-bodied samples for permanent display (e.g., larval insect collections).



8. BioTek Synergy LX Multi-Mode Plate Reader:

- This microplate reader can perform assays in absorbance (200-999 nm), fluorescence, and luminescence detection modes.It includes automated shaker functions and can support 6-384 well plates as well as sample interfaces.

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