



MULTIFACETED TECHNOLOGIES TO OBSERVE MITES

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Acari are microscopic arthropods which require magnification to clearly observe and study them. At the USDA-ARS, Electron and Confocal Microscopy Unit we utilize several new optical technologies to observe mites. 1. A Hirox Digital Video Microscope uses fiber optic technology to allow us to obtain high resolution full color light microscopy images, image of mites at 360 degrees without moving the mite, and live action videos. 2. A Hitachi Table Top TM3030 variable pressure scanning electron microscope with allows us to capture high resolution, high magnification images of mites within 4 minutes from the time you mount the mite to the time you have a digital image. 3. A Zeiss AxioZoom stereoscope which can be used to observe mites on an entire leaf using autofluorescence of the leaf and mites at low magnification. 4. A Zeiss 710 Confocal Laser Scanning Microscope which allows us to develop fluorescent 3D renderings of entire mites due to their autofluorescence which can be turned to observe the entire mites front to back, top to bottom at all angles. The 3D images can also be peeled back layer by layer to observe internal structures. 5. A Low Temperature Scanning Electron Microscope (LT-SEM) composed of a Hitachi 4700 FE-SEM with a Quorum PP2000 Cryo-Prep chamber. The LT-SEM requires the samples to be frozen in liquid nitrogen and kept frozen the entire time they are observed, however, the ultra-high resolution, high magnification images allows the researchers to study mites in a frozen frame. Once the black and white SEM images are obtained we utilize the color images obtained using the Hirox light microscope to colorize the mites to develop dramatic



full color images of the mite in high resolution. All of these techniques allow us to critically study the morphology of the mite, feeding and breeding behavior as well as how they interact with predators. Our facility contains a unique set of microscopic tools to systematically study mites.