Supplementary Materials

New biocompatible technique based on the use of laser to control the whitefly *Bemisia tabaci*

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1 – Laser Technical Specifications

Table S1 – Some of the technical specifications provided by the manufacturer regarding the **Inferno laser (635 nm) model** from Wicked Lasers (China) used in the preliminary tests conducted in this work. Wavelength emission, laser power, and beam shape were tested in the laboratory using an optical

spectrometer (Avantes, AvaSpec-HERO, Netherlands), power meter (Coherent, PowerMax, USA), and automated homemade knife-edge system with a 50 μm step, respectively.

	Manufacturer Information	**Lab Performance**
Model Name	S3 Inferno Series	-
Laser Product Class	4	4
Wavelength	635 nm	640 nm $\pm$ 1 nm (Figure S1-A)
Laser Type	Direct Diode	-
Max. Laser Power	750 mW	680 mW $\pm$ 41 mW
Beam Spatial Profile	Not Informed	Elliptical Shape (Figure S1-B)
Divergence	~3.0 mRad	-
Duty Cycle	Continuous-wave (CW)	Continuous-wave (CW)

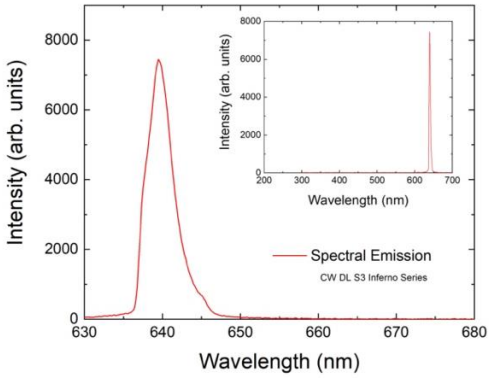


Figure S1-A – Inferno's spectral emission used in the preliminary tests, where the emission peak is centered at approximately 640 nm.

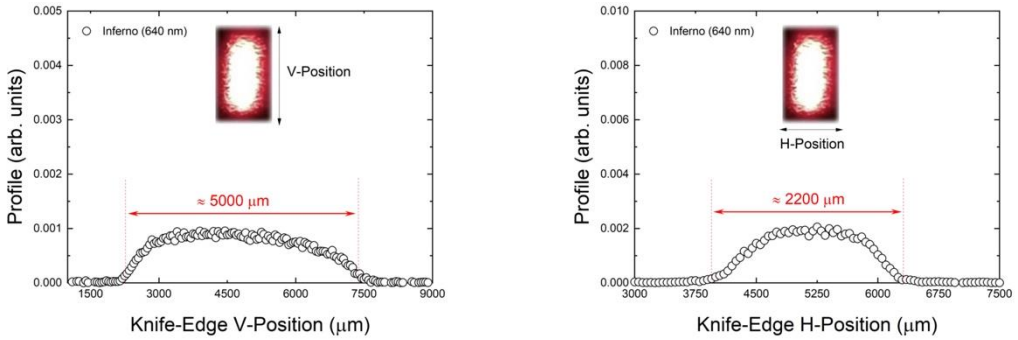


Figure S1-B – Inferno's spatial profile was acquired with an automated knife-edge home system (step of 50 μm), revealing an elliptical-like spatial profile. No additional lens was used besides the set of lenses coupled to the output facet by the manufacturer. The cross-section was acquired at ~40 cm from the laser. The inset is a laser beam photograph in a black target to give the reader a qualitative aspect ratio of the beam.

Table S2 – Some of the technical specifications provided by the manufacturer regarding the **Krypton laser (520 nm) model** from Wicked Lasers (China) used in the preliminary tests conducted in this work. Wavelength emission, laser power, and beam shape were tested in the laboratory using an optical spectrometer (Avantes, AvaSpec-HERO, Netherlands), power meter (Coherent, PowerMax, USA), and automated homemade knife-edge system with a 50 μm step, respectively.

	Manufacturer Information	Lab Performance
Model Name	S3 Krypton Series	-
Laser Product Class	4	4
Wavelength	520 nm	527 nm $\pm$ 1 nm (Figure S2-A)
Laser Type	Direct Diode	-
Max. Laser Power	>900 mW	408 mW $\pm$ 25 mW
Beam Spatial Profile	Not Informed	Elliptical Shape (Figure S1-B)
Divergence	2 mRad	-
Duty Cycle	Continuous-wave (CW)	Continuous-wave (CW)

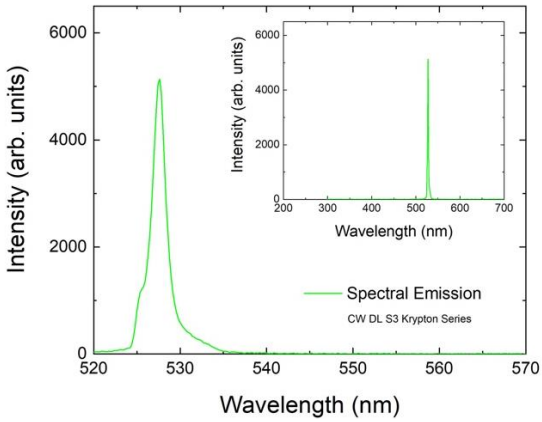


Figure S2-A – Krypton's spectral emission used in the preliminary tests, where the emission peak is centered at approximately 527 nm.

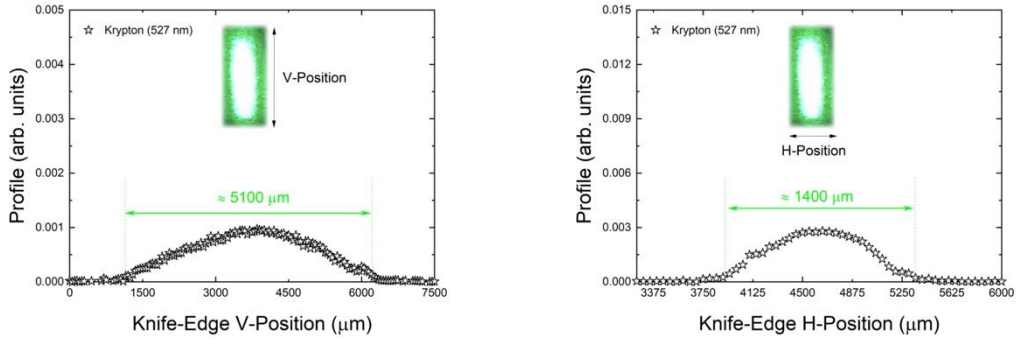


Figure S2-B – Krypton's spatial profile was acquired with an automated knife-edge home system (step of 50 μm), revealing an elliptical-like spatial profile. No additional lens was used besides the set of lenses coupled to the output facet by the manufacturer. The cross-section was acquired at ~40 cm from the laser. The inset is a laser beam photograph in a black target to give the reader a qualitative aspect ratio of the beam.

Table S3 – Some of the technical specifications provided by the manufacturer regarding the **Artic laser (445 nm) model** from Wicked Lasers (China) used in the preliminary tests conducted in this work. Wavelength emission, laser power, and beam shape were tested in the laboratory using an optical spectrometer (Avantes, AvaSpec-HERO, Netherlands), power meter (Coherent, PowerMax, USA), and automated homemade knife-edge system with a 50 μm step, respectively.

	Manufacturer Information	**Lab Performance**
Model Name	S3 Artic Series	-
Laser Product Class	4	4
Wavelength	445 nm	444 nm $\pm$ 1 nm (Figure S3-A)
Laser Type	Direct Diode	-
Max. Laser Power	>3500 mW	780 mW $\pm$ 47 mW
Beam Spatial Profile	Not Informed	Elliptical Shape (Figure S3-B)
Divergence	1.5 mRad	-
Duty Cycle	Continuous-wave (CW)	Continuous-wave (CW)

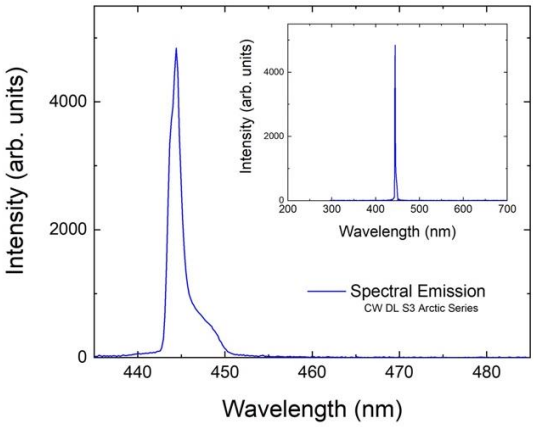


Figure S3-A – Artic's spectral emission used in the preliminary tests, where the emission peak is centered at approximately 444 nm.

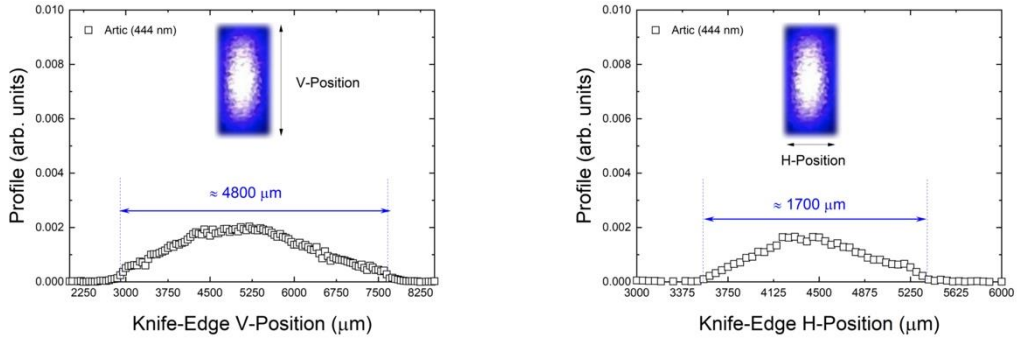


Figure S3-B – Artic's spatial profile was acquired with an automated knife-edge home system (step of 50 μm), revealing an elliptical-like spatial profile. No additional lens was used besides the set of lenses coupled to the output facet by the manufacturer. The cross-section was acquired at ~40 cm from the laser. The inset is a laser beam photograph in a black target to give the reader a qualitative aspect ratio of the beam.

Table S4 – Some of the technical specifications provided by the manufacturer regarding the **DM-B5000 laser (445 nm) model** from Sunshine Electronics (China) used in the automated tests conducted in this work. Wavelength emission, laser power, and beam shape were tested in the laboratory using an optical spectrometer (Avantes, AvaSpec-HERO, Netherlands), power meter (Coherent, PowerMax, USA), and automated homemade knife-edge system with a 50 μm step, respectively.

	Manufacturer Information	**Lab Performance**
Model Name	DM-B5000	-
Laser Product Class	4	4
Wavelength	454 nm	454 nm $\pm$ 1 nm (Figure S4-A)
Laser Type	Direct Diode	-
Max. Laser Power	1500 mW	800 mW $\pm$ 48 mW
Beam Spatial Profile	Not Informed	Elliptical Shape (Figure S4-B)
Beam Divergence	1.8 mRad	-
Duty Cycle	Continuous-wave (CW)	Continuous-wave (CW)

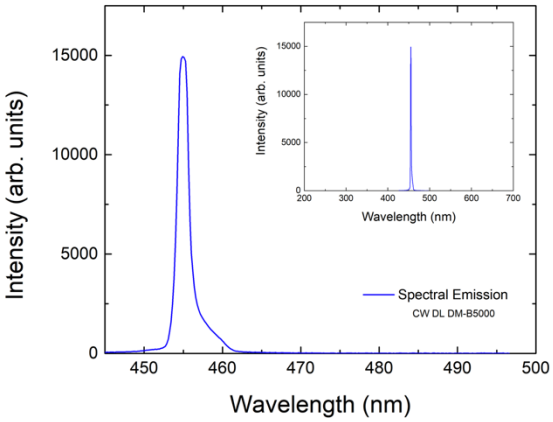


Figure S4-A – DM-B5000's spectral emission used in the preliminary tests, where the emission peak is centered at approximately 454 nm.

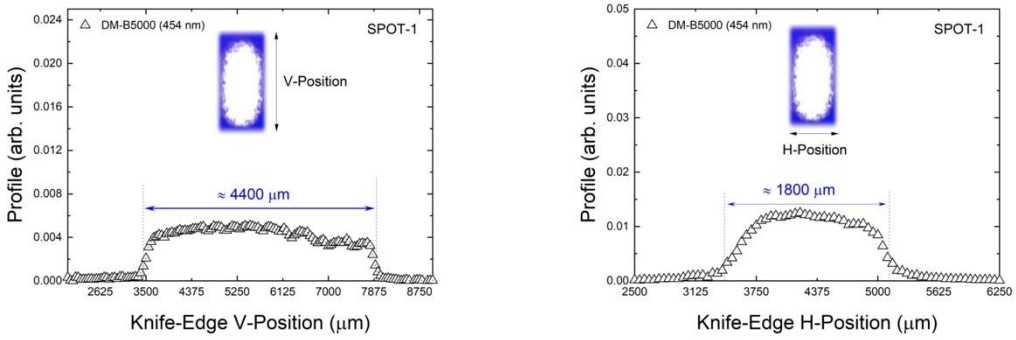


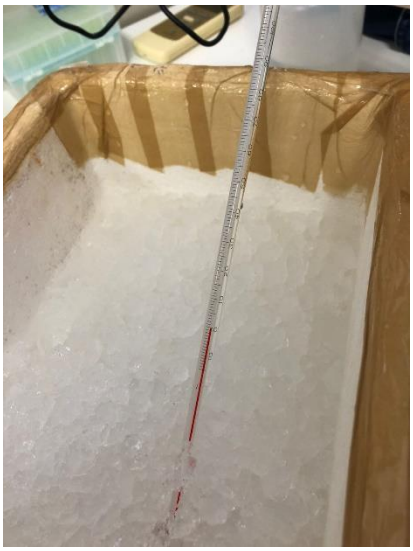
Figure S4-B – DM-B5000's spatial profile was acquired with an automated knife-edge home system (step of 50 µm), revealing an elliptical-like spatial profile. A 13,5 cm bi-convex lens was used in addition to the set of lenses coupled to the output facet by the manufacturer. The vertical and horizontal cross-sections were acquired at ~ 20 cm from the focal point. The inset is a laser beam photograph in a black target to give the reader a qualitative aspect ratio of the beam.

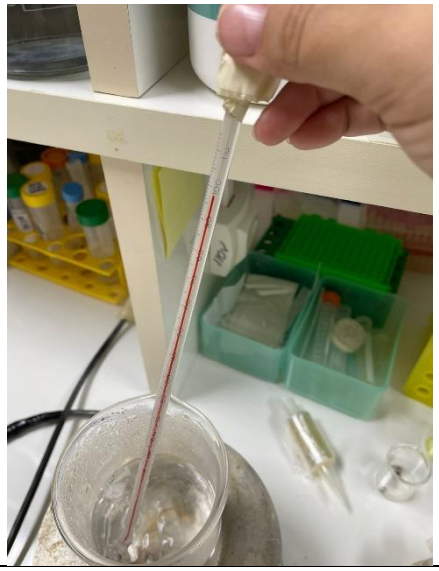
2 – Description and Calibration of Thermal Camera FLIR®

Temperature range: from -20 °C to +120 °C
Working wavelength: 8 to14 μm
Frame acquisition rate: 8.7 Hz
Spatial resolution: 12 μm

The thermal camera was calibrated as suggested by the manufacturer, using boiling water and melting ice. First, a mercury thermometer was used to measure the temperature of the boiling water (100ºC) and of melting ice (0ºC). Then, the thermal camera was used to capture thermal images of the boiling water and the melting ice with three replicates. The temperatures varied from 100.5 to 101.1ºC for the boiling water and from 0 to 0.3ºC for the melting ice, showing an acceptable variation.

The initial plant temperature, before laser application, was measured using the thermal camera and was consistently near room temperature (25-26ºC). When plants were exposed to laser irradiation for 1 s, a rapid increase in temperature was observed (to 36ºC), which was quickly captured by the thermal camera immediately after laser irradiation. Image acquisition time was less than 2 s. About 10 s after laser application, we measured the leaf temperature again and observed a rapid temperature decrease, back to room temperature, around 25–26ºC.





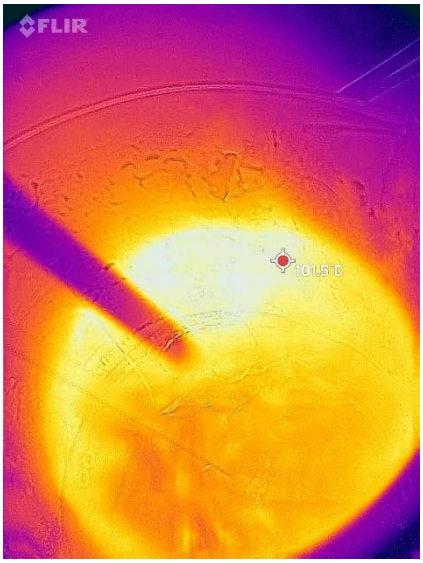


Figure S5 – Calibration procedures of the thermal camera used in this work.