1. Experimental section

1.1. Reagents and Materials.

IR-820 dye was purchased from Sigma-Aldrich (St. Louis, Missouri, USA).

1.2. Optical characterization of IR-820 dyes.

The absorption spectra of IR-820 in different solvents were measured by a UV/vis absorption spectrophotometer (Lambda 25, Perkin-Elmer, USA). Fluorescence emission spectra of IR-820 in different solvents were measured by a fluorescence spectrometer equipped with R928P and G8605-23 photodetectors, respectively (F920, Edinburgh Instruments, Ltd. UK).

1.3. NIR-Ia and NIR-Ib fluorescence imaging.

NIR-Ia images were acquired through an IVIS spectrum system (Caliper Life Sciences, Hopkinton, MA, USA) equipped with a silicon camera (detection range 350–900 nm) and a 700–900 nm bandpass filter. The excited light was 680 nm and NIR-Ia images were taken at a fixed exposure time of 1s. The images were processed by Maestro software. NIR-Ib images were captured using a 640 x 512 pixel two-dimensional InGaAs camera (detection range 900–1,700 nm) (Photonic Science, UK) equipped with a 900–1,000 nm bandpass filter (Thorlabs FEL, Newton, NJ, USA). A NIR lens pair SWIR-35 (Navitar, Rochester, NY, USA) was used to focus the image onto the photodetector. An 808 nm diode laser (laser glow technologies, Canada) offered excitation light. NIR-Ib images were captured at a fixed exposure time of 200 ms and Matlab 7 software was applied to process the images for any necessary flat-field correction.

1.4. Imaging experiment for R. rugosa.

R. rugosa purchased from a local florist was hydroponically grown in culture solution containing 50 µg/mL IR-820 under long-day conditions (16 h light, 8 h dark) at 25 °C and 40% humidity. Leaves, flowers and stems were fixed and imaged every 6 h without extraction.

1.5. Imaging experiment for G. sinensis, C. esculenta and C. interruptus.

G. sinensis and C. esculenta were obtained from the campus garden of Shenzhen Institute of Advanced Technology. C. interruptus was obtained from the hills of Liangtian Town, Chenzhou in Hunan Province. All plants were cultured in solution containing 50 µg/mL IR-820 under long-day conditions (16 h light, 8 h dark) at 25 °C and 40% humidity. Leaves and stems were cut, fixed and imaged after incubation for 24 h.

G. sinensis was incubated in culture solution containing 50 µg/mL IR-820 under long-day conditions (16 h light, 8 h dark) at 25 °C and 40% humidity. One of the plant’s side branches was either incubated inside an incubation chamber at 35 °C or irradiated by white light from a standard 15-W fluorescent light bulb placed 0.5 m away. Leaves and stems were extracted, fixed and imaged after incubation/irradiation for 6 h.

1.7. Detection and identification of fungal pathogens.

A naturally diseased K. senegalensis was obtained from the campus garden of Shenzhen Institute of Advanced Technology. The plant was cut, and its stem was cultured in solution containing 50 µg/mL IR-820 under long-day conditions (16 h light, 8 h dark) at 25 °C and 40% humidity. The diseased part of the stem was further cut, fixed and imaged after incubation for 24 h. For the inoculation experiments, C. gleosporoides and A. argyroxiphii were purchased from ATCC (Manassas, Virginia, USA). A 1 mL drop of inoculate containing 10 mg of either C. gleosporoides or A. argyroxiphii by dry weight was added to the healthy leaves of K. senegalensis and then left to grow at 25 °C and 90% humidity for 3–5 days. The plant was cut, and its stem was cultured in solution containing 50 µg/mL IR-820 under long-day conditions (16 h light, 8 h dark) at 25 °C and 40% humidity. Diseased leaves were extracted, fixed and imaged.

Fig. S1 Optical properties of IR-820 dye in different solvents. (a) UV/Vis absorption spectra in different solvents. (b) NIR-Ia emission spectra (λex = 680 nm) and (d) NIR-Ib emission spectra (λex = 808 nm) of IR-820 dye in different solvents.

Fig. S2 Toxicity analysis of IR-820 dye.
Fig. S3 White-light and NIR-Ib images of the leaf of *Swietenia mahagoni* (L.) *Jacq,* *Thelypteridaceae* and *Dracaena sanderiana.*

References