

Plant Measurement Example

Measurement of petals before and after staining

We measured petals before and after staining, using the Hadatomo™ Z photoacoustic microscope. The measurement area is 9 mm square, the scan step is 30 μm, and the laser wavelength is 532 nm.

We used lily petals. Fig 1 (a) shows an outside view of a corolla. We will use the water absorption function of the flower itself for staining, so we have pruned the stem, with 10 cm of stem left. Fig. 1(b) shows the stem, whose petals are being stained using a staining solution (Fantasy by Palace Chemical Co., Ltd.). We chose black as the stain color, because light absorption for wavelength of 532 nm is high in black. Immediately after the stem was pruned, we stained the petals for one hour, with the cut end of the stem being soaked in the staining solution. The petal before staining is shown in Fig.1 (c) and the petal after the straining is shown in Fig. 1 (d). The petal before staining is uniformly white, so we cannot see structures such as veins within the petal. In contrast, in the petal after staining, veins colored with black stain are clearly observed. We measured the areas surrounded by broken lines in Fig. 1 (c) and (d) using the Hadatomo™ Z.

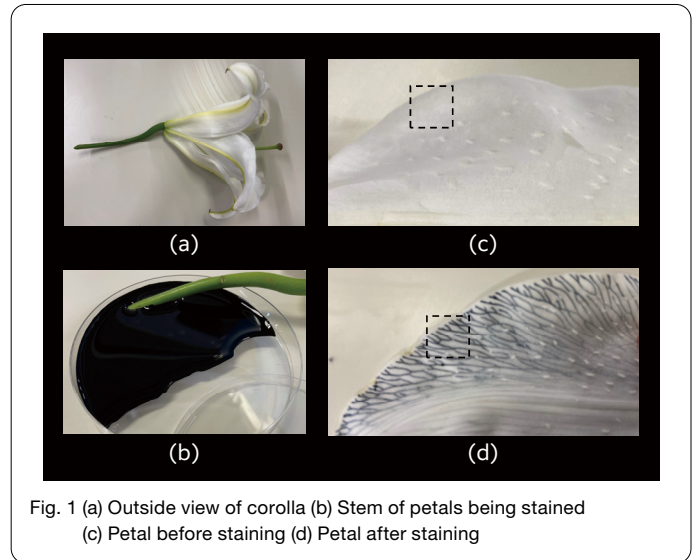


Fig. 1 (a) Outside view of corolla (b) Stem of petals being stained (c) Petal before staining (d) Petal after staining

Fig. 2 (a1) shows a photoacoustic image, and Fig.2 (a2) shows an ultrasound image superimposed on the photoacoustic image, of a petal before staining. Before staining, there is no stain or other light-absorbing substance inside the petal, so almost no photoacoustic signal is observed. In the ultrasound image, internal structure of the petal is observed by hardness difference, so it is assumed that the structure of flower vein is observed.

Fig. 2 (b1) shows a photoacoustic image, and Fig.2 (b2) shows an ultrasound image superimposed on the photoacoustic image, of the petal after staining. In the petal after staining, tubular photoacoustic signals are observed, so it is assumed that flower veins inside petals are adequately stained. In the image superimposed with the ultrasound image, arrows indicate the positions where structure changes in the ultrasound image. They are the stained positions in the photoacoustic image. Therefore, it is assumed that these areas are the flower veins, and the image of stain soaked inside the flower vein is observed.

As shown above, we could confirm that the Hadatomo™ Z photoacoustic microscope can conduct nondestructive measurement of a specified substance absorbed inside plants. There are possibilities that this technique can be applied for monitoring medicine absorption process on plants.

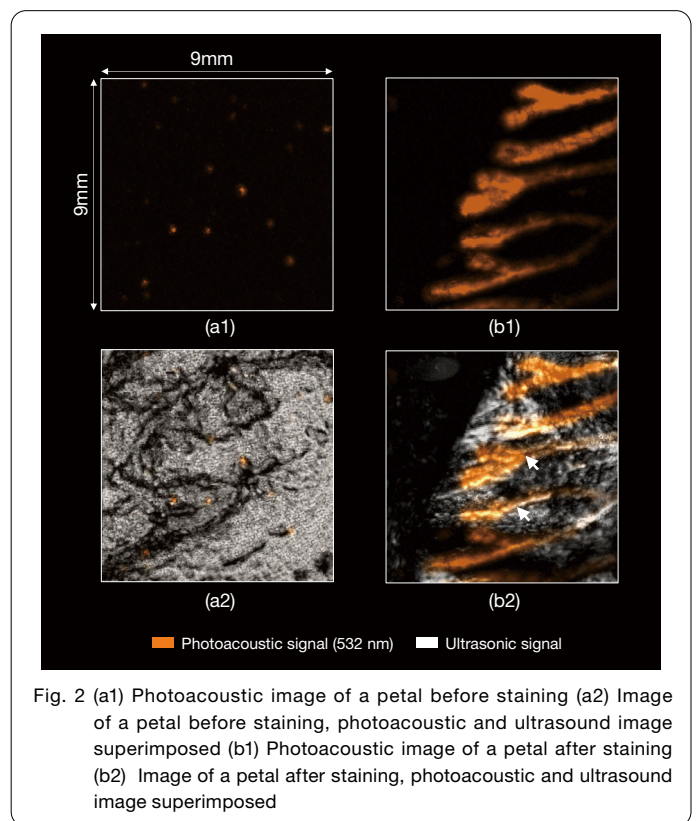


Fig. 2 (a1) Photoacoustic image of a petal before staining (a2) Image of a petal before staining, photoacoustic and ultrasound image superimposed (b1) Photoacoustic image of a petal after staining (b2) Image of a petal after staining, photoacoustic and ultrasound image superimposed

