DOI: 10.1017/S1431927603446692
Microsc Microanal 9(Suppl 2), 2003

Identification of Botanical Species Using RIMAPS Analysis on Images from Leaf Surfaces

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This research work introduces the application of Rotated Image with Maximun Average Power Spectrum (RIMAPS) analysis on biological surfaces (plant tissues). The study consists on identifying botanical species by analyzing the RIMAPS spectrum obtained from leaf surface images. It has been shown that the peaks appearing in RIMAPS spectra indicate surface pattern orientation and its characteristic topography [1] [2].. It has also been stablished that RIMAPS detects the very fingerprint of any analyzed surface enabling us to identify each individual specimen. Different species have been studied, such as *Colocasia esculenta*, *Brassica oleracea* and *Xanthosoma violaceum*. The observations of the surfaces were carried out with a scanning electron microscope (SEM). To investigate epidermal relief, different biological preparation techniques were applied [3] [4] [5]. The *Colocasia esculenta* leaf was observed with two different techniques: a) Liquid substitution with glycerol, without coating, of dried samples from herbarium; b) Liquid substitution with glycerol, without coating, of fresh samples which have been previously fixed with formalin-acetic acid-ethanol (FAA). The *Brassica oleracea* and *Xanthosoma violaceum* leaves were observed using liquid substitution with glycerol, without coating, of fresh samples.

The results indicate that RIMAPS spectra identify those peaks representing the biological species. Figures 1 and 2 show the surface of *Colocasia esculenta* using the preparation techniques a) and b). In the figure 3 it can be seen the few coincident peaks of both spectra that are representative of the species. The other peaks indicate the different preparation conditions. Figure 4 shows the RIMAPS spectra of *Xanthosoma violaceum* and *Brassica oleracea*. The respective spectra are quite different, as it was expected. In figures 5 and 6 the surfaces of both species are observed. These results emphasize the robustness of RIMAPS technique to characterize biological surfaces.

References

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[6] The authors thank Dr. P. Bozzano, Ing. M. Elechosa and Lic. P. Rosi, for their help in this work.

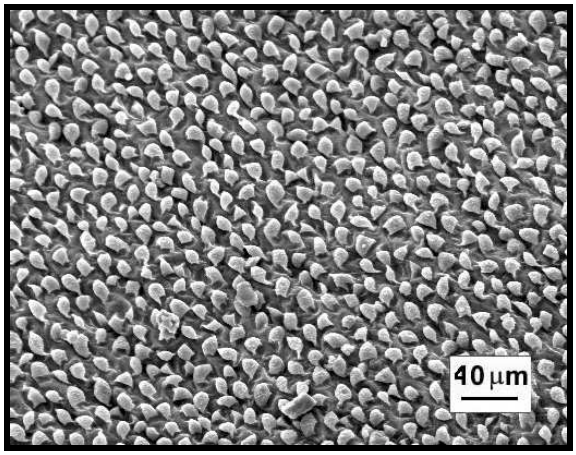

Figure 1. *Colocasia* surface with preparation (a).

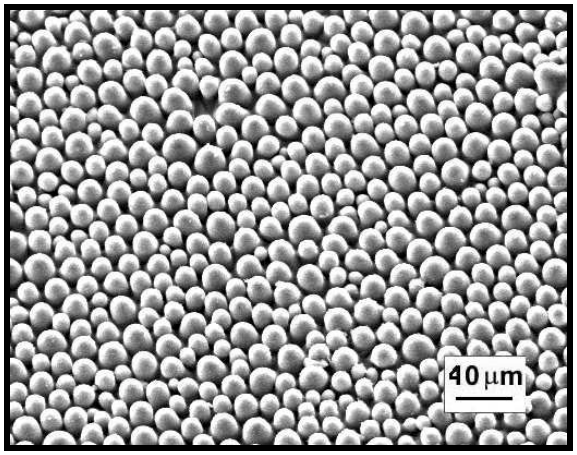

Figure 2.*Colocasia* surface with preparation (b).

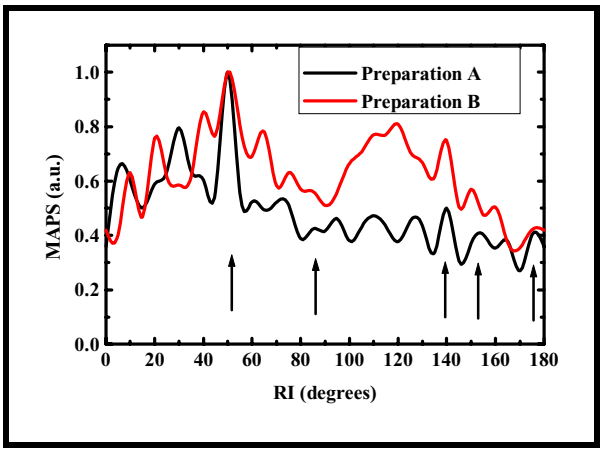

Figure 3. RIMAPS spectra of *Colocasia* surfaces with preparations (a) and (b).

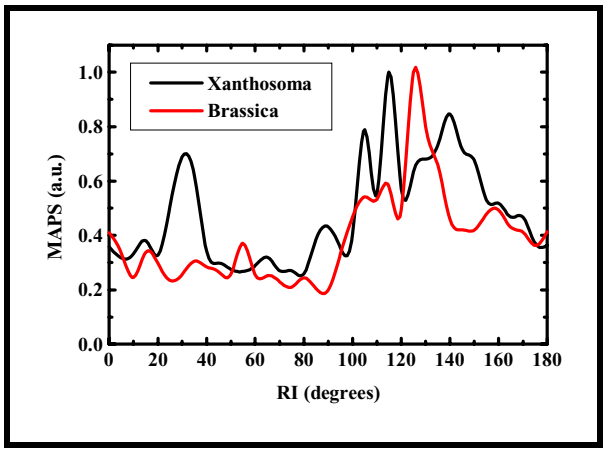

Figure 4. RIMAPS spectra of *Xanthosoma* and *Brassica* surfaces.

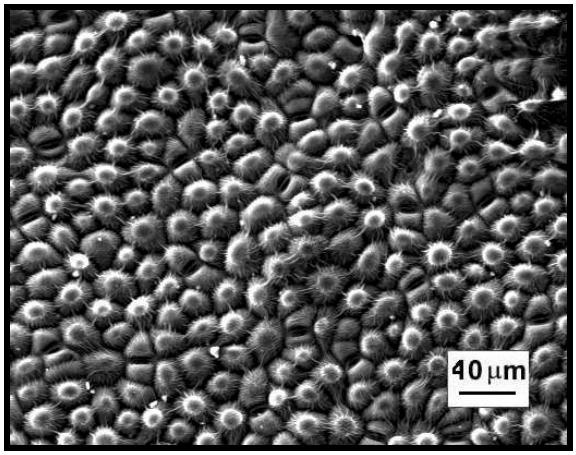

Figure 5. SEM micrograph of *Xanthosoma* surface.

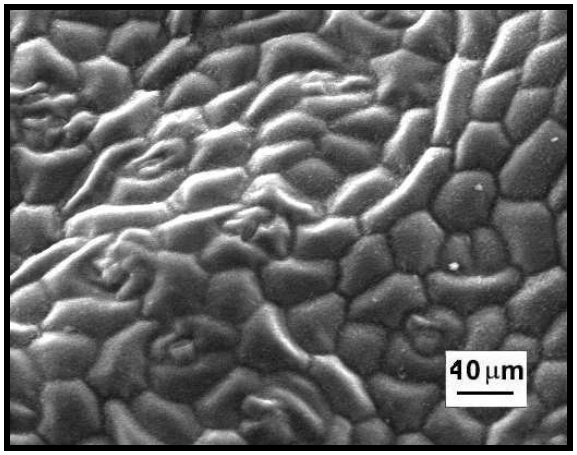

Figure 6. SEM micrograph of *Brassica* surface.

https://doi.org/10.1017/S1431927603446692 Published online by Cambridge University Press