Phenoplant: a web resource for the exploration of large chlorophyll fluorescence image datasets

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Auteur	Rousseau, Céline [1], Hunault, Gilles [2], Gaillard, Sylvain [3], Bourbeillon, Julie [4], Montiel, Grégory [5], Simier, Philippe [6], Campion, Claire [7], Jacques, Marie-Agnès [8], Belin, Etienne [9], Boureau, Tristan [10]
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Résumé en anglais	Background Image analysis is increasingly used in plant phenotyping. Among the various imaging techniques that can be used in plant phenotyping, chlorophyll fluorescence imaging allows imaging of the impact of biotic or abiotic stresses on leaves. Numerous chlorophyll fluorescence parameters may be measured or calculated, but only a few can produce a contrast in a given condition. Therefore, automated procedures that help screening chlorophyll fluorescence image datasets are needed, especially in the perspective of high-throughput plant phenotyping. Results We developed an automatic procedure aiming at facilitating the identification of chlorophyll fluorescence parameters impacted on leaves by a stress. First, for each chlorophyll fluorescence parameter, the procedure provides an overview of the data by automatically creating contact sheets of images and/or histograms. Such contact sheets enable a fast comparison of the impact on leaves of various treatments, or of the contrast dynamics during the experiments. Second, based on the global intensity of each chlorophyll fluorescence parameter, the procedure automatically produces radial plots and box plots allowing the user to identify chlorophyll fluorescence parameters that discriminate between treatments. Moreover, basic statistical analysis is automatically generated. Third, for each chlorophyll fluorescence parameter the procedure automatically performs a clustering analysis based on the histograms. This analysis clusters images of plants according to their health status. We applied this procedure to monitor the impact of the inoculation of the root parasitic plant Phelipanche ramosa on Arabidopsis thaliana ecotypes Col-0 and Ler. Conclusions Using this automatic procedure, we identified eight chlorophyll fluorescence parameters discriminating between the two ecotypes of A. thaliana, and five impacted by the infection of Arabidopsis thaliana by P. ramosa. More generally, this procedure may help to identify chlorophyll fluorescence parameters impacted by various types of stresses. We implemented this procedure at http://www.phenoplant.org [11] webcite freely accessible to users of the plant phenotyping community.
URL de la notice	http://okina.univ-angers.fr/publications/ua10937 [12]
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[2] http://okina.univ-angers.fr/gilles.hunault/publications
[3] http://okina.univ-angers.fr/publications?f[author]=12295
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[13] http://dx.doi.org/10.1186/s13007-015-0068-4
[14] http://www.plantmethods.com/content/11/1/24

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