



Image analysis from root system pictures

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Root research has been hampered by a lack of good methods and by the amount of time involved in making measurements. In general the studies from root system are made with either monolith or minirhizotron method which is used as a quantitative tool but requires comparison with conventional destructive methods. This work aimed to analyze roots systems images, obtained from a root atlas book, to different crops in order to find the root length and root length density and correlate them with the literature. Five crops images from *Zea mays*, *Secale cereale*, *Triticum aestivum*, *Medicago sativa* and *Panicum miliaceum* were divided in horizontal and vertical layers. Root length distribution was analyzed for horizontal as well as vertical layers. In order to obtain the root length density, a cuboidal volume was supposed to correspond to each part of the image. The results from regression analyses showed root length distributions according to horizontal or vertical layers. It was possible to find the root length distribution for single horizontal layers as a function of vertical layers, and also for single vertical layers as a function of horizontal layers. Regression analysis showed good fits when the root length distributions were grouped in horizontal layers according to the distance from the root center. When root length distributions were grouped according to soil horizons the fits worsened. The resulting root length density estimates were lower than those commonly found in literature, possibly due to (1) the fact that the crop images resulted from single plant situations, while the analyzed field experiments had more than one plant; (2) root overlapping may occur in the field; (3) root experiments, both in the field and image analyses as performed here, are subject to sampling errors; (4) the (hand drawn) images used in this study may have omitted some of the smallest roots.