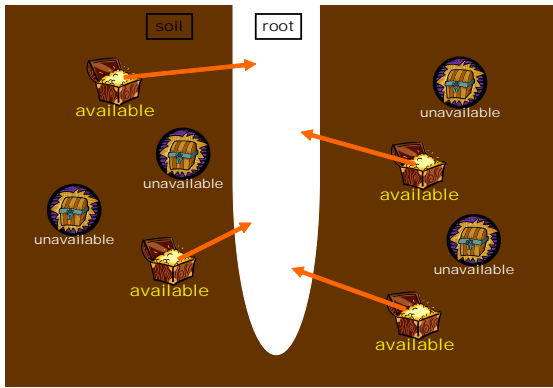


USING XYLEM SAP TO EVALUATE NUTRIENT AVAILABILITY

Akira Noguchi and Urs Schmidhalter

The "extraction method," used to evaluate nutrient availability in soil, in some cases involves complex, problematic and simultaneous assay of multiple components and mutual comparison of analytical values. We confirmed the possibility of using nutrient concentrations in xylem sap of sponge gourd (*Luffa cylindrica* Roem). seedlings as an indicator of nutrient availability in soil and suggested that the "xylem sap method," might be a solution to the above-mentioned problems and inaccuracies characteristic of chemical extraction. To determine whether or not a method is able to evaluate available nutrient contents in the soil, the criterion should probably be that the relationship between the values obtained by that method and the amount of absorption by plants does not vary according to the type of soil. In this respect, we compared the conventional extraction method with the proposed "xylem sap method". We attempted to change the CEC in soil by adding either zeolite or humic acid, or both, to the soil to change nutrient availability without changing the total quantity of nutrients in the soil in the pots. Our results showed that the amount of nutrients absorbed by plants was changed. However, in some cases, changes in the amount of phosphorus, calcium, magnesium, and zinc extracted by extractants, depending on the extractant, did not correspond to changes in the amount of these nutrients absorbed by plants. Thus, the amount of nutrients absorbed by plants was compared with nutrient concentrations in xylem sap and the amount of nutrients extracted by each extractant to examine their relationship. A highly positive correlation was constantly found between the amount of nutrients absorbed by plants and their concentrations in xylem sap for every nutrient. In contrast, the correlation was lower between the amount of nutrients absorbed by plants and the amount of nutrients extracted by the extractants. Particularly for phosphorus, no close correlation was obtained between the amount of absorption by plants and the amount of extraction when using any extractant. Since we attempted to change nutrient availability by artificially controlling the soil CEC, not by changing the total amount of nutrition present in the culture medium, changes in nutrient availability were not very dramatic. There is a possibility that the extraction method itself generates large errors for such small changes. In consideration of the above, we concluded that the xylem sap method is superior to the extraction method as an indicator of nutrient availability in soil, at least under the conditions of this experiment.



extraction method

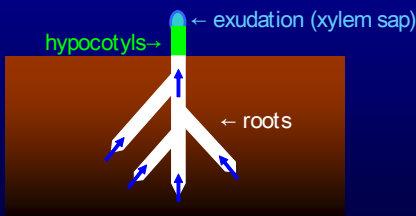
- ☀ easy to operate
- ☀ high reproducibility
- ☁ no contribution of plants
- ☁ extractant must be changed depending on the kind of elements and the soil conditions



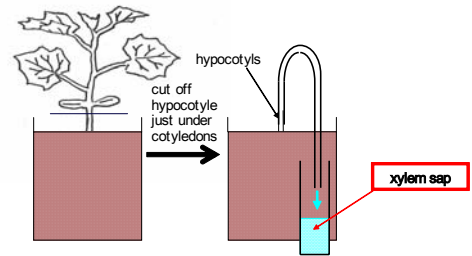
Let's ask **plants** availability!

Using plants as extractants

- There is contribution of plants.
- Different kinds of elements are able to be analyzed by using collected sap even if under different soil conditions.



collecting sap



Sponge gourd
(*Luffa cylindrica* Roem)

