Short Communication

Lateral Movement of Cations in Corn Leaves

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Seshadri Kannan

Isotopen Laboratorium, Forschungsanstalt für Landwirtschaft 33 Braunschweig, Federal Republic of Germany

ABSTRACT

Migration patterns of nutrient elements, viz. $^{54}\text{Fe}$, $^{54}\text{Mn}$, $^{65}\text{Zn}$, and $^{86}\text{Rb}$, supplied to young corn (Zea mays) leaves were studied using a modified chromatogram scanner. It was found that the isotopes supplied to one-half of the leaf did not migrate to the other side across the midrib, but moved generally toward the base of the applied part of the leaf.

Supplying the plant nutrients through the leaves is a well known agronomic practice, and foliar spraying is perhaps the only means of remedying micronutrient deficiencies in plants when there are limitations in soil for root absorption. In the last few years, several studies have been made to understand the basic mechanisms of ion penetration through the leaf cuticles and ion absorption by the leaf tissues and cells (2, 5, 8). It has also been shown that some growth substances influence the translocation of nutrients absorbed by the foliage (4, 7).

Bukovac and Wittwer (1) studied the extent of transport of foliar applied radioisotopes and classified 15 nutrient elements as mobile, partially mobile, or immobile. The micronutrients Fe, Mn, and Zn are considered to be partially mobile and are not readily translocated from the site of absorption. We investigated the migration patterns of Fe and Mn in corn leaves by means of a modified chromatogram scanner and found that the elements were essentially moving toward the base of the leaf, when these were supplied to either the apex, middle, or base position of the excised as well as intact leaves (3). The present report describes the migration patterns of Fe, Mn, Zn, and Rb, when supplied to only one-half of the corn leaf. It is found that there is very little lateral migration from the applied region to the other part of the leaf.

MATERIALS AND METHODS

Corn (Zea mays cv. Hybriidor) seeds were germinated and grown in Vermiculite, and the second leaves of 7-day-old seedlings were used in the experiments. Solutions containing different isotopes, $^{54}\text{Fe}$, $^{54}\text{Mn}$, $^{65}\text{Zn}$, and $^{86}\text{Rb}$ (0.05 ml to supply 10-50 $\mu$Ci)
RESULTS AND DISCUSSION

The scans of the radioactivities in the leaf halves are presented in Figure 1. The site of isotope application is indicated by a circle. The right and left halves of the leaf were separated as indicated by dotted lines in the leaf sketch given in the figure. The scans reveal that there is very little radioactivity detected in the left half of the leaf for all of the elements, in general, for both the partially mobile and freely mobile elements. The results clearly show that the inorganic cations are not directly transported across the midrib of the leaf. However, the nutrients may get recycled over the entire plant through the conducting vessels, given sufficient time, and the time taken for redistribution will perhaps depend on the mobility of different elements. The lack of transport across the midrib has also been found to be true in the excised leaf. This indicates that lateral transport within the leaf cannot be induced by preventing the export outside the leaf. Therefore I concluded that intercellular migration of inorganic cations is a slow process, and direct transport across the conducting vessels does not take place in monocot leaves. However, Müller and Leopold (6) obtained a lateral transport of some ions under the influence of a growth substance, kinetin.

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LITERATURE CITED