NOTIZEN

Differential Migration of Foliar Applied Zinc in Maize Plants

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The mobility of $Zn^{2\oplus}$ was assessed by supplying $^{65}Zn^{2\oplus}$ to the different leaves of maize plants, and radioassaying the plant parts after 2 days. It was found that the 3rd leaf (from the base) absorbed more $Zn^{2\oplus}$ than other leaves. A larger percentage of $Zn^{2\oplus}$ transported, was identified in the stem in general. The study further revealed that there was a close link between the 1st and the 4th leaf for the transport of $Zn^{2\oplus}$.

Mineral elements supplied to the root or the leaves have to be transported to different parts before their utilisation in their structure and function. The leaf is the seat of vital processes like photosynthesis, and also functions as a "sink" for mineral ions, too.

Micronutrients like $Fe^{2\oplus}$, $Mn^{2\oplus}$, and $Zn^{2\oplus}$ are considered to be poorly translocated from the site of absorption [1]. However, our short-term studies have shown that the problem is more associated with the re-translocation from the older to younger leaves, rather than the transport from the root [2]. The distribution of mineral elements into the leaves of a plant is dependent on a number of factors, *viz.*, the mobility of the element and the leaf age. The mobility is determined by measuring the rate of translocation of a radioactive element from leaf to leaf. The distribution of $K^{\oplus}$, $Ca^{2\oplus}$, $Mg^{2\oplus}$, and $Mn^{2\oplus}$ have been studied recently by Van Goor and Wiersma [3]. We have investigated the absorption and transport of $Zn^{2\oplus}$ by the different leaves of maize plants, and this information is basic to an understanding of the causative factors for poor mobility of $Zn^{2\oplus}$.

Maize (*Zea mays*, cv. Hybridor) were grown in soil medium for 2 months, and plants having 5 leaves were selected for uniformity. The tip of a leaf of a plant was placed upto 2 cm deep into $^{65}Zn^{2\oplus}$ labelled 0.1 mM $ZnSO_4$ solution (specific activity 10 μCi/μmol, and pH 5.5) in a test tube, and after an absorption period of 2 days, was excised and desorbed [4] for 1 hour. The transport of $Zn^{2\oplus}$ to the leaves and stem was measured from the radioactivity of the samples and expressed as nanomoles per plant part [5]. The position of the leaves is indicated by serial numbers beginning from the base to apex of the plant.

The results (Table) show that the amount of $Zn^{2\oplus}$ absorbed by the leaf part exposed to $^{65}Zn^{2\oplus}$ is the highest for the 3rd leaf, followed by the 4th and 5th leaf. The amount transported to the rest of the treated leaf is more in the 1st leaf, and is the lowest in the 5th leaf. The greater transport within the 1st leaf is also observed when the values are expressed as a percent of the total transport.

Table. Absorption and transport of $^{65}Zn^{2\oplus}$ to the leaves and stem, following the application to one of the leaves of maize plants. The values for the treated leaf is indicated by boldface types.

Content in Plant Parts	Leaf receiving the treatment, numbered from base to apex									
	1st leaf		2nd leaf		3rd leaf		4th leaf		5th leaf	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Treated leaf tip	6.59		15.77		42.79		29.35		18.14	
1st leaf	**0.207**	55.9	0.009	6.1	0.227	34.4	0.433	35.0	0.069	17.3
2nd leaf	0.025	6.8	**0.114**	64.4	0.024	3.5	0.049	3.9	0.076	19.1
3rd leaf	0.009	2.4	0.005	2.8	**0.150**	22.1	0.098	7.9	0.013	3.3
4th leaf	0.048	13.0	0.011	6.2	0.011	1.6	**0.127**	10.3	0.018	4.5
5th leaf	0.020	5.4	0.016	9.0	0.047	6.9	0.013	1.1	**0.072**	18.1
stem	0.061	16.5	0.022	11.5	0.221	31.5	0.516	41.8	0.150	37.7

(a), absolute amount, nmol per plant part; (b) percent of the total transported outside the treated part.

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The data on the transport to leaves and stem show that a larger percent is transported to the stem, in general. The transport to the stem is the highest when the 4th leaf is treated. The results indicate that $Zn^{2\oplus}$ is first accumulated in the stem before further transport to the different leaves. Furthermore, the pattern of retranslocation to other leaves from the treated leaf shows that there is a close connection between the 1st and 4th leaf. This is revealed by the largest amounts transported to the 1st and 4th leaf, when the 4th and 1st leaf respectively were supplied with $Zn^{2\oplus}$. The relationship observed here is found to be consistent and the variability between the triplicate values is within a 10% range.

When the 1st and 2nd leaf were treated, larger amounts are found to be transported within the treated leaf, than to other leaves and stem. In contrast, larger amounts of $Zn^{2\oplus}$ absorbed by the 3rd, 4th and 5th leaf are transported to the stem, 1st and 2nd leaf, showing that there is a rapid downward transport from the 3rd leaf and above, while the upward transport from the 1st and 2nd leaf is rather limited.

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