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Movement of ^{45}Ca in the Phloem of Yucca

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Redistribution of calcium applied to leaves has in general been shown to be very limited, although the phloem exudate does contain a minute amount of calcium [1–3]. The evidence obtained by Millikan and Hanger [4] indicates that a relatively large amount of calcium must be applied locally: the fixation capacity for this ion is saturated and some mobile fractions are left. Their evidence for transport in the phloem is indirect and indicated by the redistribution pattern, which is similar to that for assimilates. Research by Ringoet *et al.* [5] corroborates these findings.

As even excised parts of a young inflorescence stalk of *Yucca flaccida* Haw. have been shown to be capable of producing measurable amounts of pure phloem exudate [6], it seemed attractive to check the earlier observations. For this purpose, 10–15 cm long segments of a young inflorescence stalk were placed with the basal cut in a small amount of solution containing different amounts of calcium, labeled with 2 μC/ml ^{45}Ca. The solution also contained 0.01 M Na-EDTA and was at pH 5.0.

The exudate appearing at the top cut was collected on filter paper and could drip into a beaker. Fresh collections were started in the course of the experiment by making new cuts at the tip to remove plugged phloem. At the end of the experiment, 2 mm thick slices were excised from the stem pieces at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ height and at the tip. Samples of exudate and tissue slices were analyzed for radio-activity by the liquid-scintillation technique.

With rather dilute Ca solutions applied at the base, the collected exudate showed no radio-activity. With acidified 0.008 M Ca to which EDTA was added, transport of a trace of ^{45}Ca could be detected. Experiments carried out a year later with 0.02 M Ca solutions nearly all demonstrated calcium transport. After only 3 h ^{45}Ca was detected in the exudate. ^{45}Ca activity can already be detected in the exudate at the tip of the stalk pieces when calcium penetration into the bulk of the tissue has just about reached half way. So, once the

^{45}Ca has been able to enter the phloem, its translocation is ahead of the slow general penetration upwards in the parenchymatous tissues.

The results obtained in the *Yucca* experiments therefore confirm the previous observations that local application of relatively large amounts of calcium results in measurable uptake into the phloem and subsequent transport.

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