

A CONCENTRATION GRADIENT IN CORN STALKS.

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In a recent paper, Evelyn I. Fernald¹ has shown that the osmotic concentration of the sap of different portions of stems is correlated with the tendency of buds to develop on those portions. She has found by freezing point measurements on the expressed sap that in actively growing stems of privet, chestnut, *Philadelphus*, and *Bryophyllum* there is a concentration gradient, the highest concentration being in the apical portions, the lowest in the basal portions. In connection with these findings of Fernald on dicotyledonous stems, some measurements of the specific gravity of juice expressed from successive internodes of the corn stalk may be of interest.

The plants used in this study were all vigorous, 8 to 11 feet high, with large but immature ears. The juice from single internodes was expressed for the specific gravity measurements, except in the upper portions of the stalks where it was always necessary to take two or more adjacent internodes as one sample in order to obtain enough juice. Occasionally, also, the two basal internodes were expressed together, as indicated by brackets in the table.

After removal of the tough cortex, the tissue was thoroughly crushed in a food chopper. The juice was squeezed from the pulp by hand through a muslin cloth, and filtered until clear through a folded filter paper. Precautions against evaporation were observed throughout.

The specific gravity of the juice was determined by means of a small pycnometer in the form of a glass capsule with capillary intake and outlet tubes. A second weighing of the pycnometer filled with juice refiltered through the same paper constituted a check on each measure-

¹Fernald, E. I., *Am. J. Bot.*, 1925, xii, 287.

ment. The two weighings practically always agreed within 0.0002 gm. The specific gravity of each sample of juice given in Table I is the ratio of the weight of the sample to the weight of an equal volume of distilled water at approximately the same temperature as the juice.

To compensate for any cumulative changes in the cut stalks on standing, the order of expression and measurement of the juice from

TABLE I.
The Concentration Gradient in the Juice of Corn Stalks as Shown by Specific Gravity Measurements.

Internode (numbered from base of stalk).	Individual plant number.							
	1	2	3	4	5	6		
1	1.0347	} 1.0308	} 1.0325	1.0255	} 1.0452	1.0346		
2								
3	1.0340	1.0304	1.0328	1.0255	1.0458	1.0376		
4		1.0323	1.0331	1.0265	1.0486			
5	1.0404	1.0353	1.0358	1.0312	1.0519	1.0382		
6	1.0418	1.0371	1.0376	1.0334	1.0522			
7	1.0433	1.0385	1.0397	1.0355	1.0530	1.0395		
8	1.0448	1.0394	1.0400	1.0365	1.0534	1.0398		
9	1.0452	1.0401	1.0424	} 1.0383	} 1.0542	1.0404		
10*	1.0463	} 1.0416	1.0458			} 1.0413		
11*	} 1.0479			} 1.0473	} 1.0398		} 1.0561	
12								
13	} 1.0497	} 1.0428	} 1.0496			} 1.0427		
14								
15								
16								

* Ears borne on tenth and eleventh nodes of all these stalks.

the different internodes was varied in the different experiments. In some, the measurements proceeded from the lowest internode upwards to the top of the plant; in others, from the top downwards; and in still others, from the middle of the stalk alternately upwards and downwards. But no effect of the sequence of the determinations was discernible.

In Table I are given the data for six representative stalks, on each of which eight or more measurements were made. Similar gradients

were found in all of the thirty-eight stalks examined. The plants were cut on different days, so that the differences in the absolute values characterizing the individual stalks are probably due to differences in soil moisture and in the other environmental factors which have been shown to affect sap concentration.

It is interesting to note that in many stalks the specific gravity values for the two or three lowermost internodes do not conform to the gradient which is so well defined in every case above the third internode. With the exception of this frequent irregularity at the base of the stalks, the data are in accordance with the cryoscopic measurements reported by Fernald,¹ and with those on the gradient in trees, reported by Dixon and Atkins,² Chandler,³ and Harris, Gortner, and Lawrence.⁴

² Dixon, H. H., and Atkins, W. R. G., *Scient. Proc. Roy. Dub. Soc.*, 1916, xv, 51.

³ Chandler, W. H., *Missouri Agric. Exp. Station, Research Bull.*, 14, 1914, 491.

⁴ Harris, J. A., Gortner, R. A., and Lawrence, J. V., *Bull. Torrey Bot. Club*, 1917, xlv, 267.