Table 2. Effects of Substituting Mannitol Solutions for the Water Bathing the Petioles of Detached Leaves of *Xanthium pennsylvanicum*

Leaf No.	Time (min from mannitol application)	Mannitol concentration (M)	Stomata ($\log_{10} R$)	Transpiration deflexion (mm)
	Before mannitol treatment			
1	−1	—	$\bar{2}$·46	160
2	−1	—	$\bar{3}$·61	70
3	−1	—	$\bar{3}$·21	140
4	−1	—	$\bar{3}$·50	180
5	−1	—	$\bar{4}$·86	130
6	−1	—	$\bar{4}$·91	170
7	−1	—	$\bar{4}$·98	110
8	−1	—	$\bar{4}$·84	120
	After mannitol treatment			
1	+2½	0·4	$\bar{2}$·26	180
2	+2½	0·4	$\bar{3}$·21	80
3	+3	0·2	$\bar{4}$·98	175
4	+3	0·2	$\bar{4}$·72	240
5	+3	0·1	$\bar{4}$·77	150
6	+3	0·1	$\bar{4}$·46	200
7	+5	0·05	$\bar{4}$·84	125
8	+5	0·05	$\bar{4}$·68	130

resulted in a change in the suction pressure gradient to the epidermal cells and the loss of turgor of the latter caused 'passive' opening of the stomata, resulting in increased transpiration.

In a third type of experiment we have observed the stomatal changes that follow the cutting of the stem of a *Xanthium* plant in air ('Ivanoff effect'). Within 2–5 sec of excision a minute movement of the meniscus in the Wheatstone bridge porometer (observed with a lens or a reading microscope) indicates a very small closing movement of the stomata. This we interpret as the 'passive' closure due to the release of tension in the xylem sap. There is then a delay of a further 15 sec, after which the usual opening movement begins. We suggest that this delay is the time necessary for the water in the xylem to be used up in transpiration and the leaf water content to begin to fall. Quantitative estimates of the amounts of water involved are of course highly desirable and we hope to attempt these in the future.

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[1] Rufelt, H., *Nature*, **197**, 985 (1963).
[2] Heath, O. V. S., *Nature*, **200**, 190 (1963).
[3] Rufelt, H., *Nature*, **200**, 191 (1963).
[4] Ivanoff, L., *Ber. deutsch. Bot. Ges.*, **46**, 306 (1928).
[5] Rufelt, H., *Physiol. Plant.*, **9**, 154 (1956).
[6] Heath, O. V. S., and Russell, J., *J. Exp. Bot.*, **2**, 111 (1951).
[7] Meidner, H., and Spanner, D. C., *J. Exp. Bot.*, **10**, 190 (1959).

First, I would like to correct a vagueness in my contributions to this discussion. I certainly think that the changes in transpiration are caused by stomatal movements. I think this is very evident from an earlier paper of mine[1]. Certainly I have myself no experimental proof in my papers hitherto published but a flood of evidence can be found in the literature[2–6] and theoretical considerations point in the same direction[7]. Secondly, I do not agree with the authors when they assume that I postulate that the transpiration stream passes through the cells in the root because I postulate a permeability barrier. In earlier experiments[1] the root permeability and cell permeability were found to be probably not identical. Where the permeability barrier is localized is still a matter for discussion[8].

Thirdly, the three series of experiments published do not disprove either the hypothesis of Ivanoff or my interpretations. The main point is that the stomata are thought to be influenced by the water potential of the cell wall and not by the water potential of the whole leaf. In short-term experiments these may differ. Consequently, changes in water content of the total leaf such as those obtained by Heath and Meidner in the first series of experiments are not illustrative of the changes determining the stomatal movements. The increase which Heath and Meidner suggest that I should try to detect cannot be shown in determinations of water contents of leaves. One possibility would be to demonstrate it as an increase in water transport upwards in a plant and as such it has in fact been shown by Allerup[9–11]. It might be added that the reason why I have assumed that the easily movable water is localized in the cell walls is that this has been suggested by Strugger and others[12,13].

The results of the second series of experiments are very similar to those obtained by Haines[14] and Humphries[15]. These authors interpreted the increases in transpiration as caused by changes in water permeability. However, one circumstance makes the present experiments difficult to interpret. An osmotic suction from the mannitol solution requires a semipermeable structure. If there is one, its permeability can be changed.

The third series of experiments is a recapitulation of those of Allerup[10] which he has interpreted according to Ivanoff's hypothesis.

It is evident that most of the experiments can be interpreted according to both the hypotheses. Nevertheless, I still cannot find that the experiments described in my communication[16] by Figs. 1, 2 and 3 have been explained by Heath's hypothesis. However, I think we all make extrapolations from our results and would like to postpone further discussions as to who is right and who is wrong until some more pertinent experiments have been performed.

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[1] Rufelt, H., *Physiol. Plant.*, **12**, 390 (1959).
[2] Allerup, S., *Physiol. Plant.*, **13**, 112 (1960).
[3] Brun, W. A., *Plant Physiol.*, **36**, 577 (1961).
[4] Darwin, Fr., and Pertz, D. F. M., *Proc. Roy. Soc.*, **84**, 136 (1911).
[5] Koch, W., and Keller, Th., *Ber. Deutsch. Bot. Ges.*, **74**, 66 (1961).
[6] Willis, A. J., Yemm, E. W., and Balasubramaniam, S., *Nature*, **199**, 265 (1963).
[7] Spanner, B. C., in Ruhland, W., *Encyclopedia of Plant Physiol.*, **2**, 125 (1956).
[8] Slatyer, R. O., *Ann. Rev. Plant Physiol.*, **13**, 351 (1962).
[9] Allerup, S., *Physiol. Plant.*, **12**, 907 (1959).
[10] Allerup, S., *Physiol. Plant.*, **14**, 632 (1961).
[11] Allerup, S., and Nielsen, J., *Physiol. Plant.*, **15**, 172 (1962).
[12] Strugger, S., *Naturwiss.*, **31**, 181 (1943).
[13] Hylmö, B., *Physiol. Plant.*, **11**, 382 (1958).
[14] Haines, F. M., *Ann. Bot.*, **50**, 283 (1936).
[15] Humphries, E. C., *Ann. Bot.*, N.S., **2**, 665 (1938).
[16] Rufelt, H., *Nature*, **197**, 985 (1963).

Effect of Chloramphenicol on the Uptake of Salts and Water by Intact Castor Oil Plants

The antibiotic chloramphenicol has been found to inhibit accumulation of salt by slices of red beet tissue and carrot tissue without significantly affecting respiration[1]. This supports the hypothesis that the mechanism of salt uptake is closely related to protein synthesis put forward by Steward and Millar[2], as chloramphenicol is a specific inhibitor of protein synthesis.

Experiments have been carried out to determine the effect of chloramphenicol on the salt uptake of intact plants. Castor oil plants (*Ricinus communis*) were grown singly in aerated culture solution in 500 ml. polythene growth vessels. The culture solution was similar to that described by Stout and Arnon[3] except that it was diluted ten times and iron was present as chelate. The concentrations of potassium, calcium and nitrate were 0·79 mM, 0·50 mM and 0·38 mM respectively. The solution was renewed daily during the growth of the plants. In each experiment the uptake of the foregoing three ions and