The Influence of salts on the exudation of tomato plants
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Viscosity was minimal by day. This rhythm could be maintained over several days. Changes in the periods of illumination could influence the time at which maxima and minima occurred. Virgil demonstrated that the changes in viscosity ran parallel to those in permeability under certain circumstances. It seems possible to explain the changes of both water and salt transport as a result of changes in viscosity. However, there is nothing known as yet about the occurrence of such changes in the plasm of root cells.

**V. SUMMARY**

Starting from the supposition that the exudation is the result of a transport of salt to the vessels the salt secretion was investigated under various circumstances. For this purpose the rate of exudation was determined continuously, while the osmotic value of the sap was determined at certain instants. Also in some cases the water conductivity of the roots was determined. In most experiments tomato plants were used. Some experiments were repeated with Sanchezia nobilis.

The influence of the salt concentration of the medium on the salt secretion was studied first. Lowering the salt concentration of the outer solution caused a decrease of the rate of exudation, the course of the change depending on the extent to which the osmotic value of the medium had been simultaneously altered. From changes caused in this way it was concluded that the salts given off to the vessels must come partially from the root cells, while another part must have been transported directly to the vessels after having been taken up from the medium. If salts are present in the medium the latter process causes an increase in the exudation, but only if nitrates and chlorides are included. The importance of these anions for the exudation was demonstrated by determinations of the composition of the exudation sap. It appeared moreover that transport of phosphate to the vessels takes so much more time than that of nitrate and chloride that it suggests a different method of transport. The presence of nitrate or chloride in the outer solution always caused an increase in the exudation, no matter what cations were present.

The exflux of salts from the tissue — the tissue secretion — as well as the transfer to the vessels of salt taken up from the medium — the uptake secretion — was inhibited by inhibitors like potassium cyanide, dinitrophenol, sodium arsenate, sodium fluoride, iodo acetic acid and moreover phenylurethane. This indicates that both processes partially coincide. Their common part might be the transport of salts through the symplast. The water conductivity was also affected by these substances.

Sugar proved to promote the exudation only if salts were present in the medium.

The fact that the tissue secretion depended on the osmotic value of the medium led to the supposition, that salt and water are given off together from the tissue. An osmoregulation of the movement of water must take place. Changes in viscosity were influenced by the rhythm of plant growth: plants were not possible to suck in by the roots were shown to be influenced by day, a minimum at which maximum occurred. The changes in viscosity ran parallel to those in permeability under certain circumstances. It seems possible to explain the changes of both water and salt transport as a result of changes in viscosity. However, there is nothing known as yet about the occurrence of such changes in the plasm of root cells.
maintained over a certain period; these could influence the permeability of the organism and demonstrate changes in viscosity. The occurrence of such changes is shown in Table 2.

The rate of exudation, salt secretion and water conductivity of the roots were shown to suffer periodic fluctuations, a maximum occurring by day, a minimum during the night. A relation between the time at which maxima and minima occurred and certain conditions during the experiments or the period of cultivation could not be demonstrated. The changes in the rate of exudation observed under certain conditions were in agreement with the supposition that the exudation consists of a transport of salt and a transport of water, the roots acting as an osmometer. A less satisfactory agreement between the osmotic value of the sap calculated according to this hypothesis and the value determined was sometimes found. In most cases too, a value was actually found, in some, however, the osmotic value of the exudation sap was higher than would be expected. The possible causes of this deviation have been discussed.

LITERATURE CITED


