Short Communication

Auxin-Induced Expansion Growth in Disks of Chicory Root (Cichorium intybus)

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Summary. Expansion growth in response to auxin in chicory root slices is greater than that reported for any other fleshy tissue. Responsiveness depends on time of harvest and duration of root storage.

The recent emphasis on the interrelation of auxin-induced expansion growth and de novo nucleic acid and protein synthesis (1,5,9,10,12) points up a growing interest in auxin responsive tissue and in the metabolic prerequisites for growth. In the absence of studies relating to the metabolic transformations which take place in slices of chicory root following slicing and aging (7,8), expansion growth in response to auxin was found to be greater than that reported for any other storage tissue. Furthermore, in the intervening years it has become amply clear that the metabolic changes in question constitute the sine qua non for subsequent growth in response to auxin (11). For these reasons the venerable but heretofore unreported data presented below are offered in the hope that chicory may prove useful material in further studies involving the mechanism of auxin action.

Methods and Materials

Roots of large-rooted chicory (Cichorium intybus) were grown in the field. Seeds (Ferry Morse, Mountain-View, California or Department of Farm Crops, Michigan State University) were started in the greenhouse in March, transplanted to the field in late May, and harvested at designated intervals thereafter. Plants flowered in late September. Blocks of tissue 4 cm on a side were cut from the middle section of previously washed and peeled roots. [See (6) for the anatomical details of the tissue involved]. Blocks were several times pierced along the longitudinal root axis with a cork borer 7 mm in diameter. Millimeter-thick disks were prepared by slicing the pierced blocks with a microtome. Disks were washed in distilled water for 1 and one-half to 2 hours before use. Thereafter, 10 disks were gently shaken in 3 ml solution in small stellar or petri dishes. At regular intervals disks were surface dried, weighed, and returned to fresh solutions. 2,4-D concentration was 0.5 mg/l, pH 6.0; temperature, 25°. Solutions were unbuffered. Frequent change of solution maintained the pH and minimized contamination.

Results and Discussion

To date, the greatest responses to auxin by slices of fleshy storage organs have been manifested by Jerusalem artichoke slices which increase in volume in response to IAA or 2,4-D from 30 to 90% in 4 to 6 days (2,4,9,11). Potato slices are less responsive (3,11). Chicory disks expand until they virtually fall apart. Disks enlarge into ellipsoids, the long axis being normal to the numerous, parallel vascular strands. The parenchyma cells enlarge isodiametrically, while the vascular elements remain relatively unchanged and thereby limit expansion along one axis. Table I describes a more than

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2-fold enlargement in response to 2,4-D, which is not unusual. Table II indicates that within limits responsivity increases with storage at 3° following harvest, while Table III signifies that within limits responsivity also increases with advancing time of storage. Ca++ (0.01 M) enhances the response to auxin (Table II). Slices from roots stored from 9 to 10 months are totally unresponsive to auxin.

The respiration rise which is initiated by slicing and develops with time in chichory slices can be prevented by low temperatures, anaerobiosis, lithium ion and a variety of metabolic inhibitors (7, 8). Volume growth in response to auxin is precluded whenever the respiratory transformation is prevented. Auxin is not required for the initial metabolic changes prerequisite to growth (11). Chichory slices from freshly dug roots which show at least some malonate sensitivity will enlarge in response to auxin. Totally malonate resistant slices will not. As more is learned of the basic metabolic changes which are evoked by slicing storage organ tissue, prospects will improve for the specification of those metabolic events which are particularly related to auxin-mediated growth.

### Literature Cited