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Short Communication

Cellulase in Latex and its Possible Significance in Cell Differentiation

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Summary. Cellulase was found to be present in the latex of species with articulated laticifers but it could not be detected in the latex of species with non-articulated laticifers. It is suggested that cellulase is involved in the removal of end walls during the differentiation of articulated laticifers.

During the formation of articulated latex vessels, cell fusion takes place and walls between adjacent differentiating cells break down (ESAU, 1965). Electron microscopic investigations strongly suggest that the wall is dissolved enzymatically (SASSEN, 1965). Since cellulase could be involved in the removal of wall material, the latex of various plants has been examined for the presence of this enzyme. The latex of several plants with non-articulated laticifers has also been assayed for cellulase; laticifers of this type develop by intrusive growth without cell fusion or breakdown of cell walls (ESAU, 1965).

Latex was collected into vessels cooled with ice, and then centrifuged (SHELDRAKE and MOIR, 1969). The cellulase activity of the serum phase was measured viscometrically at 22° C and pH 6.0 using carboxymethyl cellulose as substrate. The composition of the reaction mixture and the calculation of units are described elsewhere (SHELDRAKE and MOIR, 1969).

The cellulase activities found in various latices are shown in the Table. It can be seen that cellulase is present in latex from articulated laticifers, and was not detected in latex from nonarticulated laticifers, strongly suggesting that the enzyme is concerned with the removal of wall material during differentiation. Some of the activities are high, compared with other reports of cellulase from higher plant tissues; for example, the cellulase activity of *Hevea brasiliensis* latex is 50—150 times that measured by TRACEY (1950) in expressed sap from the stems and leaves of tobacco plants (SHELDRAKE and MOIR, 1969).

Little is known about cellulase in higher plants, and all previous work has involved detecting it in sap or homogenates from a mixture of tissues. Since it is probably invoved in wall removal during the differ-

Table. *Cellulase activity of various plant latices*

Plant	Source of latex	Cellulase activity (Units/5 ml latex serum)	Type of laticifer
Apocyanaceae			
Dyera costulata HOOKER	Bark	0 (< 0.2)	Non-articulated
Caricaceae			
Carica papaya LINN.	Fruit	11	Articulated
Euphorbiaceae			
Hevea brasiliensis MUELL. ARG. (Clone RRIM 600)	Bark	203	Articulated
Hevea spruceana MUELL. ARG.	Bark	61	Articulated
Hevea benthamiana MUELL. ARG.	Bark	23	Articulated
Hevea pauciflora MUELL. ARG.	Bark	43	Articulated
Euphorbia pulcherima WILLD.	Bark	0 (< 0.5)	Non-articulated
Moraceae			
Ficus elastica ROXB.	Bark	0 (< 0.1)	Non-articulated
Ficus indica LINN.	Bark	0 (< 0.2)	Non-articulated
Musaceae			
Musa textilis NEE	Petiole	31	Articulated
Sapotaceae			
Achras sapota LINN.	Fruit	19	Articulated

entiation of articulated laticifers, it seems reasonable to suggest that it may also play a part in wall removal during the differentiation of xylem vessels: again, there is ultrastructural evidence that enzymic hydrolysis of wall material is involved (SASSEN, 1965). This could account for the presence of the enzyme in homogenates of plant tissue or in sap expressed from them. The higher amounts of cellulase in young than in mature tissues (TRACEY, 1950) could be a reflection of the larger number of xylem elements differentiating in them. It has been found that treatment of pea epicotyls with auxin causes a considerable increase in cellulase activity over a period of a few days. These increases have been explained as showing that cellulase is involved in auxin-induced cell enlargement by weakening the primary walls of the growing cells (FAN and MACLACHLAN, 1966). However, since the concentrations of auxin applied induce considerable vascular differentiation within the tissue (SCOTT, 1938), the elevated cellulase activities could be due to the increase in number of differentiating xylem cells.

In the study of cell differentiation in plants it is usually difficult to correlate the results of ultrastructural and biochemical investigations

since the contents of the differentiating cells cannot be obtained free from contamination by other cells. Because of this difficulty, very little is known about the biochemistry of cell differentiation in higher plants, although for some tissues, like the xylem and phloem, much information is available about the ultrastructure of the differentiating cells. It is unfortunate that the differentiation of laticifers has received relatively little attention, since they have the unique advantage that anatomical and ultrastructural studies can be correlated with biochemical studies on the cytoplasm of the differentiated cells, readily available in the form of latex.

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