Preliminary

Characterization of Xyloglucan Endotransglycosylation in Suspension-cultured Poplar Cells

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Abbreviations: XXXG, heptasaccharide (glucose/xylose, 4:3); XXXGXXXG, tetradecanosaccharide (glucose/xylose, 8:6); XXXGXXXGXXXG, hendecosanosaccharide (glucose/xylose, 12:9); XXXGXXXGXXXGXXXG, (glucose/xylose, 16:12).

Introduction

Xyloglucan endotransglycosylases occur widely in higher plants[1], where the enzyme activities catalyze the transfer of a part of one xyloglucan to the other xyloglucan (oligosaccharides). The activities are closely related to various physiological aspects of plant growth, such as seed germination[2,3], cell expansion[4], GA3-related elongation[5], somatic embryogenesis[6], and fruit ripening[7]. The question is specifically whether xyloglucan endotransglycosylase in poplar cells are responsible for xyloglucan degradation or xyloglucan rearrangement in the cell wall. It is necessary to characterize the dominant reaction for xyloglucan endotransglycosylases in suspension-cultured poplar cells. This paper describes the properties of xyloglucan endotransglycosylase in suspension-cultured poplar cells and the changes of the enzyme activity during growth.

Results and Discussion

Xyloglucan endotransglycosylase activities in suspension-cultured poplar cells were determined by the quantity of ^{3}H-xyloglucan formed by the transfer of a part of large xyloglucan molecule to [^{3}H]-XXXGol. The specificity of acceptor was studied using

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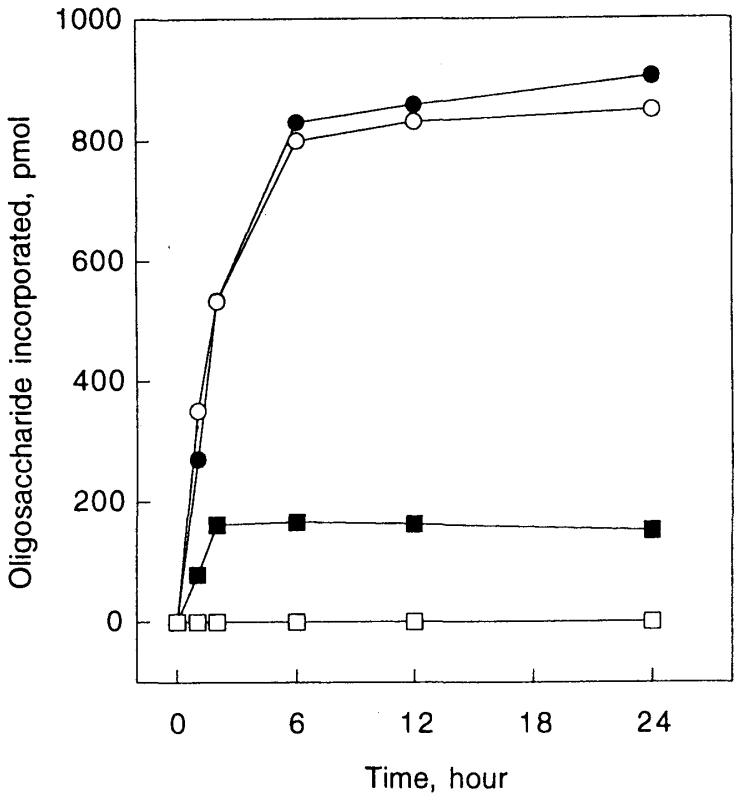

Fig. 1. Time course of xyloglucan endotransglycosylation with oligosaccharides using XXXGol (●) and XXXGXXXGol (○) and XXXG-XXXGXXXGol (■) and XXGXXXGXXXGXXXGol (□) as acceptor. The concentration of each oligosaccharide was at 200 μM.

alterative xyloglucan molecule such as ^{3}H-monomer (XXXGol), ^{3}H-dimer (XXXGXXXGol), ^{3}H-trimer (XXXGXXXGXXXGol) and ^{3}H-tetramer (XXXG-XXXGXXXGXXXGol) of heptasaccharide (Fig. 1). The quantity of ^{3}H-xyloglucan formed by the ^{3}H-monomer and ^{3}H-dimer increased in proportion to the reaction time within 6 h. But the ^{3}H-trimer and ^{3}H-tetramer were completely ineffective as acceptor. Though the concentration of each acceptor was varied in the reaction mixture, high molecular sizes of acceptor such as ^{3}H-trimer and ^{3}H-tetramer were ineffective. These results show that xyloglucan endotransglycosylase transfers xyloglucan to low molecular xyloglucan oligosaccharides. It was suggested that the xyloglucan endotransglycosylase may appear to function for the degradation of xyloglucan rather than rearrangement of xyloglucan.

Plant hormones such as 2, 4-D and benzyladenine, abscisic acid, gibbererin, brasinolide, ethylene did not enhance the enzyme activity during the early stage of growth.

The activity of xyloglucan endotransglycosylase markedly increased at the exponential growth and decreased immediately at the stationary phase of cells in present of 2, 4-D (Fig. 2). The enzyme activity is not evoked by 2, 4-D but increased and then decreased during

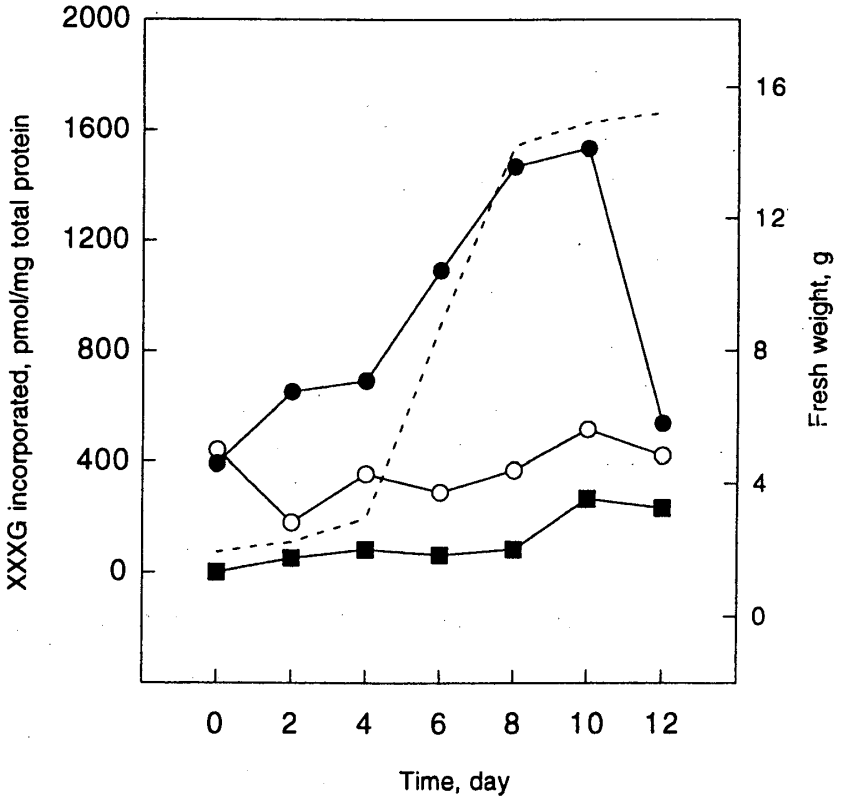

Fig. 2. Changes of xyloglucan endotransglycosylase activity during cell growth. The cells were grown in shaker flasks in the MS medium containing 10 μM 2, 4-D. On the days indicated, cells were harvested for determination of xyloglucan endotransglycosylase activity in buffer-soluble (○) and buffer-insoluble (●), extracellular fraction (■).

cell development in the present of 2, 4-D. These results suggested that the activity of xyloglucan endotransglycosylase is developmentally regulated during normal cell growth.

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