Chapter 8

Composition and Structure of Cell Wall Polysaccharides in Forages

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Plant cell walls of forages serve as a major source of energy for ruminants. The cell walls consist mainly of polysaccharides, protein, and lignin. These polymers together with small amounts of other components, like acetyl groups and phenolic substituents, are organized in complex three-dimensional structures that are neither uniform nor completely described for different plants, plant fractions, or cell wall structures (Nordkvist, 1987; Áman & Graham, 1990). Also the utilization by ruminants of cell wall components is different for various plant fractions and development stages, as well as for different types of cell walls (Chesson et al., 1986).

Cell wall polysaccharides in forages are a complex group of components differing widely in physical properties and nutritional effects (Graham et al., 1990). The recent upsurge of interest in polysaccharides has resulted from the development of more sophisticated and accurate methods of analysis and the realization that cell wall polysaccharides are not only energy-yielding compounds but can also control the utilization of other dietary components (Áman & Graham, 1990). The relation between structure and nutritional effect is, however, as yet poorly understood.

Information about the composition and organization of forage cell walls is of vital importance to understand the mechanisms of ruminant digestion and optimize pretreatment conditions and utilization of ruminant feeds. In this chapter, methods of structural analysis of forage cell wall polysaccharides will be discussed as well as polysaccharide structures. Also, the composition of nonstarch polysaccharides in different forages and forage fractions will be presented.

I. FRACTIONATION

For structural analysis of cell wall polysaccharides, it is often necessary to isolate cell wall materials. Growing and parenchymatous tissues generally