

Cattle Producer's Handbook

Nutrition Section

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Forage Terminology

Plant Structure

Forages or roughages are difficult feeds to define. Some have described forages as bulky feeds that have relatively low digestibility. Such a definition, however, has major exceptions. Corn silage is definitely a forage, but can be over 70 percent digestible. Perhaps the best way to understand forages is to look at the properties that make them unique.

Forages contain significant portions of plant cell-wall material (Fig. 1). From the standpoint of a forage user, the amount and type of plant cell wall is extremely important because it greatly influences how a particular forage will be used by animals to produce meat or milk. A young plant cell has a single outer layer referred to as the primary cell wall. Later, as the plant matures, a second layer is laid down on the inside of the cell. This is called the secondary cell wall.

The secondary wall is thicker, and gives the plant cell tensile strength. The main structural components of the primary and secondary walls are the complex carbohydrates, cellulose, and hemicellulose. Together, the primary and secondary cell walls make up a large portion of the forage (40 to 80 percent).

Humans and species with similar digestive tracts have very limited ability to digest plant cell wall compounds. This is unfortunate, as cellulose is one of the most abundant materials on earth. Forage eaters, however, have bacteria and other microbial populations in their digestive tracts that can partially digest these compounds into usable nutrients. Animals that have the ability to use forages as the primary portion of their diet do not have the enzymes necessary to digest the cellulose and hemicellulose compounds found in forage. They must rely on the microbial populations within their digestive system.

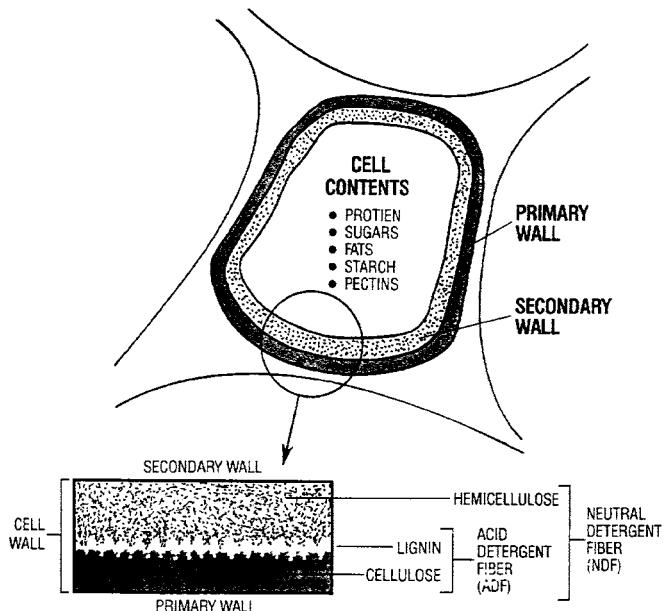


Fig. 1. Diagram of a plant cell showing wall structure.

With advancing growth and maturity, forage cells insert a non-carbohydrate material known as lignin into the primary and secondary walls. This complex compound gives the plant additional tensile strength and rigidity. Lignin can be thought of as the primary skeleton of the plant cell. It is important from a nutritional perspective because it is a non-digestible substance and its presence will inhibit the availability of the cellulose and hemicellulose portions of the forage.

A simplified analogy is to think of the young plant cell wall as a wall containing two layers. The initial primary cell wall is the outer brick wall, lacking mortar. The secondary cell wall is like cinder blocks on the inside