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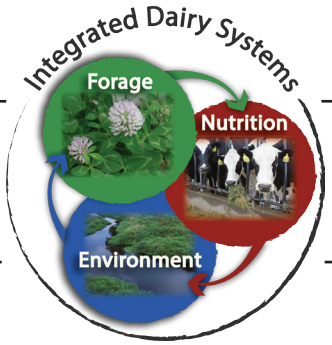
A quick lesson on plant structure, growth and regrowth in pastures



U.S. Dairy Forage Research Center

Without really knowing it, grazing-based dairy producers are often faced with the question: Is pasture management based on what's best for the animal, or what's best for the plant? Manage for the plant because it is the basis of feeding.

A grazing-based producer benefits most from having a uniform and predictable seasonal distribution of grass. How does one achieve this? First let's take a quick lesson in plant growth and structure and how they're affected by weather and management.

Photosynthesis of carbohydrates

It starts with photosynthesis which uses the sun's energy to produce carbohydrates in the plant. Fructose, a sugar, is the primary carbohydrate.

Carbohydrates:

- are produced by photosynthesis;
- enable the plant to grow more leaves and tillers;
- are stored in stem bases, roots, and rhizomes;
- are consumed by grazing animals;
- keep plants alive during stress (winter, drought).

Effects of grazing

How does grazing affect the plant? In order to regrow and make the necessary leaves, the plant uses two sources of energy: existing leaves, which make new carbohydrates via photosynthesis; and stored carbohydrates.

When an adequate residual is left after grazing, photosynthesis in the leaves remaining produces most of the carbohydrates for new leaves (Figure 1). When there is an inadequate residual left after grazing, the plant must move stored carbohydrates up from the stem base to produce new leaves (Figure 2). Plants would prefer to grow new leaves by producing carbohydrates with old leaves than by moving stored carbohydrates. It's easier and more efficient. Figure 3 shows the rate at which grass grows depending on the residual height. The rate increases as residual increases – until the grass is long enough to start shading the underside of the plant and slowing down the growth.

Figure 1

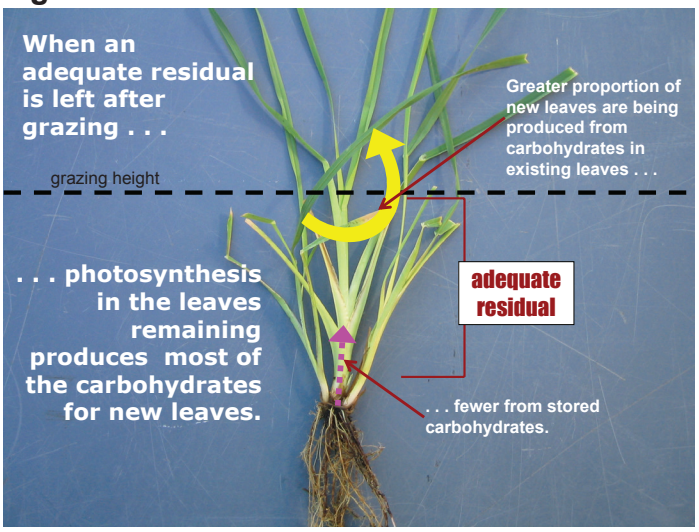
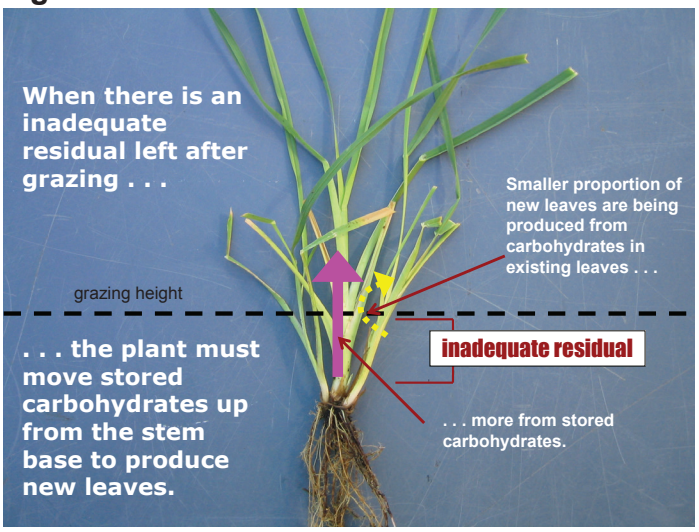


Figure 2



An adequate residual height, which promotes quicker regrowth, also shortens the length of time before cattle can graze in the same pasture again (Figure 4). Shorter residual height:

- will increase the length of rest periods;
- may change pasture composition;
- may encourage weeds.

Grazing during drought

During dry weather, be on the lookout for early signs of moisture stress. During moisture stress, plants are more dependent on stored carbohydrates for growth. Increase residual height of the grazed plants and lengthen the rest periods between rotations. This way there are more leaves present to help supply the plant with carbohydrates.

If the drought persists, consider a sacrifice pasture. Remove the animals from all paddocks except this sacrifice pasture and feed them hay. You know that the plants in the sacrifice paddock may die from overgrazing, but you'll be saving the rest in the process.

The importance of the late-season grazing period

In late summer and early fall, temperate grasses produce new tillers that will be the basis for growth in the following spring. Because growing conditions may be less than optimum during this time, control grazing pressure to insure productive pastures next year; severe defoliation near the end of the growing season will reduce future forage production.

Let grasses grow (uninterrupted) 3 to 4 leaves before a killing frost to store sufficient carbohydrates, and leave a 3 - 4" residual. ❑

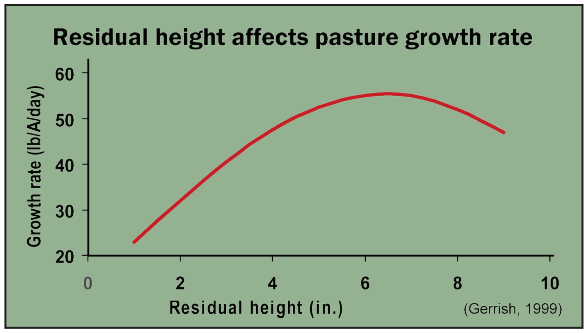


Figure 3. Grass grows back more quickly when there is adequate residual height after grazing.

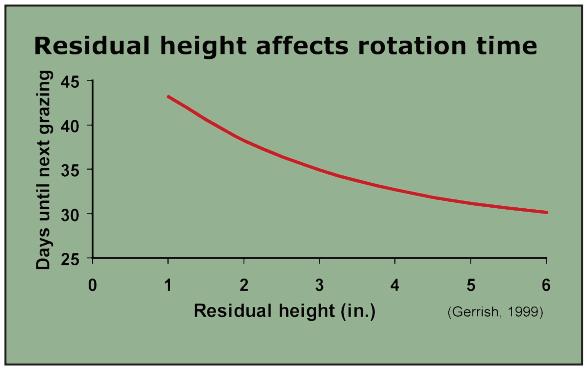


Figure 4. An adequate residual height will also shorten the length of time until grass can be grazed again.

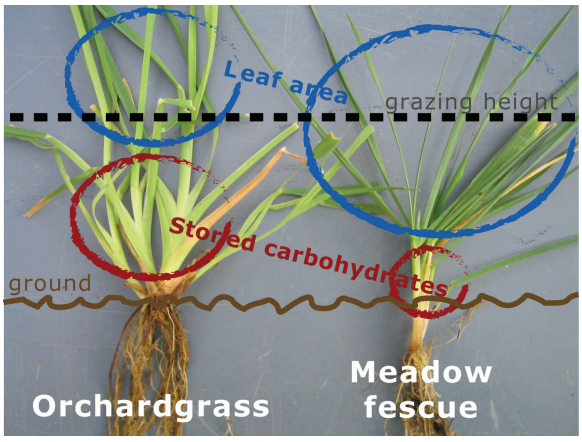


Figure 5. When compared to meadow fescue, orchardgrass exhibits slower regrowth after grazing for two reasons: The stored carbohydrates in the stem base are more likely to be eaten (and not available for regrowth) because the stem base is higher in the canopy; and there is less leaf area remaining after grazing to photosynthesize new carbohydrates.

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