Corn is the most widely used forage crop in the U.S., and corn silage usually comprises the bulk of the roughage portion of dairy diets. Corn is a popular forage crop because it is high yielding, very palatable to animals, high in energy content, relatively easy to grow and preserve as silage, and is well adapted to mechanization from planting to feeding.

Brown midrib (BMR) is a genetic trait found in corn and a number of forage species (i.e., sorghum, sudangrass, pearl millet, and now alfalfa (not technically the same trait but new varieties with low lignin concentration are becoming available)) and is characterized by plants having lower lignin content. Corn plants with the BMR trait show reddish to brown pigmentation of the center midrib on the underside of the leaf and thus the name “brown midrib” was coined from this phenotypic trait for grasses with this type mutation in the lignin biosynthesis pathway. In grasses, the pigmentation or color starts to become visible in plants at the four- to six-leaf stage. The color is also seen in the stem as lignification becomes apparent in rind and vascular bundles. Leaf pigmentation fades as the plant matures but remains in the stalks. Although the trait is considered as recessive (the recessive gene must be expressed on both pairs of the chromosome for the full effect to occur), whole-plant corn containing any of the BMR genes will always exhibit the reddish brown coloration on the leaf and stalks.

Occurring as a natural mutation, the first BMR corn was discovered in 1924 from a one-year self-pollinated line of northwestern dent corn at the University of Minnesota. The impact of this gene comes about since it involves changes in the expression of certain enzymes involved in lignin biosynthesis. In effect, the BMR gene interferes with lignin production in the plant and results in these forages having lower lignin content than their conventional counterpart. The BMR gene has little to no effect on the concentration of other important plant quality components in corn such as crude protein (CP), neutral detergent fiber (NDF, often associated with voluntary intake), acid detergent fiber (ADF), and ash.

To date, four BMR mutant genes called alleles have been identified in corn and have been labelled bm1, bm2, bm3, and bm4. Each mutated allele has different impacts on the production of lignin, which is a very complex pathway. However at the current time, most BMR corn hybrids used and commercialized by the seed industry have the bm3 allele that generally induces lower lignin concentrations and higher NDF digestibility than the other bm genes.

For more than 35 years, numerous research studies in ruminant nutrition have studied the use of corn hybrids with the low-lignin (BMR) trait. Following will be a review of some of the benefits and drawbacks on the use of BMR corn in ruminant nutrition. The article will also try to provide some suggestions on how BMR corn can be successfully used in dairy production systems.

Lignin composition and plant function

What is lignin and what is its function in plants? Lignin is an important, highly complex compound found in plants, making it possible for non-aquatic (dryland) plants to exist. Of the biopolymers found in plant cell walls, lignin is the only one that is not composed of carbohydrate (sugar) monomers. Instead, lignin is made up of complex polymers of aromatic alcohols (coumaryl, coniferyl, and syringyl alcohols) known as monolignols. How these alcohols bond to each other is quite variable, so lignin is often a mixture of many different complex molecules and lacks a defined primary structure. Lignin works with the other cell wall fiber components such as cellulose to provide