

Literature citations comparing bmr-6 and bmr-12 genes in Sorghum genus.

1) Porter, K.S. et. al. (1978). Crop Science 18:205-208.

This publication reports research involving the original brown midrib mutants developed at Purdue University. Data is presented showing forage quality parameters for the 19 original mutants. Comparison of measured forage quality parameters clearly showed in the original research that the bmr-12 gene is superior to the bmr-6 gene.

Comparison of bmr-6 and bmr-12 genes			
Porter, K.S. et. al. (1978). Crop Science 18:205-208.			
Forage Quality Parameter	bmr-6	bmr-12	bmr-18
Stem lignin (ADL)	4.37	3.46	3.45
Stem In Vitro Dry Matter Disappearance (IVDMD)	64.0	74.0	74.3
Stem In Vitro Cell Wall Disappearance (dNDF)	61.9	76.9	72.9
Leaf lignin (ADL)	5.02	4.73	5.23
Leaf In Vitro Dry Matter Disappearance (IVDMD)	63.5	66.0	6.4
Leaf In Vitro Cell Wall Disappearance (dNDF)	70.8	79.0	77.3

Stem and leaf lignin content of bmr-12 are lower than for bmr-6. More importantly, fiber digestibility is significantly higher in bmr-12 compared to bmr-6.

Subsequent research by others indicated bmr-6 and bmr-12 are associated with reduced activity of different enzymes in the lignin biosynthetic pathway. Bmr-6 modifies activity of cinnamyl alcohol dehydrogenase (CAD) whereas bmr-12 modifies activity of caffeic acid O-methyl transferase (COMT). Based on the results of Porter and others, modification of COMT appears to result in greater reduction of lignin and improved digestibility.

2) Barriere, et. al. (2003). Animal Research 52:193-228, are quoted as follows: “ The BMR-12 mutant in sorghum(s) (and possibly bmr-18) which are altered in COMT activity appeared as most efficient in cell wall digestibility improvement”.

3) Oliver, A.L. et. al. (2005). Crop Science 45:2234-2239, working at USDA-ARS Lincoln Nebraska report as follows: “When all data are considered in aggregate, the bmr-12 gene appears superior to the bmr-6 in terms of less negative impact on agronomic performance and greater positive impact on ADL content and fiber digestibility”.

- 4) Dann, H. et al. (2007). J. Dairy Science 90:556, working at USDA-ARS Lincoln Nebraska report on feeding studies with forage stover. Comparison of digestion kinetics with wild type, bmr-6 and bmr-12 sorghum revealed the following: NDF - 52.7, 53.1, and 50.9%, respectively; ADL – 5.3, 3.8, and 3.6%, respectively; Potential Extent of Digestion (PED) of dry matter – 52.1, 55.6, and 64.3%, respectively; PED of NDF – 53.1, 54.7, and 65.3%, respectively.

Research conducted in the last 30 years since the initial publication of Porter et. al. has increased knowledge and understanding of the mechanisms of the different bmr genes and confirmed the original findings that the bmr-12 gene is superior to the bmr-6 gene in improving forage quality and animal performance.