

# Forage Legumes: Forage Quality, Fixed Nitrogen, or Both

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## ABSTRACT

Forage legumes have the unique attributes of producing a high-quality forage to enhance animal performance and the ability to utilize atmospheric N that eliminates the legume plants dependence on soil N. Biological N<sub>2</sub> fixation (BNF) rates are dependent on the infection by an effective rhizobia strain on the root hairs for each legume species. Producers planting forage legumes have the potential to utilize both benefits. However, both forage quality and BNF are influenced by numerous factors, including legume species, management practices, and climate, which determine their contribution to a forage-livestock system. Because of soil and climatic differences, the region of the United States dictates which legume species are grown, how productive they are, and how they are utilized in a forage-livestock system. Major factors influencing the contribution of legumes will be reviewed followed by a discussion of predominant legume species and their utilization in various regions of the United States.

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**Abbreviations:** BNF, biological N<sub>2</sub> fixation; DM, dry matter.

## LEGUME FORAGE QUALITY

MUCH IS KNOWN about the factors that influence legume forage quality because of the large alfalfa (*Medicago sativa* L.) hectareage and the demand for high-quality forage by the dairy industry (Undersander, 2004). The first report to represent forage quality by forage classes (perennial warm-season grasses, annual warm-season grasses, perennial cool-season grasses, annual cool-season grasses, and legumes) was by Ellis and Lippke (1976). In terms of total digestible nutrients (TDN), legumes were reported to have a higher range than all classes of grasses (Fig. 1). When presented on a dry matter (DM) disappearance basis in a more recent report by Collins and Fritz (2003), legumes and cool-season annual and perennial grasses are reported to be similar. At the same stage of maturity, legumes and cool-season grasses have similar acid detergent fiber (ADF) concentrations and DM digestibility values. However grasses are generally greater in neutral detergent fiber (NDF) and therefore have lower predicted voluntary intake levels resulting in lower animal performance than legumes.

The main factors influencing legume forage quality are species and maturity. If cut for stored forage, harvesting conditions are also a factor (Collins and Fritz, 2003). The difference due to species is primarily due to morphology of the shoot growth. In legume species with an erect growth habit, for example, alfalfa and red clover (*Trifolium pratense* L.), the percent stem increases with maturity (Barnes and Gordon, 1972). Stems are less

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