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Defoliation effects of leafy spurge on sheep rumen microorganisms

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Most herbivores avoid the noxious weed leafy spurge (*Euphorbia esula* L.) when grazing. However, ruminants, including sheep, will consume leafy spurge at levels up to 50% of their total diet. An herbivore may avoid a plant due to a nutritional deficiency in plant tissues, structural defenses, or the presence of adverse phytochemicals. Because leafy spurge is high in protein and has no structural defenses, we examined the presence of phytochemicals in the plant and the effects they may have on sheep rumen microorganisms. Plant secondary chemicals reduce an herbivore's ability to digest forages and assimilate nutrients, or are toxic at high levels. Plants may increase levels of secondary chemicals in regrowth as an evolutionary response to herbivory. Our objectives were: (1) to determine if defoliation increases the level of secondary plant chemicals in leafy spurge regrowth and (2) to determine if defoliation adversely affects sheep rumen microorganisms. We measured in vitro microbial gas production, purine accumulation and dry matter disappearance to evaluate sheep rumen microbial response to leafy spurge primary growth and regrowth. Primary growth and regrowth were collected on 9 June, 14 July, and 18 August, 1994. Forage quality of stems, leaves, and flowers was determined to establish baseline values to assess microbial response. All plant parts were analyzed using four ratios of leafy spurge and grass hay, and 100% grass hay was used as a control. We also analyzed primary growth and regrowth samples from each date for condensed tannins. The microbial assays indicate there is a positive associative effect with the addition of leafy spurge to grass hay. At very high levels of leafy spurge, the metabolic activity of rumen microorganisms is depressed, but at 75% leafy spurge, metabolic activity is higher than that of microbes consuming grass alone. However, purine concentrations indicate that microbial mass is the greatest at the highest levels of leafy spurge. Dry matter disappearance was the greatest in flowers and leaves, declined seasonally, and was lower for stem regrowth than for stem primary growth. Leafy spurge contains condensed tannins, they are highest in the stem regrowth, and they increase seasonally. We predict that at relatively high levels of leafy spurge early in the growing season, sheep rumen microorganisms are not adversely affected by secondary defense chemicals in the plant. However, as the growing season progresses microbial activity decreases. Defoliation increased the production of secondary defense chemicals in stems of leafy spurge.