Determining the Relative Affinities of Alkaloids in Reed Canarygrass for Tannic Acid

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Gramine, hordenine, and tannic acid are secondary metabolites found in animal fodder, such as reed canarygrass and sorghum, that can be toxic or detrimental to animals. However, these plant secondary metabolites provide stress resistance to the plants and are part of cattle’s natural, healthy diet. Recent studies suggest that some secondary metabolites found in plants bind and precipitate in the guts of cattle, preventing the animals from absorbing these toxic molecules. The purpose of this experiment is to determine the relative affinities of alkaloids gramine and hordenine for tannic acid in order to assess their role in the gastrointestinal tract of cattle. Bovine serum albumin(BSA) is a protein used in assays and is known to bind and precipitate tannic acid. In this experiment hordenine and gramine were combined at different concentrations with dyed BSA and tannic acid in a competition assay. The absorbance of the precipitated BSA in the samples was measured to determine how much the alkaloids inhibited the protein’s binding. Using the half-maximal inhibitory concentration (IC50) the relative affinity of the alkaloids for tannic acid was determined. The alkaloids were found to have a high relative affinity for tannic acid compared to several common proteins, suggesting that they bind with tannic acid in the gut of cattle to provide positive benefits. This had not been previously tested. The results of this experiment suggest that the use of reed canarygrass and sorghum in tandem as feed for cattle should be explored for its potential benefits in livestock farming. The results of this experiment are part of a larger body of evidence showing that a wide variety of plant secondary metabolites in cattle's diet is extremely beneficial to the animal's health.

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