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PLANT AMINES AFFECT STRESS RELATED AND REPRODUCTIVE HORMONE RELEASE IN SHEEP

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Background. Toxic plants occur on ranges throughout Texas. Guajillo is a commonly occurring browse species which is found from the Edwards Plateau, south into Northern Mexico. It offers browse of high nutritional quality. However, guajillo also contains a class of plant chemicals known broadly as 'amines' which, when over consumed by sheep and goats can cause paralysis of the legs. In extreme cases, death losses of up to 50% have been reported. The amine, N-methyl-B-phenethylamine (NMPA), and possibly also tyramine (T), have been reported to cause overstimulation of the nervous system due excessive release of stress related hormones. It is known that under certain conditions, stress hormones can interfere with reproductive function by altering the release of the reproductive hormone, luteinizing hormone (LH). Therefore, the goals of these studies were to determine the potential for plant amines to affect LH release, and also, to determine whether or not the stress related hormones adrenocorticotrophic hormone (ACTH), cortisol, adrenaline (EPI) and noradrenaline (NE) are involved. Our ultimate goal is to evaluate the potential for inhibiting reproduction in animals which browse guajillo.

Research Findings. Two experiments were conducted using Suffolk and Suffolk-cross wethers. In Experiment 1, 16 wethers were allotted into three treatments: TRT 0 (control); TRT 2 (2 mg NMPA/2.2 lbs body weight) and TRT 4 (4 mg NMPA/2.2 lbs body weight). They were dosed with NMPA and challenged with a releasing hormone for LH. Blood was collected and analyzed for LH, EPI, NE, ACTH and cortisol. Average hormone concentrations were not affected. However, the amplitude of LH response was lower in TRT 2 vs TRT 0. Conversely, the amplitude of cortisol release in TRT 2 vs TRT 0 was greater; suggesting that excess cortisol inhibited LH release. Also, wethers treated with NMPA had a more rapid NE response.

In Experiment 2, 18 wethers were allotted into three treatment groups: TRT 0 (saline control), N (4 mg NMPA/2.2 lbs body weight) and N+T (4 mg NMPA + 2 mg tyramine / 2.2 lbs) body weight. Blood samples were collected and analyzed as in Experiment 1. Over the blood sampling period, there were significant time x treatment effects for LH, Cortisol and NE concentrations. Treatment with either N alone, or with N+T resulted in an increase in the release of the stress related hormones, cortisol and NE while simultaneously reducing the LH response to its releasing hormone. Responses over the sampling period are depicted for LH and cortisol in Figures 1 and 2, respectively.

Application. Because LH is necessary for proper egg development in the female and proper sperm development in the male, it is apparent that guajillo has the potential to alter fertility. The levels of plant intake necessary to cause this are not currently know. Inhibition of reproductive hormones would appear to occur prior to clinical signs of toxicity such as paralysis or death. Release of stress related hormones from any stressor could produce the same lowered reproductive potential.

FIGURE 1. PLASMA LH CONCENTRATIONS

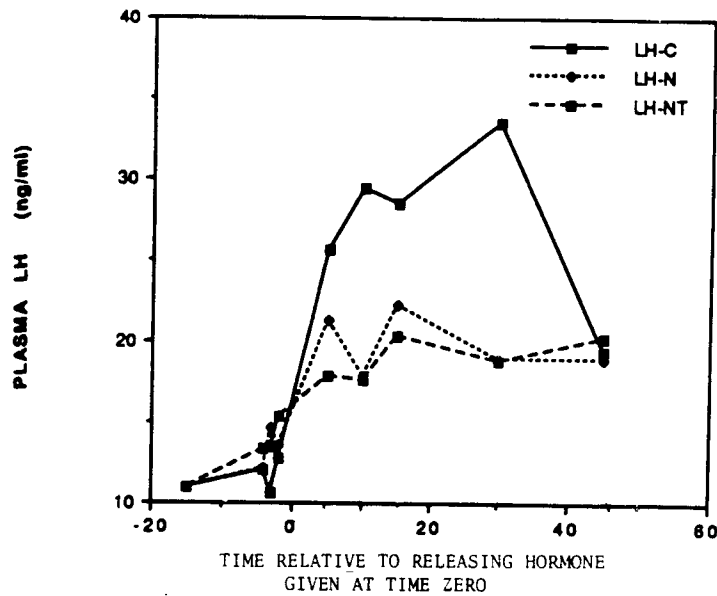


FIGURE 2. PLASMA CORTISOL CONCENTRATIONS

