Researchers study tall larkspur toxicity in cattle

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In the western foothills and mountain rangelands of the U.S., wild larkspurs (*Delphinium* spp.) are a major cause of cattle losses.

For the most part, grazing cattle can self-regulate consumption of larkspurs and avoid toxicity problems. However, when cattle eat too much, too quickly, or they eat low amounts continuously, toxicity can occur. Symptoms of toxicity include muscle weakness. Cattle also can become non-ambulatory and die.

In a recent study published in the *Journal of Animal Science*, researchers with the USDA-ARS Poisonous Plant Research Laboratory in Logan, Utah, determined the amount of tall larkspur that a 1,100-pound steer could consume without becoming poisoned. Until now, there has been little research that mimics the multiple exposures of larkspur to grazing cattle.

During the study, 12 steers received one dosing of tall larkspur equivalent to 8 mg "MSAL-type" alkaloids per kg of body weight (BW). Certain alkaloids found in larkspur are toxic to cattle. "MSAL-type" are the most common of the toxic alkaloids. All 12 steers experienced signs of toxicity, becoming non-ambulatory.

Following a three-month rest period, the cattle received a daily dose of 8, 4 or 2 mg MSAL alkaloids per kg BW for 4 days, or until they showed signs of muscle weakness.

None of the steers that received 2 mg/kg BW per day developed muscle weakness, even after 8 doses (4 days). The steers were able to successfully walk for 20 min each day. However, all of the steers dosed with 4 mg MSAL alkaloids/kg BW per day could not walk for 20 minutes at the 48-hour mark. These results suggest that the "no observable adverse effect level," or NOAEL, is 2 mg/kg BW per day.

After computer modeling, the researchers found that a 1,102 pound (500 kg) steer can consume a daily dose of 2.8 pounds (1.25 kg) of fresh tall larkspur without becoming severely poisoned.

The authors note that "the ratio of non-MSAL-type to MSAL-type alkaloids has an important impact on the toxicity potential of tall larkspur populations." Consequently the results from this study (e.g., a NOAEL of 2 mg/kg MSAL-type alkaloids per day) may only be valid for larkspur populations that contain 4 mg/g MSAL-type alkaloids and

16 mg/g total alkaloids.

Larkspur contains about 15-20% crude protein and is palatable to cattle. In order to reduce toxicity problems, producers should not allow cattle to graze after larkspur has begun to flower and/or very late in the summer when the pods begin to shatter.

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