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J. A. Mosjidis
Auburn University

I. Khan
University of Mississippi

J. Hess
Auburn University

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Pyrrolizidine Alkaloid content and seed toxicity in *Crotalaria* species

J. A. Mosjidis¹, I. Khan², J. Hess³

¹Dept. Agronomy and Soils and ³Poultry Science Dept., Auburn University, Ala. Agric. Expt. Stn., Auburn, AL 36849, E-mail mosjid@auburn.edu. ²Nat. Center for Natural Products Research, School of Pharmacy, Univ. Mississippi, MS 38677, USA

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Introduction *Crotalaria* spp. have been reported to contain various pyrrolizidine alkaloids (PA) in the seeds. Sunn hemp (*C. juncea*) is a summer legume with the potential to be valuable as animal fodder in late summer in the Southeast, USA (Mansoor et al. 1997). It has been reported that sunn hemp seeds contain pyrrolizidine alkaloids (PA) that have toxic effects on some farm animals such as pigs (Zhang, 1985). However, other researchers have reported that seeds can be fed to farm animals with no toxic effects. Rotar and Joy (1983) determined that seeds of cultivar Tropic Sun were not toxic. Chicken have been reported to be the most sensitive animals to PA. The presence and quantity of PA in several populations were determined and the effect of including sunn hemp seed in the feed on chicken mortality was evaluated.

Materials and methods Eight populations of sunn hemp from several countries obtained from the National Plant Germplasm System and breeding material developed at Auburn University were grown until seed maturity in Tallahassee, Alabama. Seed of *C. juncea*, *C. spectabilis* and *C. retusa* were analyzed for PA composition using HPLC-UV-MS (Ji et al. 2005). Seed of a breeding population of *C. juncea* was fed whole or ground to young broiler chicken to determine the effect on bird mortality (J. Hess and J. Mosjidis, personal communication). Sunn hemp seed was added to the diet at contaminant level (0.5%) or as part of the diet (2% or 5%).

Results and discussion A variety of PA have been reported in the seeds of *Crotalaria* spp. (Table 1). An in-depth chemical analysis of the seeds of several populations of sunn hemp tested them for the presence of junceine, riddelliine, senecionine, seneciophylline, trichodesmine, heliotrine, retrorsine, integerrimine and lasiocarpine. Results indicated that the only PA present were small amounts of junceine and trichodesmine what contradicts previous reports. The amounts of junceine were larger than of trichodesmine except in one population that had higher amounts of trichodesmine.

Table 1 Pyrrolizidine alkaloids present in several *Crotalaria* spp. (Smith and Culvenor, 1981).

Species	Pyrrolizidine alkaloids
<i>C. juncea</i>	Junceine, riddelliine, senecionine, seneciophylline and trichodesmine
<i>C. pallida</i>	Crotastratine, integerrimine, mucronatine, nilgirine,
<i>C. retusa</i>	Monocrotaline, retusine, retusamine, retronecine
<i>C. spectabilis</i>	Monocrotaline, retusine, spectabiline

The tests conducted to determine the effect of including 0.5% and 5% (test 1) of whole seed or 0.5%, 2% (test 2) of ground sunn hemp seed in the diet of chicken broilers indicated that mortality rate were not significantly different than the check (0% sunn hemp seed). Thus, the results from the two tests indicated that mortality rate was not affected by inclusion of sunn hemp seed.

Conclusions The large number of sunn hemp populations tested that showed the presence of a limited number of PA in very small amounts and the lack of effect on chicken mortality indicates that feed contaminated with low levels of sunn hemp seed are not dangerous to animals. Reports indicating that the seeds cause animal death may represent cases where the seeds have been included as a high percentage of the diet.

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