1973

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A.S. Series 73-36

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For a number of years, ranchers in western South Dakota have been of the opinion that pregnant cows will abort after the consumption of sufficient quantities of yellow pine (Pinus ponderosa) needles. Problem areas exist where the yellow pine is the predominant pine species. Incidence of pine needle abortion is particularly high in late winter and early spring after cows in the last trimester of pregnancy graze on the needles. Some ranchers, however, have experienced the problem throughout the year when cows in earlier stages of pregnancy have aborted. Retained placentas are frequently associated with the abortions. If true abortions did not occur, animals frequently gave birth to live but weak premature calves.

An investigation concerned with pine needle abortion is currently being conducted to determine the abortive factor(s). Results of preliminary research testing different fractions obtained from pine needles are presented in this report.

Procedures

Samples of yellow pine needles were collected at a site near Sturgis, South Dakota, and stored in plastic bags at 20 C. Needles collected in September, October and January were used for the trial studies. Fractions were prepared as follows: (1) Water-soluble fraction. The needles were cut into inch long segments and macerated in a blender with distilled water. The liquid portion was decanted into a funnel and the residue extracted twice with additional water. The filtrate and washings were concentrated in a flash evaporator and designated as the aqueous fraction. (2) Acetone-soluble fraction. The solids, a green mass from the water extraction, were transferred into the blender and extracted with acetone following the procedure used for the water extraction. The filtrate and washings were concentrate in a flash evaporator and designated as the acetone fraction.

The water-soluble and acetone-soluble fractions are designated aqueous and acetone fractions, respectively. The amount of pine needle fraction added to the basal feed, Purina Laboratory Chow, was calculated according to the amount of each fraction extracted from a known weight of fresh needles. For consumption purposes, the amount of concentrated extract obtained from 25 grams of fresh needles was added to each 100 grams of the basal feed. Control rats were fed only the basal feed throughout the experiment.

Twenty-eight virgin female rats of the Sprague-Dawley strain were randomly mated with two females per male. The vaginal smear technique was used to determine estrus. Feeding of the pine needle fractions began three to four days after mating.

Prepared for the Seventeenth Annual Cattle Feeders Day, November 2, 1973.

Discussion

Results given in table 1 indicate that the aqueous fraction had a greater detrimental effect upon litter size than the acetone fraction. The number of surviving embryos from aqueous-treated rats was approximately one-half that of the control litters. A somewhat lesser effect upon reproduction was obtained after feeding the acetone fraction, although resorption of embryos appeared to occur as measured by reduction in litter size.

A high incidence of gastrointestinal inflammation did occur with the feeding of both pine needle fractions. Upon autopsy, severe hemorrhage of the entire intestinal tract was observed in the pregnant rats. The pregnant rats appeared to suffer the toxic effects of the pine needle extracts as much as the embryos they were carrying.

Table 1. Effect of Various Pine Needle Fractions on Pregnancy in Rats

Test ration	No. of pregnant rats	No. of rats giving birth	Avg. litter size	Total no. of stillborn
Control	4	4	11.2	3
Aqueous fraction July collection	4	3	8.7	5
Acetone fraction July collection	4	4	7.8	3
Aqueous fraction October collection	4	3	7.3	5
Acetone fraction October collection	4	4	6.8	1
Aqueous fraction January collection	4	2	5.5	5
Acetone fraction January collection	4	2	7.0	4