Pine Needle Water Extracts as Potential Abortive Agents in Gestating Cow Diets

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Highlight: A number of bovine abortions were reported during warm spells of the winter of 1974 in the southern interior of British Columbia. Observers speculated that the frequent thawing periods produced a run-off which extracted and accumulated abortive agents from the pine needle litter. In a test of this hypothesis, five pregnant cows each consumed extract from 200 to 300 kg ponderosa pine needles during their last trimester. No pre-partum effects were observed and five normal calves were delivered.

Abortions in cattle induced by yellow pine (Pinus ponderosa) needles have been reported by numerous investigators in western Canada and the United States (MacDonald 1952; Stevenson et al. 1972; Kamstra 1975). Veterinarians and ranchers in the southern interior of British Columbia reported a rash of bovine abortions during the warm spells of the winter of 1974. However, the incidents occurred in ponderosa pine stands devoid of slash or fresh windfall foliage. Observers speculated that the frequent thawing periods produced a run-off which extracted and accumulated abortive agents from the pine needle litter. It appeared that abortions occurred when

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cows drank from pools containing leached components of dried pine needles.

To test this hypothesis, in 1975 the drinking water of five pregnant Jersey cows in their last trimester was replaced by a water extract of pine needles; the needles had been collected from the litter of a ponderosa pine savannah range. The extract was produced in batches by soaking approximately 40-kg needles in 400 liters water for one week at 7°C. The foamy, straw-coloured extract was consumed by each animal at the rate of 20 to 30 kg/day with hay rations at 7 kg/day and bimonthly salt and mineral supplements for the remainder of the pregnancy. During this period, the total liquid consumption for each cow represented the extract of 200 to 300 kg pine needles. No prepartum effects were observed and five normal calves were delivered. All survived with the exception of one which died at seven days, and in this case, the cause of death was histopathologically diagnosed as pneumonia.

Chow et al. (1972) reported that an aqueous fraction of ponderosa pine needles could disrupt fetal development in mice. Subsequent experiments by the authors (Chow et al. 1974) however, failed to induce reproductive failure. Similarly, inconsistent results were obtained at the Agriculture Canada Research Station, Kamloops (Nicholson, 1954; Agriculture Canada Annual Reports 1955 to 1959) when abortion trials with cows were repeated following the initial study by MacDonald (1952). In 1953, for example, one cow in the control group of six aborted, while only two cows of the 12 consuming pine needles aborted. MacDonald (1952), on the other hand, had reported a reproductive failure rate of 75% under similar experimental conditions. The studies were repeated again during the winters of 1958 and 1959. The former trial yielded a reproductive failure rate of 50%, but all the calves survived in the final experiment. It should also be noted that no abortions were recorded in two analogous studies with lodgepole pine (Pinus contorta) needles (Nicholson 1954; Agriculture Canada Annual Report 1957).

Chow et al. (1974) were able to obtain reproducible results with mice, however, when the aqueous pine needle extracts were infected with a fungus occurring on ponderosa pine needles. The authors suggested, therefore, that toxic fungal metabolites derived from plant constituents could be more directly involved in pine needle abortion. Whether the variability in the earlier experiments at Kamloops and the recent results with pine needle litter are related to the presence or absence of a mycotoxin(s) remains to be seen but the fungal parameter should be considered in further research on pine needle abortion.

**Literature Cited**


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**THESIS: TEXAS A&M UNIVERSITY**

Vegetation Response and Management of South Texas Rangeland Following Chemical and Mechanical Brush Control, by George Preston Durham, MS, Range Science. 1975.

Herbicides, rates, and combinations evaluated at 1.12 kg/ha for improvement of rangeland in South Texas included 2,4,5-T, 2,4,5-T + dicamba (1:1), and 2,4,5-T + picloram (1:1). The herbicide treatments were evaluated alone and in combination with prescribed burning and compared to various chaining treatments for their systematic application and maximum range improvement on a Sarita fine sandy loam range site supporting a mixed-brush community near San Perlita, Texas.

All herbicides effectively reduced the canopy of honey mesquite and green area of pricklypear and barbwire acanthocereus cladophylls. The 2,4,5-T + picloram combination also effectively reduced the canopy of lime pricklyash and spiny hackberry and was the most effective treatment relative to percentage of woody plants which were not resprouting 1 year after treatment.

Throughout the growing season, areas treated with the herbicide combinations produced more grass than those treated with 2,4,5-T or left untreated. A year following application, areas treated with 2,4,5-T produced more grass than untreated areas. Forb production was lower in areas receiving the herbicide combinations as compared to untreated plots.

Grass utilization in 1973 was increased significantly in areas treated with herbicides when compared to untreated areas. In 1974, areas treated with the herbicide combinations were utilized significantly more than the untreated plots. Average utilization trends across years followed production changes until early to mid-summer. Then, even though production continued to increase, utilization decreased steadily into the late summer and fall.

Reduced brush cover 1 year after herbicide application resulted in increased basal cover by grasses, regardless of treatment. Areas treated with 2,4,5-T + dicamba did not support the percentage of fair to good grazing species as did those sprayed with 2,4,5-T + picloram.

Approximately 18 months after treatment, only the areas treated with 2,4,5-T + picloram indicated an upward trend in range condition.

Chaining one way or chaining two ways effectively reduced the density of honey mesquite and lime pricklyash but were not effective on species with switchy growth forms such as spiny hackberry. Chaining two ways, raking and stacking was the most effective treatment for reducing brush density.

Plots chained two ways or chained two ways, raked and stacked produced 1,100 kg/ha more grass than did the areas left untreated or chained one way. Forage utilization following chaining two ways, raking and stacking was significantly greater than following other treatments.

Response of the honey mesquite canopy to the prescribed and commercial burns was highly variable. When compared to areas sprayed only, resprouting of honey mesquite remained about the same in the area which was sprayed and then commercially burned, however, resprouting increased in the area which was sprayed and prescribed burned. Forage production and utilization in areas sprayed and burned remained about the same as on areas sprayed only.

Economic analysis, based on assumptions made for a 2,000-ha, hypothetical ranch over a 5-year planning horizon and 1973 contracting costs, indicated that treating areas with 2,4,5-T + dicamba and 2,4,5-T + picloram were economically feasible when they were applied in an above-average rainfall year and cattle prices were at least $135/205 kg calf. In a below-average rainfall year, the areas chained two ways or chained two ways, raked, and debris stacked were economically feasible when cattle prices were at least $135/205 kg calf. Areas treated with 2,4,5-T + dicamba were economically feasible except when discounted at 10% and cattle prices were $135/205 kg calf; whereas, 2,4,5-T + picloram was economically feasible only when cattle prices were at least $180/205 kg calf and the discount rate was 6% or less.