

2005 HAIR SHEEP WORKSHOP @ VIRGINIA STATE UNIVERSITY

Accelerated Lambing and Out-of-Season Breeding With Hair Sheep

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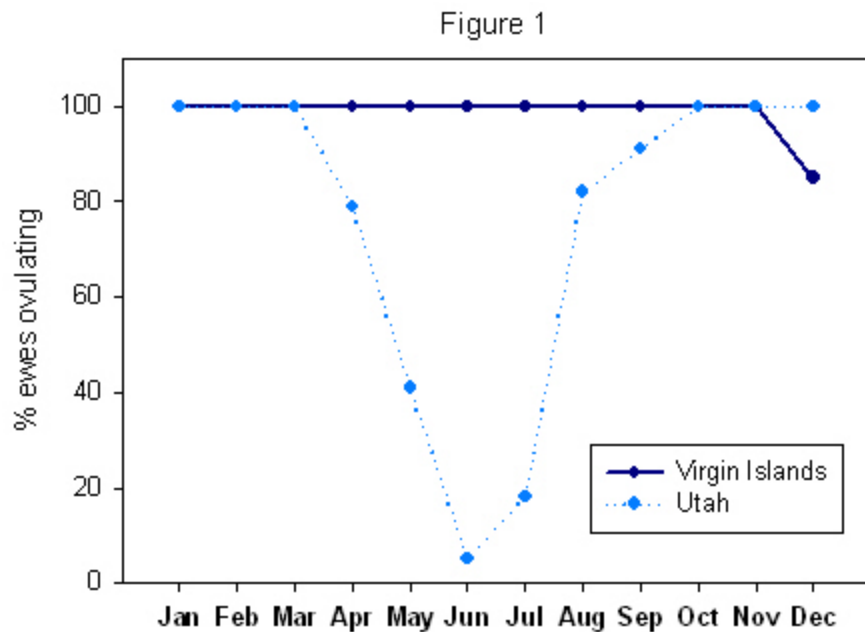
Sheep have the theoretical potential to produce at a "biological ceiling" of 3-4 lambs at 6 months intervals. A major constraint towards achieving such an idealized level production is the seasonal nature of breeding of sheep in temperate environments. Increasing the frequency of lambing and shifting towards year-round production, however, can be a means of utilizing facilities and labor more effectively, and taking advantage of favorable markets.



Hair sheep originate in the tropical regions of the world with limited changes in day length throughout the year. Under these conditions they breed year-round, or have breeding seasons influenced by rainfall and forage availability, rather than photoperiod. If these tropical breeds are transferred to temperate climatic conditions with more distinct seasonal variation in day length, they begin to show periods of seasonal anestrus. In St. Croix ewes in the Virgin Islands (17°N) 100% of ewes displayed estrus and ovulated throughout the year, whereas St. Croix ewes in a temperate environment in Utah (41°N), showed a distinct anestrus period in June and July, with transitional seasons in April and May and again August (Figure 1). Similarly, ovulation rates at the tropical

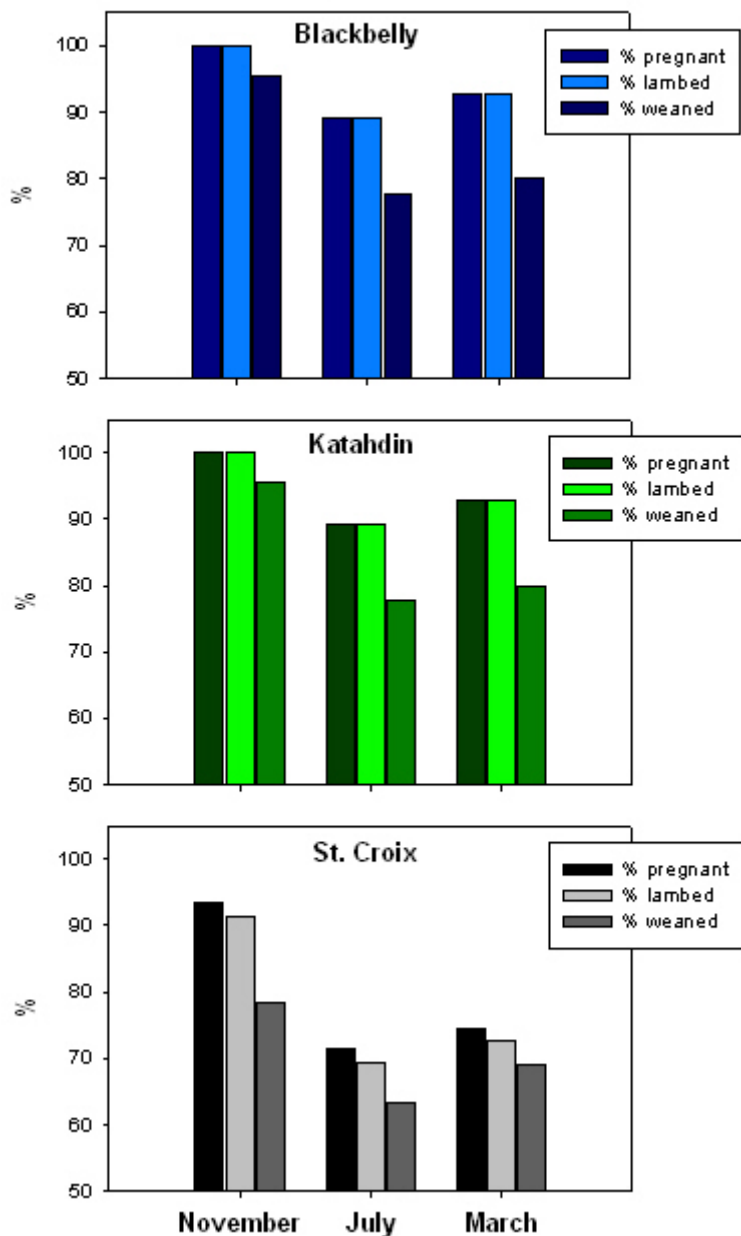
location remained constant at 2.0 eggs/ovulation throughout the year, but declined between April and June at the temperate location.

Evidence of seasonal breeding in St. Croix sheep under temperate conditions was also provided in Arkansas (35°N) where groups of ewes exposed to breeding in two months intervals showed a distinct seasonal pattern with the highest lambing percentage in October and December (>90%), and a reduced percentage (<20%) in April and June (Brown and Jackson, 1995). Similar observations were made in Ohio (40°N) where both St. Croix and Barbados Blackbelly ewes mated in July through September had a higher lambing rate (95 and 80%, respectively) and litter size (1.97 and 1.65, respectively) than those in February (25% and 20%; and 1.67 and 1.20, respectively) (Parker et al., 1991).



With the information from these earlier studies in mind the use of hair sheep in an accelerated mating project was evaluated at Virginia State University (37° N). Three of the hair sheep breeds currently available in the U.S. were used in the project (Barbados Blackbelly, St. Croix, and Katahdin). Flocks of Katahdin and St. Croix were established from a diverse cross-section of each breed, representing ewes and rams from at least five breeders per breed, and were maintained as purebred populations with several sire lines. Polled Barbados Blackbelly in the U.S. are rare and mostly trace their origin to a single flock located in North Carolina. Barbados Blackbelly ewes used in this project originated from this polled flock, and were mated to rams imported from a flock maintained at the University of the Virgin Islands to establish the current research flock. Animals used in the project should be considered representative of breed populations in the southern U.S.

Figure 2



In a preliminary experiment, a Katahdin flock of 25 ewes was used and exposed to two or more rams in single-sire mating groups in 42 day breeding seasons starting the first of November, July and March. Mating periods were selected to avoid breeding ewes during periods of likely seasonal anestrus (April through June). Rams used for breeding had passed a breeding soundness examination 2-3 weeks prior to mating that involved both an evaluation of semen quality and libido. Ewes were managed extensively on pasture, and were maintained as a single flock, except during breeding. During winter, forage was supplied as grass hay on pasture. Ewes were supplemented with concentrate feeds during the late stages pregnancy and lactation. Lambs were born on pasture and assistance was provided only to ewes in severe distress (i.e. abnormal presentation of lamb). Lambs were handled merely to record birth weights and apply identification. Lambs had access to supplement provided to ewes, but did not receive creep feed, and were weaned at 63 days of age.

In this initial trial pregnancy rates were similar in the three mating periods (87-90%). Following the November and March mating periods lambing rate corresponded to pregnancy rate, but lambing rate was reduced to 65% following the July mating. Also, during July mating the average time to first mating was later (25 days) than in November (9 days) and March (12 days). Findings from the preliminary trial indicated that Katahdin hair sheep appear suited for use in an accelerated mating scheme, but also suggest that summer heat stress may have impaired embryo survival in ewes mated in July, and that seasonal breeding patterns may have delayed mating in July.

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A more comprehensive project evaluated the performance of all three hair sheep breeds under a similar accelerated mating scheme over two, 2-year production cycles. In this project 25-30 ewes per breed were mated in 30-day mating periods in November, July, and March, using two single sire mating groups per breed per mating period. All other management was similar to that described for the preliminary trial.

Pregnancy rates (30-50 days post mating) and lambing rates were higher for all breeds following November mating (>90%) during the peak of seasonal breeding, but exceeded 80% in the other two mating periods (**Figure 2**). Pre-natal losses were generally limited (0-2%) except for Katahdin in the first July mating period (12%). In line with the higher pregnancy rate, weaning rate was higher following November (89%) than July (70%) and March (74%) mating. There were differences between breeds in average annual lambing rate which was higher in Barbados Blackbelly (93%) than St. Croix (77%), with Katahdin intermediate (85%).

Litter size at birth (no. lambs/ewe lambing) was also higher following November (1.91), than July (1.64) and March (1.52) mating. Pre-weaning losses reduced average litter size by 0.2-0.3 lambs, but were not affected by mating period. Breeds differed in average litter size, which was higher in St. Croix (1.85) than in Barbados (1.56) and Katahdin (1.66). The weight of lamb weaned as percentage of ewe body weight (production efficiency) was higher following November (51.3%) than July (41.5%) and March (43.0%) mating, but was similar for the three breeds.

Overall lambing and weaning rate was similar in the first and second two-year production cycle (85% and 77%, respectively), while litter size increased from 1.61 to 1.76 lambs at birth, and 1.32 to 1.54 lambs at weaning. Production efficiency also increased from 43.1 to 47.0% from the first to the second cycle, suggesting no negative long-term effects of accelerated mating on ewe productivity.

Trait	Barbados Blackbelly	Katahdin	St. Croix
Lambs born per ewe lambing	2.36	2.49	2.77
Lambs weaned per ewe lambing	2.04	2.12	2.33
60-day adjusted weaning weight, lbs.	54.8	83.2	63.8
Percent litter weight weaned	63.0	63.2	61.7

The accelerated mating system implemented here produced an annual lamb crop of 2.36-2.77 lambs/ewe lambing depending on breed, with a production efficiency of 62-63% (**Table 1**). This represents an increase of 28-38% in annual lamb crop, and 20-22% increase in production efficiency compared to once annual November mating. Costs of additional feed resources for lactating ewes and additional labor during lambing have to be evaluated to estimate the feasibility of implementing an accelerated mating under specific production conditions.

Conclusion

Hair sheep breeds appear suited for use in accelerated mating systems due to an extended breeding season and their ability to be productive with limited inputs. Reduced pregnancy rates during the transitional mating periods (March and July) were mostly the result of yearling replacements ewes failing to conceive, but litter size at birth was reduced regardless of ewe age. Care needs to be expanded in the selection of fertile rams with adequate libido for use in the transitional mating periods.

Literature cited:

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 Parker, C.F., K.E. McClure, and R.P. Herd, 1991. Hair sheep potential for specific environmental conditions and production systems in North America. In: *Proceedings Hair Sheep Research Symposium*, S. Wildeus (ed.), St. Croix, V.I., pp. 321-327.