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Evaluation of lactation performance identifies superior sire in Anglo Nubian dairy goat herd

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Anglo Nubian goats are commonly considered poor milk-producers among Australian dairy goat breeds and fall short of the 300+ day lactations desired in commercial dairies (Abud and Stubbs 2009). Anglo Nubians have milk with a high % of fat and protein however, lower overall milk production results in low total fat and protein yields. Markets for Australian goat milk include whole milk, cheese, yoghurt, and milk powder, meaning that both quality and quantity of milk are commercially relevant. Lactation recording can identify animals with superior milk production traits including lactation length, total milk, fat and protein yield. Understanding the performance of related animals forms the basis of a breeding program, therefore sire identification is critical (Lindsay and Skerritt 2003). The aim of this paper is to demonstrate the benefit of lactation recording to identify sires of high producing does in a case study Anglo Nubian herd.

The case study herd of Anglo Nubians goats (of known parentage) registered with the Dairy Goat Society of Australia (DGSA), was located 15 km north of Rockhampton, Australia. Milk production (lactation length, milk yield, fat and protein % and yield) was monitored over three lactations from 2014 to 2021. Lactating does were managed as a single group with *ad libitum* access to forage oat or sorghum hay during the day and lucerne hay overnight. Each doe was fed 2 kg/day of a grain ration (17.25% crude protein; 12.53 MJ/kg metabolisable energy, as fed). Milk production of does was recorded according to the Herd Recording production test rules of the DGSA (DGSA 2021). Does were kidded annually in batches from July to October and milk recorded until drying off due to subsequent pregnancy. Milk samples were analysed for fat and protein using a Bentley Fourier Transform Spectrometer component analyser and lactation summaries compiled by Dairy Express, Agricultural Business Research Institute, Australia. Lactation data were analysed by residual maximum likelihood with fixed effects of sire and lactation and random effects of sire.doe. Pairwise comparison of means was performed by least significant difference tests at the 5% probability level.

A summary of mean lactation components for does sired by 4 bucks, over 3 lactations, is presented in Table 1. All variables had a significant interaction between lactation number and sire ($P < 0.05$). Results show that Sire A produced does with the longest and most constant lactation lengths (range 292 - 304), and the greatest milk yields which increased with lactation number. Sire A daughters also produced the greatest yield of fat and protein compared to does sired by other bucks. Fat and protein % of milk from these does ranged from 3.82% to 4.21% and 3.52% and 3.63%, respectively.

Table 1. Anglo Nubian milk production components by lactation number and sire^A

Sire	Lactation number	Number of does	Lactation length (days)	Total milk yield (kg)	Total fat yield (kg)	Total protein yield (kg)
A	1	9	292 ^a	771 ^{cd}	31 ^{cd}	27 ^{cd}
A	2	7	303 ^a	1,080 ^b	41 ^b	38 ^b
A	3	3	304 ^a	1,328 ^a	56 ^a	48 ^a
B	1	7	228 ^{bc}	496 ^{eg}	21 ^e	17 ^e
B	2	4	227 ^{bcd}	679 ^{def}	27 ^{de}	22 ^{de}
B	3	1	270 ^{abc}	817 ^{cde}	30 ^{bcd}	26 ^{cde}
D	1	3	273 ^{ab}	648 ^{defg}	27 ^{de}	22 ^{de}
D	2	3	298 ^a	895 ^{bc}	40 ^{bc}	32 ^{bc}
D	3	3	216 ^{cdef}	675 ^{defg}	29 ^{de}	23 ^{de}
E	1	9	226 ^{cde}	517 ^{efg}	24 ^e	19 ^e
E	2	4	182 ^{ef}	653 ^{defg}	28 ^{de}	23 ^{de}
E	3	3	169 ^f	512 ^{efg}	20 ^e	18 ^e
Average s.e.d.			24	102	5.1	3.6

^AMeans not followed by a common letter are statistically different at $P = 0.05$. Significance letters sorted in descending order.

Lactation recording of the Anglo Nubian herd in this case study identified one buck, Sire A, that consistently sired more productive does that by the second and third lactation, had reached the commercially desirable 300+ day lactation length. The same does also produced higher fat and protein yields as a function of fat and protein % and total milk yields. This study has demonstrated the importance of lactation recording as a breeding support tool, but also identified an Anglo Nubian sire that produces doe progeny approaching commercial relevance. Whilst other Australian breeds dominate commercial goat dairies due to higher production (Abud and Stubbs 2009), it may be possible to use tools such as lactation recording to select Anglo Nubians that complement these breeding programs. It is recommended that all dairy goat breeders utilise lactation recording as a breeding tool when selecting for genetic improvement.

References

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