Access time to pasture has an effect on goats' milk production and body condition

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Abstract. Increasing the proportion of grass in rations, without decreasing the total intake, is nowadays a key aspect of goat feeding. The objective is thereby to maintain or even improve individual performance, keep goats in good metabolic health and ensure an efficient utilization of forage resources. Various studies focusing on daily access times to pasture have been conducted between 2015 and 2018 in two experimental stations, including the 'Station du Pradel' in the South East of France (Ardèche, 07). The experiment reported here lasted 49 days, during spring 2018. The objective was to compare a continuous access to pasture of 7h vs 10h per day. The animals were separated in homogeneous groups of 59 goats (46 multiparous and 13 primiparous) and were milked once a day. Access time had significant effect on milk production and bodyweight. Goats that were grazed outdoors for 10h produced 260g more milk (+8%) and lost only 2.8kg during the experimental period, vs 4.0kg for the 7h-group. This can be explained by a difference in the time spent ingesting grass at pasture: 5h30 for the 7h-group, vs 6h15 for the 10h-group (method Lifecorder). The proportion of time spent ingesting grass was higher for the 7h-group (73.7% of the time outside) than for the 10h-group (60.5%). Also, primiparous goats spent more time (+10%, whatever the group) ingesting grass than multiparous goats. These results are slightly different from those obtained in western France.

Keywords. Feeding – Grazing – Dairy goats.

Le temps d'accès au pâturage a un effet sur la production laitière et l'état corporel des chèvres

Résumé. *Augmenter la proportion d'herbe dans les rations, sans diminuer l'ingestion, est aujourd'hui un défi de l'alimentation des chèvres. Le but est ainsi de maintenir voire d'augmenter les performances individuelles, de garantir une bonne santé métabolique des chèvres et d'assurer une bonne valorisation nutritionnelle de la ressource fourragère. Plusieurs études sur le temps d'accès au pâturage ont été conduites entre 2015 et 2018 sur deux stations expérimentales, dont la station du Pradel dans le Sud-Est de la France (Ardèche, 07). L'essai a duré 49 jours au printemps 2018 et a permis de comparer des accès continus au pâturage de 7h et 10h par jour. Les animaux ont été séparés en deux groupes homogènes de 59 chèvres (46 multipares et 13 primipares) traites une fois par jour. Le temps d'accès au pâturage a eu un effet significatif sur la production laitière et l'état corporel. Les chèvres qui étaient à l'extérieur 10h par jour ont produit 260g de lait en plus (+8%) et n'ont perdu que 2,8kg de poids vif contre 4,0kg pour le groupe qui sortait 7h. Cette différence peut être expliquée par le temps que les chèvres ont passé à ingérer lorsqu'elles étaient au pâturage. En effet, le groupe qui pâturait 7h a passé 5h30 à ingérer de l'herbe contre 6h15 pour le groupe qui sortait pendant 10h (méthode Lifecorder). La proportion de temps passé à ingérer était supérieure pour le groupe 7h (73,7% de son temps passé à l'extérieur) par rapport au groupe 10h (60,5%). Enfin, les primipares ont passé plus de temps à ingérer de l'herbe au pâturage (+10%, quel que soit le groupe). Tous les résultats présentés sont légèrement différents de ceux obtenus dans l'Ouest de la France.*

Mots-clés. *Alimentation – Pâturage – Chèvres laitières.*

I – Introduction

Goat production is increasing worldwide, with global livestock raising from 750 million heads in 2000 to 1034 million heads in 2017. Meanwhile, goat milk production evolved from 12.7 million of tons to 18.7 million of tons on the same period, according to the FAO statistics (2017).

Unfortunately, goat production is also the less self-sufficient herbivorous production in terms of feed. The principal lever to improve self-sufficiency is to use more grass, in all forms, in the ration (Legarto & Leclerc, 2007).

The goal of the experiment reported here was to study the effect of access time to pasture on goats' performances, feeding behaviour and identify the potential effect of this parameter on the organization of a working day.

II – Materials and methods

The experiment took place during spring 2018, from the 9th of April to the 28th of May.

1. Animals

The Pradel experimental station is located in the South East of France (Ardèche, 07). After a 4-week pre-experimental period, 118 Alpine goats were separated in two homogenous groups of 59 (46 multiparous and 13 primiparous goats). At the beginning of the experiment, the two groups had the same milk production, fat and protein rates, body condition, body weight and lactation stage. Goats were milked once a day at 6.00, then fed the same amount of corn and of an industrial concentrate. A rotational grazing system was used on the farm. The total surface used for the trial was 7.78 ha divided in 12 plots, of which 10 were ryegrass/cocksfoot or cocksfoot/brome grass mixtures and 2 were pure white clover. The 7h-group was out from 9.00 to 16.00 and the 10h-group from 9.30 to 19.30. The experiment lasted for 7 weeks and goats were grazing every day when the meteorological conditions were good enough.

2. Measurements

Milk controls were performed every week and individual milk production was recorded. Total production and production of each group were also measured daily. Body weight and body condition score (BCS) were recorded once in the middle of the experiment and once at the end.

Feeding behaviour was evaluated at pasture with the Lifecorder® device, a portable accelerometer which measures the vertical movement of the animal's head and determines when it is grazing. The method was tested and validated on cows (Delagarde and Lamberton, 2015) then on goats (Charpentier, 2015; Cornut, 2016). In each group, 13 goats were equipped with the Lifecorder® device. The monitoring of grazed paddocks was done daily and entry and exit heights were recorded for each new plot using a plate meter (30 measures/ha).

Four periods were defined to take into account the changes in supplementation (based on the availability of grass and the corn/concentrate ratio). Periods 2 to 4 were used for statistical analyses. Period 1 was not analysed because the weather was too bad for the goats to go outside.

3. Statistical analysis

Individual performances were analysed with a covariance analysis (ANCOVA) with fixed effects of treatment and period, a random effect due to the individual, the effect of the interaction between treatment and time and the initial performance as a covariate. For feeding behaviour, the effect of parity was also tested.

III – Results

1. Milk production

Treatment, period and interaction treatment*period had a significant effect on the total milk production (P=0.0003, P<0.0001 and P=0.0247 respectively), in periods 2 and 3. Over the experiment, goats on the 10h-group produced 260g more milk per day than the 7h-group. Details about the different periods are available in Table 1.

The treatment didn't have a remarkable effect on milk quality indicators.

Table 1. Mean individual milk productions global and per period

	Period 2		Period 3		Period 4		Total experiment
	Milk production (kg/d/goat)	P-value	Milk production (kg/d/goat)	P-value	Milk production (kg/d/goat)	P-value	Milk production (kg/d/goat)
7h-group n = 57	3.60* (±0.74)	0.0003	3.24* (±0.65)	0.0004	3.96 (±0.76)	0.1284	3.60* (±0.77)
10h-group n = 57	3.92* (±0.88)		3.55* (±0.81)		4.10 (±0.93)		3.86* (±0.90)

*Significant result, P-value < 0.05.

2. Body weight and body condition

Access time to pasture also had a significant effect on body weight (P=0.01151), but not on body condition. The mean loss of body weight for the 10h-group was 2.76kg vs 3.95kg for the 7h-group, as shown in Table 2.

Table 2. Mean individual variation of body weight and BCS

	Body weight (kg)	BCS (lumbar zone)	BCS (sternal zone)
7h-group n = 57	- 3.95*	- 0.10	- 0.14
10h-group n = 57	- 2.76*	- 0.06	- 0.12

*Significant result, P-value < 0.05.

3. Feeding behaviour

Treatment, period and parity all had a significant effect on feeding behaviour (P=0.0005, P<0.0001 and P=0.0254 respectively). As could be expected given the results about milk production, the 10h-group spent more time ingesting grass while outside (and thus had a higher total intake) than the 7h-group. The 7h-group spent 5h30 of its time ingesting grass vs 6h15 for the 10h-group. However, proportionally, the 10h-group spent less of its available time ingesting grass at pasture (60.5% of the time outside) than the 7h-group (73.7%). In the two groups, primiparous goats spent more time ingesting grass (+10% of available time) than multiparous goats, probably due to a lower intake rate (Fig. 1).

III – Discussion

An access time to pasture of 10 hours instead of 7 hours lead to a higher milk production (+260g/d/goat). This result differs from Charpentier (2018) where an access time of 8 hours instead of 11 hours didn't have a significant impact on milk production. Goats of the 11h-group produced 0.025kg more milk per extra hour outside whereas in our study in the 10h-group they produced 0.087kg more per extra hour, which is significantly different from the 7h-group.

To explain the difference, the most likely hypothesis is that goats from the 10h-group consumed more grass and mobilized less their body reserves than goats on the other group; they produced more milk and lost less body weight.

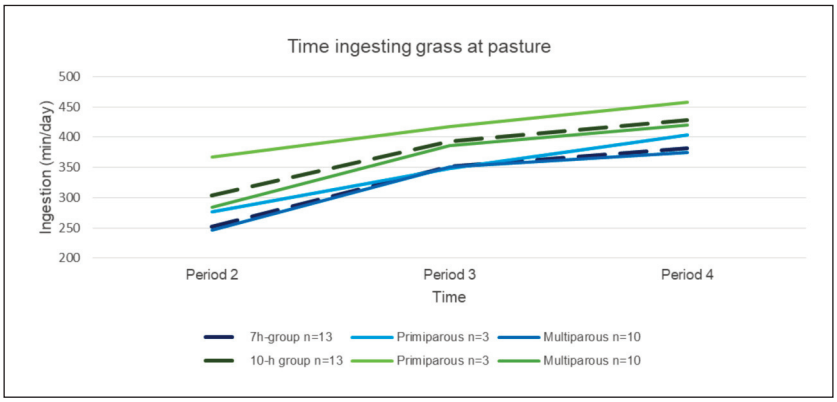

Fig. 1. Time ingesting grass at pasture.

III – Conclusion

Access time to pasture had a significant effect on milk production and bodyweight. Goats proportionally spend more time grazing when their access time to pasture was lower. In this study, given the level of supplementation, an access time of 7h might have not been sufficient to ingest enough grass to express the full dairy potential. Conversely, a 10-hour access to pasture allowed the goats to consume more grass and produce more milk.

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