Production and cow-traffic management during the pasture season in large herds with automatic milking

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Abstract

A field study on management during the pasture season was conducted on 20 Swedish farms with at least two automatic milking (AM) units and over 130 cows registered in the official control system. The objective was to compare milk production during indoor and pasture seasons, and to study cow traffic management during the pasture season. Using data from the official monthly control milkings, average yield of milked cows during winter (November-March) and summer (June-August) seasons were analysed using a mixed model with farm as repeated subject and season as variable. Days in milk and cows per robot were tested in the model but were non-significant. Milk yield was 30.1 and 28.4 kg energy corrected milk in winter and summer season, respectively (P<0.001). A more detailed analysis, using daily production farm data from the AM unit from the months before and after pasture let-out on each farm, showed a significant (P<0.05) decrease in the number of cows milked per robot after pasture let-out (57.5) compared with before (60.1). When number of cows per robot was included in the model together with season, a significantly (P<0.01) higher milking frequency per cow was observed before pasture let-out (2.57) compared with after (2.45). The effects of different management factors on production variables were also analysed but were not significant in this study.

Keywords: automatic milking, pasture, cow traffic, pasture selection gate, grazing, season

Introduction

Studies have shown that grazing often decreases when automatic milking (AM) is introduced on dairy farms (Mathijs, 2004). It seems that combining automatic milking with grazing is a challenge for many farmers. Over the latest decades, dairy farms in many countries have increased in size, further increasing the difficulties in logistics and cow traffic with combining grazing and AM. A common view among farmers is that milk production decreases over the pasture season. However, there are many economic and animal welfare benefits with pasture and grazing, and management solutions that facilitate grazing are thus of great interest to many European farmers, especially organic farmers where grazing is required. The objective of this study was therefore to investigate how 20 larger AM farms with production pasture organize cow traffic during the pasture season and to compare their milk production level during the pasture and indoor seasons.

Material and methods

The study is built on interviews and collected data from 20 Swedish AM farms with production pasture. All the farms had more than 130 dairy cows in the official cow control system, at least 2 milking robots and 18 of the farms were organic. At each farm visit, the pasture and the barn layout were inspected and management during the pasture season was recorded following a structured protocol with approximately 110 questions. Milk production data was downloaded from the AM computer together with data regarding cow numbers and utilization of the AM robot. Furthermore, with the permission of the farmers, production data from the latest production year was obtained from the official Swedish cow control system together with production averages of four categories of producers, all with more than 60 cows in the control system: (1) conventional milk producers without AM, (2) conventional milk producers with AM, (3) organic milk producers without AM and (4) organic milk producers with AM.

Statistical analysis was performed using the statistical analysis system SAS (version 9.3) with three data sets. Average milk production data from the cow control system during the indoor season (November-March) was compared with milk production during pasture months (June-August) on the 20 farms in a mixed model with farm as repeated subject and season (indoor vs pasture) as an independent variable. Days in milk and cows per robot were tested in the model but were non-significant. Furthermore, production data (milk yield and milking frequency per cow and per robot as well as robot utilization in percent) was downloaded directly from the milking robot for two periods, before and after pasture let-out, i.e. from 1st of March to pasture let-out and from pasture let-out to 22nd of June, respectively. Production before and after pasture let-out was compared in a mixed model with period, and with number of cows in the robot as independent variables using farm as repeated subject. Finally, a mixed model was used to study effects of various management routines on earlier mentioned production variables from the milking robot. The management routines that were evaluated statistically were effects of cow traffic system (free vs controlled), effects of amount of concentrate in the feed mixture, effects of location of drinking water (barn and/or pasture), and effects of controlled vs free exit to pasture.

Results and discussion

The statistical analysis of the differences between indoor and pasture season using the official cow control data showed production data was higher during the indoor season compared with the pasture season (Table 1). Although cows were later in lactation during the pasture season, this factor was not significant in the statistical analysis and could therefore not be the major reason for the observed results.

In the analysis of the production data obtained from the milking robot (Table 2), there was only a tendency for difference in milk production. However, milking frequency per cow and per robot was higher just before pasture let-out, compared with the period after. The number of cows per robot was

Table 1. Milk production during the indoor season (November-March) compared with the pasture season (June-August) for farms in the study based on data from the official cow control system. Least square means, standard error and significance (n=20).

	Indoor season	Pasture season	Standard error	Significance[1]
Milk, kg	29.5	28.4	0.4	*
ECM[2], kg	30.1	28.4	0.4	***
Milkfat, kg	1.23	1.13	0.02	***
Milkprotein, kg	1.01	0.96	0.01	**

[1] * = $P<0.05$; ** = $P<0.01$; *** = $P<0.001$.

[2] ECM = energy corrected milk.

Table 2. Effect of season on production parameters based on data from the milking robots on the farms in the study, during indoor and early pasture season, i.e. approximately 1.5 months before and after pasture let-out. Least square means, standard error and significance (n=20).

	Indoor	Early pasture	Standard error	Significance[1]
Robot utilisation, %[2]	78.7	74.7	0.7	***
Milkings robot^{-1}	149	143	2	**
Milkings cow^{-1}	2.57	2.45	0.04	**
Milk robot^{-1}	1,779	1,737	42	Tend
Milk cow^{-1}	30.0	29.7	0.4	Tend

[1] Tend = $P<0.1$; * $P<0.05$; ** = $P<0.01$; *** = $P<0.001$.

[2] % of time the robot is utilized.

significantly lower in the pasture season (57.5) compared with the indoor season (60.1) (P<0.05) and the number of cows was therefore included in the models.

The management differed substantially between farms. Pasture let-out differed substantially, occurring between early April and late May. Nineteen of the 20 farms in the study fed supplementary silage indoors throughout the summer period. Most of the farms (17) reported that they fed at least 6 kg dry matter (DM) silage in the summer compared with at least 12 kg DM in the winter period. Eight farms had no concentrate feeders while remaining farms had between 1 and 3. The amount of concentrate that was fed in the feed-mix varied, eight farms reported that the mix contained only 0-1 kg concentrate per cow while 10 farms made a mix with 2-5 kg concentrate and two farms had 6-8 kg concentrate in the mix. A majority of the farms (17) practiced some type of rotational grazing and most common (8) was a rotation period of 10-20 days. Almost all farms (16) offered drinking water only in the barn. A total of 13 farms had some type of controlled pasture let-out, using a selection gate (9 farms) or some other system to prevent cows with milking permission to leave the barn. Half of the farms fetched cows late for milking each day, five once a day and five twice daily. There was a large variation between the farms with regard to how the pastures were situated in relation to the barn, how the cows walked out to the pasture area, and the walking distance to pasture. In this study none of the management factors studied had any statistically significant effect on production parameters such as milking frequency, milk yield or robot utilisation.

The data from the official cow control system showed that for the farms in the present study, the average yield per cow in milk was 29.5 kg energy corrected milk (ECM), somewhat higher than the national average for cows on organic farms with (n=144), and without (n=93) AM who produced 28.6 and 27.7 kg ECM, respectively. As a comparison, corresponding figures for all conventional farms were higher, but the same for the group with (n=557) or without (n=751) AM, 31.1 and 31.2 kg ECM, respectively.

In conclusion, the results showed that most production parameters such as number of milkings and robot utilization were significantly lower in the early grazing period compared with the indoor period just before pasture let-out on the studied farms. The reason that there were fewer milkings during the grazing season, even when the lower number of cows per robot had been accounted for, was probably a combination of increased synchronization in the herd and that the cows came later to milking. A system with controlled pasture let-out, i.e. a system that prevents cows with milking permission to go out, is an effective way to improve cow traffic during the pasture season. This could be combined with earlier milking permission during summertime to improve milking frequencies.

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