UDC 636.034:591.552.637.02 https://doi.org/10.15407/animbiol21.02.032

RELATIONSHIP BETWEEN HERD SIZE, MILKING TECHNOLOGY AND MILK PRODUCTION PARAMETERS ON LARGE-SCALE HUNGARIAN DAIRY FARMS

D. Ivanyos[1], A. Monostori[2], Cs. Németh[2], I. Fodor[1], L. Ózsvári[1]
ivanyos.dorottya@univet.hu

[1]University of Veterinary Medicine Budapest,
István út. 2, Budapest, 1078, Hungary
[2]Livestock Performance Testing Ltd.,
Dózsa György út. 58, Gödöllő, 2100, Hungary

The aim of the study was to survey the milking technology on the large-scale (≥50 cows) Hungarian dairy farms and to compare the different types of milking parlour with herd size, average daily milk yield, average daily milk production per each cow and average somatic cell count (SCC).

The milking technology was surveyed by using a questionnaire on 380 large-scale commercial Hungarian dairy farms in 2017, and it was compared with the official farm milk production data of March 2017. Three herd size categories (Group 1: 50–300 cows, Group 2: 301–600 cows and Group 3: >600 cows) were set up and the relationship between milking technology, herd-size and milk production parameters were analysed by using two-way ANOVA and Tukey-test.

In Group 1, 2 and 3 (1) the number of farms was 142, 142 and 96; (2) the average herd size was 165, 437 and 958 cows; (3) the average daily milk yield was 24.73, 29.42 and 32.25 kg; (4) the average daily milk production per each cow was 21.07, 25.83 and 28.49 kg; and (5) the weighted average SCC was 432.5, 412.7 and 341.9×10³/ml. As the herd size increases, so does the average daily milk yield and the average daily milk production per each cow, however, the average SCC decreases significantly (P<0.001). The type of milking parlour had a significant effect (P=0.027) on the average SCC, and dairy units having herringbone milking system produced the lowest quality of milk with an average of 430.0×10³ SCC/ml.

The type of milking parlour has an impact on milk quality, however further research is required in this regard.

Keywords: DAIRY FARM, MILKING TECHNOLOGY, HERD SIZE, MILK YIELD, SCC

Milking technology greatly influences the organization of animal movements, the selection of milking routines, the influence of the quality of human labour, the hygiene of technology and the technical efficiency of milking equipment during the time of milking. Technological diversity has an impact on milk production, particularly on milk quality. The most common milking system on large dairy farms is herringbone. In addition parallel, tandem and carousel milking technology is used, but in recent years the spread of robot milking systems has also started [3]. [5] compared three types of milking technology (pipeline, parallel milking parlour and robot). In the case of pipeline milking, the germ count (18,000 CFU/cm³) was one and a half times higher than that of the parallel milking parlour (11,500 CFU/cm³) and robot (6,200 CFU/cm³). Somatic cell count (SCC) was 279,000/cm³ in pipeline milking, 281,600/cm³ in parallel and 195,600/cm³ in robot milking system. The lowest milk fat% (3.75 %) was also measured in pipeline milking system, while the milk fat% was 3.83 % in parallel and 3.88 % in robot milking system. Further research has also confirmed that in case of robot milking, the daily milk production is higher and the SCC is lower compared to the traditional milking parlour (herringbone) [1; 2].

The aim of the study was to survey the milking technology on the large-scale (≥50 cows) Hungarian dairy farms and to compare the different types of milking parlour [herringbone (H), parallel (P), carousel (C) and other (O)] with herd size, average daily milk yield, average daily milk production per each cow and average somatic cell count (SCC).

Materials and methods

The milking technology was surveyed by using a questionnaire on 380 large-scale commercial Hungarian dairy farms in 2017, and it was

compared with the official farm milk production data of March 2017. On the surveyed farms milk performance test is conducted monthly that is based on individual milk samples from all milking cows. The herd size of the Hungarian dairy farms varies largely, therefore three herd size categories (Group 1: 50–300 cows, Group 2: 301–600 cows and Group 3: >601 cows) were set up. Data were processed in *MS Excel 2013* software (*Microsoft Corporation*, Redmond, WA, USA). The relationship between milking technology, herd-size and milk production parameters were analysed. Statistical analysis was performed by using two-way ANOVA and Tukey-test in *R version 3.5.1.* [4].

Results and discussion

The most common type of parlour is the herringbone, but with the increase number of cows, the number of parallel and carousel milking parlour also increases (fig.).

The differences by the type of parlour of herd size, average daily milk yield, average daily milk production per cow and SCC are shown in table 1.

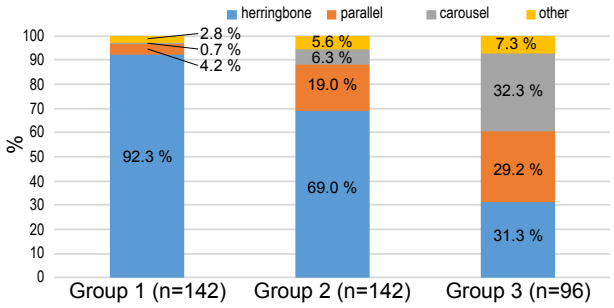

Fig. The distribution of farms using different type of milking parlour per herd size groups (n=380)

As the herd size increases, so does the average daily milk yield and the average daily milk production per each cow, however, the average SCC decreases significantly (P<0.001) (table 2).

The type of milking parlour had a significant effect (P=0.027) on the average SCC, and dairy units having herringbone milking system produced the lowest quality of milk with an average of 430.0×10³ SCC/ml (table 3).

The lower milk production in smaller dairy farms can be explained with lower standards of housing, feeding, milking technology and genetics. The type of milking parlour has an impact on milk quality. Herringbone parlours mostly used in older

Table 1

Milk production parameters in different herd size groups and milking parlour (n=380)

	Parlour	Average number of cows	Average daily milk yield, kg/day	Average daily milk production per cow, kg/day	Average SCC, ×10³ cell/ml
Group 1	herringbone	164	24.69	21.03	441.50
	parallel	167	24.59	21.12	364.14
	carousel	152	19.95	17.19	368.00
	other	180	26.72	22.71	258.75
Group 2	herringbone	420	29.03	25.48	432.42
	parallel	486	31.32	27.78	347.74
	carousel	477	29.32	25.06	356.00
	other	437	27.89	24.31	453.75
Group 3	herringbone	787	30.28	26.51	376.93
	parallel	937	33.44	29.41	342.21
	carousel	1055	32.35	28.80	317.45
	other	1227	34.29	30.76	316.67

Table 2

Milk production parameters by herd size groups (n=380)

	Number of farms	Average number of cows	Average daily milk yield, kg/day	Average daily milk production per cow, kg/day	Average SCC, ×10³ cell/ml
Group 1	142	165	24.73[a]	21.07[a]	432.5[a]
Group 2	142	437	29.42[b]	25.83[b]	412.7[a]
Group 3	96	958	32.25[c]	28.49[c]	341.9[a]

Note: [a, b, c] groups with different superscripts differ significantly (P<0.05).

Table 3

Milk production parameters by the type of milking parlour (n=380)

Parlour	Number of farms	Average daily milk yield, kg/day	Average daily milk production per cow, kg/day	Average SCC, $\times 10^3$ cell/ml
herringbone	259	27.03[a]	23.40[a]	430.00[a]
parallel	61	31.71[b]	27.94[b]	346.75[a]
carousel	41	31.38[ab]	27.70[ab]	327.15[a]
other	19	30.06[ab]	26.41[ab]	363.79[a]

Note: [a, b] Milking parlour types with different superscripts differ significantly ($P<0.05$).

milking systems. Higher cow number and milk production enable the use of newer technologies, which could have an impact on production.

The average SCC in Hungary is high in all groups, which is not only the most commonly used indicator of milk quality but could influence the quantity of milk production, as well. It makes necessary to explore the weak points in the dairy production. Regarding to this study milking technology and herd size have impact on the milk production parameters, as well. Further researches are needed to explain the influences of each segment of the used technologies in Hungary.

Conclusions

The lower milk production in smaller dairy farms can be explained with lower standards of housing, feeding, milking technology and genetics. The type of milking parlour and the number of cows has an impact on milk production, however further research is required in this regard.

The Project was supported by the European Union and co-financed by the European Social Fund: (1) EFOP-3.6.1-16-2016-00024 “Innovations for Intelligent Specialisation on the University of Veterinary Science and the Faculty of Agricultural and Food Sciences of the Széchenyi István University Cooperation”; (2) EFOP-3.6.2-16-2017-00012 “Development of a product chain model for functional, healthy and safe foods from farm to fork based on a thematic research network”; and (3) EFOP-3.6.3-VEKOP-16-2017-00005 “Strengthening the scientific replacement by supporting the academic workshops and programs of students, developing a mentoring process”.

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