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Comparison between two methods of measurement of milking speed in dairy cattle reared in Trento province

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RIASSUNTO – Confronto tra due metodi di rilievo della velocità di mungitura nei bovini da latte allevati in provincia di Trento – *La velocità di mungitura è considerata un importante carattere funzionale per la salute della mammella e per incrementare il profitto aziendale. Lo scopo di questa ricerca è stato di comparare i dati di mungibilità registrati dagli impianti di mungitura informatizzati con quelli rilevati da controllori mediante l'uso di cronometri. L'analisi è stata condotta, dopo un filtro sui dati incompleti ed anomali, su 444 vacche in lattazione, di razza Bruna e Frisona, presenti in 17 allevamenti con impianti di mungitura informatizzati della provincia di Trento. I coefficienti di correlazione dei due metodi di misura analizzati sono risultati pari a 0,87 e 0,91, rispettivamente per il tempo totale di mungitura e per il flusso di latte nell'unità di tempo (kg/min).*

KEY WORDS: dairy cattle, milking speed, methods of measurement.

INTRODUCTION – Milking speed can be considered an important functional trait in dairy cattle, with regard to udder health, and to improve the dairy profits (Mein, 1998, Blake and McDaniel, 1978; Meyer and Burnside, 1987; Luttinen and Juga, 1997; Dodenhoff *et al.*, 2000, Bagnato *et al.*, 2001). National Breeders Association of Italian Brown and Friesian cattle are official recording milking speed using a flowmeter (Lactocorder by Foss Electric) and subjective evaluation given by the farmer, respectively. The flowmeter is an instrument easily adaptable on different milking machine (Santus and Bagnato, 1999), but it does not allow a complete recording of all cows in all dairy herds, especially when located in mountain area. Therefore, the Superbrown Consortium of Bolzano-Bozen and Trento started to record milking speed, using a chronometer, in order to help in the future the national recording system and to provide service for all dairy farmers. Electronic data might integrate the milking speed data recorded using chronometer. This might contribute to the milking speed data base used for breeding values estimation. Aim of this research is to compare chronometer and computerised milking devices as two methods of measurement milking speed collected on Italian Brown and Friesian cows.

MATERIAL AND METHODS – The study was carried out in July 2002 in 17 computerised herds located in the Trento province measuring 539 lactating cows. Editing of data regarded days in milk (from 6 to 500 days) and animals with calving age and parity known. After this editing the statistical analysis was performed on 346 Brown and 98 Holstein Friesian cows. The computerised milking devices (MD) were of two different commercial types: DeLaval® (DL) with lactometer FloMaster, used in 10 herds with 134 total recorded cows, and Westfalia® (W) with lactometer Metatron, used in 7 herds with 310 total recorded cows. The milking speed traits were: milking time (MT), expressed in minute, and direct flow rate (DFR), expressed as ratio between milk yield (kg) and milking time (min). The MT of each cow was simultaneously timed from three adequately trained controllers, and moreover, the MD milking speeds

(MMS) was recorded. Total MT recorded by the controllers through a standard chronometer was defined as the interval from attaching the last teat cup and the cluster's complete removal (Meyer and Burnside, 1987). The MD milking time (MMT) is the interval among the two minimum levels of milk flow from the start to the end of regular milking procedure, defined by a sensor.

Table 1. Descriptive statistics of timed cows (444 records).

	Mean	SD	*Minimum*	*Maximum*
Milk yield (kg)	26.2	9.1	7.1	64.3
Parity	2.5	1.7	1.0	9.0
Calving age (month)	52.7	24.5	24.3	147.4
Days in milk	179.6	95.0	5.0	481.0

A preliminary analysis of variance, using a GLM procedure (SAS, 1990), was conducted for both traits (MT and DFR) in order to study the sources of variation: herd, milking controller, parity, calving age, breed, class of milk yield and stage of lactation. Only herd and days in milk (DIM) were statistically significant for this sample of data. The final analysis of variance was performed in order to study the relation between methods of measurement of milking speed using the following linear model:

$$Y_{ijkl} = \mu + MD_i + H_{ij} + DIM_k + b*MMS_{ijkl} + e_{ijkl}$$

where: Y_{ijkl} = MT recorded by chronometer; μ = general mean; MD_i = fixed effect of milking device on herd (i = DL and W); H_{ij} = fixed effect of herd within MD (j = 1,…,17); DIM_k = fixed effect of DIM (k = 1,…,7 classes of 45 days, except to class 7: >275 days); b = linear regression coefficient of milking machine speed (MMS) on MT timed by chronometer; e_{ijkl} = random effect of error ~ $N(0, \sigma_e^2)$.

RESULTS AND CONCLUSIONS – Descriptive statistics for milk yield, parity, calving age and DIM are given in Table 1. Data sample is comparable with dairy cattle population under milk recording system in Trento province (AIA, 2002). Analysis of variance is presented in Table 2. The effects of MMS and herd within MD were highly significant for both traits (MT and DFR) and they absorbed the major percentage of total variation (71% and 28% for MT, respectively; 65% and 30% for DFR, respectively). The R^2 of model were high and equal to 83% and 87% for MT and DFR, respectively. Least square means for milking speeds and relative standard errors are shown in Table 3. The MD effect showed as the milking time recorded by W device was lower then DL device (6.40 *vs* 7.36, respectively), while W device showed

Table 2. Analysis of variance for milking time (MT) and direct flow rate (DFR).

Source of variation	d.f.	Mean square	
		MT (min)	DFR (kg/min)
Milking device (MD)	1	61.95 *	8.01 *
Herd within MD	15	5.26 ***	1.76 ***
MD milking speed	1	1178.15 ***	487.93 ***
Days in milk	6	2.14 *	1.14 **
Error	420	0.89	0.29
R^2		83	87

**** = P<0.0001;** = P<0.001;* = P<0.05*

Table 3. Least square means and standard error for milking time (MT) and direct flow rate (DFR).

Fixed effects	MT (min)	DFR (kg/min)
DL device	7.36 ± 0.39	3.86 ± 0.22
W device	6.40 ± 0.00	4.22 ± 0.00
Farm (average of 17 records)	6.96 ± 0.04	4.01 ± 0.02
DIM 1 (from 6 to 50 days)	7.17 ± 0.20	4.03 ± 0.02
DIM 2 (from 51 to 95 days)	7.05 ± 0.21	4.14 ± 0.11
DIM 3 (from 96 to 140 days)	6.83 ± 0.17	4.06 ± 0.12
DIM 4 (from 141 to 185 days)	6.60 ± 0.16	4.23 ± 0.10
DIM 5 (from 186 to 230 days)	6.76 ± 0.16	4.04 ± 0.09
DIM 6 (from 231 to 275 days)	6.76 ± 0.17	3.98 ± 0.09
DIM 7 (> 275 days)	7.00 ± 0.00	3.80 ± 0.10

an higher DFR respect to DL device (4.22 *vs* 3.86, respectively). Least square means of DIM classes showed a no-linear effect with a *minimum* MT and a *maximum* DFR on the 4th DIM class.

The simple correlation between TMT and MMS was high (0.87 for MT and 0.91 for DFR) suggesting that milking speed recorded by the computerised MD might be helpful to integrate the provincial database of milking speed records, especially in farms not computerised. The rapidity achieved for data recording using electronic devices might be helpful for breeding value estimation because it allows a quicker collection and a larger number of data in dairy herds located in mountain area.

REFERENCES – **AIA**, 2001. Bollettino controlli produttività del latte. **Bagnato**, A., Gandini, G.C., Maltecca, C., Orlandini, P., Pizzi, F., 2001. Proc. XIV A.S.P.A. Congress. **Blake**, R.W., McDaniel, B.T., 1978. J. Dairy Sci. 61:363-378. **Dodenhoff** J., Sprengel, D., Duda, J., Dempfle, L., 2000. GIFT workshop Wageningen. **Luttinen**, A., Juga, J., 1997. Interbull Bulletin 15:78-83. **Mein**, G.A., 1999. http://www.nmconline.org/articles.htm. **Meyer**, K., Burnside, E.B., 1987. J. Dairy Sci. 70:1061-1068. **Santus**, E., Bagnato, A., 1998. Proc. 6th WCGALP. **SAS/STAT**, 1990. User's Guide, version 6, fourth edition. SAS Institute Inc.