COMPARISON BETWEEN AUTOMATED AND MANUAL SYSTEMS OF SHEEP MILK COLLECTION IN TUSCANY (ITALY)

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Figure 1. Cheese factories and collecting trips location.

Introduction. Tuscany Region Authority and Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana (IZSLT) promoted a traceability project in the sheep dairy production chain, in accordance with UNI EN ISO 22005/2008, with the aim of guaranteeing the Tuscan origin of the milk transformed by four cheese-factories. Collection of milk represents a critical and troublesome phase for traceability of dairy products. The reference method to measure milk production in sheep farms consists in calibrated bars installed at farm tanks. In addiction, milk samples for qualitative evaluation are usually collected manually; thus, mesurement and analytical results may be influenced by human errors. In order to increase reliability and accuracy, a "*human independent*" fully-automated collecting system was installed on trucks. This system permits: 1)*identification of dairy farms* by GPS; 2)*authomatic measurements of collected milk* by a homologated system with <2% error; 3) *collection of representative milk samples* identified with bar codes, for further qualitative analysis.

In the present study, this automatic system was compared with the reference methods (calibrated bars and manual sampling).

Matherials and Methods. From february to april 2011, 8 milk collecting trips were performed using 4 trucks equipped with automated milk collection system, for total 46 dairy farms conferring milk to 4 dairy factories: factory A (21 farms), factory B (6 farms), factory C (7 farms), factory D (12 farms). For 92 times (2 for each farm), the milk production was measured both by authomatic system and by reference method (graduated bars); in addiction, two 50mL milk samples were collected (automatically and manually). Samples were added with Bronopol 0.4%, stored at 4±1°C and analized within 48 hours for fat (%), proteins (%), lactose (%), somatic cell count (SCC, cells/mL) (Combifoss®, Foss Italia) and total bacterial count (TBC, cfu/mL) (Bacto-Scan 8000S®, Foss Italia). Data were submitted to statistical analysis (Pearson correlation coefficient).

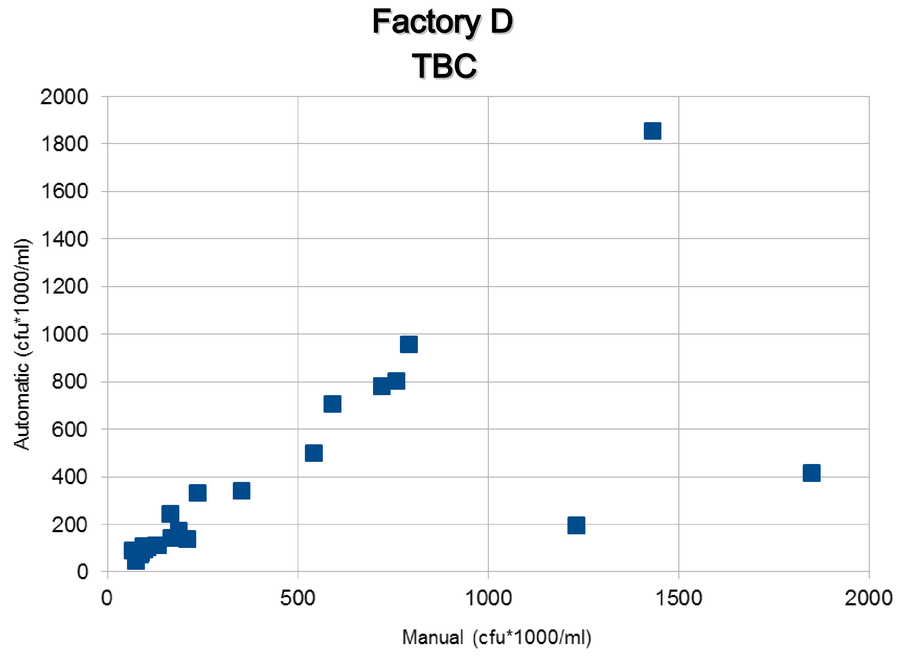
Figure 2. Farm tank with calibrated bar (left) and the automated system (right).

Results. Comparison and Pearson correlation coefficient of collected data are shown in table 1. Results showed an excellent concordance (P<0,0001) for almost each of the analysed parameters; in factory D total bacterial count resulted significally higher for manuallly collected samples (P=0,004).

Table 1 – Pearson correlation coefficient

Factory	Production (L)	Fat (%)	Protein (%)	Lactose (%)	TBC (CFU*1000/mL)	SCC (Cells*1000/mL)
A	0,999*	0,934*	1,000*	0,996*	0,953*	0,988*
B	0,999*	0,934*	0,945*	0,982*	0,998*	0,998*
C	0,999*	0,995*	0,996*	0,978*	0,875*	0,998*
D	0,999*	0,919*	0,972*	0,914*	0,662**	0,882*
Total	0,999*	0,965*	0,999*	0,960*	0,912*	0,984*

* (P<0,0001); **(P=0,004)



Discussion and conclusions. This trial demonstrates an excellent concordance between the two classes of data (reference and authomatic methods). Only in factory D TBC was significantly higher for manually collected samples (P=0,004): 2 of the 24 (8,33%) manually collected samples showed a higher bacterial count, probably beacause of contaminations during sampling.

From an overall evaluation, the authomatic system appears preferrable because of its riproducibility, repeatability and good applicability on-field: the measure precision is guarantee, human independent and farmers are not required anymore to level the tanks off at farm. Thus, the authomatic system represents a *super –partes* gaurantee in the tricky relation between factories and farmers, both for the measure of milk and for sampling. In conclusion, the adoption of such a system may inhance efficiency in the milk collection phase; it therefore represents an important tool to obtain the certification of traceability under the regulation UNI EN ISO 22005/2008 and to apply a quality based system for differentiated payment of sheep milk in Tuscany.

References

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