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THE INFLUENCE OF MILK COOLER HCA PERFORMANCES ON THE TOTAL NUMBER OF EMBRYOS (NTG) FOUND IN MILK

INFLUENŢA PERFORMANŢELOR RĂCITOARELOR DE LAPTE HCA ASUPRA NUMĂRULUI TOTAL DE GERMENI (NTG) DIN LAPTE

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The purpose of the present researches, established in conditions of great productivity, is to create influence of the cooling devices over the microbiological qulity of milk submited to the cooling quantified through NTG. The results obtained point out the aspect that the technique-functional performances and the hygine state belonging to the studied cooling devices (of the same tipe) influence the microbiological quality of milk, the sens and the size of the influence is very diferent according to the cooling used practicaly.
Key words: cooling real rate, milk cooling method, total number of aerobi mezofili embryos

Introduction

The initial qulities of milk, given by the inter-relations established between animal organisms (geneticaly potential, health state) and the environmental factors (nourishing, watering, microclimat), cannot be improven once the milk left the udder but on the other hand the qualieties can be lost inreversibly on the flux of harvesting/conditioning/manipulation (milking, cooling, transport), when the specific hygine conditions of milk, as a „living" product, are not satisfied.

Material and Methods

The researches done , netween 1997-2004 (on 4 experimental cycles made anualy: Cx 1...4), on the milk milked in the night or in the morning, with sheltered milking devices, but diferent types and source and cooled with milk cooler RCA, (fig. 1) the coruse is DeLaval, having different capacities.

As index of the microbiological quality as been choosen the *total number of the aerobic mezofil embryos (NTG).*

His determination has been done on milk tests, in the laboratory of the beneficiary reception of milk through the *direct method* (*succesive decimal diluting method).*

Fig.1.: **Milk cooler HCA (after DeLaval)**

The gathering of evidence has been done imediatly before putting in action the refrigeratory devices and right after the automatic interruption of frigorifical agregates, by touching the suggested temperature level (3 ºC in the summer and 4 ºC in the winter), respecting the general and special rules provided in the legislation. The ustensil and recipients used, 50 cm^3, for the gathering of evidence have been clean and dry and sterilized (through soaking in etilical alcool (70%) and putting thourgh flame to eliminate the alcool). Every evidence has been transmited to the laboratory, has been sealed and labeled with a label which contained the dates for the identification of the milk lot from which the evidence has been tacken (provider, date, place and the moment of gathering, the analises that wish to be performed, special conditions). The transportation of evidence towards the laboratory has been done with the milk tank, during the transport the evidence have been kept at refrigerating temperatures (4-8 ºC) and in the dark, in frigorifical chest.

Results and Discussions

For establishing the sens and the size of the influence of technical-functional parametrees and of the hygine state belonging to the surfaces of the cooling devices over the NTG of milk it has been followed a comparative analyses of the evolution of medium values belonging to this indexs registered before and after the cooling (on milk evidence gathered before the initiation of the cooling frigorifical devices and after the automatic interruption of this and getting to the proposed temperature level) for the studied cooling devices, on annual experimental cycles showen in *tabel 1 and 2.* It is observed that *the total number of aerobi mezofili embryos – NTG*, expressed like number embryo x

$10^3/cm^3$ milk, shows during the cooling, *senses of evolution and diferent modification sizes* soecialy according to the cooling method aplied practicaly in the utilisation of the milk coolers HCA had in discussion, and the initial level and sistematic quality of the milk microflora before the cooling. The influence of the cooling - *ΔNTGr*, the evolution sens and the size of the modification in the cooling process (with the important influence over the attained evolutions in the next links for the NTG and for the milk acidity and as a result over the final technological quality of milk) are given in the following form:

- During the attained cooling with the HCA 8000 cooler, the milk submited to cooling inscribe a *fine-draw of the multiplication of embryos and even a slite diminuation* with a medium value on the entire period of 5, 95 embryos $x10^3/cm^3$ (from 788, 02 embryos x $10^3/cm^3$ before cooling to 782, 07 embryos x $10^3/cm^3$ after cooling), the evolution over the studied years is a favorable one, of progress of the recorded diminuation from 3, 96 embryos x $10^3/cm^3$ in Cex 1 (from 913, 50 embryos x $10^3/cm^3$ to 909,54 embryos x $10^3/cm^3$). The favorable evolution is stimulated by the initial values from which the cooling starts, values situated in a progressic diminuation, along the annual experimental cycles.
- Along the cooling period established with HCA 6000 cooler the milk submited to cooling records *an important size* of NTG on the entire period of 61, 63 embryos x $10^3/cm^3$ (from 1214, 83 embryos x $10^3/cm^3$ to 1276, 46 embryos x $10^3/cm^3$), the established evolution along the years is a fluctuant one inducted by the initial fluctuand values (from the begining of the cooling) and very variate (the variability coeficients of environments is placed to big values of: 54,12 % in Cex 1; 36,89 % in Cex 2; 33,46 % in Cex 3 şi 17,33 % in Cex 4).
- Along the cooling process established with HCA 5000 cooler the milk submited to cooling records *a more important size* of NTG on the entire period, of 88, 70 embryos x $10^3/cm^3$ (from 1143,79 embryos x $10^3/cm^3$ to 1232,49 embryos $x10^3/cm^3$), the evolution established along the years is a fluctuant one inducted by the inital fluctuant values (from the begining of the cooling) and very variate (the variability coeficients of environments is placed to big values of: 54,12 % în Cex 1; 36,89 % în Cex 2; 33,46 % în Cex 3 şi 17,33 % în Cex 4).

The diferent evolution senses and great diferences recorded between the medium values of NTG found after milk cooling with the three coolers HCA (of 94,65 embryos x $10^3/cm^3$ between HCA 8000 and HCA 5000; 67,56 embryos x $10^3/cm^3$ between HCA 8000 and HCA 6000 and 27,07 embryos x $10^3/cm^3$ between HCA 5000 and HCA 6000) can be explained through the establishment and gathering of some conditions very diferent and variate for the development of microorganisms on the milk lots during the cooling process.

Tabel 1. **the cooling infleunce over the total number of aerobi mezofili embryos-*ΔNTGr*(embryos x10³/cm³) along the established cooling with the studied HCA milk cooler**

SPECIFICARE			Studied period				
			Cex 1	**Cex 2**	**Cex 3**	**Cex 4**	**Media**
HCA 8000	NTG before cooling - $NTG_{îr}$	**x** ± Sx	**913.50** ± 92.24	**756.75** ± 40.90	**749.25** ± 40.65	**732.58** ± 37.92	**788,02** ±28,82
		cv%	33.36	17.92	18.06	18.09	25,34
	NTG after cooling - NTG_{dr}	**x** ± Sx	**909.54** ± 59.91	**751.88** ± 27.18	**743.67** ± 26.57	**723.21** ± 28.36	**782,07** ± 20,29
		cv%	32.27	17.71	17.50	19.21	25,42
	Cooling variation - *ΔNTGr*		**-3,96**	**-4.87**	**-5.58**	**-9.37**	**-5.95**
HCA 5000	NTG before cooling - $NTG_{îr}$	**x** ± Sx	**1587.25** ± 308.11	**1005.58** ± 71.69	**949.67** ± 67.44	**1032.67** ± 61.70	**1143,79** ± 85,49
		cv%	64.59	24.14	24.83	20.18	51,78
	NTG after cooling - NTG_{dr}	**x** ± Sx	**1680.17** ± 168.04	**1095.42** ± 60.80	**1085.71** ± 66.42	**1068.67** ± 59.764	**1232,49** ± 55,86
		cv%	49.00	27.19	29.97	27.40	44,41
	Cooling variation - *ΔNTGr*		**+92,92**	**+89.84**	**+136.04**	**+36.00**	**+88.70**
HCA 6000	NTG before cooling - $NTG_{îr}$	**x** ± Sx	**1598.00** ± 261.06	**1101.25** ± 117.02	**1157.17** ± 113.12	**1002.92** ± 51.52	**1214,83** ± 80,22
		cv%	54.12	36.89	33.46	17.33	45,75
	NTG after cooling - NTG_{dr}	**x** ± Sx	**1610.67** ± 144.74	**1172.42** ± 69.62	**1166.46** ± 64.99	**1156.29** ± 78.91	**1276,46** ± 50,86
		cv%	44.02	29.09	27.29	33.43	39,04
	Cooling variation - *ΔNTGr*		**+92,92**	**+71.17**	**+9.29**	**+153.37**	**+61.63**

In the case of the cooling with HCA 8000 cooler the offered conditions to the microrganisms are totaly inferios as quality for multiplication and even survivol because the rapid decrease of temperature at the proposed refrigorifical level (3 ^{o}C in the summer and 4 ^{o}C in the winter time) it is established along the manifestation of bacterial power of milk and along the acomodation crises of the germs populations to another environment of life, the milk is submited to fracitonat cooling to a short time (17 minutes) after it has been gathered.

It must be taken in consideration that the level of NTG diminuation even during this cooling, considered a correct one, its not a modest one (under 10000 embryos/cm³ in all cases), fact which confirms that the cooling of milk cannot correct the hygien deficiencies from the former links of the flux of obtaining milk.

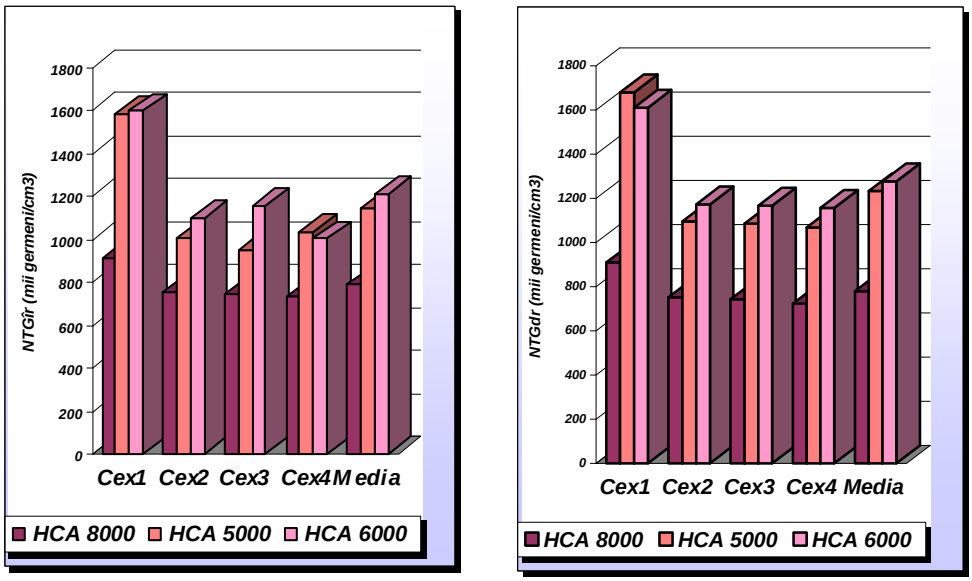

***Fig. The influence of cooling over the total number of aerobi mezofili embryos – ΔNTGr* (embryos x10³/cm³) along the achieved cooling with the studied HCA milk coolers**

In the case of the cooling made with HCA 6000 and HCA 5000, to the germ load already high and which consists in major secundary microflora (developed during the preservation and manipulation of milk after milking process from inital microflora), the cooling method used brings other favourable conditions to survivol and to the multiplication of microorganisms, such as:

- Through micturing milk fractions at their entering the cooler tank for the sooling it is established a real insemination of the entire lot of milk with the germ populations already found in a development faze in the first fractures of the milked milk.

- The temperature in the milks weight mentaines itself a very good period of time (cca 53 min) in the 15...24ºC interval, because of the cooling rate very low (-0,17ºC/min) which allowes the multiplication of germs.

- The short period of time from the first fractions of milk obtained and the moment of touching the refrigorifical level proposed (3....4ºC) is 4,4 h at HCA 5000 cooler and 4, 45 h at the HCA 6000 cooler which means that the cooling has not been established during the germ state of milk (when the milk is considered fresh) only after there have been done some ireversible modifications in the chemical compose of microbiological milk (degradation of laptoza) confirmed through levels of grouth from titratable acidity already shown .

At this deficiencies inducted in the milking link its added in all three cases, al least for Cex 1, self deficiencies of the cooling devices concerning the corect hygien of their surfaces that come in direct contact with milk, thier influence is

visible through the corelation of results of estimation of hygien through NTG tests with the sens of evolution NTG in milk and diferences recorded during cooling, but in diferent conditions.

Very important to observe that in the situations where the modification sens is similar, the sizes most noticeble are found in the years in which the initial values of NTG 6000, in Cex 4 are very low (for the cooling established with cooler HCA 6000, in Cex 4 when the the grouth is 153, 37 embryos $x10^3/cm^3$ (from a minimum of 1002, 92 embryos to 1156,29 embryos x $10^3/cm^3$) and for the cooling established with HCA 5000, in Cex, the grouth is 136, 04 embryos x $10^3/cm^3$ (from the minimum of 949, 67 embryos x 10^3cm^3 at a maximum of 1085, 71 embryos x 10^3cm^3).

This aspect is explainable with the further mentioning that at favourable factors gathered for the multiplication of embryos and that of the existence of a big nutritional ground, and the concurence intra- and interspecifical exercised by the microorganisms for the life environment is low.

Conclusions

In the sintesis of the material presented sofar it can be mentionated that the technical-functional performances and the hygine state of the cooling mashinery (of the same type) influence the microbiological quality of milk, the sens and size of this influence is very diferent according to the cooling method used of the cooling maschinery of milk can influence very much the functioning performances of the frigorifical instalations and even of the atumatical units of washing.

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