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THE INFLUENCE OF HCA MILK COOLERS PERFORMANCES OVER THE TITRATABLE ACIDITY OF MILK

INFLUENŢA PERFORMANŢELOR RĂCITOARELOR DE LAPTE HCA ASUPRA ACIDITĂŢII TITRABILE A LAPTELUI

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The influence of cooling over the titratable acidity - ΔAr materialozes itself in all cases in a growth of medium values of the parameters, of values of ths growth are different: only 0,8 ºT at the HCA 8000 cooler, 1, 09 ºT at the HCA 5000 cooler and even 1,21 ºT at HCA 6000 cooler. The differences are due to the difference in the cooling method used, but also due to the performances regarding the real rates of cooling accomplished in cooling the milk with HCA coolers.

Key words: milk cooling method, titratable acidity, technological quality

Introduction

The initial qualities of milk, given by the inter-relations established between animal organisms (geneticaly potential, healthy state) and environmental factors (feeding, watering, microclimate), cannot be improved once the milk has exit the udder but on the other hand the qualities can be lost ireversably through the flux of harvest/conditioning/manipulation (milking, cooling, transport), when the hygine requirements specific to milk as a „living" product are not satisfied.

The purpose if the present researches, accomplished in concrete conditions of high productivity, is to establish the influence that the performaces of the cooling mashinery has over the technological quality of milk sibmited to cooling, quality which is quantified through the titratable acidity parameter, which means in the end the milk freshness, pointing out, indirectly, the transformation degree (by the lactic microorganisms existing in milk) of milk lactose in lactic acid.

Material and Methods

The accomplished researches, between 1997-2004 (on 4 annual experimental cycles: Cex 1…4, with 10 monthly measurement), on 3 milk lots (milking at evening milking or morning milking, with sheltered milking

mashinery, of diferent types and origin) and cooled with 3 RCA milk coolers, (fig.1) DeLaval origin, with diferent capacities: 5009; 6000 and 8000 1.

As technological quality indexs the *titratable acidity* has been choosen – A, the determinations are done on milk tests, through the titratable method.

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

The gathering of evidence has been accomplished before setting to work the frigorifical mashinery and imediatly after automatic interruption of the frigorifical agregates, by reaching the suggested temperature level (3 ^{o}C in summer 4 ^{o}C in winter), taking in consideration the general and special rules found in the present legislation. The used utensil and recipients, of 50 cm^{3}, for the gathering of proof have been dry out and sterilized (through soaking in etilical alcohol (70%) and passing through flame to move away the alcohol.

Results and Discussions

To establish the sens and size of the technical-functioning parameters performances influence and the hygine state of the surfaces belonging to the cooling mashinery over the titratable acidity – A of milk it was necessary to proceed by a comparativ analizes of the evolution of average values of this index recorded before and after cooling for the studied cooling mashinery, on annual experimental cycles, presented in tabel 1 and 2.

It is observable that the titratable acidity, is accomplishing during the cooling process, in all cases a growth of average values, the values of this growth are *very different* especially according to the cooling method used, but also according to the performaces regarding the real rates of cooling established in cooling the milk with HCA cooler, in this way:

- At 8000 HCA coolers the average growth on the entire period is very low, of only 0,08 ºT (from 16,48 ºT before cooling at 16, 56 ºT after cooling), showing a fluctuant evolution on the studied period, from 0,04 ºT in Cex 3, (from 16, 54 ºT to 16,58 ºT) to 0,12 ºT in Cex 1 (from 16, 56 ºT to 16,62 ºT);

Tabel 1. **The influence of cooling over the titratable acidity of milk -*ΔAr* (ºT) during the accomplished cooling process done with the help of studied HCA milk coolers**

SPECIFICATION			Studied period				
			Ceg 1	**Ceg 2**	**Ceg 3**	**Cexg4**	**Average**
HCA 8000	Acidity before cooling - $A_{îr}$	**x** ± Sx	**16.42** ± 0.10	**16.50** ± 0.10	**16.54** ± 0.10	**16.46** ± 0.10	**16,48** ± 0,05
		cv%	3.07	3.10	3.08	3.09	3,05
	Acidity after cooling - A_{dr}	**x** ± Sx	**16.50** ± 0.10	**16.62** ± 0.10	**16.58** ± 0.10	**16.54** ± 0.10	**16,56** ± 0,05
		cv%	3.1	2.98	3.04	3.08	4,11
	Cooling difference - *ΔAr*		**+0,08**	**+0.12**	**+0.04**	**+0.08**	**+0.08**
HCA 5000	Acidity before cooling - $A_{îr}$	**x** ± Sx	**16.71** ± 0.13	**16.67** ± 0.12	**16.75** ± 0.15	**16.63** ± 0.13	**16,69** ± 0,07
		cv%	3.74	3.39	4.40	3.89	3,82
	Acidity after cooling - A_{dr}	**x** ± Sx	**17.83** ± 0.27	**17.92** ± 0.25	**17.75** ± 0.24	**17.62** ± 0.19	**17,78** ± 0,12
		cv%	7.33	6.77	6.49	5.25	4,50
	Cooling difference - *ΔAr*		**+1,12**	**+1.25**	**+1.00**	**+0.99**	**+1.09**
HCA 6000	Acidity before cooling- $A_{îr}$	**x** ± Sx	**16.88** ± 0.12	**16.89** ± 0.12	**16.79** ± 0.15	**16.96** ± 0.11	**16,88** ± 0,06
		cv%	3.63	3.62	4.29	3.24	3,67
	Acidity after cooling - A_{dr}	**x** ± Sx	**18.20** ± 0.30	**17.96** ± 0.29	**18.00** ± 0.27	**18.21** ± 0.19	**18,09** ± 0,13
		cv%	8.10	7.78	0.00	5.12	4,91
	Cooling difference - *ΔAr*		**+1,12**	**+1.07**	**+1.21**	**+1.25**	**+1.21**

- At 5000 HCA cooler the average growth on the entire period is high enough, 1,09 ºT (from 16,69 ºT before cooling at 17,78 ºT after cooling), showing during the evolution a certain decrease tendency from 1,25 ºT in Cex 2, (from 16,67 ºT to 17,92 ºT) to 0,99 ºT in Cex 4 (from 16,63 ºT to 17,62 ºT);
- In the case of 6000 HCA cooler the average growth on the entire period is the biggest from the cases that have been analized, 1, 21 ºT (from 16,88 ºT before cooling to 18,09 ºT after cooling), showing a fluctuant evolution on the studied period, with a lower growth in Cex 2, from 1,07 ºT(from 16,89 ºT to 17,96 ºT) and maximum in Cex 1, from 1,32 ºT (from 16,88 ºT to 18,20 ºT);

The medium influences of cooling over the titratable acidity -*ΔAr* recorded during the cooling process shows big differences between the growth of acidity recorded at the accomplished cooling with the HCA 8000 milk cooler and the other cooling accomplished qith HCA 5000 milk cooler (1,13 ºT) and HCA 6000 (1,01ºT) and low differences between the growth of acidity recorded at the

cooling processes accomplished with HCA 5000 coolers and HCA 6000 (0,12ºT) aspect shown in *figure 2*.

The explanation already mentionated of these differences (being given by the differences in the practical method used at the milk coolers, differences that induct seriouse modifications of the real cooling performances of the mashinery in use) there are the next argumentations:

- the average higher values of titratable acidity found before cooling, in the case of the evidence gathered from the harvested milk lots which were supposed to be cooled with HCA 5000 coolers and HCA 6000 coolers, in comparison to the average values of titratable acidity found before cooling, in the case of the evidence harvested from the milk lots that were supposed to be cooled with HCA 8000 coolers (16,69 ºT and 16,48 ºT) with indicat a higher transformation degree of the lactoze in the lactic acid (so to say a bigger quantity of lactic acid) even before the controlled cooling started.
- the very low real cooling rates of milk accomplished with the mashinery HCA 5000 and HCA 6000 that make in at leat first period of cooling (the first cca. 53 min) the temperature existing in milk to establish between 15º ..... 24 º , which makes possible for the lactic microorganism to have an intens metabolical activity and even a numerical multiplication demonstrated through recorded growth in what concerns NTG presented in the following assertations.

Analizing in the same time the following aspects:

- the fact that the average values of NTG found in the link after the milking process, very low at the milk lots that were supposed to be cooled with HCA 5000 and HCA 6000 coolers lower than the average values found in the milk lots that were followed to be cooled with HCA 8000 coolers (differences that were interpretated as being due to a bigger contamination of milk from external sources (during the milking process) in the case of the milking mashinery with pipe collectiong, in comparison to a more significant proportion of microflora with internal origin in the microgerm contamination of the can milked milk with the milking mashinery),
- knowing the fact that lactical microorganisms are more rezistent to milk bacterial action (in the bacterial faze),
- the practical ascertainement that for the first samples of milk (comig fromthe first milked cows) the maximum period of time of the bacterial faze is overpassed as a result in the noted fractions, there is a significant multiplication of the lactical

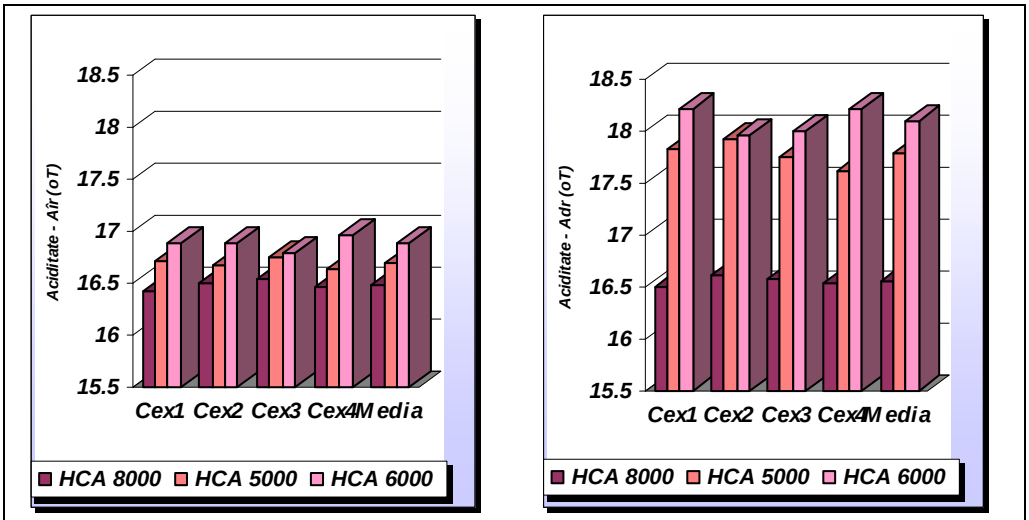

Fig. 1: **The influence of cooling over the titratable acidity of milk - *ΔAr* (ºT) during the cooling process accomplished with milk coolers HCA**

bacteria, it can be interpreted that, for the milk lots that have been cooled with HCA 5000 and HCA 6000 coolers, all the favourable requirements gather (of numerical and quality development of primary microflora of milk aster milking, temperature and time) for the development of a secundary microflora noted before reaching, through controlled cooling, a termical level that permits the prolongation with great eficiency of the bacterial faze of milk.

Conclusions

In the sintesys of the what has been presented above, it can be said that the technical-functional performances and the hgine state of the studied cooling mashinery (of the same type) influence the technological quality of milk, the size of influence beeing different according to the cooling method aplyed practicaly.

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