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INFLUENCE OF *BACILLUS CEREUS* ON THE KEEPING QUALITY OF PASTEURISED MILK

P.K. AGGARWAL and R.A. SRINIVASAN

Division of Dairy Microbiology, National Dairy Research Institute, Karnal-132 001

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Bacillus cereus occurs in milk and other dairy products as a contaminant (Chopra *et al.*, 1980). It is one of the milk spoilage agents and is implicated in bitty cream and sweet curdling defects of stored pasteurized milk (Franklin, 1969). An attempt was made to establish whether there is any relationship between the keeping quality (KQ) of pasteurized milk and its post-pasteurization population of *B. cereus*.

Pasteurized milk samples were collected from the experimental dairy unit of the Institute, immediately after pasteurization, as per method of APHA (1972).

Total bacterial counts were made on tryptone-dextrose agar (ISI, 1962) using physiological saline as the diluent. *B. cereus* counts were determined on mannitol yeast extract polymyxin agar, MYPA (Mossel *et al.*, 1967), substituting meat extract with beef extract for better uniformity in the medium. For this medium 20% egg yolk emulsion was prepared according to Cruickshank (1970). Polymyxin-B-sulphate ('Aerosporin'; Burronghs Wellcome, London) was added to the egg yolk enriched medium to get a final concentration of 10 µg antibiotic/ml of complete MYPA medium.

The titratable acidity (in terms of % lactic acid) was measured as per ISI (1960) using N/9 NaOH.

The end of keeping quality was determined by clot-on-boil (COB) test according to the method prescribed by ISI (1960).

With a view to compare the influence of the number of *B. cereus* cells on the keeping quality of milk, the samples showing below 100 colonies of this organism/ml were placed

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TABLE

Relationship between keeping quality (KQ) of pasteurized milk and its *B. cereus* population at 30°C

Group	Initial quality				Quality at COB positive stage				COB (KQ) time (h)	Increase in %LA
	B. cereus	Total bacteria	%LA	pH	*B. cereus*	Total bacteria	%LA	pH		
	—cfu/ml—				—cfu/ml—					
A.	1-100 (18)*	11,000-2,89,000 (68,000)	0.12-0.16 (0.14)	6.6-6.8 (6.7)	15-4,400 (1,370)	$39\text{-}191 \times 10^8$ (77.83×10^8)	0.27-0.35 (0.30)	5.95-6.1 (6.03)	6.17 (14.38)	0.16
B.	>100 (855)	10,100-88,000 (31,400)	0.12-0.16 (0.14)	6.4-6.7 (6.59)	660-17,000 (6,850)	$0.67\text{-}77 \times 10^8$ (47.86×10^8)	0.26-0.27 (0.27)	6.0-6.1 (6.07)	6-16 (12.67)	0.13

*Figures in parentheses represent average values.

under group A and those containing over 100 colonies/ml under group B (Table). In group A the average *B. cereus* counts were 18/ml with a corresponding total bacterial load of 11,000-2,89,000/ml (average 68,000/ml) whereas in group B the average *B. cereus* counts were 855/ml and the total viable bacterial counts ranged between 10,100-88,000/ml (average 31,400/ml).

There was a reduction of 1 hr 30 min in the keeping quality of pasteurised milk when there was an increase of about 48 times in the initial *B. cereus* count from group A to group B However, the corresponding average *B. cereus* counts at COB stage increased only by 5 times in group B over those in group A in which they averaged 1,370/ml. Lactic acid increased to 0.30% from the initial value of 0.14%, pH values decreased from 6.7 to 6.0 at COB positive stage. Almost a similar trend was observed with group B samples, having high initial *B. cereus* counts where the samples clotted on boiling after 12 hr 40 min. At this stage *B. cereus* counts averaged 6,850/ml. Lactic acid content in such samples was found to be 0.27% and pH decreased to 6.0 from the initial 6.6.

The present observations show that *B. cereus* plays an important role in the keeping quality of pasteurized milk which was determined on the basis of developed acidity at the COB positive (protein instability) stage. Whereas the total bacterial population of milk at the end of keeping quality was not much different in both the groups, the initial *B. cereus* population may have caused proteolysis (Mikolajcik and Rao, 1974) yielding basic radicals (Terplan *et al.*, 1973) and its rennet action (Srinivasan, 1966; Tani *et al.*, 1968) also might have helped in early spoilage of the samples irrespective of the overall bacterial load just after pasteurization. This also highlights the importance of the organism present even in small numbers in milk and that its spoilage potential cannot be overlooked in heat treated milk and milk products.

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