

A Study On Effect Of Added Neutralisers On Starter Culture Growth In Fermented Milks

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ABSTRACT: The Dairy starter culture is referred to carefully selection of desirable microorganisms. Those are intentionally added to milk during conversion into cheese, dahi, yoghurt, and other fermented dairy products to bring about specific changes in the appearance, body and texture, flavor and desired organoleptic characteristics of the final product. The quality of milk itself has an important bearing on the growth of starter organisms. The mastitis milk has abnormal in composition and such milk with high salt concentration does not support the growth of starter culture that leads to production of poor quality of fermented dairy products with weak body.. The presence of certain neutralizing substances performed in milk has found to interfere with growth of starters. There was a definite lag in the growth of the starter organisms as well as acid development when neutralizers were added to raw milk samples. This may be due to the bacteriostatic effect of added neutralizers. But discrepancy was seen to the greatest extent in the case of neutralized, mastitis and highly advanced lactation milks and to a lesser degree on the early lactation milk obtained on the 4th and 5th days.

Key words: Starter culture, Neutralizers, Dahi, Fermentation.

Introduction

The developed acidity in milk is mainly due to the production of lactic acid by the action of microorganisms. Because of the large time gap during the transportation of milk from the production center to the main processing plant, milk under goes chemical changes due to the action of large number of contaminated microorganisms and may also lead to the spoilage of milk. During summer season the quality of milk deteriorates very quickly because of high temperature and lack of cooling facilities. Because of this reason dairy plants in India receive considerable amount of sour milk of varying degrees of acidity. Thus it becomes imperative to neutralize high acid milk before it is heat processed. The neutralizers are chemical substances, which are alkaline in nature Mc Dowell (1938). They are added to food in order to regulate the hydrogen ion concentration. These neutralizers are commonly used in foods such as bakery products as leavening agents to liberate the carbon dioxide in the dough, which improves the quality of bread (Arora et al., 1985). But use of neutralizers in milk and milk products is prohibited according to PFA (1955). However, many times there is no check on the use of neutralizers in milk. The effect of added neutralizers on preparation and sensory characteristics of dahi using mixed culture of *Streptococcus Salvarius* ssp, thermophilus, lactococcus, delbreucki ssp. bulgaricus investigated. It was generally noticed that curdling times was greatly increased in the neutralized milk samples. Titratable acidity values obtained from all the experimental samples were generally lower compared to the control. This is in agreement with Lindgram (1988) and Umesh (1984) who also observed that added neutralizers reduced growth of mixed cultures and titratable acidity.

Materials and methods

1. Chemicals and Reagents

The chemicals and reagents used were mainly of analytical grade. All the necessary reagents were prepared using distilled or double distilled water. The following chemicals were used in the investigation.

2. Milk

Composite cow and buffalo milk were collected from UAS Dairy farm and also some commercially available milk samples were also collected for the investigation.

3. Equipments

The following equipment's were used for the investigation

1. Refrigerator
2. Incubator
3. Water bath
4. pH meter (Eliko)
5. Hot air oven

4. Cultures

Pure cultures of *Streptococcus salivarius*ssp, thermophilus, *Lactococcus, delbreucki*ssp, bulgaricus obtained from Dairy Microbiology lab were used to prepare the fermented milks in the study.

5. Neutralizers

Chemical neutralizers such as sodium carbonate, sodium bicarbonate, and sodium hydroxide were used in the study. The generally used neutralizers are the alkalis such as sodium hydroxide, sodium bicarbonate, sodium carbonate and calcium hydroxide (Taylor and Clegg, 1958).

6. Thoroughly cleaned and sterilized stainless steel utensils.

7. Preparation of dahi from neutralized milk.

100 ml of neutralized milk samples were taken in a clean sterilized beaker. It was inoculated with mixed starter culture at the rate of 2 percent under aseptic conditions samples were incubated in the incubator at 37°C for setting of curd for about 6-7 h and fermented milk was analyzed for acidity, curd strength, and sensory characteristics (Umesh, 1984).

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RESULTS AND DISCUSSIONS

Effect of added neutralizer on rate of development of acidity in cultured milk.

The activity of starter culture in the neutralized milk was measured by determining the titrable acidity of curd incubated at 30°C with mixed culture during preparation of dahi, after every 2 h of the incubation period. It is

evident from the Table 1 that the control milk samples took 6hr for formation of curd while sample with added neutralizers took 8, 10, and 10hrs for curd setting respectively in case Na₂CO₃ treated samples; 8,9 and 10hs in case of samples treated with added NaHCO₃, and 6,8,10 in case of samples treated with added NaOH respectively in case of milk samples neutralized from 0.22, 0.25 and 0.30 levels of acidities.

Table 1: Effect of added neutralizers on development of acidity in neutralized cultured milks.

Incubation period (hr)	Control	Na ₂ CO ₃			NaHCO ₃			NaOH		
		A	B	C	A	B	C			
Percentage of lactic acid										
0	0.14	0.14	0.14	0.1	0.15	0.15	0.15	0.16	0.16	0.16
2	0.20	0.18	0.17	0.18	0.22	0.20	0.18	0.28	0.21	0.20
4	0.52	0.34	0.28	0.32	0.44	0.40	0.37	0.42	0.39	0.37
6	0.68*	0.50	0.44	0.49	0.61	0.58	0.54	0.60	0.56	0.53
8	0.76	0.65*	0.52	0.55*	0.72	0.64	0.65	0.75*	0.70*	0.66
10	0.82	0.76	0.65*	0.69	0.85*	0.80*	0.78*	0.88	0.82	0.76*
12	0.98	0.86	0.79	0.78	0.91	0.89	0.87	0.93	0.88	0.83
14	1.08	0.92	0.87	0.85	0.96	0.94	0.92	0.96	0.93	0.89
16	1.24	0.98	0.96	0.96	1.0	0.92	0.98	0.99	0.96	0.95

: Curding Time Control milk 0.15% lactic acid

A: Milk neutralized from 0.20% lactic acid

B: Milk neutralized from 0.25% lactic acid

C: Milk neutralized from 0.30% lactic acid

As the concentration of added neutralizers increases, the rate of acid development showed declining trend in all experimental samples as it can be observed from the Fig. 9,10 and 11 respectively for Na₂CO₃, NaHCO₃, NaOH. In the experimental samples the acidity developed at the time of curdling were 0.65,0.65, 0.69 percent with respect to Na₂CO₃, 0.72,0.75,0.78 percent lactic acid with respect to NaHCO₃, and 0.60,0.70,0.76 percent lactic acid respectively with NaOH. This indicates that the rate of acid development reduced drastically with increase in levels of neutralization of milk affected the acid development in cultured products.

Effect of added neutralizers on sensory characteristics of dahi

The curd prepared from the control as well as experimental treated samples were served to panel of five judges for judging the quality of curd with respect to color and appearance, body and texture, flavor and overall acceptability of the curd. The mean scores of sensory characteristic are presented in Table 2.

1 Effect on color appearance

It is evident from the Table 2 that the extent of Neutralization has remarkable effect on color and appearance of curd prepared from the milk neutralized by different neutralizers. The mean scores obtained for color and appearance were 4.0, 3.5 and 2.5 for the curd prepared from milk neutralized from 0.2, 0.25, 0.30 percent lactic acid as against control samples. The statistical analysis of data revealed that there is significant effect of added neutralizers on color and appearance of the curd.

2 Effect on body and texture

From the results presented in the Table 2 with respect to the body and texture, it is evident that the extent of neutralization has considerable effect found profound effect on the scores awarded for body and texture of curd. As the extend of neutralization increased the scores decreased significantly. The mean scores obtained for the body and texture of experimental samples of curd prepared from the milk neutralized from the acidity levels of 0.20, 0.25 and 0.30 percent lactic acid were 4.0,3.0 and 2.5 as against 4.5 for the control. The statistical analysis showed that the neutralization milk has significant effect on body and textural characteristic of curd.

3 Effect on flavor

The mean scores for flavor of milk which were neutralized from acidity levels of 0.20, 0.25 and 0.30 percent lactic acid were 12.0, 9.0 and 8.0 against 14.0 for control sample. Further statistical analysis proved that the addition of neutralizers significantly affected the flavor of curd prepared from the treated samples.

Table 2: Sensory evaluation of dahi prepared from milk with added NaOH.

Attributes	Control	A	B	C
Color and Appearance (5)	4.5	4.0	3.5	2.5
Flavor (15)	14	12	9.0	8.0
Body and texture (5)	4.5	4.0	3.0	2.5
Total score (25)	23	20	15.5	13

CD for total score 2.22

F-value-692.3

Average of 5 trials

Control: Milk with 0.15% lactic acid
 A: Milk neutralized from the acidity 0.20% lactic acid
 B: Milk neutralized from the acidity 0.25% lactic acid
 C: Milk neutralized from the acidity 0.30% lactic acid

Effect of added neutralizers on development of acidity and sensory characteristics in fermented milks

Among the three neutralizers the development of acidity was greatly retarded in the experimental milk samples treated with sodium bicarbonates. This may be due to the bacteriostatic effect of this neutralizers on the growth of starter cultures. In addition to the hindrance of growth of organisms due to bacteriostatic effect, added neutralizers may solubilize some of the colloidal calcium in the casein micelle and thus delay the coagulation leading to a weaker body and texture and whey separation as observed in present investigation. The milk with 0.20, 0.25 and 0.30 per cent acidity neutralized to that of control obtained score of 4.0, 3.0 and 2.5 respectively, indicating that body and texture of the curd was deteriorated in neutralized samples depending upon the extent of neutralization. The flavor score of the curds prepared from the milk with different added neutralizers decreased with the increase in level of neutralization of sour milk. However, the extent of decrease was more pronounced in milk samples, which were neutralized from 0.30 per cent lactic acid. Further the added neutralizers may also impart a soapy flavor to the product, when the concentration exceeds the limit. The protein denaturation which cause release of free sulphhydryls attribute cooked or smoky flavor in the product prepared from neutralized milk. The overall acceptance studies confirmed that the product prepared milk neutralized from the acidity of 0.20 lactic acid matched with that of control.

Conclusion

The effect of added neutralizers to milks on the rate of lactic acid production in the fermented milks showed significant reduction in rate of acid development in cultured milks making the incubation period longer. The sensory evaluation of cultured products like dahi prepared from neutralized milk samples were studied by panel of five judges and the sensory quality of dahi obtained from neutralizers added milk showed general decrease in sensory scores compared to the scores for the control samples indicating unsuitability of neutralized milk for preparation of fermented milks.

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