



# A Study on Gel Firmness of Misti Dahi prepared from Cow and Buffalo milk at different levels of total solids with different cultures at the end of incubation (8 hours)

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## ABSTRACT

Misti dahi prepared with three strains characterized as *Str. thermophilus* (C2, C3 and C4) for the preparation of misti dahi on the basis of their superiority with respect to firmness, acid production and organoleptic evaluation. Commercial mixed strain No.1379 (C1), LF40 (C5) were also used as starter for the preparation of misti dahi. In case of cow milk fat, SNF and sugar were kept respectively at 4, 10 and 18 per cent (L1) ; 4, 12 and 18 per cent (L2) and 4, 14 and 18 per cent (L3). In case of buffalo milk the above ingredients respectively were adjusted to 6, 10 and 18 percent (B1) ; 6, 12 and 18 per cent (B2) and 6, 14 and 18 per cent (B3) levels of total solids and penetrometer readings were taken after incubation of 8 hrs. Misti dahi prepared with C2 or C3 cultures at L3 levels of total solids from cow milk showed the lowest penetrometer readings after incubation and misti dahi with C2 or C3 cultures at B3 levels of total solids from buffalo milk showed the lower penetrometer readings than that with other cultures at B3 level after 8 hrs incubation. Misti dahi from buffalo milk showed lower penetrometer reading / higher firmness than that of cow milk with all the treatments.

**Key words :** Misti dahi, cow and buffalo milk, total solids, gel firmness.

## 1. INTRODUCTION

Tramer (1973) observed that a reasonable development of acidity was needed to achieve desired firmness of the coagulum. Foster *et al.* (1958) stated that at the curdling point, usually about 0.60 per cent acidity at 21°C casein was in its minimum state of hydration. As the acidity increases into the range 0.75 to 0.80 per cent, hydration of

casein (and thus whey – retaining property) again increases, thereby improving firmness/viscosity. The increase of total solids increases the firmness of semisolid mass.

The present study was done to measure gel firmness of misti dahi in terms of reading of penetrometer.

## 2. METHODS

### Determination of Gel Firmness

The gel firmness of *misti dahi* was measured using AIMIL Make, Universal Cone Penetrometer, type FPN-3, immediately after 8 hrs of incubation. The penetration measurement was made using a cone and a test rod weighing 151.5 g for a fix time of 10 sec. For the same replication, readings were recorded at three cups and the average value was reported as mm of penetration for one replication.

## 3. RESULTS AND DISCUSSIONS

### (A) Penetrometer Reading (in mm) of *Misti Dahi* prepared from Cow milk at different levels of total solids with different cultures at the end of incubation.

#### Effect of culture :

The results presented in Table-1 indicate that differences in penetrometer readings (in mm) with different cultures were significant. It was found that on an average C<sub>3</sub> showed the lowest penetrometer reading of 31.0000 mm followed by culture C<sub>2</sub> (31.0556). However, both of them were statistically at par. Culture C<sub>4</sub> showed significantly higher mm of penetration (37.0778 mm). C<sub>2</sub> and C<sub>3</sub> showed higher firmness/ lower penetration because of production of higher acidity at all three levels of total solids than C<sub>1</sub>, C<sub>4</sub> and C<sub>5</sub>. Foster *et al.* (1958) stated that as the acidity increased from curdling stage into the range of 0.75 to 0.80 per cent L.A.; hydration of casein again increased and thereby improving firmness/ viscosity.

#### Effect of total solids:

It was observed that the differences in penetrometer readings were significantly affected by different levels of total solids in milk. The increase in levels of total solids decreased the penetrometer reading. Minimum penetrometer reading was given by L<sub>3</sub> followed by L<sub>2</sub>. But both were significantly different. This is in accordance with Rasic and Kurmann (1978) who noticed that firmness of set yogurt could be markedly increased by increasing the total solids of basic milk.

However, it was observed that the interaction between type of culture and level of total solids was significant. So different cultures behaved differently with different levels of total solids.

### Effect of interaction between type of culture and level of total solids:

It was revealed from Table-1 that combinations C<sub>2</sub>L<sub>3</sub> and C<sub>3</sub>L<sub>3</sub> gave the lowest mm of penetration followed by combination C<sub>3</sub>L<sub>2</sub>. However, C<sub>3</sub>L<sub>2</sub> was significantly different from the treatments C<sub>2</sub>L<sub>3</sub> and C<sub>3</sub>L<sub>3</sub>.

From the above results it can be concluded that the combination of C<sub>2</sub> or C<sub>3</sub> at L<sub>3</sub> level of total solids in cow milk showed both higher titratable acidity and lower penetrometer reading (or higher degree of firmness) compared to C<sub>1</sub>, C<sub>4</sub> and C<sub>5</sub> with L<sub>3</sub> level of total solids.

### (B) Penetrometer Reading (in mm) of *Misti Dahi* prepared from Buffalo milk at different levels of total solids with different cultures at the end of incubation.

#### Effect of culture :

The results presented in Table-2 indicate that differences in penetrometer readings (in mm) with different cultures were significant. It was found that on an average C<sub>3</sub> showed the lowest penetrometer reading of 25.8556 mm followed by culture C<sub>2</sub> (25.9444). However, both of them were statistically same. Culture C<sub>5</sub> showed highest mm of penetration (33.7333 mm). Culture C<sub>2</sub> and C<sub>3</sub> showed higher firmness/ lower penetration because of production of higher acidity at all three levels of total solids than C<sub>1</sub>, C<sub>4</sub> and C<sub>5</sub>. Tramer (1973) observed that a responsible development of acidity was needed to achieve desired firmness of the coagulum. Foster *et al.* (1958) stated that as the curdling point, usually about 0.60 per cent acidity at 21°C casein was in its minimum state of hydration. As the acidity increases into the range 0.75 to 0.80 per cent, hydration of casein (and thus whey-retaining property) again increases, thereby improving firmness/viscosity.

#### Effect of total solids :

It was observed that the differences in penetrometer readings were significantly affected by different levels of total solids in milk. The increase in levels of total solids decreased the penetrometer reading. The minimum penetrometer reading was shown by B<sub>3</sub> followed by B<sub>2</sub>. Both were significantly different. This is in accordance with Rasic and Kurmann (1978) who noticed that as the total solids of milk was raised from 8.0 to 50.0 per cent there was marked improvement in the firmness of set yogurt. However, it was observed that the interaction between type of culture and level of total solids was significant indicating the differential behavior of different cultures with different levels of total solids.



**Effect of interaction between type of culture and level of total solids :**

The data in Table-2 showed that culture C<sub>2</sub> with total solids level B<sub>3</sub> gave the lowest mm of penetration followed by combination C<sub>3</sub>B<sub>3</sub>. However, both of them were statistically at par.

From the above results it can be observed that the combination of C<sub>2</sub> or C<sub>3</sub> at B<sub>3</sub> level of total solids in buffalo milk gives both higher titratable acidity and lower penetrometer reading (or higher degree of firmness) compared to C<sub>1</sub>, C<sub>4</sub> and C<sub>5</sub> with B<sub>3</sub> level of total solids.

**Conflict of interest statement**

Authors declare that they do not have any conflict of interest.

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**Table-1 : Penetrometer Reading (in mm) of Misti Dahi prepared from Cow milk at different levels of total solids with different cultures at the end of incubation (8 hrs).**

Type of culture	Level of total solids			Average mm of penetration with different cultures
	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	
C <sub>1</sub>	38.9667	33.7667	32.3000	35.0111
C <sub>2</sub>	35.5667	29.3000	28.3000	31.0556
C <sub>3</sub>	35.6000	29.1000	28.3000	31.0000
C <sub>4</sub>	39.7333	36.6000	34.9000	37.0778
C <sub>5</sub>	39.4667	35.7333	34.2000	36.4667
Average mm of penetration with different levels of total solids	37.8667	32.9000	31.6000	-

	S. Em.	C. D. at 5 %	C. V. %
Type of culture (C)	0.0765	0.2209	0.6727
Level of total solids (L)	0.0593	0.1711	-
C x L	0.1325	0.3827	-

Average of three replications (each replication is average readings of three cups under same treatment). Incubation period of 8 hours.

**Table-2 : Penetrometer Reading (in mm) of Misti Dahi prepared from Buffalo milk at different levels of total solids with different cultures at the end of incubation (8 hrs).**

Type of culture	Level of total solids			Average mm of penetration with different cultures
	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	
C <sub>1</sub>	34.9333	31.4333	29.4667	31.9444
C <sub>2</sub>	29.5000	24.6667	23.6667	25.9444
C <sub>3</sub>	29.2333	24.6333	23.7000	25.8556
C <sub>4</sub>	32.0333	30.0333	30.0000	30.9889
C <sub>5</sub>	36.1000	33.0000	32.1000	33.7333
Average mm of penetration with different levels of total solids	32.3600	28.8933	27.8267	-

	S. Em.	C. D. at 5 %	C. V. %
Type of culture (C)	0.0666	0.1925	0.6733
Level of total solids (B)	0.0516	0.1491	-
C x B	0.1154	0.3333	-

Average of three replications (each replication is average readings of three cups under same treatment). Incubation period of 8 hours.