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# Effect of Different Additives from Local Source on the Quality of Yoghurt

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**Abstract:** Yoghurt is the most popular fermented milk product in the most parts of world. It involves use of specific symbiotic culture of *L. bulgaricus* and *S. thermophilus*. Yoghurt consists of valuable nutrients as in milk but it seems to have more than milk. In the present study different food additives from local source are used as additives and the effect is estimated for possible influence on the quality of yoghurt. Yoghurt was prepared by using different stabilizers like carboxymethyl-cellulose (CMC), guar gum, gelatin, cornstarch and their combinations like CMC-gelatin, gelatin-cornstarch and CMC-cornstarch at different levels i.e. 0.1, 0.2, 0.3, 0.4 and 0.5% at 0, 7, 14 and 21 day of storage interval. Guar gum at 0.1% gives best result for low acidity and low pH where as total solid free fatty acid, acetaldehyde contents comes best with the cornstarch. Food additives have influence on pH, acidity, total solid and acetaldehyde contents. During the storage of 21 days with increasing amounts of food additives, there was an increase in acidity, free fatty acids, total solid and acetaldehyde contents but decrease in pH.

**Key words:** Yoghurt quality, stabilizers, thickeners, CMC, Gelatin

## Introduction

Yogurt is fermented and coagulated milk product with a smooth texture having mildly sour taste and pleasant flavor. It is obtained from pasteurized or boiled milk by souring natural or other wise using lactic acid fermented bacteria. (Soomro *et al*., 2003). It is one of the oldest popular foods of the world because of its nutritional and therapeutic value in the human diet. (Zahoor *et al*., 2002). Typical plain yoghurt contained 3.5% fat 12.06% total solids, 3.60% protein 18.94% moisture, 0.76% ash and 4.2% lactose (Ather, 1986).

Yoghurt is characterized as a smooth, viscous, gel with specific taste of sharp acid and green apple flavor (Bodyfelt *et al*., 1988). Some yoghurts exhibit a heavy consistency that closely resemble custard of milk pudding. In contrast, others are purposely soft boiled and are essentially drinkable (Connolly *et al*., 1984). The moist important textural characteristics of yoghurt are firmness and other ability to retains water. The type of culture is an important factor affecting microstructure and the textural properties of yoghurt (Hussan *et al*., 1999).

Stabilizers and thickeners are important in several manufactured products such as chocolate, dressing milk drinks, ice cream and yoghurt. These substances prevent separation of various ingredients, increase the viscosity and inhibit the formation of large crystals. Substances used as stabilizers and thinkers include vegetable gums such as gum tragacanth and gum Arabic agar and pectin. Cellulose compound like methyl cellulose and CMC are also used (Awan, 1995).

Keeping in view the importance of the subject this study is designed to check the effect of different stabilizers on the yoghurt quality different concentration with combination also used to analyze their effects. Mains objectives are, to compare the effect of stabilizers on yogurt quality and to assess the yogurt chemically.

## Materials and Methods

**Preliminary preparation:** Standardized milk and stabilizers (carboxymethyl-cellulose (CMC), guar gum, gelatin and cornstarch) were collected from local market. These stabilizers were used in concentration of 0.1, 0.2, 0.3, 0.4 and 0.5% either individually or in combinations. Additions of stabilizers were made in each sample of milk at room temperature and were blended.

**Preparation and storage of yoghurt:** After addition of stabilizers milk were pasteurized at73°C for 15 min. milk was cooled at 42°C till and starter culture was added at the rate of 2% and transferred to polytheyne cups. The culture milk was incubated at 42°C till the desired body texture with 0.8%v acidity and pH 4.25 was obtained. The yoghurt was cooled downed to 6°C.

**Product analysis:** Acidity, PH, total solid, free fatty acids and acetaldehyde contents was measured by methods as described in No. 967.16, 981.12, 941.08, 940.28 and 906.02 respectively of AOAC (1990).

**Statistical analysis:** The data obtained was analyzed by tow factor factorial design according to Steel and Torrie (1980).

## Results and Discussion

Yoghurt samples of different stabilizer concentrations were chemically analyzed for acidity, pH, total solids free

Table 1: Effect of different additives during storage periods (6°C) on acidity of yoghurt

| Stabilizers | Treatments | 0 days | 7 days | 14 days | 21 days |
|---|---|---|---|---|---|
| CMC | T1 (0.1) | 0.86t-x* | 0.92q-u | 1.14i-n | 1.42bc |
| | T2 (0.2) | 0.86t-x | 0.92q-u | 1.15i-n | 1.45ab |
| | T3 (0.3) | 0.87s-x | 0.93q-u | 1.14i-n | 1.4bcd |
| | T4 (0.4) | 0.84 t-y | 0.90q-u | 1.16h-m | 1.41bc |
| | T5 (0.5) | 0.86t-x | 0.91q-u | 1.13i-n | 1.37b-g |
| Guar Gum | T6 (0.1) | 0.69z | 0.89r-v | 1.02m-r | 1.24f-k |
| | T7 (0.2) | 0.79u-z | 0.91q-u | 1.04m-r | 1.32b-g |
| | T8 (0.3) | 0.74w-z | 0.93q-u | 1.08m-p | 1.33b-g |
| | T9 (0.4) | 0.74w-z | 0.90q-u | 1.09i-o | 1.25e-j |
| | T10 (0.5) | 0.72xyz | 0.93q-u | 1.07m-p | 1.31b-g |
| Gelatin | T11 (0.1) | 0.82t-z | 0.91q-u | 1.10k-n | 1.31b-g |
| | T12(0.2) | 0.83t-y | 0.93q-u | 1.11j-n | 1.34b-g |
| | T13 (0.3) | 0.83t-y | 0.93q-u | 1.15i-n | 1.38b-f |
| | T14 (0.4) | 0.83t-y | 0.92q-u | 1.13i-n | 1.32b-g |
| | T15 (0.5) | 0.86t-x | 0.95p-t | 1.15i-n | 1.4bcd |
| Cornstarch | T16 (0.1) | 0.83t-y | 0.90q-u | 1.07m-p | 1.23g-l |
| | T17 (0.2) | 0.83t-y | 0.92q-u | 1.08m-p | 1.29c-h |
| | T18 (0.3) | 0.84t-y | 0.90q-u | 1.08m-p | 1.3c-g |
| | T19 (0.4) | 0.83t-y | 0.92q-u | 1.08m-p | 1.29c-h |
| | T20 (0.5) | 0.89r-v | 0.95q-u | 1.01n-s | 1.29c-h |
| Gelatin/ | T21 (0.1) | 0.89 r-v | 0.94q-t | 1.12j-n | 1.32b-g |
| Corn starch | T22 (0.2) | 0.83t-y | 0.90q-u | 1.08m-p | 1.25e-j |
| | T23 (0.3) | 0.89r-v | 0.96o-t | 1.14i-n | 1.29ch |
| | T24 (0.4) | 0.89r-v | 0.95p-t | 1.13i-n | 1.27d-l |
| | T25 (0.5) | 0.86t-x | 0.96o-t | 1.12j-n | 1.27d-l |
| Gelatin/CMC | T27 (0.1) | 0.79u-z | 0.90q-u | 1.15i-n | 1.3c-g |
| | T28 (0.2) | 0.75v-z | 0.91q-u | 1.15i-n | 1.32b-g |
| | T29 (0.3) | 0.71yz | 0.93q-u | 1.13i-n | 1.24f-k |
| | T30 (0.4) | 0.69z | 0.93q-u | 1.15i-n | 1.30c-g |
| | T31 (0.5) | 0.77xyz | 0.95p-t | 1.14i-n | 1.33b-g |
| CMC/ | T31 (0.1) | 0.86t-x | 0.90q-u | 1.11j-n | 1.37b-g |
| Corn starch | T32 (0.2) | 0.86t-x | 0.912q-u | 1.14i-n | 1.42bc |
| | T33 (0.3) | 0.86t-x | 0.92q-u | 1.15i-n | 1.45ab |
| | T34 (0.4) | 0.84t-y | 0.90q-u | 1.14i-n | 1.39b-d |
| | T35 (0.5) | 0.86t-x | 0.93q-u | 1.14i-n | 1.4bed |
| Control | T36 | 0.90q-u | 1.02m-r | 1.23g-l | 1.56a |

*All values are results of three replication. *Mean sharing the same letter do not differ significantly. *LSD at 0.05 Alpha for treatment, interval and interaction is 0.5682, 0.01894 and 0.1136 respectively.

Table 2: Effect of different additives during storage periods (6°C) on pH of yoghurt

| Stabilizers | Treatments | 0 days | 7 days | 14 days | 21 days |
|---|---|---|---|---|---|
| CMC | T1 (0.1) | 4.15a-h | 4.09d-l | 3.87l-r | 3.65wxy |
| | T2 (0.2) | 4.16a-g | 4.11c-l | 3.85l-s | 3.62xy |
| | T3 (0.3) | 4.13b-l | 4..04hij | 3.88l-r | 3.68u-y |
| | T4 (0.4) | 4.14a-h | 4.1c-l | 3.85l-s | 3.8o-t |
| | T5 (0.5) | 4.2abcd | 4.1c-l | 3.9l-p | 3.83m-s |
| Guar Gum | T6 (0.1) | 4.25a | 4.1c-l | 3.95jkl | 3.8o-t |
| | T7 (0.2) | 4.25ab | 4.09d-l | 3.91imno | 3.8o-t |
| | T8 (0.3) | 4.19a-e | 4.06fgh | 3.89l-q | 3.78q-u |
| | T9 (0.4) | 4.19a-e | 4.06fghi | 3.9l-p | 3.8o-t |
| | T10 (0.5) | 4.12abc | 4.07ghi | 3.91lmno | 3.82n-s |
| Gelatin | T11 (0.1) | 4.14a-h | 4.09 d-l | 3.94klm | 3.62xy |
| | T12 (0.2) | 4.13b-l | 4.08e-l | 3.92klmn | 3.86i-s |
| | T13 (0.3) | 4.15b-l | 4.1c-l | 3.89l-q | 3.75s-w |
| | T14 (0.4) | 4.13b-l | 4.07fghi | 3.91l-q | 3.68u-y |
| | T15 (0.5) | 4.12b-l | 4.06fghi | 3.92l-q | 3.62o-t |
| Cornstarch | T16 (0.1) | 4.16a-g | 4.1c-l | 3.92l-p | 3.82n-s |
| | T17 (0.2) | 4.15a-h | 4.07fghi | 3.89l-p | 3.79p-t |
| | T18 (0.3) | 4.11a-g | 4.07fghi | 3.89l-q | 3.87l-r |
| | T 19 (0.4) | 4.16a-g | 4.06fghi | 3.90l-p | 3.87l-r |
| | T20 (0.5) | 4.17a-f | 4.1c-l | 3.90l-p | 3.83o-t |
| Gelatin/ | T21 (0.1) | 4.11c-l | 4.07fgh | 3.89l-q | 3.71t-x |
| Corn starch | T22 (0.2) | 4.16a-g | 4.1c-l | 3.86klmn | 3.7t-y |
| | T23 (0.3) | 4.14a-h | 4.08e-l | 3.89klmn | 3.6y |
| | T24 (0.4) | 4.16a-h | 4.08e-l | 3.93klmn | 3.68u-y |
| | T25 (0.5) | 4.16a-g | 4.06fhgi | 3.92l-q | 3.68u-y |
| Gelatin/CMC | T27 (0.1) | 4.12b-h | 4.09dd-l | 3.89l-q | 3.65wxy |
| | T28 (0.2) | 4.15a-h | 4.05ghi | 3.93klim | 3.75s-w |
| | T29 (0.3) | 4.12b-l | 4.06fghi | 3.92klmn | 3.77r-v |
| | T30 (0.4) | 4.13b-l | 4.07fghi | 3.93klmn | 3.75s-w |
| | T31 (0.5) | 4.13b-l | 4.07d-i | 3.89l-q | 3.62xy |
| CMC/ | T31 (0.1) | 4.15a-h | 4.08e-l | 3.89l-q | 3.66wxy |
| Corn starch | T32 (0.2) | 4.17a-f | 4.09d-i | 3.86l-s | 3.63xy |
| | T33 (0.3) | 4.14a-h | 4.02ijk | 3.89l-s | 3.67wxy |
| | T34 (0.4) | 4.21abc | 4.06fghi | 3.89l-q | 3.75s-w |
| | T35 (0.5) | 4.20abcd | 4.06fghi | 3.87l-r | 3.84l-s |
| Control | T36 | 4.14a-h | 3.95jki | 3.83m-s | 3.8o-t |

*All values are results of three replication. *Mean sharing the same letter do not differ significantly. *LSD at 0.05 Alpha for treatment, interval and interaction is 0.04401, 0.01467 and 0.08802, respectively45.

fatty acids and acetaldehyde content. The data obtained was subjected to statically analysis. The results obtained for each determination are described individually as under.

**Total titratable acidity:** The data on the effect of different doses of CMC, guar gum, gelatin, corn starch and their combinations like corn starch/gelatin, gelatin/CMC and CMC/ cornstarch at level (T1 to T36) of 0.1, 0.2, 0.3, 0.4 and 0.5% on the acidity of yoghurt during storage period are presented in Table 1. The results show that maximum acidity (1.56) was obtained from the yoghurt with at control (T36) after 21 days of storage followed by CMC (1.45) at 0.2% (T2) after 21 days of storage and CMC/gelatin at 0.3% (T33) after 21 days of storage respectively. The lowest values for acidity was found in all treatment on 0 days that increase from incubation period till end of storage, so maximum acidity was found during 21 days storage interval. The statistical analysis showed that effect of different amount of food additives and effect of storage period was highly significantly differ for acidity of yoghurt while interaction is non significant. Results obtained confirmed the finding of Georgala *et al.* (1995) who observed similar changes in the acidity of yoghurt during storage.

**PH:** The data for the effect of storage on pH under different stabilizer treatments are presented in the Table 3. The results showed that pH decreased throughout the storage interval. The maximum pH value was found with T6 followed by T7 and T5. The lowest value for pH was found with T23. The pH at 0 day interval was the highest in all treatment and it gradually decreased throughout the storage interval. The statistical analysis showed that effect of different amount of food additives and effect of storage period was highly significantly differ for acidity of yoghurt while interaction is non significant. The comparison of four stabilizers and their combination showed that the final of yoghurt manufactured with guar gum stabilizers was higher than the others which was related to better quality yoghurt. It is evident from the results that the pH decreased throughout the storage

Table 3: Effect of different additives during storage periods (6°C) on Total solid of yoghurt

| Stabilizers | Treatments | 0 days | 7 days | 14 days | 21 days |
|---|---|---|---|---|---|
| CMC | T1 (0.1) | 13.12kl | 13.14jkl | 13.25hij | 13.3ghi |
| | T2 (0.2) | 13.3ghi | 13.32gh | 13.34gh | 13.5f |
| | T3 (0.3) | 13.52f | 13.54f | 13.56f | 13.7de |
| | T4 (0.4) | 13.72de | 13.74de | 13.76d | 13.9c |
| | T5 (0.5) | 14.9a | 14.92a | 14.94a | 14.95a |
| Guar Gum | T6 (0.1) | 13.11kl | 13.12ki | 13.13jkl | 13.14jkl |
| | T7 (0.2) | 13.3ghi | 13.32gh | 13.33gh | 13.35gh |
| | T8 (0.3) | 13.5f | 13.51 f | 13.52f | 13.54fde |
| | T9 (0.4) | 13.7de | 13.71de | 13.73d | 13.74d |
| | T10 (0.5) | 14.9.a | 14.92a | 14.95a | 14.98a |
| Gelatin | T11 (0.1) | 13.1kl | 13.12ki | 13.13jkl | 13.15jkl |
| | T12 (0.2) | 13.3ghi | 13.32gh | 13.33gh | 13.35gh |
| | T13 (0.3) | 13.5f | 13.51f | 13.51f | 13.52f |
| | T14 (0.4) | 13.7de | 13.71de | 13.73d | 13.77d |
| | T15 (0.5) | 14.9a | 14.92a | 14.92a | 14.96a |
| Cornstarch | T16 (0.1) | 13.1kl | 13.14jkl | 13.14jkl | 13.16jkl |
| | T17 (0.2) | 13.3ghi | 13.34gh | 13.34gh | 13.38gh |
| | T18 (0.3) | 13.5f | 13.56f | 13.52f | 13.6ef |
| | T 19 (0.4) | 13.7de | 13.74de | 13.73d | 13.77d |
| | T20 (0.5) | 14.9a | 14.72ba | 14.93a | 14.96a |
| Gelatin/ | T21 (0.1) | 13.12kl | 13.12ki | 13.15jkl | 13.18jkl |
| Corn starch | T22 (0.2) | 13.3ghi | 13.32gh | 13.36gh | 13.35gh |
| | T23 (0.3) | 13.52f | 13.51f | 13.58f | 13.56fde |
| | T24 (0.4) | 13.7de | 13.71de | 13.76d | 13.77d |
| | T25 (0.5) | 14.9a | 14.92a | 14.74a | 14.96a |
| Gelatin/CMC | T27 (0.1) | 13.11kl | 13.12ki | 13.15jkl | 13.25hij |
| | T28 (0.2) | 13.3ghi | 13.32gh | 13.36gh | 13.36gh |
| | T29 (0.3) | 13.5f | 13.51f | 13.58f | 13.56f |
| | T30 (0.4) | 13.7de | 13.71de | 13.76d | 13.76d |
| | T31 (0.5) | 14.9.a | 14.92a | 14.74a | 14.95a |
| CMC/ | T31 (0.1) | 13.1kl | 13.12ki | 13.13jkl | 13.16jkl |
| Corn starch | T32 (0.2) | 13.3ghi | 13.32gh | 13.33gh | 13.38gh |
| | T33 (0.3) | 13.5f | 13.51f | 13.51f | 13.6ef |
| | T34 (0.4) | 13.7de | 13.71de | 13.73d | 13.77d |
| | T35 (0.5) | 14.9a | 14.92a | 14.94a | 14.96a |
| Control | T36 | 12.9m | 13.05l | 13.1kl | 13.35gh |

*All values are results of three replication. *Mean sharing the same letter do not differ significantly. *LSD at 0.05 Alpha for treatment, interval and interaction is 0.05082, 0.0.1694 and 0.1016, respectively.

Table 4: Effect of different additives during storage periods (6°C) on Free Fatty acid of yoghurt

| Stabilizers | Treatments | 0 days | 7 days | 14 days | 21 days |
|---|---|---|---|---|---|
| CMC | T1 (0.1) | 0.98q | 0.72[ | 1.1z | 1.4y |
| | T2 (0.2) | 1.1z | 1.13z | 1.2z | 1.5wxy |
| | T3 (0.3) | 1.15z | 1.19z | 1.22Z | 1.6zw |
| | T4 (0.4) | 1.45xv | 2imn | 2.15ijk | 2.25hi |
| | T5 (0.5) | 1.55vwx | 1.6vw | 1.8q-u | 2.24defg |
| Guar Gum | T6 (0.1) | 0.99q | 1.85opq | 1.25z | 1.4y |
| | T7 (0.2) | 1.19z | 1.2z | 1.59vwx | 1.6vw |
| | T8 (0.3) | 1.55vwx | 1.6vw | 1.89m-q | 2.24hi |
| | T9 (0.4) | 1.6vw | 1.86nopq | 2mnl | 2.5bcde |
| | T10 (0.5) | 1.68tuv | 1.9m-q | 2.1jkl | 2.58bc |
| Gelatin | T11 (0.1) | 1.14z | 2.4efg | 2.48bcde | 2.52bcde |
| | T12 (0.2) | 1.16z | 2.45cdef | 2.5bcde | 2.56bcd |
| | T13 (0.3) | 1.17z | 2.32fgh | 2.41efg | 2.59bc |
| | T14 (0.4) | 1.12z | 1.98l-p | 2.2hij | 2.45cdef |
| | T15 (0.5) | 1.98lmnop | 2.02klm | 2.49bcde | 2.62b |
| Cornstarch | T16 (0.1) | 1.61vw | 1.68tuv | 1.7r-v | 2.45cdef |
| | T17 (0.2) | 1.63vw | 1.69stuv | 1.84prq | 2.6bc |
| | T18 (0.3) | 1.7r-v | 2.25hi | 2.57bcd | 2.78a |
| | T 19 (0.4) | 1.81qrst | 2.31fgh | 2.57bcd | 2.8a |
| | T20 (0.5) | 1.84pqr | 2.32fgh | 2.59bc | 2.82a |
| Gelatin/ | T21 (0.1) | 1.58vwx | 1.65vw | 1.99lmno | 2.3gh |
| Corn starch | T22 (0.2) | 1.62vw | 1.68tuv | 2.07fg | 2.41efg |
| | T23 (0.3) | 1.66uv | 1.83qrs | 2.26c | 2.5bc |
| | T24 (0.4) | 1.71m | 1.99hi | 2.45a | 2.68a |
| | T25 (0.5) | 1.82l | 2.11ef | 2.59a | 2.68/a |
| Gelatin/CMC | T27 (0.1) | 1.01q | 1.56n | 1.99hi | 2.2d |
| | T28 (0.2) | 1.45n | 1.58n | 2.07fg | 2.36ab |
| | T29 (0.3) | 1.78l | 1.87jkl | 2.26c | 2.58a |
| | T30 (0.4) | 1.91jik | 1.99hi | 2.45a | 2.68a |
| | T31 (0.5) | 1.99hi | 1.86jkl | 2.59a | 2.76a |
| CMC/ | T31 (0.1) | 1.03q | 1.23q | 1.67m | 1.99hi |
| Corn starch | T32 (0.2) | 1.56n | 1.64m | 1.99hi | 2.1de |
| | T33 (0.3) | 1.6m | 1.89jkl | 2.15de | 2.46a |
| | T34 (0.4) | 1.62vw | 1.9ijk | 2.2d | 2.54a |
| | T35 (0.5) | 1.67m | 1.99hi | 2.4a | 2.72a |
| Control | T36 | 0.99q | 1.32fgh | 1.56bcd | 1.67zw |

*All values are results of three replication. *Mean sharing the same letter do not differ significantly. *LSD at 0.05 Alpha for treatment, interval and interaction is 0.06224, 0.02075 and 0.1245, respectively.

period. The reason for decrease in the pH was increase in acidity during storage. The results obtained are similar to the findings of Radke and Sandine (1986); Moon *et al.* (1993) who reported decrease in the pH valve of the yoghurt during storage.

**Total solid:** The data regarding the total solid of all treatments during storage are shown in the Table 3 .The results showed that total solids increased throughout the storage interval. The maximum total solids were found with T10 followed by T35 and T5. The lowest value for acidity was found with T23. The total solid at 0 day interval was the highest in all treatment and it gradually decreased throughout the storage interval. The statistical analysis showed that effect of different amount of food additives and effect of storage period was highly significantly differ for total solid of yoghurt while interaction is non significant. The average increase in the total solids was lower in the case of control. The initial means values for total solid in case of CMC treated samples ranged from 13.12 to 14.90%. These values increased from 13.30 to 14.95% in the final observation. In the guar gum the initial mean values were ranged from 13.11 to 14.90%, while the final observation indicated an increase in total solid from 13.14 to 14.98%. In the case of combination treatment of gelatin and corn starch, the initial mean value ranged between 13.12 to 14.71 where as the final values ranged between 13.18 to 14.78%.

The comparison of four stabilizers and their combination shows that final total solid of yoghurt manufactured with guar gum T10 was high than the other, which was related to better quality. The results re in agreement with the finding of Salji *et al.*(1985) who reported a gradual increase in the total solids o the yoghurt during storage.

**Free fatty acid:** The effect of different stabilizers and their combination at storage intervals on the free fatty acids of the yoghurt is presented in Table 4. The results showed that free fatty acid increased throughout the storage interval. The maximum free fatty acid was found with T20 followed by T19 and T18. The lowest value for acidity

Table 5: Effect of different additives during storage periods ( 6°C) on Acetaldehyde of yoghurt

| Stabilizers | Treatments | 0 days | 7 days | 14 days | 21 days |
|---|---|---|---|---|---|
| CMC | T1 (0.1) | 10.25r | 12.5edf | 13d | 12.07b |
| | T2 (0.2) | 10.32q | 12.36efgh | 13d | 12.28a |
| | T3 (0.3) | 10.5q | 10.9wxyz | 11.5opqrs | 11.60ef |
| | T4 (0.4) | 10.25r | 10.9wxyz | 11.25q-u | 11.10lmn |
| | T5 (0.5) | 11 u-y | 11.8mn | 12.33hijk | 12.13b |
| Guar Gum | T6 (0.1) | 10.5q | 11u-y | 11.25q-u | 11.19kl |
| | T7 (0.2) | 9.25s | 10.2r | 10.9wxyz | 10.32r |
| | T8 (0.3) | 10.s | 10.48r | 10.75yz | 10.65q |
| | T9 (0.4) | 10.25s | 10.9wxyz | 11.45opqr | 11.04mno |
| | T10 (0.5) | 10.5q | 10.9wxyz | 11.5opq | 11.13lm |
| Gelatin | T11 (0.1) | 10.2r | 10.99u-y | 11.58nop | 11.10lmn |
| | T12 (0.2) | 10r | 10.5q | 11.35prs1 | 10.81p |
| | T13 (0.3) | 10.25r | 10.85xyz | 1.36o-s | 10.97o |
| | T14 (0.4) | 10.2q | 10.8xyz | 11.56o-s | 11.09lmno |
| | T15 (0.5) | 10.25q | 11u-y | 11.35pqrs | 11.091mno |
| Cornstarch | T16 (0.1) | 8.76t | 9.2t | 10.2r | 9.74s |
| | T17 (0.2) | 10.5q | 1093 wxyz | 11.56nop | 11.32ij |
| | T18 (0.3) | 10.76yz | 11.04 t-x | 11.87 im | 11.51fgh |
| | T 19 (0.4) | 10.76yz | 11.35 pqrst | 12.08 ijkl | 11.67de |
| | T20 (0.5) | 10.63q | 12.04jklm | 12.89d | 12.34s |
| Gelatin/ Corn starch | T21 (0.1) | 9.76s | 10.68z | 11.45opqr | 10.99no |
| | T22 (0.2) | 10.33r | 10.06 t-x | 11.79 mn | 11.30jk |
| | T23 (0.3) | 10.34r | 11.13 s-w | 11.8 mn | 11.41hij |
| | T24 (0.4) | 10.36r | 11.2 r-v | 11.99 klm | 11.53fg |
| | T25 (0.5) | 10.4r | 11.01 t-y | 11.78 mn | 11.40hij |
| Gelatin/CMC | T27 (0.1) | 10.01s | 10.67 z | 11.45 opqr | 11.03mno |
| | T28 (0.2) | 10.32r | 10.87 wxyz | 11.56 nop | 11.19k |
| | T29 (0.3) | 10.39r | 11.u-y | 11.78 mn | 11.43ghi |
| | T30 (0.4) | 10.41r | 11.35 pqrs | 12.24 hijk | 11.75cdl |
| | T31 (0.5) | 10.42r | 11.37 opqrst | 12.28 ghij | 11.79c |
| CMC/ Corn starch | T31 (0.1) | 10.33r | 10.96 wxyz | 11.39 o-s | 11.17l |
| | T32 (0.2) | 10.34r | 11.01 t-y | 11.89 lm | 11.42ghi |
| | T33 (0.3) | 10.44r | 11.21 r-v | 12.35 efgh | 11.82c |
| | T34 (0.4) | 10.11s | 10.77 yz | 11.26 qust | 10.98ij |
| | T35 (0.5) | 10.45r | 10.99 no | 11.56 fg | 11.34ij |
| Control | T36 | 8.22t | 9.01t | 9.45s | 9.17t |

*All values are results of three replications. *Mean sharing the same letter do not differ significantly. *LSD at 0.05 alpha for treatment, interval and interaction is 0.1078, 0.3593 and 0.2156, respectively.

was found with T1. The free fatty acid 0 day interval was the highest in all treatment and it gradually decreased throughout the storage interval. The statistical analysis showed that effect of different amount of food additives and effect of storage period was highly significantly differ for total solid of yoghurt while interaction is non significant. Results shows that free fatty acid increased gradually in all treatments, results support he finding the Beshkova *et al*. (1988) who reported that free fatty acid contents depend on the fat level further more microbial activity play important roles. Georgala *et al*. (1995) found that the chemical composition of the milk and processing conditions.

**Acetaldehyde contents:** The effect of different stabilizers and their combination at storage intervals on the acetaldehyde contents of the yoghurt is presented in Table 5 The statistical analysis showed that effect of different amount of food additives and effect of storage period was highly significantly differ for total solid of yoghurt while interaction is non significant. The results showed that total solids increased throughout the storage interval. The maximum acetaldehyde contents were found with T20 followed by T2 and T5. The lowest value for acidity was found with T36. The acetaldehyde contents at 0 day interval was the highest in all treatment and it gradually decreased throughout the storage interval. The results showed that acetaldehyde contents gradually increased in all treatments with the increased storage period. The results agree the finding of Wilkins *et al*. (1986) who reported that threonine is converted by the enzymes threonine aldolase to produced acetaldehyde contents. Results also support the finding the Veduamuthu (1991), who concluded that the optimum range for acetaldehyde contents in the yoghurt is 10-15 ppm.

## References

AOAC, 1990. Official Methods of Analysis. Association of Analytical Chemists. 15th Edn. Virginia 2221, Arlington. USA.

Athar, I.H., 1986. Preparation of cheese and yoghurt at household level. Pak. Agri. Council Islamabad, Pakistan, pp: 24-35.

Awan, J.A., 1995. Chemicals additives as non preservatives. Elements Food Sci. Technol., pp: 190.

Beskova, F., F. Simova, G. Frengova and Z. Simov, 1988. Production of Flavour compound by yogurt starter cultures. J. Microbiol. Biotecnol., 20: 180-184.

Bodyfelt, F., W.J. Tobias and G.M. Trout, 1988.Sensory Evaluation of Dairy Products. Van Rostrand Reinhold. New York.

Connolly, E.J., C.H. White, E.W. Custer and E.R. Vedamuthu, 1984. Cultures Dairy Food improvement manual. Cultured Dariy Product Ins., Washington. DC., pp: 40.

Georgala, A.I.K., E. Taskalidin, I. Kandarakis and G. Kalantzopoulos, 1995. Flavour production in ewe,s milk yoghurt by single strains and combinations of *S. thermophilus* and *L. bulgaricus* isolated from traditional greek Yoghurt. J. Food Tech., 75: 271-279.

Hussan, F.A.M., A. Flemy and A.K. Enab, 1999. Utalization od some local polysaccaride in the manufacturing of yoghurt. Egyptian J. Dairy Sci., 27: 281-289.

Moon, S., K.A.S. Eun and S. Hwa, 1993. Polysiochamical properties of commercial yoghurt in korea. J. Food Sci. Tech., 48: 89-92.

Radkle - Mitchell, HC. and W.E. Sandine, 1986. Influce of temperature on associative growth of *S. thermophilus* and *L. bulgaricus* J. Dairy Sci., 73: 894-899.

Salji, J.P., A.K. Fawal S.R. Saadi, A.A. Ismail and A. Mashhadi, 1985. Effect of processing and compositional Parameters of quality of pain liquid yoghurt. Milchwissenchaft, 40: 734-736. 254.

Steel, R.G.C. and J.M. Torrie, 1980. Principles and procedures of Statistics. McGraw Hill Book Co., Inc. New York, USA., pp: 107-109.

Soomro, A.H., A.A. Rain and M. Kashkeli, 2003. Industrial yogurt and indigenous dahi. Online J. Boil. Sci., 3: 86-90.

Veduamuthu, E.R., 1991. The yoghurt story-past, present and future. Dariy Food and Environ. Sanitation, 11: 202-203.

Wilkins, D.W., R.H. Schmidt, R.B. Shireman, K.I. Smith and J.J. Jezeski, 1986. Evaluating acetaldehyde synthesis from threonnine by *S. thermophillus* and *Lb. bulgaricus*. J. Dairy Sci., 69: 1219-1224.

Zahoor, T., M. Rafique, N., Huma and B.E. Bajawa, 2002. Stability and acceptability studies on the banana fruit set yoghurt. Pak. J. Food Sci., 12: 41-45.