

# PREPARATION AND NUTRITIONAL EVALUATION OF GARLIC BASED YOGURT

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**ABSTRACT:** Garlic based yogurt was prepared and its Physio-Chemical analysis was done. Different parameters such as moisture contents, ash contents, fat contents, protein contents, total solid mass, acidity and lactose contents were studied. The results revealed that the nutritional values of yogurt were slightly increased with the addition of garlic powder in different concentrations.

Keywords: Yogurt, Garlic, Nutritional evaluation.

## INTRODUCTION

Bourlioux, and Pochart [1] defined yogurt as,

“A coagulated milk product that results from the fermentation of lactic acid in milk by *Lactobacillus bulgaricus* and *Streptococcus thermophilus*”.

Yogurt is one of the most widely distributed dairy products. Yogurt has a smooth texture, mildly sour and pleasant flavor. It is obtained from milk soured by *Lactobacillus bulgaricus* and *Streptococcus thermophilus* [2], and also by *Lactobacillus helveticus* and *Lactobacillus delbrueckii* spp [3]. Yogurt in different forms with diverse local names is made throughout the world [4]. The composition of yogurt is dependent on the type and source of milk and a range of seasonal factors [5,6].

Dairy products have generally been considered an excellent source of high-quality protein, calcium, potassium, phosphorus, magnesium, zinc, and the B vitamins riboflavin, niacin, vitamin B-6, and vitamin B-12 [7].

Proteins in yogurt are of excellent biological quality, as are that in milk, because the nutritional value of milk proteins is well preserved during the fermentation process [8].

It has been argued that protein from yogurt is more easily digested than is protein from milk, as bacterial predigestion of milk proteins in yogurt may occur [9,10]. Both the caseins and the whey proteins in yogurt are rich source of Amino acids (93%) and high in nitrogen availability is high [11,12]. Amino acids like proline and glycine are present in free form and higher contents in yogurt than in milk [13].

Yogurt shelf life is based on whether the products display any of the, physical Chemical, microbiological or sensory characteristics that are unacceptable for consumption. Studies of changes in these quality characteristics during storage would be instrumental in predicting the shelf life of the product. [14] Functional foods which include probiotics, prebiotics and synbiotics are claimed to have a positive effect on health [15].

Garlic is a frost-hardy bulbous perennial erect herb of 30–100 cm in height with narrow flat leaves and bears small white flowers and bulbils [16]. It has long been taken as a tonic, a bactericide and a popular remedy for various ailments [17]. More recently, however, it has been recognized as a medicinal plant for the prevention of blood circulatory disorders [18,19], cancer [20,21,22,23].

Garlic has been considered as a rich source of carbohydrate, proteins and phosphorus. Ascorbic acid contents are reported to be very high in green garlic [24]. The acute and fatal garlic poisoning in human is reported to be very rare. Since the consumption and level of sulphur-containing ingredients of garlic that are supposed to be toxic are so low.

## MATERIALS AND METHODS

Nestle milk; Gelatin, sugar and garlic powder (National) are used as raw material. *Lactobacillus spp* was used as starter culture. Yoghurt was prepared with the method described by [25] Different concentration of galic was added in yogurt.(0.05 & 0.1 i.e., 5% and 10%) and then mixes it. Garlic based yoghurt was packed in disposable cups, covered with aluminum foil. The cups were stored in refrigerator at 4°C for further experimentation.

### Physio-chemical Analysis

The physio-chemical analysis was carried out during 15 days of storage period.

**Protein:** Protein and nitrogen contents of yogurt samples were determined by Kjeldahl method according to the BS 1741-5.2 [26].

**Fat:** Fat was determined (on wet weight basis) by Soxhlet's method by using this formula, % Fat = g of fat in dry sample/g fat of in wet sample\* 100 [44].

**Total solid:** Total solids were determined by following formula, % Total solids (wt/wt) = wt. Of dry sample/ wt. of wet sample\* 100 [45].

**Moisture:** Moisture contents of yogurt were determined by oven dry method [27] and calculation were carried out by using following formula: Moisture % = wt. of fresh sample – wt. of sample after drying x 100/weight of sample

**Ash:** Ash contents were determined by following formula: Ash % = wt of crucible and Ash – wt of crucible x 100/wt of sample

**Lactose:** The lactose in yogurt sample was determined by the gravimetric method described by AOAC official methods [28].

## RESULTS AND DISCUSSION

### Physio-chemical analysis

**Moisture:** The moisture content of garlic based yogurt is shown in Table 1. The average moisture % of different samples is as follow: for X=84.71 %, X<sub>1</sub>=83.44 %, X<sub>2</sub>=83.21 % and X<sub>3</sub>=83.12. Kamruzaman, *et al.*, [29] calculated the maximum moisture content of plain yogurt was 82.90 %. They revealed that the moisture content of yogurt was

decreased during storage period is due to the evaporation rate of moisture content during storage at refrigerated condition. Hamdan, *et al.*, [30] and Bills, *et al.*, [31] stated that the moisture contents decreased from

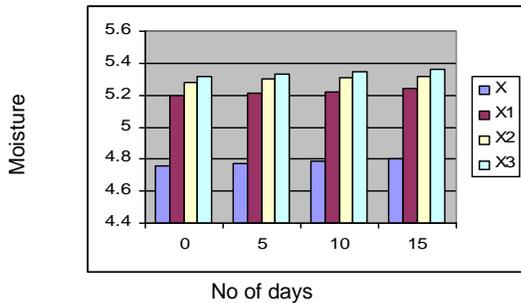


Figure 1(a): Moisture % in Yogurt within 15 Days

86.90 % to 84.95 % during refrigerated storage. According to Mohammad, *et al.*, [32] the equilibrium relative humidity (ERH) of garlic powder was found to be 14%. These results were close to our findings.

**Protein:** The protein % of garlic based yogurt is indicated in Table 2. Hussain, *et al.* [33] reported that the average protein content of probiotic yogurt was 5.4 % and that of natural yogurt was 5.3 %. There it has been reported that the protein contents in garlic powder was 17.5 % [34] which increase the quality of garlic based yogurt. Nwinuka, *et al.*, [35] reported that the crude protein contents ranged 17.35% in garlic powder. These results were close to our findings. According to Law and Haandrikman [36], the proteolytic system of lactic acid bacteria is essential for their growth in milk. The increase in protein contents in yogurt depends on the proteolytic activity of Lactic acid bacteria which hydrolyses proteins into peptides and amino acids. Lactic acid bacteria require a wide range of amino acids for growth and their proteolytic enzyme complement is able to split most types of peptide bonds [37]. Probably, the free amino acid present in yogurt was the result of hydrolysis of protein under the influence of proteolytic enzymes. During the storage period these free amino acids again combine to form the peptide bonds that transform into protein. Hence the protein contents of yogurt increased during storage.

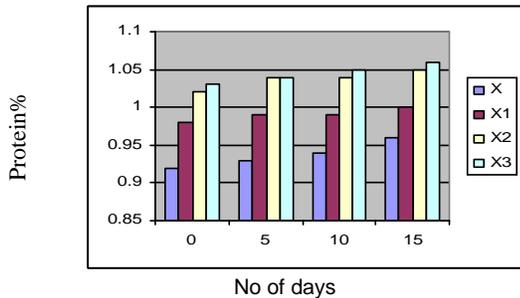


Figure 2(a) Protein % in yogurt within 15 day

**Ash:** Ali, *et al.*, [38] studied the quality of yogurt made in laboratory and available in the market and found the average ash contents 1.12 %. The content of ash of freeze-dried garlic was 3.6% [39]. The ash content of garlic based yogurt is shown in Table 3. The ash % of all yogurt samples is given below: X=0.94 %, X<sub>1</sub>=0.99, X<sub>2</sub>=1.03 % and X<sub>3</sub>=1.04.

As a result, garlic enhanced ash contents of garlic based yogurt. These values were close to our findings

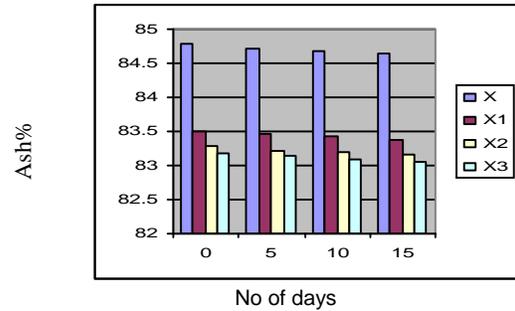


Figure 3(a) Ash % in yogurt within 15 days

**Fat:** Ahmad [40] reported that the fat contents of yogurt have the maximum range of 4.5 %. In another experiment Mutlu, *et al.*, [41] reported that the fat contents of bio yogurt ranged from 3.1 % to 4.5 % during storage period. The garlic powder has the fat contents that range between 0.1 % to 0.6 % [34] and there was no significance increase fou%, X<sub>2</sub>=4.65 % and X<sub>3</sub>=4.67 % the control X with X<sub>1</sub>, X<sub>2</sub> and X<sub>3</sub>. Table.4

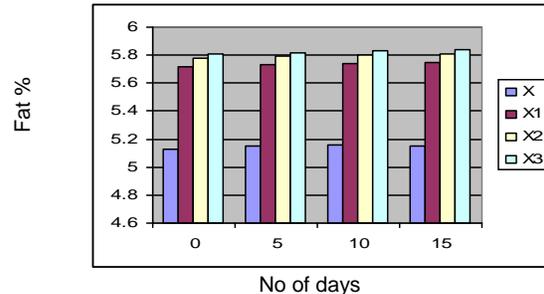


Figure 4(a) Fat % in yogurt within 15 days

**Lactose:** The garlic powder has the Carbohydrate contents 71.4 [34] In nonfat yogurts made from skim milk fortified with high milk protein powder showed the lactose contents 1.6 % to 7.9 % with different treatments in control yogurt sample [42]. The average lactose % for different yogurt samples is listed

below: X=5.15 %, X<sub>1</sub>=5.74 %, X<sub>2</sub>=5.79 % and X<sub>3</sub>=5.83 %. These ranges close to our findings. So there was a significance increase in lactose % as we compared different yogurt samples with the control.

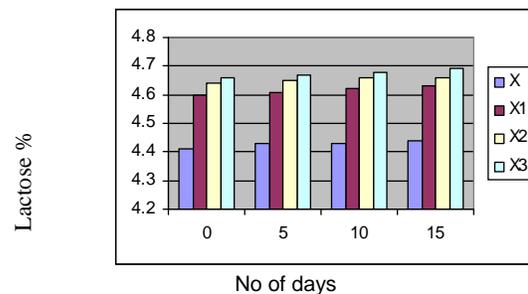


Figure 5(a) Lactose % in yogurt within 15 days

**Total solids:** Muhammad, *et al.*, [43], estimated the highest range of total solids in yogurt as 17.1 %. These are close to our findings. The average % of total solids is given below: X=15.29 %, X<sub>1</sub>=16.56 %, X<sub>2</sub>=16.78 % and X<sub>3</sub>=16.88 %. The average total solids content of probiotic yogurt was 17.75 % and that of natural yogurt was 19.2 % [33].

Table 1. Moisture % in Yogurt prepared by Garlic Powder during Storage of 15 days.

Treatment	Moisture % in Yogurt within 15 Days of storage			
	0 Days	5 Days	10 Days	15 Days
X	84.78	84.72	84.68	84.65
X1	83.50	83.46	83.43	83.38
X2	83.28	83.22	83.19	83.16
X3	83.18	83.14	83.09	83.05

Table 2. Protein % in Yogurt prepared by Garlic Powder during Storage of 15 days.

Treatment	Protein contents % in yogurt within 15 days of storage			
	0 Days	5 Days	10 Days	15 Days
X	4.76	4.77	4.79	4.80
X <sub>1</sub>	5.20	5.21	5.22	5.24
X <sub>2</sub>	5.28	5.30	5.31	5.32
X <sub>3</sub>	5.32	5.33	5.35	5.36

Table 3. Ash % in Yogurt prepared by Garlic Powder during Storage of 15 days.

Treatment	Ash contents % in yogurt within 15 days of storage			
	0 Days	5 Days	10 Days	15 Days
X	0.92	0.93	0.94	0.96
X <sub>1</sub>	0.98	0.99	0.99	1.00
X <sub>2</sub>	1.02	1.04	1.04	1.05
X <sub>3</sub>	1.03	1.04	1.05	1.06

Table 3.4 Fat contents % in Yogurt Prepared by Garlic Powder during Storage

Treatment	Fat contents % in yogurt within 15 days of storage			
	0 Days	5 Days	10 Days	15 Days
X	4.41	4.43	4.43	4.44
X <sub>1</sub>	4.60	4.61	4.62	4.63
X <sub>2</sub>	4.64	4.65	4.66	4.66
X <sub>3</sub>	4.66	4.67	4.68	4.69

Table 5. Lactose % in Yogurt prepared by Garlic Powder during Storage of 15 days.

Treatment	Lactose contents % in yogurt within 15 days of storage			
	0 Days	5 Days	10 Days	15 Days
X	5.13	5.15	5.16	5.15
X <sub>1</sub>	5.72	5.73	5.74	5.75
X <sub>2</sub>	5.78	5.79	5.80	5.81
X <sub>3</sub>	5.81	5.82	5.83	5.84

Table 6. Total solids % in Yogurt prepared by Garlic Powder during Storage of 15 days.

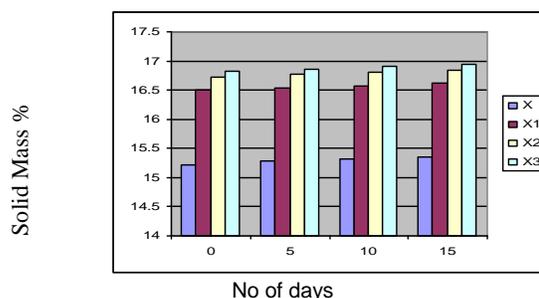


Figure 6(a) Total solid mass % in yogurt within 15 days

**CONCLUSION**

Physio-Chemical analysis of garlic based yogurt during 15 days storage period was done by using different parameters. The nutritional values of garlic based yogurt are higher as compared to the plain yogurt. Where as the value of protein, lactose, fat, acidity and total solids increased slightly whereas moisture contents decreased.

**REFERENCES**

1. Bourlioux, P., and Pochart, P., "Nutritional and Health Properties of Yogurt". *World Rev. Nutr. Diet*, **56**:217-58(1988)..
2. FAO, *Lab. Manual F.A.O.* "Regional Dairy Development and Training Center for near East Philippines" 1977.
3. Mckinley, M.C., "The Nutrition and Health Benefits of Yogurt". *International Journal of Dairy Technology*, **58** (1) 1-12(2005).
4. Tarakci, Z., and Erdogan, K., "Physical, chemical, microbiological and sensory characteristics of some fruit-flavored yogurt". *Y.Y.U. Vet. Derg.*, **14**:10-14(2003).
5. Blance, B., "The Nutritional Value of Yogurt". *Int. J. Immunotherapy*, Pp: 25-47(1986).
6. Adolfsson, O., Meydani, N.S., and Russell, R.M., "Yogurt and Gut Function". *Am. J. clin Nutr.*, **80**: 245-56 (2004).
7. Buttriss, J., "Nutritional properties of fermented milk products". *Int J. Dairy Tech*; **50**:21-7(1997).
8. Hewitt, D., Bancroft, H.J., "Nutritional Value of Yogurt". *J Dairy Res*; **52**:197-207(1985).
9. Shahani, K.M., Chandan, R.C., "Nutritional and healthful aspects of cultured and culture-containing dairy foods". *J Dairy Sci*; **62**:1685-94(1979).
10. Rasic, J.L., Kurmann, J.A., "Yoghurt: scientific grounds, technology, manufacture and preparations". Vol 1 of Rasic JL, Kurmann JA, eds. *Fermented fresh milk products and their cultures*. Copenhagen: Technical Dairy Publishing House(1978).
11. Bissonnette, D.J, Jeejeebhoy, K.N., "Meeting Dietary Nutrient Requirements with Cow's Milk and Milk Products". Rotterdam: Balkema(1994).
12. Gaudichon, C., Roos, N., Mahé, S., Sick, H., Bouley, C., and Tomé, D., "Gastric Emptying regulates the Kinetics of Nitrogen Absorption from 15Nlabeled Milk and 15N-labeled Yogurt in Miniature Pigs". *J Nutr*; **124**:1970-7(1994).
13. Loones, A., "Transformation of Milk Components during Yogurt Fermentation". In: Chandan RC, ed.

- Yogurt: nutritional and health properties. McLean, VA: National Yogurt Association,:95–114(1989).
14. Salvador, A., and Fiszman, S. M., "Textural and sensory Characteristics of Whole and Skimmed Flavored Set-Type Yogurt during Long Storage". *Journal of Dairy Science*, **87**:4033-4041(2004)..
  15. Stanton, C., Gardiner, G., Meehan, H., Collins, K., Fitzgerald, G., Lynch, P.B., and Ross, R.P., "Market Potential for probiotics". *American Journal of Clinical Nutrition*, **73** (suppl): 476S-483S(2001).
  16. Janick, J., "*Horticultural Science*". San Fransisco, Freeman & Co., p. 544(1979).
  17. Blackwood, J., and Fulder, S., (1986). "Garlic" Nature's Original Remedy, Javelin Books, England.
  18. Fogarty, M., "Garlic's Potential role in Reducing Heart Disease". *Br. J. Clin. Pract.*, **47**: 64–65(1993).
  19. Steiner, M., Kahn, A. H., Holbert, D., and Lin, R.I.S., (1996). "A double-blind crossover study in moderately hypercholesterolemic men that compared the effect of aged garlic extract and placebo administration on blood lipids". *Am. J. Clin. Nutr.*, **64**: 866–870.
  20. Amagase, H. and Milner, J. A., "Impact of various Sources of Garlic and their constituents on 7, 12-dimethylbenz (a) anthracene binding to mammary cell DNA". *Carcinogenesis*, **14**: 1627–1631(1993).
  21. Nishino, H., Iwashima, A., Itakura, Y., Matsuura, H., and Fuwa, T., "Antitumor- promoting activity of garlic extracts". *Oncology*, **46**: 277–280(1989).
  22. Wargovich, M.J., "Dietary promoters and antipromoters". *Antimutat. Anticancer Mech.* 409(1986).
  23. Moriguchi, T., Takashina, K., Chu, P.J., Saito, H., and Nishiyama, N., "Prolongation of Life Span and improved learning in the Senescence Accelerated Mouse produced by Aged Garlic extracts". *Biol. Pharm. Bull.*, **17**: 1589–1594(1994).
  24. Podan, G.E., Florescu, E., Mihalache, M., Visarion, M., Bacue, E., Dorobantee, N., and Tudor, T. (1977) *Nicolbalcescu Hort.*, **17**, 7–15.
  25. Aggarwala, A.C. and Sharma, R. M (1961). "A laboratory manual of milk Inspection". Asia publishing house. Pp. 137-142.
  26. BS, 1741-5.2, (1990). *Methods for chemical analysis of liquid milk and cream*.
  27. AOAC, International. "*Official methods of analysis of AOAC Arlington, VA*", Association of official chemists. **16**:82-84(1995).
  28. AOAC, International. "*Official methods of analysis of AOAC Arlington, VA*", Association of official chemists. **16**:141-147(1995)..
  29. Kamruzzaman, M., Islam, M.N., Rahman, M.M., Parvin, S, and Rahman, M.F, "Evaporation Rate of Moisture from Dahi (Yogurt) During Storage at Refrigerated Condition." *Pakistan journal of nutrition*, **1** (5): 209-211(2002).
  30. Hamdan, I.Y., kunsman, J.E., and Deane, D.D., "Moisture and Acetaldehyde Production by Combined Yoghurt Cultures." *J. Dairy Sci.*, **54**: 1080-1082(1971).
  31. Bills, D.D., Yang, C.S., Morgan, M.E., and Bodyfelt, F.W., "Effect of Sucrose on the Production of Acetaldehyde and Acids by Yoghurt Culture Bacteria." *J. Dairy Sci.*, **55**: 1570-1571(1972).
  32. Mohammad, N., Anwar, M., Ehteshamuddin, A.F.M., and Jamil, M, (1986). "Moisture Sorption Studies on Garlic Powder."
  33. Hussain, I., Rahman, A., and Atkinson, N., (2009). "Quality Comparison of Probiotic and Natural Yogurt." *Pakistan Journal of Nutrition* **8** (1): 9-12.
  34. Pruthi, J.S., (1987). "Spices and Condiments". New Delhi, National Book Trust of India, 130–1.
  35. Nwinuka, N.M., Ibeh, G.O., and Ekeke, G.I. (2005) "Proximate Composition and Levels of Some Toxicants in Four Commonly Consumed Spices." *Journal of Applied Sciences and Environmental Management*. Vol. 9(1): 150-155.
  36. Law, J., and Haandrikman, A., (1995). "Proteolytic Enzymes of Lactic Acid Bacteria."
  37. Thomas, T.D., and Mills, O.E., (1981). "Proteolytic Enzymes of Starter Bacteria." *Netherlands Milk and Dairy Journal*. Vol. 35, no. 3-4, pp. 255-273.
  38. Ali, M.Y., Islam, M. A., Alam, M.J., and Islam, M.N., "Quality of Yogurt (Dahi) made in Laboratory and Available in the Market of Mymensingh Town in Bangladesh." *Pakistan journal of biological sciences*, **5**(3): 343-345(2002).
  39. Seo, Y., Gweon, O., Im, J., Lee, Y., Kang, M, and Kim, J, "Effect of Garlic and Aged Black Garlic on Hyperglycemia and Dyslipidemia in Animal Model of Type 2 Diabetes Mellitus." *J. Food Sci Nutr.*, Vol, **14**:1-7(2009)..
  40. Ahmad, M., "Preparation and Evaluation of Fruit Yogurt." M.Sc. (Hons). Thesis, Deptt. Food Technology University Agriculture, Faisalabad(1999)..
  41. Mutlu, B. Guler and A.M. Serdar Akin, "Effects of cysteine and different incubation temperatures on the microflora, chemical composition and sensory characteristics of bio-yogurt made from goat's milk." (2005).
  42. Mistry, V.V., and Hassan, H.N., "Manufacture of Nonfat Yogurt from a high Milk Protein Powder." *J. Dairy Sci.*, **75**: 947-957(1992).
  43. Muhammad, B.F., M.M. Abubakar and E.O. Oyawoye., "Effects of culture concentration and inoculation temperature on physicochemical, microbial and organoleptic properties of yogurt." *Nig. Food J.*, **23**: 156-165(2005).
  44. Suzanne, N., "Food analysis". Purdue University West Lafayette, Indiana. Plenum Publishers, pp: 119(2003a).
  45. Suzanne, N., "Food analysis". Purdue University West Lafayette, Indiana. Plenum Publishers, pp: 88(2003b).