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Short communication

Probiotic-enriched acidophilus milk: A source of nutritional and therapeutic value nutritional significance of acidophilus milk

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Abstract

Acidophilus milk is a fermented dairy product in the presence of *Lactobacillus acidophilus* a gram positive bacteria. It is a rich source of nutrition as well as assist in controlling the gastro-intestinal disorders. The present study review the compositional changes during ffermentation, the probiotic mechanism of *L. acidophilus* milk in comparison to conventional milk. Further study describes, the fermentation process enhances the digestibility of milk protein and lactose, which also improve the bioavailability of essential nutrient such as Ca, Vitamins and amino acid. Regular consumption of acidophilus milk has been associated with modulation of gut microbiota, improved gastrointestinal health and potential cholesterol lowering effect. In the USSR acidophilus yeast milk is widely used in treating tuberculosis. The findings underscore acidophilus milk as a functional food with promising application in dietary intervention and public health nutrition.

Keywords Acidophilus milk, Lactobacillus acidophilus, Probiotics, Gut microbiota, Lactose intolerance, therapeutic and prophylactic action

Introduction

Acidophilus milk is a sour milk product obtained by lactic fermentation of cow or buffalo milk. A good quality acidophilus milk is of firm and uniform consistency with acid aroma and clean taste, pure culture of *Lactobacillus acidophilus* is used for the production of this fermented milk. Several varieties of acidophilus based fermented milk's such as sweet acidophilus milk, acidophilin, acidophilus paste, acdidophilus concetrate, acidophilus yoghurt and acidophilus yeast milk have been evolved by various worker's (Vedanmuthu, 1974; Lang and Lang, 1975; Gandhi and Nambudripad, 1978; and Subramanian and Shankar, 1985). Consumption of acidophilus milk has emerged in Europe, United State, USSR and Yogoslavia. Acidophilus milk is consumed either in sweetened or salted form directly. The consumption of acidophilus milk has been observed to be useful in controlling the gastro-intestinal disorders caused by various enter pathogenic bacteria. Hence, the acidophilus milk has been attributed to possess therapeutic value.

Nutritional Content: The composition of acidophilus milk depend upon the type of milk used and manufacturing condition. The average composition of acidophilus milk from whole milk is as -

Water - 85-88%, Fat -5-8%, Protein-3.2 -3.4%, Lactose-4.6-5.2%, Ash -0.7-0.75%, Lactic acid- 1.2-1.5%, Calcium- 0.12-0.14%, Phosphorus- 0.09-0.11%, Energy-50-70 kcal, Magnesium-10-12 mg, Potassium- 140-150gmg, Sodium-40-50mg, Vitamin A-40-5µg, Vitamin D-0.05-0.1µg, Vitamin B_2 - 0.15-0.2mg, Vitamin B_{12}-0.3-0.4µg, Live Lactic Acid bacteria (*L. acidophilus*) ~10^6-10^8 CFU/ml. It supplies essential nutrient such as minerals vitamins and high quality protein in significant amount through it is not considered as source of vitamin C, D and nicotinic acid. In adition acidophilus milk may also contain some B complex vitamins, free amino acids, peptides and cell protein in easily digetable form (Shankar and Laxmina, 1974).

Methods of Preparation- Manufacturing of acidophilus products are explained by following flow diagram-

Receiving of milk (Skim/whole/detested)
↓
Filtration/clarification (35-40^{0}C)
↓
Heating (45^{0}C for 1 hour)
↓
Cooling (37^{0}C, 3-4 hour)
↓
Reheating (40-45^{0}C, 5-10 minutes)
↓
Cooling (37-40^{0}C)
↓
Inoculation (3-5%)
↓
Incubation (38-42^{0}C, 12-16 hours)
↓
Coagulation
↓
Breaking of Coagulum
↓
Cooling (10^{0}C)
↓
Packing and Storage 5^{0}C

Acidophilus milk is generally made from cow or buffalo milk. However skim milk from either species can also be used but to a lesser extent Acidophilus milk is a weak gel when prepared from cow or skim milk. The gel is relatively firm when buffalo milk or the milk containing higher solid is used. Efficient heat treatment is essential in the preparation of good quality acidophilus milk. Milk should be free from bacterial spores which grow faster than acidophilus organism. This can be achieved by autoclaving but this results in the development of browning and cooked flavour in milk. Thus reducing the consumer appeal. Alternatively good quality milk is heated to around 45^{0}C for upto 1 hour and then cooked to 37^{0}C . The milk is held at this latter temperature for 3-4 hour to encourage germination of spore and is then reheated to 40-45^{0}C to kill residual vegetative cells. The cooled milk 37^{0}C is them inoculated with pure starter culture *Lactobarcillus acidophilus* (3-5%). Milk is incubated at 38-42^{0}C for 12-16 hour untill curd form with about 1% titration acidity. The coagulation is broken

down, cooled 10^0C filled or bottled. Acidophilus milk is chilled to 5^0C and distributed rapidly. The acidophilus sour milk can be preserved for upto 10 days below 5^0C without loss of antibactorial activity or taste.

Changes during fermentation

Changes that takes place during fermentation are as A vigorous culture produce 1.2 to 1.5 percent lactic acid after 12-16 hour of setting milk stored for long, before inoculation with starter, often results in poor flavour and broken curd. A good quality acidophilus milk has p^H in the range of 3.7 - 4.0 and titratable acidity in the range of 1.2-1.5% in the term of lactic acid (Rao and Gandhi, 1988). Lactose, the chief carbon source in milk is hydrolyzed to D-glucose and D-galactose by beta-galactosidase of the starter organism. D-glucose ender's the Embden Meyer Hoff pathway directly, where as D-galactose goes through a series of reactions resulting in the formation of lactic acid accounting for more than 90% of total acidity. The rest being volatile acid. The high level of lactic acid impact the acidio-flavour to acidophilus milk. A portion of acid combine with the calcium of casein to form calcium lactate. Lipid, during formation the electrical changes on the fat particles are neutralized, causing the globules to coalesce and rise to the lop. The total nitrogen content of milk remains more or less unchanged during fermentation. Appreciable changes occurs in non protein nitrogen, albumin nitrogen, ammonia nitrogen and dialysable nitrogen during fermentation. The increase in the non-protein nitrogenous constituents in accomplished by a corresponding decrease in protein nitrogen there by showing that this increase is due to the break down of protein during fermentation.

Advantages of consuming acidophilus milk

Acidophilus milks are known to play very important and significant role in the nutrition of man besides their therapeutic and prophylactic action. They have proved to control gastro-intestinal disorders such as diarrhea, constipation, dyspepsia (indigestion), flatulence (gas air in stomach), colitis and several other alimentary disorder's in adults and children's. In recent years emphasis to feeding lactobacilli has resulted from the increased use of antibiotics. Antibiotics alter the intestinal microflora and intestinal discomfort are caused by flatulence and diarrhea. Induction into the intestine of *L. acidophilus accelerates* return to normally in the intestinal microflora and body. Product of mixed fermentation such as acidophilus yeast milk which is rich in alcohol and carbon di oxide excites the respiratory and central nervous system. This improves the process of oxidation and reduction in the organism and hence there is an increase in oxygen flow to the lungs. In the USSR acidophilus yeast milk is widely used in treating tuberculosis. Generally fermented milk's contain all the nutrient present in milk. It has been suggested that cultured products are digested more easily and therefore, are more-notorious because the proteins, carbohydrate and fat are predigested by bacterial cultures in their manufacture (Lipatove *et al.* 1978). It has been known that fluid milk is not tolerated by certain ethnic groups of people due to the no availability of lactose in their intestinal microvilli (Flatz and Saengudom, 1965). But not a single report so far has been published claiming that people are intolerant to fermented milks. Grosswise *et.al.* 1947 described antibacterial substance by *L. acidophilus* as heat stable, acid stable and effective against gram positive and gram negative bacteria. Tomickarvic (1962, 1974) reported that consumption of half litre acidophilus milk daily cured or improved the control of infectious disease caused by *salmonella, staphylococcal spp., streptococci spp., Escherichia coli shigella spp* as well as Osteomyelitis in children. They also found that acidophilus milk served as remedy for the treatment of rheumatism, furunculosis and other purulent condition in diabetics, infectious hepatitis as well as wounds ulcerations and acne. Some reports suggest that acidophilus milk therapy not only relives such conditions as uncomplicated gastrointestinal disorders but also produce a feeling of general vigour and health and contributes to

longevity. It has been reported by some scientist that acidophilus milk products combined with chemotherapeutic preparation can also be effectively used for several diseases such as typhoid, paratyphoid psoriasis, osteomyelitis, pneumonia, migraine and urological infections. Experiments have revealed that the body weight of a child, a man or an animal increase when fed with acidophilus milk preparation. A curious and significant aspects of marketing acidophilus milk is that the product does not have any new or different culinary distinctions. It tastes like and the same basic nutritional properties as other low fat milk's. Consumer's buy it and drink it being that the bacteria in the milk contribute to their well-being. Thus, the knowledge that *L. acidophilus* bacteria are present in the milk as stated on the label in accordance with legal definition would seem to be sufficient to persuade consumers to buy the product.

Conclusion

The acidophilus milk have nutritional and therapeutic significance and emphasize its role in treatment of diarrhea, constipation, dyspepsia, flatulence, calitis and tuberculosis. It can also be used in chemotherapeutic preparation for control on typhoid, paratyphoid and urological infection. While current evidence is promising, more large scale clinical studies are required to validate long-term benefits across diverse population. Future research should also investigate formulation stability, bioactive compound interactions, and its role in chronic disease prevention.

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