

CHAPTER 1

INTRODUCTION

Introduction

Fermentation is one of the oldest and one of the most lucrative methods of food preservation. From the time immemorial different communities worldwide have been adopting fermentation as an integral process for preserving their foods with an aim to increase shelf life, flavour and aroma components. Steinkraus [1, 2] defined fermented foods as those kinds of food in which different types of microorganisms play a pivotal role in enhancing flavour, aromas, nutritional components and texture through lactic acid, acetic acid, alcoholic and alkaline fermentation. Tamang [3] used the term “ethnic fermented foods” for describing fermented foods as those foods which are prepared by the people of a particular ethnicity using their native knowledge from locally available raw materials of plant and animal origin. Mainly two types of fermentations are involved in this process: spontaneous and starter culture- based; the latter involves the addition of microorganisms. Both should fulfill the criteria of social and cultural acceptance.

Fermented foods can be classified into three basic types on the basis of their sensory and physicochemical properties: acidic, basic and alcoholic, which are the end products of acidic, alkaline and alcoholic fermentations respectively. The microorganisms associated with fermented foods therefore depend upon the type of fermentation took place. Lactic acid fermented products are dominated by lactic acid bacteria (LAB) belonging to the genera *Lactobacillus*, *Pediococcus*, *Enterococcus*, *Lactococcus*, *Leuconostoc*, *Oenococcus*, *Streptococcus*, *Tetragenococcus*, *Carnobacterium*, *Vagococcus*, *Propionibacterium*, *Bifidobacterium* and *Weissella* [4]. On the other hand, alkaline fermented products are the results of microbial degradation of proteins and amino acids present in the substrates forming products with alkaline pH. Most important bacteria involved in this type of fermentation are *Bacillus* spp., *Staphylococcus* and *Micrococcus*. Alcoholic fermented products are dominated by *Saccharomyces*, *Kluyveromyces*, *Metschnikowia*, *Pichia*, *Rhodotorula*, *Saccharomycodes*, *Saccharomycopsis*, *Schizosaccharomyces*, *Torulopsis*, *Trichosporon*, *Yarrowia*, and *Zygosaccharomyces* [5]. Some of the microorganisms present in fermented foods are considered as ‘probiotic’. The most consensus definition of probiotics was given by The International Scientific Association for probiotics and prebiotics as “live microorganisms that, when administered in adequate

amounts, confer a health benefit on the host” [6]. The selection criteria of probiotic bacteria include resistance to gastrointestinal stress tolerance, host intestinal colonization, competitive exclusion of pathogens, survivability in oxygen exposure or storage, generally regarded as safe (GRAS) characteristics like non- pathogenicity and antibiotic susceptibility [7,8]. Man vs. wild conflict is in fact a million years old process and harnessing nature’s power for the benefit of mankind denotes the beginning of human civilization. Preparation of fermented food is also an act of showing human supremacy over natural power which was exploited by the ancient people as a process to undermine the effects of detrimental microbes in food. Fermentation was preferred over drying since fermentation enhanced taste and aroma of food. When any food produced after spontaneous fermentation led to the improvement in nutritional value over raw product without any toxic effects, that food became readily acceptable.

North- East India, part South Asia, bordering East and Southeast Asia. North East region of India; comprising eight states and lying between 21.50 and 29.50 °N and between 85.50 and 97.30 °E. Assam is situated between 90-96 °E Longitude and 24-28 °N Latitude, Assam is bordered in the North and East by the Kingdom of Bhutan and Arunachal Pradesh. Along the south lie Nagaland, Manipur and Mizoram [9]. More than forty five different ethnic groups are there in Assam which includes Ahoms, Bodo, Karbi, Dimasa, Rabha, Mishng, Deori, Nepali, Manipuri, Tea tribe etc. Arunachal Pradesh is situated between latitude 26°28' North and 29°30' North and longitude 91°30' East and 96°30' East, shares borders with Assam, Nagaland, Bhutan, Tibet, China and Myanmar [10]. This state is inhabited by 20 major tribes which includes Adi, Nyishi, Apatani, Bugun, Galo, Hrusso, Koro, Meyor, Monpa, Tagin etc. The origin of these tribes is as old as Neolithic or at the earliest, Mid- Palaeolithic, when Mongoloid and Australoids started colonizing this region [11]. Apart from these tribes, Indo-Aryans also colonized in the plains of Brahmaputra and Barak valley. While talking about the fermented foods of this region, majority of these products are found to be non- dairy in origin. This might be due to the fact that about 90-100% people of East Asia are lactose intolerant [12] and the tribal people from North-East India has a common root of origin with the people of this region. While selecting the raw materials for the preparation of fermented food the most readily available

substrates such as fruits, vegetables, cereals, meats and fishes play the most important role as are readily available.

From the beginning probiotic products marketed worldwide are of dairy origin because milk provides an excellent carrier matrix for probiotic microorganisms. But with increasing cases of people suffering from metabolic syndromes such as lactose intolerance and dyslipidemia, finding alternative food matrices for the growth and survivability of probiotic microorganisms has become the main priority for food microbiologists [13,14]. Therefore, microorganisms with potential probiotic properties isolated from non-dairy fermented foods have the prospective to become starter cultures for the preparation of functional foods of non-dairy origin. Keeping all these in mind, following objectives were set for the study:

Objectives:

- 1) Documentation and microbial characterization of traditional fermented foods of Assam and Arunachal Pradesh.
- 2) Study of antimicrobial and antibiofilm activities of potential probiotic strains.
- 3) Assessment of cholesterol lowering activities of potential probiotic strains.

Bibliography:

1. Steinkraus, K.H. Nutritional significance of fermented foods. *Food Research International*, 27: 259–267, 1994.
2. Steinkraus, K.H. *Handbook of Indigenous Fermented Food*, Marcel Dekker, Inc., New York, 2nd edition, 1996.
3. Tamang, J.P. *Himalayan Fermented Foods: Microbiology, Nutrition, and Ethnic Values*. New York, CRC Press/Taylor & Francis, 2010.
4. Tamang, J. and Kailasapathy, K. *Fermented Foods and Beverages of the World*. New York, CRC Press, 2010.
5. Pretorius, I.S. Tailoring wine yeast for the new millennium: Novel approaches to the ancient art of winemaking. *Yeast*, 16: 675–729, 2000.
6. Hill, C., Guarner, F., Reid, G., Gibson, G. R., Merenstein, D. J., Pot, B., Morelli, L., Canani, R. B. , Flint, H. J., Salminen, S., Calder, P. C., and Sanders, M. E. Expert consensus document: The International Scientific

- Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. *Nature Reviews Gastroenterology & Hepatology*, 11(8): 506–514, 2014.
7. Collins, J. K., Thornton, G., and Sullivan, G. O. Selection of probiotic strains for human applications. *International Dairy Journal*, 8: 487–490, 1998.
 8. Kailasapathy, K. and J.C. Chin. Survival and therapeutic potential of probiotic organisms with reference to *Lactobacillus acidophilus* and *Bifidobacterium* spp. *Immunology and Cell Biology*, 78: 80–88, 2000.
 9. Maps of India. *Assam geography*. Retrieved on 12 Jan. 2017 from <http://www.mapsofindia.com/assam/geography.html>, 2011.
 10. Maps of India. *Arunachal Pradesh geography*. Retrieved on 12 Jan. 2017 from <http://www.mapsofindia.com/arunachal-pradesh/geography.html>, 2013.
 11. Dikshit, K. R. and Dikshit, J. K. Early Colonisation of North-East India. North-East India: Land, People and Economy, 259–283, 2013. doi:10.1007/978-94-007-7055-3_10.
 12. de Vrese, M., Stegelmann, A., Richter, B., Fenselau, S., Laue, C., and Schrezenmeir, J. Probiotics- compensation for lactase insufficiency. *The American Journal of Clinical Nutrition*, 73(2): 421S–429S, 2001.
 13. Peres, C. M., Peres, C., Hernández-Mendoza, A., and Malcata, F. X. Review on fermented plant materials as carriers and sources of potentially probiotic lactic acid bacteria — with an emphasis on table olives. *Trends in Food Science & Technology*, 26: 31–42, 2012.
 14. Martins, E. M. F., Ramos, A. M., Vanzela, E. S. L., Stringheta, P. C., de Oliveira Pinto, C. L., and Martins, J. M. Products of vegetable origin: A new alternative for the consumption of probiotic bacteria. *Food Research International*, 51(2): 764–770, 2001.