IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 4, Issue 2 (May. - Jun. 2013), PP 29-33
www.Iosrjournals.Org

Hawaijar –A Fermented Soya of Manipur, India: Review

Somishon Keishing[1], Thahira Banu. A[2]
Assistant Professor, Department of Home Science, Faculty of Rural Oriented Sciences, The Gandhigram Rural Institute-Deemed University, Gandhigram-624302, Tamil Nadu, India

Abstract: *Hawaijar is an indigenous fermented soyabean product of Manipur, India. It is has been consumed in every household directly or used as an ingredient in several signature dishes of Manipur. Hawaijar is rich in almost all the nutrients and Bacillus sp. is the microorganism involved in the fermentation process. They are known for its flavour and aroma. In this present study, it is aimed to document and summarize the processing methods of hawaijar, its nutritional value and microbes involved in its fermentation.*
Key words: *Hawaijar, fermented soyabean, processing, nutrient composition, bacillus sp.*

I. Introduction

Manipur located in the far north-eastern part of India and is a state described as the "Jewel of India" by late Pandit Jawaharlal Nehru for its scenic beauty and biodiversity. It is situated at the end of the eastern Himalaya with various ethnic groups living together from time immemorial. Each ethnic group has their own unique and distinctive culture and tradition with some similarities which would have resulted due to their co-existence for years.

Food plays a very important role in defining the identity of one ethnic group from the other. Fermented foods and its products are prepared and consumed worldwide. The people of Manipur also consumed different types of fermented food prepared traditionally at home. In Manipur fermentation is a household art handed down from generation to generation.

Fermented soybean products have been reported to be used extensively in almost all the states of north-east India and bears resemblance to tou-shi, hamanto, chiang-yu, shi-tche, chiang and tofu of China, tempekedele, kecap and taoco of Indonesia, shoyu and miso of Japan (Wang and Fang 1986; Nout, 1995).

Fermentation is a very important process that allows the utilization of microorganisms to break down complex compounds to yield a unique taste and aroma. Not only the process of fermentation preserve foods, it also improves digestibility by breaking down proteins within foods and have been known to enrich nutrients such as vitamins, amino acids and fatty acids (Steinkraus and Keith, 2004).

More than 250 different types of familiar and less familiar ethnic fermented food and alcoholic beverages are prepared and consumed by the different ethnic people of North-east India. All the fermented foods are region specific and have their unique substrate and preparation methods. Locally available materials like milk, vegetable, bamboo, soybean, meat, fish and cereal are commonly fermented (Tamang *et al.*, 2012; Das and Deka, 2012).

Climatic condition also plays an important role in the type of fermented food produced due to their temperate, sub-tropical and tropical climate in Manipur.

Among the fermented foods consumed in India, fermented soyabean product locally known as Hawaijar is traditionally prepared and consumed in Manipur (Irabanta and Umabati, 1995). It plays an economical, social and cultural role in Manipur. Hawaijar making provides income to the rural masess in Manipur and bears deep attachment with socio cultural lives of the people (Premarani and Chhetry 2011; Das and Deka, 2012).

Hawaijar is consumed commonly in the local diet as a low cost source of high protein food (Devi and Kumar, 2012). It has been reported in many studies for its various health benefits. They are known for their anti-cancer, anti-osteoporosis and hypocholesterolemic effects.

II. Processing And Preparation Of Hawaijar

Hawaijar is an indigenous traditional fermented soya product of Manipur with a characteristics flavour and stickiness and has been consumed as a regular food in every household (Premarani and Chhetry, 2011).

In the traditional method of preparation of Hawaijar small and medium sized soyabean (*Glycine max* L.) seeds are cleaned and sorted (Devi and Kumar 2012). Although there are many varieties of soyabean, 2 variety namely, the local variety with small and bigger, round seeded variety 'JS355' are especially used in the preparation of Hawaijar. However, hawaijar prepared from local variety is more preferred because of its unique taste (Premarani and Chhetry, 2008).

The fermentation process takes place by natural fermentation. In the Hawaijar preparation whole soya are utilized. They are prepared at home without requiring much sophiscated equipments rather by using the rudimentary utensils available in every household. The seeds are soaked overnight /12-24 hours and washed thoroughly with tap water and boiled / pressure cooked till the seeds are soft. After the excess water is drained out the cooked soya are washed with hot water, it is wrapped with clean cotton cloth /healthy fig leaves (*ficus hispada*) / banana leaves (*Musa sp*.) and packed tightly in a small bamboo basket with lid locally known as *lubak*. The base and sides of the basket is layered and lined with fig or banana leaves. The basket is then wrapped with cloth and kept in the Sun or near stove or buried in paddy straw for the fermentation process to take place. The whole process takes about 4 to 5 days. The final product is brown in colour with sticky slimy white appearance that emits light ammoniacal aroma. The finished products are the wrapped in banana leaves (Premarani and Chhetry, 2010; Appaiah *et al.*, 2011; Tamang *et al.*, 2012).

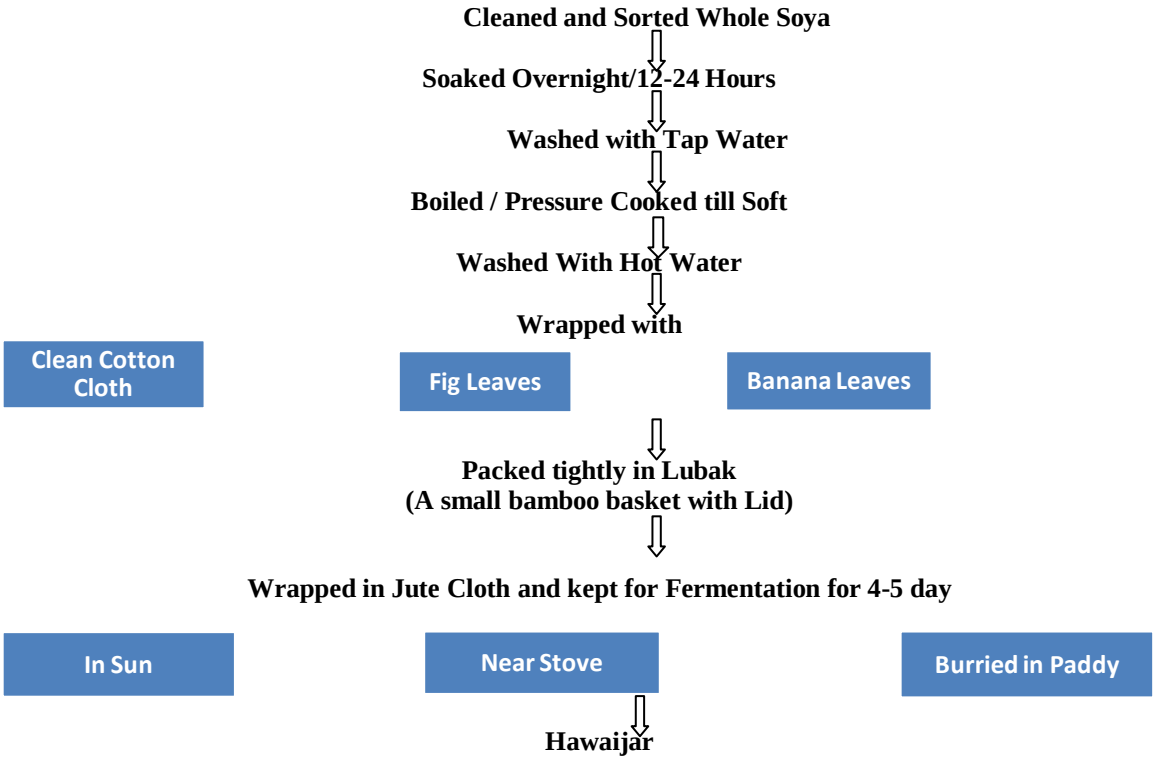

Fig. Steps Involved in Production of Hawaijar

Microorganism Involved

Hawaijar is a naturally fermented product; no starter culture is intentionally added during its preparation. The high number of different *Bacillus* strains isolated from Hawaijar confirms the diversity of the microflora. The *Bacillus* isolates responsible for the fermentation may have been acquired from raw soya or other materials like lubak, cotton cloths or fig leaves used during fermentation (Premarani and Chhetry, 2008). The presence of *B.subtilis* on raw soyabean has been reported earlier (Tamang, 2003; Hesseltine, 1983).

The microorganisms found in fresh Hawaijar are *Bacillus subtilis, B.licheniformis, B.cereus, Staphylococus aureus, S.sciuri, Alkaligenes spp., Providencia rettgeri* (Jeyaram *et al.*, 2008). *Bacillus subtilis* was reported to be prevalent (70%) in *Hawaijar and the remaining belonged to Xanthomonas sp*. (Appaiah *et al*., 2011). Earlier studies have reported the presence of these microorganisms in Hawaijar and were obtained from the fig leaves used for wrapping material during the fermentation process (Irabanta and Umabati, 1995).

III. Shelf Life

Hawaijar has a very short shelf life of 3-4 days. Hence the product is sometimes dried in the Sun for long term storage (Premarani and Chhetry, 2010). Similar observation was reported that the high moisture content imparts the product a short shelf life of 3-4 days at room temperature. The traditional method involves drying the product under the Sun (Appaiah *et al.*, 2011).

For long term storage and depending on the choice of taste, the fermented beans are kept in cake form above the fire place or individual beans are separated, dried in the sun and stored in containers (Mao and Odyou, 2007).

Other methods of storage are mixing with salt after one week of preparation and pouring the *Hawaijar* in bamboo (any bamboo with longer internodes, bigger holes and thinner outer part) where it is sealed with bamboo leaves and tied very tightly with plastic sheets. This is then placed on top of fire place in the kitchen (Devi and Kumar, 2012).

IV. Uses In Manipuri Cuisine

Hawaijar is known for its unique organoleptic properties. It has characteristic flavor and aroma and has been consumed as a regular food in every household. It is found in most of the signature dishes of Manipur. It is widely used as a condiment with vegetables. It is consumed directly or used as flavouring agent in vegetable items making it softer and tasty (Premarani and Chhetry, 2008).

A special delicacy of the Manipuris called *chagempomba* is prepared using Hawaijar, rice and other vegetables. It is also consumed as accompaniment eaten as paste with chilli and salt known as *Ametpa.* A fermented fish called *Ngari* is added to enhance the flavor (Premarani and Chhetry, 2010). It can be eaten raw with salt and chilli or cooked etc. (Devi and Kumar, 2012).

The dried fermented beans are also cooked with meat or used for preparation of chutney with chilly, tomato and salt (Mao and Odyou, 2007).

It is also consumed in a pickle form. This method is practiced recently by the people of Manipur. In this preparation Hawaijar is fried in oil along with some spices and added a pinch of salt to taste. It is then filled in a bottle along with the excess oil and sealed which can be stored for longer period of time (Devi and Kumar, 2012). To make soya chutney, whole dried Hawaijar are soaked, deep fried in vegetable oil, and then mixed with salt and chillies (Tamang, 1996).

V. Nutritional Quality

Fermented products are known for providing bio-nutrients, minerals and enhancement of flavor and aroma. The process also increases digestibility and exerts health promoting benefits (Jeyaram *et al.*, 2009).

Microorganisms convert the chemical constituents of raw substrate of plant or animal origins during food fermentation and enhances the nutritional value of the products, improve flavor and texture, fortify the products with health promoting bio-active compounds and anti-nutritive factors, produce antioxidants components and anti-microbial compounds (Tamang, 1998; Farhad et al., 2010).

The nutritional properties of Hawaijar have been analyzed, examined and reported by many. The crude fibre content of fresh Hawaijar was higher than the raw soyabeans and then decreased during storage period (Premarani and Chhetry, 2010; Appaiah *et al.*, 2011).

Proximate Composition of Soyabean and Hawaijar

Parameters (%W/W)	**Soyabean**	**Hawaijar**
Total Crude Protein	35	43.8
Total Fat	4.75	1.75
Total Carbohydrate	28.6	9.4
Reducing Sugar	1.10	3.1
Total Ash	3.99	3.88
Total Crude Fiber	3.51	5.56
Moisture	10.4	13.8
pH	6.0	8.6

Appaiah *et al.*, 2011

Fermented soya is known for their quality and richness in protein. The most significant biochemical changes that occur during Hawaijar fermentation is protein hydrolysis (Appaiah *et al.*, 2011). During fermentation of Hawaijar the protein increases due to proteolysis. The most significant biochemical changes that occur during the hawaijar fermentation are protein hydrolysis (Appaiah *et al.*, 2011).

The percentage of soluble protein in Hawaijar increases after fermentation with slight increase during storage (Premarani and Chhetry, 2010). Free amino- acid are released by hydrolysis of protein with protease enzymes produced by micro-organism during fermentation (Dajanta *et al.*, 2011)

Bacillus subtilis found predominantly in fermented soya product gave rise to high proteolytic activity and markedly increase the free amino acid content (Sarkar *et al.*, 1997).

Dajanta *et al.*, (2011) reported that after fermentation, essential amino acid also increased extensively (6-9 times) with respect to their original amount in unfermented soybean in thaunao which is similar to hawaijar.

The major amino acids reported to be present in fermented soya (thau nau) are trypsin followed by glutamine, cystine, lysine and leucine. All essential amino acids are also present in considerable amounts (Dajanta, 2010).

The level of reducing sugar decreased during the processing for hawaijar but increased slightly during fermentation (Premarani and Chhetry 2011). The increased level of reducing sugar is a reflection of the activities of α-amylase and sucrose in the fermenting seeds (Omafuvbe e*t al.*, 2000). Decrease in the sugar level could be a result of its utilization by the metabolizing microbes involved in the fermentation (Babalola and Giwa, 2012).

The total soluble sugar of raw seed (2.27%) was found to decrease to 1.2% after boiling kept on decreasing till the first day of fermentation. (Premarani and Chhetry, 2011). Similar observation was made earlier while working with production of natto where partial loss of oligosaccharides took place due to soaking and cooking (Kanno *et al*, 1982). The fat content of raw soya (4.75) was found decreased in hawaijar(1.75). The decrease is most likely due to utilization of fat by the growing micro-organism (Appaiah *et al*, 2011). Similar result was also obtained by Premarani and Chhetry (2011) and Mbajunwa (1995) and suggested that fermentation probably enhances oil extraction.

VI. Conclusion

Hawaijar produced traditionally by the people of Manipur is known for their flavour, enhancement in the nutritional qualities which is important from the nutritional point of view. The increment in the protein value after fermentation is the most significant one. This could help in combating malnutrition and providing food security which is in agreement with the MDG. It can be substituted for protein supplement and can form the major source of protein and other nutrients. Currently the methods of preparation are rudiment and their shelf life is also poor.

High and modern science and technological knowledge need to be united with the traditional technology to come out with better products. Newer products with Hawaijar should be developed which can compliance with the expected nutritional quality, shelf life has to be improved and at the same time it should have appealing flavor to other non-Hawaijar consumers to share the goodness of it to them. This could in term improve the economy of the state of Manipur and can bring about upliftment to rural mass in Manipur.

Reference

[1] Appaiah K.A.A. General T Koijam K, Khedarani Koijam. 2011. Process Improvement as Influenced by Inoculums and Product Preservation in the Production of Hawaijar. A Traditional Fermented Soybean. African Journal of Food Science 5 (2) : 63- 68.

[2] Babalola., R.O. and Giwa, O.E.2012. Effect of Fermentation on Nutritional and Anti-nutritional Properties of Fermenting Soybean and the Antagonistic Effect of the Fermenting Organism on Selected Pathogens. International Research Journal of Microbiology 3(10): 333-338.

[3] Dajanta, K.2010 Production of High Nutritional Fermented Soyabean (thau nau) by Bacillus Subtilis. Ph.D Thesis, Chiang Mai University, Chiang Mai, Thailand.

[4] Dajanta, K., Apichartrangkoon, A., Chukeatirote, E. and Frazier, R.A. 2011. Free-Amino Acid Profiles of Thau Nao, A Thai Fermented Soybean. Food Chemistry. 125: 342-347.

[5] Das A J, Deka SC, Fermented Foods and Beverages of the Northeast India, International Food Research Journal 19(2): 377-392, 2012.

[6] Devi, P. Kumar,S.P., 2012. Traditional Ethnic and Fermented Foods of Different Tribes of Manipur. Indian Journal of Traditional Knowledge. 11(1) : 70-77.

[7] Farhad M, Kailasapathy K, Tamang JP, 2010. Health Aspects of Fermented Foods, In : Fermented Foods and Beverages of the World, edited by Tamang JP, Kailasapathy K,(CRC Press, Taylor and Francis Group, New York),391-414.

[8] Hesseltine CW 1983. Microbiology of Oriental Fermented Foods. Ann Rev Microbiol 37:575-601.

[9] Irabanta SN, Umabati Devi A 1995. Fermentation Process of two Phylloplane Bacteria in Traditional Hawaijar made from Boiled Soyabean (Glycine max L.,). J Food Sci Technol 32:219-220.

[10] Jeyaram J, Anand Singh Th, Romi W, Ranjita Devi A, Mohendro Singh W, Dayanidhi H,Rajamohun Singh N & Tamang JP. 2009 Traditional Fermented Foods of Manipur, Indian J Tradit Knowle, 8 (1) 115-121.

[11] Jeyaram K, Mohendro Singh W, Premarani T, Ranjita Devi A, Selina Chanu K, Talukdar NC& Rohinikumar Singh M, 2008. Molecular Identification of Dominant Microflora Associated with-'Hawaijar' – A Traditional Fermented Soyabean (Glycine Max (L)) Food of Manipur, India, Int J Food Microbiol, 122 259-268.

[12] Kanno A, Takamatsu H,Takano N, Akimoto T. 1982 Studies on Natto-Changes of Saccharides in Soyabeans During Manufacturing of Natto, Nippon Shokuhin Kogyo Gakkaishi. 29: 105-119.

[13] Mao Ashiho A, Odyou N, 2007. Traditional Fermented foods of the Naga Tribes of Northeastern, India. Indian J Tradit Knowle 6 (1) 37-41.

[14] Mbajunwa OK , 1999. Effect of Processing on Some antinutritive and toxic components and the nutritional composition of the African oil bean seed (Pentadethra macrophylla) . J Sci Food Agric. 68: 153-158.

[15] Nout MJR, 1995. Useful Role of Fungi in Food Processing in Samson RA, Hoekstra E, Frisvad JC and Filtenborg O. (Eds). Introduction to Food Borne Fungi, p-295-303. Central Bureau voor Schimmelcultures, Baarn.

[16] Omafuvbe BO, Shonukan OO, Abiose SH, 2000 Microbiological and Biochemical Changes in the Traditional Fermentation of Soyabean Dawadawa- a Nigerian Food Condiment. Food Microbiol.17: 469-474.

[17] Premarani T, Chhetry GKN, Microbiota Associated with Natural Fermentation of Hawaijar (An Indegeneous Fermented Soyabean Product) of Manipur and their Enzymatic Activity. J Food Sci Technol, 2008 45(6), 516-519.

[18] Premarani, T. Chhetry, G.K.N. 2011. Nutritional Analysis of Fermented Soyabean (Hawaijar). Assam University Journal of Science & Technology 7 (1) : 96-100.
[19] Premarani,T. Chhetry 2010, Evaluation of Traditional Fermentation Technology for the Preparation of Hawaijar in Manipur. Assam University Journal of Science and Technology: Biological and Environmental Science 6(I) :82-88.
[20] Sarkar PK, Jones LJ, Craven GS, Somerset SM, Palmer C, 1997. Amino Acid Profiles of Kinema, A Soya Bean Fermented Food, Food Chem, 59 (1) 69-75.
[21] Steinkraus, Keith. 2004. "Origin and History of Food Fermentation." Hand Book of Food and Beverage Fermentation Technology. New York: Marcel Dekker, Inc.
[22] Tamang, J.P., Tamang,N., Thapa,S., Dewan,S., Tamang,B., Yonzan,H., Rai,A.P., Chettri,R., Chakrabarty,J and Kharel, N. 2012. Micro-organism and Nutritive Value of Ethnic Fermented Foods and Alcoholic Beverages of North-East India. Indian Journal of Traditional Knowledge 11(1): 7-25.
[23] Tamang JP, 1998. Role of Microorganisms in Traditional Fermented Foods, Indian Food Industry, 17 (3) 162-167.
[24] Tamang JP, 1996. Fermented Soyabean Products in India. In: Alex Buchanan, ed. 1996. Proceedings of the Second International Soyabean Processing and Utilization Conference: 8-13, Bangkok.
[25] Tamang JP 2003. Native Microorganisms in the Fermentation of Kinema. Indian J Microbiol 43:127-130
[26] Wang HL, Fang SF, 1986 History of Chinese Fermented Foods. In Hesseltine CW, Wang HL(Eds) Indigeneous Fermented Food of Non-Western Origin, 23-35. Cramer, Berlin.