SHORT RESEARCH PAPER

Journal of Hill Research
23 (1&2): 22-25, 2010

Nutritional Value of Lesser-known Ethnic Meat Products of the Himalayas

Arun Kumar Rai[1], Jyoti Prakash Tamang[1] and Uma Palni[2]*

[1]Food Microbiology Laboratory, Sikkim Government College, Sikkim University, Tadong 737102, Sikkim

[2]Department of Botany, D.S.B. Campus, Kumaun University, Nainital 263002, Uttarakhand

(Received 25 March 2010; accepted 15 April 2010)

Meat is highly nutritious but, in its fresh state, it is perishable and can be an agent for the transmission of a range of infections and intoxications (Adams, 2010). The domestic livestock species of the Himalayan regions of India, Nepal, Bhutan and China (Tibet) are mostly cattle, sheep, goats, pigs, yaks, etc. which are mainly used for meat, milk and milk products (Tamang, 2010a). The Himalayan people prepare and consume a variety of traditionally processed smoked or sun dried or air dried or fermented meat products including ethnic sausages for centuries. They use their indigenous knowledge of preservation of perishable meats without using starter culture and chemicals (Rai *et al.*, 2009). Microorganisms transform the chemical constituents of raw substrates during fermentation into acceptable food products with improved flavour, aroma and texture, enhancing nutritional value and other health benefits (Tamang, 2010b). Lesser-known traditionally processed ethnic meat products of the Himalayas are *kargyong, satchu, suka ko masu, kheuri, chilu, chartayshya, jamma* and *arjia. Kargyong* is an ethnic sausage-like product prepared from yak, beef and pork meat, and is mostly consumed by the Bhutia, Tibetans, Drupka, Lepcha, and Sherpa in the Himalayas (Rai et al., 2009). Three varieties of *kargyong* are prepared and consumed: *yak kargyong* (prepared from yak meat), *lang kargyong* (prepared from beef), and *faak kargyong* (prepared from pork). *Satchu* is an air dried or smoked meat product, mostly prepared from yak and beef meat. Two varieties of *satchu* are usually prepared i.e. *lang satchu* and *yak satchu. Suka ko masu* is a air dried or smoked chevon or buffalo meat product. Ethnic people of Western Himalayas prepare and consume mostly three types of meat products made up of goat meat and its scraps such as *chartayshya, arjia* and *jamma. Chartayshya* is a traditional chevon (chevon means meat of goat) meat product of the Kumaun Himalayas, consumed by Bhutia of Dharchula and Munsiyari in the district of Pithoregarh of Uttarakhand. This product is preferred by the people of Darma, Chawdas and Byans valley of Dharchula. It is prepared mainly during the religious festival called 'Kolatch' (worshiping ancestral spirit).

Drying or smoking or fermentation of perishable meat is a remarkable step in the traditional meat processing as bipreservation in the Himalayas. Bacteria- *Lactobacillus sake, Lb. curvatus, Lb. divergens, Lb. carnis, Lb. sanfransisco, Lb. plantarum, Lb. casei, Lb. brevis, Enterococcus faecium, E. cecorum, Leuconostoc mesenteroides, Pediococcus pentosaceous, Bacillus subtilis, B. mycoides, B. lentus, B.*

Corresponding Author

thuringiensis, and *B. licheniformis, Micrococcus* and *Staphylococcus;* yeasts- *Debaryomyces hansenii, D. polymorphus D. pseudopolymorphus, P. burtonii, P. anomala, Candida famata* and the mould *Rhizopus* were isolated from these lesser-known ethnic meat products of the Himalayas (Rai *et al.,* 2010). Many of the LAB isolates demonstrated some antimicrobial activity, enzymatic activities and a few showed a remarkable degree of hydrophobicity (Rai *et al.*, 2010). The present paper is aimed to analyse the nutritional value of lesser-known ethnic meat products of the Himalayas

Samples were collected aseptically in pre-sterile poly-bags and were, sealed and labelled for further analyses. The pH of the sample was determined directly using a digital pH meter (Type 361, Systronics) calibrated with standard buffer solutions (Merck). Titratable acidity of sample was calculated by titrating the filtrates of a well blended 10 g sample in 90 ml carbon-dioxide free distilled water with 0.1 N sodium hydroxide to end point of phenolphthalein (0.1 % w/v in 95 % ethanol) (AOAC, 1990). Moisture content was determined by weight loss of accurately weighed 1 g of sample (in triplicate) after heating at 135 °C for 2 h. Ash content was measured by heating the sample at 550 °C until the difference between two successive weighing was £ 1mg (AOAC, 1990). Protein content was determined by multiplying total nitrogen, estimated by standard Kjeldahl method, by 6.25 (AOAC, 1990; Feiner, 2006). Fat content was determined by ether extraction using glass soxhlet (AOAC, 1990). Carbohydrate content was estimated by difference: 100 - (% protein + % fat + % ash) (Standal, 1963). Energy value of a sample was estimated as the method described by Indrayan *et al.* (2005). The statistical data were analysed by determining the standard deviation (SD) as described by Snedecor and Cochran (1989).

The nutritional value of *kargyong, satchu, suka ko masu, kheuri, chilu, chartayshya, jamma* and *arjia* were analyzed (Table 1). The pH of all these products was in between 5.3 and 6.9. The pH increases and may be high as 7 in some thin, mould ripened sausages which taste quite different to the smoked 'tangy' sausages (Lücke, 1985). Anifantaki *et al.* (2002) reported the pH values of *frankfurters* ranged from 6.3-6.6 and in some cases the value was 5.7. Due to the production of lactic acid, the final pH of cooked meat products reached pH values of 5.0-5.3 (Gardner, 1983). Sun-and smoke-drying of most of the products, such as *yak kargyong, faak kargyong, lang satchu, yak satchu, suka ko masu* and *chartayshya* as a result of dehydration, have < 41 % of the moisture content. This data corresponds with the work reported by Garcia-Fontan *et al.* (2007) on Spanish traditional pork sausage *androlla.* Due to the low moisture content and slightly acidic nature of some of the meat products like *kargyong, satchu, suka ko masu, chartayshya* etc., can be kept for longer period and are safe for consumption. Titrable acidity was ranging from 0.3-2.6 %. In all samples analysed, food value ranged from 400.0-634.5 kcal/100g dry matter. The protein content was ranging in between 6.0-58.0 % indicating increasing protein intake in the local diet.

Drying or smoking or fermentation of perishable meat is a remarkable step in the traditional meat processing as biopreservation of highly spoilage raw meats in the Himalayas. Preparation of sausages is different from that of the European method in regards to use of natural casing, meat mixture and particularly the sausages of yak-product which is unique to the Himalayas. Lesser-known ethnic meat products are preserved for several months without refrigeration and can be consumed at anytime Due to high calorie value, the Himalayan ethnic meat products are good source of animal protein and other nutritional intake for the people living in high mountainous regions.

REFERENCES

Adams, M. (2010). Fermented meat products. In: *Fermented Foods and Beverages of the World*, eds. Tamang, J.P. and Kailasapathy, K., 309-322. New York: CRC Press, Taylor & Francis Group.

Anifantaki, K., Metaxopoulos, J., Kammernon, M., Drosinos, E.H. and Vlassi, M. (2002). The effect of smoking, packaging and storage temperature on the bacterial greening of frankfurters caused by *Leuconostoc mesenteroides* subsp. *mesenteroides*. *Italian Journal of Food science* 14 (2): 135-144.

AOAC (1990). *Official Methods of Analysis*, 15th edition. Association of Official Analytical Chemists, Virginia.

Feiner, G. (2006). Meat Products Handbook: Practical science and technology. CRC Press, Boca Raton Boston, London New York, Wasington, D.C.

Garcia-Fontan, M.C., Lorenzo, J.M., Parada, A., Franco, I. and Carballo, J. (2007). Microbiological characteristics of "Androlla", a Spanish traditional pok sausage. *Food Microbiology* 24 (1): 52-58.

Gardner, G.A. (1983). Microbial spoilage of cured meats. In: *Food Microbiology: advances and Prospects*, eds. Roberts, T.A. and Skinner, F.A., 179. London: Academic Press.

Indrayan, A.K., Sharma, S., Durgapal, D. Kumar, N. and Kumar, M. (2005). Determination of nutritive value and analysis of mineral elements for some medicinally valued plants from Uttaranchal. *Current Science* 89 (7): 1252-1255.

Lücke, F.K. (1985). Fermented sausages. In: *Microbiology of fermented foods*, vol. 2, ed. Wood, B.J.B., 41-83. London: Elsevier Applied Science Publishers.

Rai, A. K., Palni, U. and Tamang, J. P. (2009). Traditional knowledge of the Himalayan people on production of indigenous meat products. *Indian Journal of Traditional Knowledge* 8(1): 104–109.

Rai, A. K., Tamang, J.P. and Palni, U. (2010). Microbiological studies of ethnic meat products of the Eastern Himalayas. *Meat Science* 85: 560–567.

Snedecor, G.W. and Cochran, W.G. (1989). *Statistical Methods,* 8th edn. Iowa State University Press, Ames.

Standal, B.R. (1963). Nutritional value of proteins of oriental soybean foods. *Journal of Nutrition* 81: 279-285.

Steinkraus, K.H. (1996). *Handbook of Indigenous Fermented Food*, 2nd edition. New York: Marcel Dekker, Inc..

Tamang, J. P. (2010a). *Himalayan fermented foods: Microbiology, nutrition, and ethnic values.* New York: CRC Press, Taylor and Francis Group.

Tamang, J.P. (2010b). Diversity of fermented foods. In: *Fermented Foods and Beverages of the World*, eds. Tamang, J.P. and Kailasapathy, K., 41-84. New York: CRC Press, Taylor & Francis Group.

Table 1. Nutritional value of lesser-known ethnic meat products of the Himalayas

Meat product		% DM				Kcal/100 g DM
	Moisture (%)	Ash	Fat	Protein	Carbohydrate	Nutritive value
Lang kargyong (n= 17)	59.8 ± 0.8	3.8 ± 0.6	10.3 ± 1.1	8.4 ± 1.2	77.5 ± 2.7	436.2 ± 3.2
Yak kargyong (n= 7)	21.9 ± 0.7	2.8 ± 0.4	49.1 ± 0.7	16.0 ± 0.8	32.0 ± 1.7	634.5 ± 2.3
Faak kargyong (n= 8)	41.0 ± 1.0	2.8 ± 0.3	27.1 ± 0.8	11.5 ± 0.8	58.6 ± 2.1	501.4 ± 4.8
Lang satchu (n= 9)	22.8 ± 0.7	5.4 ± 0.6	*5.9 ± 0.6*	57.7 ± 1.2	31.0 ± 2.3	407.7 ± 2.0
Yak satchu (n= 6)	23.7 ± 1.5	7.3 ± 0.4	4.7 ± 0.5	51.0 ± 1.6	37.0 ± 2.4	405.8 ± 0.9
Suka ko masu (n= 6)	23.2 ± 0.3	1.8 ± 0.4	2.0 ± 0.1	44.8 ± 0.8	51.4 ± 1.5	403.1 ± 0.5
Chartayshya (n= 6)	17.4 ± 0.2	7.8 ± 1.2	17.0 ± 0.2	36.6 ± 3.0	38.6 ± 4.3	454.0 ± 5.9
Jamma (n= 6)	65.1 ± 0.6	5.2 ± 0.5	4.2 ± 0.5	7.8 ± 1.0	82.8 ± 2.0	400.0 ± 0.7
Arjia (n= 4)	60.2 ± 0.2	3.5 ± 0.4	5.5 ± 0.4	6.4 ± 0.9	84.6 ± 1.7	413.5 ± 1.2

n, total number of samples (n) is given in parenthesis.
DM, dry matter.
Data represents the means (± SD) of triplicate of each sample.
pH of all samples (5.3-6.9); acidity (0.3-2.6 %).