

INDIGENOUS MILK COAGULANTS AND THE TRADITION OF CHEESE MAKING IN NIGERIA: A REVIEW

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Abstract

This paper reviews the use of indigenous milk coagulants in the process of cheese making. It covers the usage of vegetable, chemical as well as enzymatic coagulants in cheese making tradition in Nigeria. Cheeses produced in Nigeria using vegetable extract, extract from animal origin and chemical as coagulant are documented. Indigenous milk coagulants plays a vital role in cheese making but less investigated in Nigeria. Much work remains to be done to understand indigenous milk coagulants action during cheese maturation and further characterization.

Key words: Cheese, indigenous, milk coagulants, Nigeria

Introduction

Milk coagulant is a very important ingredient in cheese making, and there are so many different kinds and forms. The primary function of coagulant is to produce curds (by converting the liquid milk into a gel) (Green, 1984). Many milk coagulating agents could be used in cheese manufacture among these are; the juice extract of Sodom apple (*Calotropis procera*) (O'Connor, 1993; Belewu, 2001; Jibir and Garba, 2002; Adetunji and Babalobi, 2011), lemon grass (*Cymbopogon citrates*) (Adetunji and Babalobi, 2011), lemon juice (Adetunji *et al.* 2008). There exist a great potential for these coagulants as the use of animal rennet may be limited for religious reasons, diet (vegetarianism), or being against genetically engineered foods, the incidence of bovine spongiform encephalopathy (BSE) has reduced both supply and demand for bovine rennet (Luisa *et al.*, 2003). Indigenous milk coagulants are believed to have no religious and dietary biases, therefore provides an alternative to the use of commercial rennet which is expensive and unavailable in the urban and rural areas in Nigeria. The aim of this review article was to discuss available local cheese coagulants used in the technology of cheese making in Nigeria.

Cheese making and dietary significance of cheese

Milk can easily be converted to a range of products to increase shelf-life and to provide additional opportunities for improved income to the smallholder. One such product is cheese (Mona and Nawal, 2011). Cheese making is a process of concentrating milk components, in particular fat and protein contents using coagulant as precipitating agent. After preparation some cheeses are used as fresh, while

others are ripened for a period with respect to the variety (Sameen *et al.*, 2010). According to O'Connor (1993) cheese has a shelf-life from 4–5 days up to five years depending on the variety. Cheese therefore provides an ideal vehicle for preserving the valuable nutrients in milk and making them available throughout the year. The processing of milk, particularly the production of cheese have been a critical development because it not only allowed the preservation of milk products in a non-perishable and transportable form, but it also made milk a more digestible commodity (Mélanie *et al.*, 2012).

Cheese making tradition in Nigeria

The bulk of the cheese in Nigeria is prepared by indigenous technology using local coagulants. Exceptions to this could be found in highly commercialized enterprises such as WAMCO, a company that produces a cheddar cheese, marketed under the trade name Farm Fresh (Jibir and Garba, 2009). Of the indigenous cheese in Nigeria, *Wara* and *Chuku* are the most popular. The former also called Nigerian white cheese and is a soft cheese consumed fresh or fried. It is cherished in the middle belt and south-western parts of the country. *Chuku* is a hard variety popular in the northern fringes of the country. It is manufactured using extract from the abomasa of small ruminants as coagulant (Jibir and Garba, 2002).

Indigenous Milk coagulants

Cheeses made with indigenous milk coagulants are normally produced on small scale level in Nigeria. However, they have an important socio-economical contribution to the dairy sector at local and regional areas of each country and thus play an important part in the local agricultural economy (Luisa *et al.*, 2003). Research works conducted across Nigeria have showed that local milk

coagulants obtained from the juice extract of the plant Sodom apple (*Calotropis procera*) (Aworth and Muller, 1987; Belewu, 2001; Jibir and Garba, 2002; Adetunji and Babalobi, 2011), Paw Paw (*Carica papaya*) (Adetunji and Salawu, 2008), Lemon grass (*Cymbopogon citrates*) (Adetunji and Babalobi, 2011), lemon juice (Adetunji *et al.* 2008; 2011;) have proved promising as substitute to animal rennet. According to Adetunji and Salawu (2008) vegetable coagulants have some inherent drawbacks that limit their use. Plant proteases are considered too proteolytic, leading to generation of excessive acid, bitter flavors and also texture defects in cheese (Luisa *et al.*, 2003). Despite these drawbacks, experiments have shown production of better cheese with vegetable coagulant (Jeanne, 2008). Potential sources of coagulants suitable for the production of wara cheese include steep waste water from pap production, an aqueous solution of calcium chloride and an aqueous solution of alum (Omotosho *et al.*, 2011). Similarly, Jibir and Garba (2002) reported the successful usage of abomasum extract as indigenous milk coagulants in the manufacture of soft cheese (wara) and hard cheese (chukwu) respectively in Nigeria.

Classification of indigenous milk coagulants according to source

There are numerous milk coagulants used in cheese production that are indigenous in nature and can be classified according to the source of extraction (Table 1). Crude rennet extract may be obtained from abomasums of goat kids or calves when they are about four weeks old. Male goat kids or calves that have been fed on milk and that are not required for breeding are usually used (O'Connor, 1993; Jibir and Garba, 2009). Vegetable extracts have been used as coagulants in cheese making since ancient times, although relatively little is known about their action. Several plant extracts that have the capacity to coagulate milk also have proteolytic activity (Roseiro *et al.*, 2003). Omotosho *et al.* (2011) reported other potential sources of cheap coagulants suitable for the production of cheese include steep water, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ and alum.

Conclusion

Indigenous milk coagulants plays a vital role in cheese making among the rural and urban cheese makers but less investigated in Nigeria.

Recommendation

Much work remains to be undertaken to understand the action of indigenous milk coagulants during cheese maturation and further characterization.

References

- Adetunji, V.O. and O.T. Salawu (2008). West African soft cheese 'wara' processed with *Calotropis procera* and *Carica papaya*: A comparative assessment of nutritional values. *African Journal of Biotechnology*, 7(18): 3360-3362.
- Adetunji, V.O. and Babalobi, O.O. (2011). A comparative assessment of the nutritional contents of 'wara' a West African soft cheese using *Calotropis procera* and *Cymbopogon Citratus* as coagulants. *African Journal of Food, Agriculture, Nutrition and Development*, 11(7): 5573-5585.
- Adetunji, V.O., Alonge, D.O., Singh, R.K. and Chen, J. (2008). Production of wara, a West African soft cheese using lemon juice as a coagulant. *L.W.T.* 41(1):331-336.
- Aworth, O.C. and Muller, H.G. (1987). Cheese-making properties of vegetable rennet from Sodom apple (*Calotropis procera*). *Food Chem.* 26:71-79.
- Belewu, M.A. (2001). Nutritional and rheological evaluation of West African soft cheese made from plant coagulant (*Calotropis procera*) during storage. *J. of Food Technol. in Afr.* 6(3): 93-95.
- Green M. L. (1984). Milk Coagulation and the Development of Cheese Texture. in: *Advances in the Microbiology and Biochemistry of Cheese and Fermented Milk*, Davies, F.L. and B.A. Law (Eds.). Elsevier Applied Science Publishers Ltd., New York, USA.
- Jeanne, Y. (2008). An Update on Rennet. *Vegetarian Journal*, issue3: Cited from http://www.vrg.org/journal/vj2008issue3/update_renet.htm on 20/05/2015
- Jibir, M. and Garba, S. (2002). Comparative evaluation of cheese produced using different milk coagulants. *Journal of Agriculture and Environment*, 3(1): 49-53.
- Jibir, M. and Garba, S. (2009). Cheese yield as determine by type and quantity of two indigenous milk coagulants. In: Akinlade, J.A., Olayeni, T.B., Rafiu, T.A., Akinwumi, A.O., Aderinola, O.A., Ojebiyi, O.O., and A.A. Odunsi (Eds). *Global Economic Recession and the Challenges to Livestock Production in Nigeria*. Proceedings of the 14th Annual Conference of the Animal

- Science Association of Nigeria, 14th – 17th September, LAUTECH, Ogbomosho, Oyo State, Nigeria. Pp. 197-198.
- Luisa B. R., Manuela B., Jennifer M. and R. A. Wilbey (2003).** Cheesemaking with vegetable coagulants-the use of *Cynara L.* for the production of ovine milk cheeses. *International Journal of Dairy Technology* 56(2): 76-85.
- Mélanie Salque, Peter I. Bogucki, Joanna Pyzel, Iwona Sobkowiak-Tabaka, Ryszard Grygiel, Marzena Szmyt and Richard P. E. (2012).** Use of natural coagulants of plant origin in production of soycurd (Tofu). *International Journal of Food Engineering* 4(1):1-8.
- Mona, A.M.A. and Nawal, S. A. (2011).** Cheese yield as affected by some parameters review. *Acta Sci. Pol., Technol. Aliment*, 10: 131-153
- O'Connor C B. 1993.** *Traditional cheesemaking manual.* ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia
- Omotosho, O.E., G. Oboh and Iweala, E.E.J. (2011).** Comparative Effects of Local Coagulants on the Nutritive Value, in vitro Multienzyme Protein Digestibility and Sensory Properties of Wara Cheese. *International Journal of Dairy Science*, 6(1): 58-65
- Roseiro, L.B., Barbosa, M., Ames, J.M. and Wilbey, R.A. (2003).** Cheese making with vegetable coagulants-the use of *Cynara L.* for the production of ovine milk cheeses. *Int. J. Dairy Technol.* 56 (2): 76-85.
- Sameen, A., F.M. Anjum, N. Huma and M.I. Khan (2010).** Comparison of locally isolated culture from yoghurt (*Dahi*) with commercial culture for the production of mozzarella cheese. *Int. J. Agric. Biol.* 12: 231-236

Table 1: Indigenous milk coagulants according to sources

S/N	Source	Example
1	Vegetable	Lemon juice, Paw paw fruit extract, Sod om apple leaf extract
2	Animal	Abomasum extract
3	Mineral	Aqueous solution of CaCl ₂ , Aqueous solution of Alum
4	By-product of food processing	Steep water from cereals (Maize, Sorghum, Millet, etc.)