Entrepreneurship and Innovation Management Journal http://absronline.org/journals
p-ISSN: 2310-0079, e-ISSN: 2311-1836
Volume: 2, Issue: 4 (November 2014), *Pages: 214-218*

Effect of Different Levels of Cassava Powder (*Manihot esculenta*) on the Yield and Quality of Sudanese White Soft Cheese

Koc Ruben Ramzi Dhuol[1]* and Omer Ibrahim Ahmed Hamid[2]

1. *Department of Dairy Production, Faculty of Animal Production, Upper Nile University, Malakal, South Sudan.*
2. *Departments of Dairy Sciences and Technology, College of Animal Production Science and Technology, Sudan University of Science and Technology Khartoum North, Sudan . omerhi30@yahoo.com*

This study was carried out to determine the effect of different levels of Cassava powder (Manihot esculenta) on the yield and quality of Sudanese white soft cheese. One hundred and twenty (120) liters of fresh cow's full cream milk were used. In this study four treatments were carried out : The First treatment is the control in which cow's cheese milk had left free without any additive , While in the second , third and fourth treatments 0.5 % , 0.75% and 1 % of cassava powder were added respectively to cheese milk before pasteurization . The different types of milk were then manufactured to a Sudanese white soft cheese. The final results showed that the highest yield was obtained from the cheese made from 1% cassava while the lowest one was obtained from cheese made without cassava powder.

Keywords: Sudanese white soft cheese, Cheese yield, Cassava powder (Manihot esculenta)

INTRODUCTION

The real beginning of cheeses-making is unrecorded in history. However, it must have occurred within few centuries after the domestication of the cows and other mammals about 8000 B.C. (John, 1975).

Cheese can be made from the milk of cows, sheep, goats and camels (Herrington, 2000) , it can also be made from cream milk , skim milk, whey, or mixture of two of these . Each type of milk imparts the characteristics quality of cheese made from it and the resulting cheese will diver in body texture, and flavor (Andrew, 2010). There are great varieties of cheese, some are perishable and must be consumed within few days while other can be stored for years (Herrington, 2000). The objective of cheese making is to obtain the optimum cheese composition with respect to moisture, acidity (pH), fat, protein and minerals (Price, 1974).

Cheese making can also be described as the process of removing water, lactose and some minerals from milk to produce a concentrate milk fat and protein. The essential ingredients of cheese are milk, coagulating enzyme (rennet), bacterial cultures and salt (Price,1974).

Warsama *et.,al* (2006) reported that Sudanese white soft cheese contained 47.8% total solids, 14.0% fat, 15.9% protein and 6.2% ash , and it is locally known in Sudan as (Gibna Bayda) or Gibbna which is the most famous name , and it is usually stored in containers filled with whey (Kur , 1992.

There are many types of cassava and it can be classified as sweet or bitter cassava (Ravindran,

**Corresponding author:* Koc Ruben Ramzi Dhuol,
Department of Dairy Production, Faculty of Animal Production, Upper Nile University, Malakal, South Sudan.
E-Mail: kocruben @hotmail.com

1991). The tuber of or flesh of the cassava composed of about 61 % water , 35 % carbohydrate , 1-2 % protein 0.3 % fat 1-2 Fiber , and 2 % minerals. Especially cassava roots are very rich in minerals and contains significant amounts of calcium (50 mg/100g), phosphorus (40 mg/100g) and vitamin C (25 mg/100g) (Olsen ,1999).

For the making of cassava flour, the fresh roots are peeled, washed, and cut into large or small slabs. The slabs are then allowed to dry under the sun, and when the flour (powder) is needed the dry slabs can be milled to produce grayish white flour which can be used for producing of many type of food (John ,1978).

Cheese yield is defined as the amount of cheese, expressed in kilograms, obtained from 100 kg of milk .Banks *et al.*, 1981.

Cheese yield is affected by many factors including milk composition , Genetic variants of milk , physiological factors , lactation stage , seasonal variations of milk , type of milk , processing conditions , storage of milk , standardization of milk ,types of starter culture used , heat treatments of milk , homogenization of milk, types of coagulant used , curd firmness , curd handling systems and others factors . Johnson *et al.*, 2001 ; Brown 2002 ; Everett and Auty ;2008 ; Najaf *et al.*, 2008 ; Ismail *et al.* 2007; Paolo *et al.,* 2008 ; Skeie ,2007 ; Yardibi *et al,.* 2009; Guo *et al.*, 2004.

MATERIALS AND METHODS

Materials

One hundred and twenty liters (120 liters) of fresh cow's full cream milk were purchase from a private farm at Khartoum north and then divided into four equal groups (30 liters each) . Cassava roots were brought from Konyo-Konyo market at Juba and then were cut into small pieces and dried under the sun light for 1-3 days, then grinded to a fine powder (flour) before added to the milk. A fine commercial Salt (Sodium Chloride NaCl) was purchased from the local market at Haj Yousif Shikila . Rennet powder of one gram per 50 liters of milk was obtained from Hassan El-said center for veterinary services at Hellat Kuku Khartoum North – Bahary . Calcium Chloride Powder was purchased from Lab line International Company. Khartoum – Sudan. Commercial starter (Streptococcus thermophillus and Lactobacillus bulgaricus) was purchase from local markets .

Cheese manufacturing:

Cheese was manufacture according to the method described by Ibrahim (2003) with some modifications. One hundred twenty liters(120 liters) of fresh clean cow's full cream milk was divided into four equal volumes (30 liters each) and kept in three separate tanks .The first volume was left free without any additive of cassava powder , while in the other three volumes cassava powder was added at the levels of 0.5 , 0.75 , and 1 % to the milk respectively . The different milk samples was laboratory pasteurized at 72^{o}c for 1 minutes. The milk samples were then transferred into stainless steel containers for cheese manufacture and then cooled to 42 ^{o}c. Commercial starter (Streptococcus thermophillus and Lactobacillus bulgaricus) in the ratio of 1:1% concentrate was added at the level of 1 % (W/v) . The milk was stirred gently for 15 minutes to avoid creaming before renneting. Rennet powder (1 gram/50 liters) was dissolved in 50 ml of distilled water and added to milk at 40 ^{o}c. Fine Calcium chloride was added at the levels of 0.02 % immediately. Milk was then stirred for 20 minutes and then left undisturbed for 3 hours to develop curd. The curd was cut into small cubs (2.5x2.5x2 cm) .After draining, salt at 2% (w/v) was mixed with the curds .The curd was poured into small clean wooden molds lined with cheese cloth and press by (30 kg) weight overnight . The yields of cheese were directly calculated after the manufacturing.

Method

The cheese yield was determined according to Paolo *et al*. 2008; Walstra , 1999 and Abdel Moneim *et. al.,* 2012 as follow:

$$\text{yield} = \frac{\text{Wight of chees}}{\text{wight of sample}} \text{X}100$$

RESULTS

The yield of the suddenness white cheese was affected by the different levels of cassava powder; it's increased with the addition of cassava powder. The yield of cheese made with 1 % cassava powder was the highest yield (17.78 %), flowed by that made from 0.75 (17.41 %) and 0.5 (16.85 %) respectively, while the lowest yield was recorded by the cheese made from milk without cassava (15.93 %) .

DISCUSSION

The yield of cheese increased with the addition of cassava. This could be explained by denatureration of whey protein and /or by higher retention of water in the soft curd formed (Zaki *et al*.1974, Abdel Razig ,1996). It could also be explained by the effect of cassava on cheese proprieties of holding water in cheese curd resulting in releasing of small amount of whey which finally give cheese made from cassava higher yields. Ustunol and Brown (1985) stated that the yield of cheese increase due to the corporation of whey proteins.

Makki (1987) found the yield of queso blanko cheese made under Sudan condition ranged between 14-16.5%. Driani *et al*. (1980), Babkier (1987) and Ahamed and Khalifa (1989) reported a high yield of milk cheese between `9-19.2%. Rehab, 2011 used different levels of sodium chloride (1 , 3 , 5 , 8 and 11 %) to manufacture white soft cheese and found that the yield decrease with the levels of sodium chloride .

Farkey (2004) reported that it's ranged between 9-15. Abdel razig (1996) reported that the yield of cheese is 19.08 % while Khalid (1991) reported that the yield of cheese is 27.80%. Khateeb (1997) reported that the yield of cheese is 13.25-17.00 % and Abdul-Rahaman (2013) indicated that the yield of cheese made from safflower was lower 12.73% from that made with rennet 13.8 %.

This variation in the yield of the cheese may be related to different heat treatments and the source of milk and variation in its composition (Rehab 201).

CONCLUSION

It could be conclude that the cheese yield increase with the levels of cassava powder. The different types of cheese obtained in this study were of good standard, quality, attractive with better consistency, clean and of good flavor without gas holes or bad odor.

REFERENCES

Abdel Moneim, S. R.A., Mohamed, A. and Kamal.A.A. (2012) Productio and Effect of storage in the chemical composition of Mozzerla cheese. International Journal of food Science and Nutrition Engraining 2012 2(3):21-26.

Abdel Razig, K.A. (1996) . The production of white soft cheese from different milk sources. M.Sc. Thesis, University of Kartoum-Sudan.

Abdul-Rahaman .S. (2013). Using of Safflower (Cortamus tinctorus) seeds extract for white cheese manufacturing .Journal of university of tikrit for Agricultural sciences, 2013.

Ahmed, T.K. and N.A. Khalifa, (1989). The manufacture of white soft cheese (Gibna Beyda) from recombined milk . Sudan J. Anim. Prod., 2: 63-69.

Andrew, W.K.B. (2010). Milk and Milk Products. Published by Updesh Purohit Agrobis . India.

Babiker ,M.E.A.(1987) . Technological studies on Sudanese white cheese (Gibnna Bayda). M.Sc. Theise , University of Khartoum –Sudan.

Banks J.M., Banks W., Muir D.D., Wilson A.G., (1981). Cheese yield: composition does matter. Dairy Ind. Int. 46 (5), 15, 17, 19, 21-22.

Dariani D.N., M.K. Galal, S.J. Speek and M. Loenenstein (1980). Manufacturing soft pickled cheese using cows and goats milk . Dairy ScienceAbstract , 4:3 *689*.

Everett D.W., Auty M.A.E., (2008). Cheese structure and current methods of analysis: Review. Int.Dairy J. 18, 759-773.

Farky , N.Y. (2004). Cheese technology . Internation . Journal of Dairy Technology. Vo 57:91-98.

Guo M., Park Y.W., Dixon P.H., Gilmore J.A., Kindstedt P.S., (2004). Relationship between the yield of cheese (Chevre) and chemical composition of goat milk. Small Rumin . Res. 52, 103- -107.

Herrington, B.L. (2000). Milk and Milk Processing . Published by Green world Publisher. New Delhi. India.

Ibrahim , A.A.(2003). Effect of processing and storage condition on chemical composition and microbiological quality of white soft cheese .M.Sc. Thesis , University of Khartoum – Sudan.

Ismail M.M., Ayyad K.M., Hamad M.N., (2007). Manufacture of Mozzarella cheese using Glucono- Delta-Lacton. In: Proc. 10th Egypt. Conf. Dairy Sci. Techn. 19-21 November 2007. Cairo, 415-432.

John,R.C.,Robert,T.M.(1975).The Science of Providing Milk For Man , Mcguraw.Hill Book Company , New York.

John,W.,Sons,C., (1978). The Tropical Tubers Crops, Yam, Cassava Sweet Potato, and Coco yams.I.C.Onwueme, University of life. Nigeria.

Kateeb , A.H. (1997) . An Attempt to Standardize the manufacture for Sudanese white cheese . M.Sc. Thiesis , University of Khartoum- Sudan.

Khalid, E.A. and O.A.O. El Owni, (1991). The effect of salt concentration on the yield and chemical composition of Sudanese white soft cheese.SudanJ. Vet. Sci. Anim. Husbandry, 30: 7-10.

Kur, L.L.A.,(1992). Effect of storage on the quality and chemical composition of Sudanese white cheese. M.Sc. Thesis, University of Khartoum, Sudan.

Makki, Y.Y., (1987). Manufacture of Latin American white cheese queso blanco. M.Sc. Thesis , University of Khartoum, Sudan.

Najaf M., Koocheki A., Mahdizadeh M., (2008). Studies on the effect of starter culture concentration and renneting pH on the Iranian brine cheese yield. Am.-Euras. J. Agric. Environ. Sci. 3 (3), 325-332.

Olsen, KM; Schaal, BA (1999). "Evidence on the origin of cassava: biogeography of Manihot esculenta". Proceedings of the National .

Paolo F., Andrea S., Piero F., Massimo M., Primo M., (2008). Cheese yield: Factors of variation and predictive formulas. A review focused particularly on grana type cheeses. Ann. Fac. Med. Vet. Parma 28, 211-232.

Price, W.V. and Bush, M.A. (1974). The Process Cheese Industry in the United States: A review. I. Industrial growth and problems. J. Milk and Food Technol. 37: 135 - 152. II. Research and development. Ibid 37: 179 - 198.

Ravindran (1991) Preparation of cassava leaf products and their use as animal feeds. Proceedings of the FAO Expert Consultation, CIAT, Cali, Colombia 21-25 January 1991, pp81-95.

Rehab, E.M. (2011). Effect o sodium chloride concentration and storage period on physicochemical characteristics of Sudanese white soft cheese – MSc.

Thesis –Sudan University of Science and technology – colloge of graduate studies .

Skeie S., (2007). Characteristics in milk influencing the cheese yield and cheese quality. J. Anim. Feed Sci. 16 (1), 130-142.

Ustunnol , Z and Brown ,K.J. (1985) . Effect of Heat treatment and pasteurization holding time on rennet clotting of milk. J. Dairy Sci.68:525-530.

Walstra P, Geurts TJ, Noomen A, Jellema A, Nan Boekel MAJS (1999). Dairy technology principles of milk properties and processes. Marcel Dekker, Inc. New York.

Warsama L M, Elzubeir I E M and El Owni O A O (2006). Composition and hygienic quality of Sudanese White Cheese in Khartoum North markets (Sudan). International Journal of Dairy Science 1: 36-43.

Yardibi H., Turkay G., Mengi A., Kaygisiz F., Oztabak K., (2009). Genetic polymorphisms of α-lactalbumin and β-lactoglobulin in south Anatolian and East Anatolian red Cattle. Asian J. Anim. Vet. Adv. 4 (5), 252-257.

Zaki, M.H., N.H. Metwalley and L.A. El-Koussy, (1974). Domiati cheese stored at room temperature as affected by heat treatment of milk and different salting levels. Agric. Res. Rev., 52: 217-231.