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

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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,
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 Yousef 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 thermophilus 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°C for 1 minutes. The milk samples were then transferred into stainless steel containers for cheese manufacture and then cooled to 42°C. Commercial starter (Streptococcus thermophilus 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°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 cubes (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:

\[ \text{yield} = \frac{\text{Wight of cheese}}{\text{Wight of sample}} \times 100 \]
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 denaturation 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), Babiker (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


