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STUDY ON BACTERIOLOGICAL QUALITY OF KUNUN AYA (TIGERNUT JUICE) SOLD AT UMARU MUSA YAR'ADUA UNIVERSITY (UMYU) CAMPUS, KATSINA

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Abstract

The study was aimed at determining the Bacteriological quality of Kunun aya (Tigernut juice) which is one of the most regularly non-alcoholic drinks consumed within Umaru Musa Yar'adua University campus. Samples were collected and analyzed from different places at the University for the Enumeration of bacteria. Serial dilutions were carried out from the collected samples where a dilution factor of 10^{-5} was obtained for each sample. Total aerobic bacterial counts, total coliform counts and Salmonella-Shigella counts were determined from the samples using Pour Plate Technique. The results obtained shows high bacterial load as the total aerobic bacterial counts had a range of $2.2x10^4$ - $1.4x10^6$ cfu/ml. Total coliform counts had 8.2×10^2 - 6.1×10^4 cfu/ml while Salmonella-Shigella counts had 1.1×10^2 - 8.7×10^4 cfu/ml. The result shows high bacterial contamination of Kunun aya, which may be obtained from the poor hygienic preparation process. This could be the reason for its quick spoilage. Preserving the drink in very low temperature may reduce the chances for its early spoilage.

Key words**:** Bacteriological load, Kunun aya (Tiger nut Juice), Serial dilution, Tiger nut (*Cyperus esculentus*)

Introduction

Tigernut (*Cyperus esculentus*) belongs to the family Cyperaccae (Uva *et al*., 1997). It is a tuber that grows freely and is consumed widely in Nigeria and in various other parts of West and East Africa (Abaejoh *et al*., 2006). As a food, tigernut can be eaten either unprepared or soaked in water. It is however fried and eaten mixed with roasted groundnuts (Abaejoh *et al*., 2006). Kofi (1990) reported that sweetened tigernut extract is curdled by boiling, kept in glass bottles or jars uncovered and sold in shops and markets in Ghana. According to Ojobe and Tempo (1993) the protein in tigernut is of high biological value considering the many essential amino acids that it contains.

Tigernut (*Cyperus esculentus*) juice is whitish and very refreshing especially when chilled. It is prepared mostly for domestic and public consumption. In every society, drinks of indigenous origin are produced in different ways and served sometimes in several occasions (Abegaz, 2007).

Tigernut was reported to be high in dietary fibre content, which could be effective in the treatment and prevention of many diseases including colon cancer, coronary heart diseases, obesity, diabetes and gastrointestinal diseases (Anderson *et al.*, 1994). It has 5.8% moisture, rich in protein (7%) (Temple *et al.*, 1990) and carbohydrate such as reducing sugar (7.4%), soluble polysaccharide (7.4%), and starch (86.4%) (Temple, 1989).

The protein in tigernut is of high biological value considering many essential amino acids it contained (Ojobe and Tempo, 1993) which are higher than those proposed in the FAO/WHO, (2002a, b) standards. This also satisfied amino acid need for adults (Bosch *et al.*, 2005).

The milk extracted from tigernut is rich in nutrients (Abaejoh *et al*., 2006). Despite high nutritive value of this milk, its production in Nigeria has been hampered due to the deteriorating effects of some microorganisms on the milk (Abaejoh *et al*., 2006). The present study is therefore aimed at enumerating the bacterial contents associated with tigernut juice deterioration.

Methodology

Samples were collected from local sellers of Kunun aya (Tigernut juice) at UMYU from four different selling points designated as sampling points A, B, C and D. A total of 20 samples were processed from all the sampling sites. The method described in Adeyemo *et al.*, 2002 was adopted to obtain the bacterial counts where Nutrient agar was used for total aerobic bacterial count, MaCconkey agar was used for coliform count and SS agar was used for Salmonella Shigella counts respectively. All media used were sterilized in an autoclave at 121ºC for 15 minutes (APHA, 1998).

Serial dilution was first carried out, where 1ml of the sample collected was transferred into a test tube containing 9.0ml of sterile distilled water and the tube was shaken and labelled 1: 10. From this tube 1.0ml was then transferred into another tube containing 9.0 ml of sterile distilled water and labelled as 1: 100. This was also agitated and the procedure was repeated up to 1: 10^5 using sterile syringes.

1.0 ml from the dilution factors of each labeled sample was transferred into appropriately labelled triplicate sterile petri dishes. This was followed by pouring a cooled molten prepared nutrient agar, SS agar and MaCconkey agar each into appropriately labeled triplicate petri dishes. The dishes were gently rocked, allowed to solidify and incubated at 37°C for 24hours. After 24 hours incubation, plates showing less than 300 colonies were counted and the average was computed which was multiplied by the reciprocal of the dilution factor to get the actual number of organisms. Dilution factor of 10^{-5} were selected for total aerobic bacterial count and 10^{-2} were also selected for SS count and total coliform count respectively. The results were finally expressed in colony forming unit per ml (cfu/ml) of the sample (FAO, 2007).

Results and discussion

The total aerobic bacterial counts result (table 1) had a range of $2.2x10^4$ - $1.4x10^6$ cfu/ml during the study (figure 1-4). The total *Coliform* count (table 1) had $8.2x10^2$ - $6.1x10^4$ cfu/ml (figure 5-8). The SS count had a range of $1.1x10^2$ - $8.7x10^4$ (figure 9-12). These counts were generally higher in all the samples processed. The result corresponds with that of Onovo and Ogaraku, (2007): Ukwuru and Ogbodo (2011) who reported similar abnormality in their works on microbial identification in tiger-nut milk.

Table 1 Total Aerobic Bacterial Counts

S/N	Sample	Total Bacterial Counts (X 10^5 cfu/ml)	Total Coliform Counts (X 10^3 cfu/ml)	Salmonella-Shigella Counts (X 10^3 cfu/ml)
1.	SSA(Gate)	0.22	61.00	6.10
2.	SSB (Humanities)	1.65	11.10	1.11
3.	SSC (Student's center)	0.32	8.20	8.20
4.	SSD (Hostel)	14.40	8.70	87.00

Key: SSA; Sampling site A (School Gate), SSB; Sampling Site B (Faculty of Humanities), SSC; Sampling site C (Student's centre), SSD; Sampling site D (Female's hostel)

All the bacterial counts studied are indicator of contaminations. Coliform bacteria in drinks are considered as indicators of bacterial pollution of human or animal origin. The results obtained during the study revealed the presence of coliform bacteria in the studied drinks. The presence of these bacteria indicates contamination by human and animal waste which could be obtained during preparation of the drinks. The bacteria studied may pose a special health risk on human being especially on infants, young children's and people with severely compromised immune system (Obire *et al.,* 2005).

High coliform counts indicated disease causing microorganisms may be present. Hence, any drinks containing such, is not recommended for consumption (Obire *et al.*, 2005). The official limit recommended for microbial contamination of beverages or sorrel drinks requires the complete absence of indicator organisms.

The presence of coliforms group in kunun aya samples generally suggests that the kunun aya studied may have been contaminated with faeces either of human or animal origin. Other more dangerous microorganisms could also be present (Okonko *et al.*, 2008).

The results of the study indicate bacterial population enumerated could be as a result of using contaminated water or personnel hygiene during preparation of the drinks. Under the tropical climate characterized by ambient temperature frequently above 30^{o}C, rapid increase of microorganism are likely to occur in beverages.

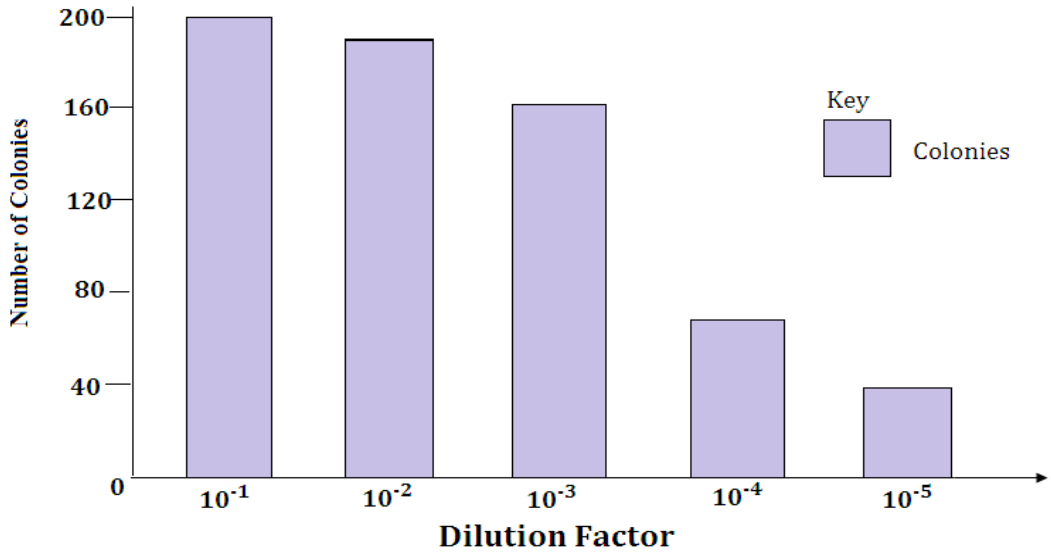

Fig 1: Total aerobic bacterial counts obtained from Kunun aya samples in sampling site A

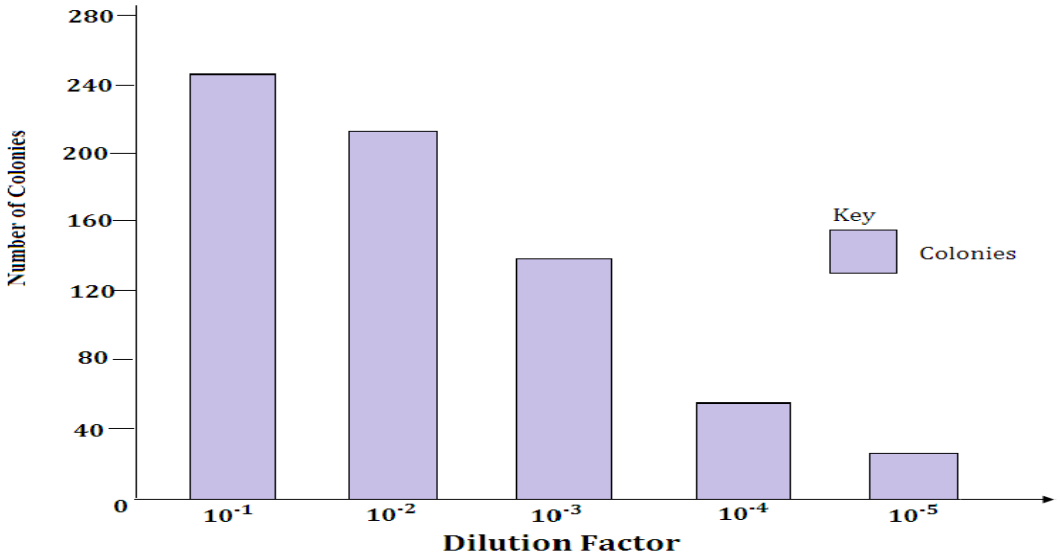

Fig 2: Total aerobic bacterial counts obtained from Kunun aya samples in sampling site B

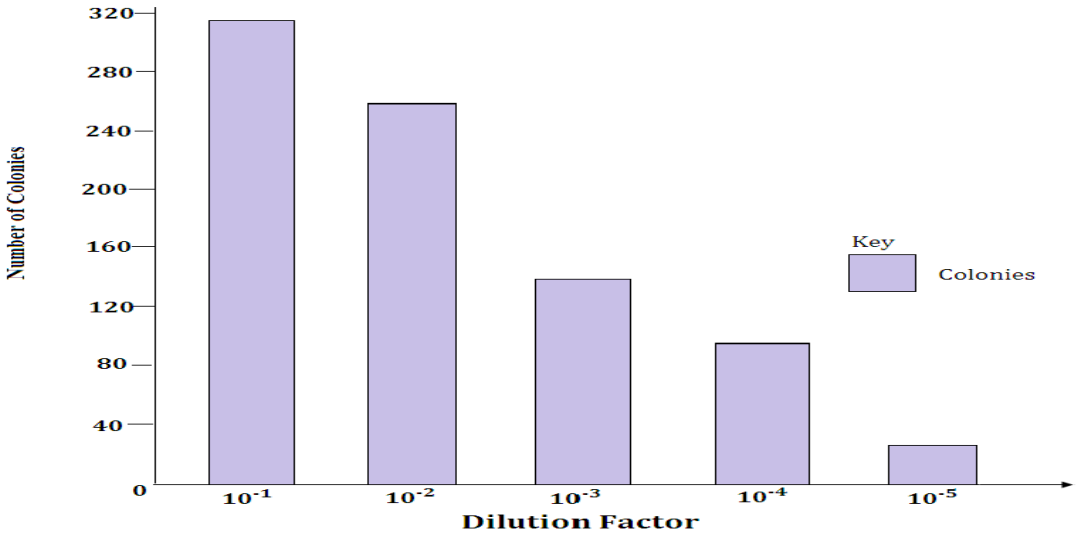

Fig 3: Total aerobic bacterial counts obtained from Kunun aya samples in sampling site C

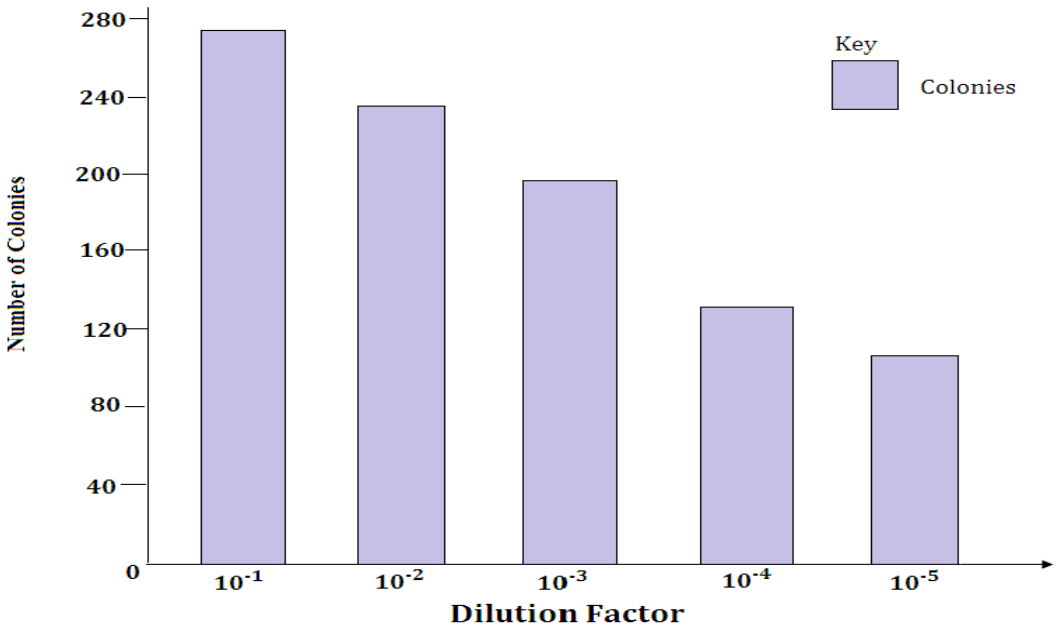

Fig 4: Total aerobic bacterial counts obtained from Kunun aya samples in sampling site D

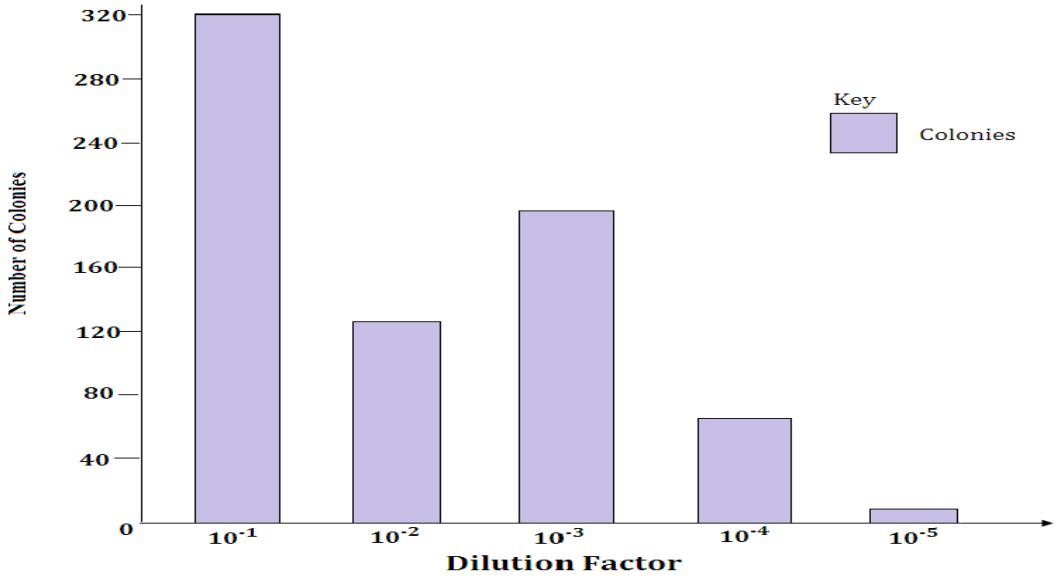

Fig 5: Total coliform counts obtained from Kunun Aya samples in sampling site A (cfu/ml)

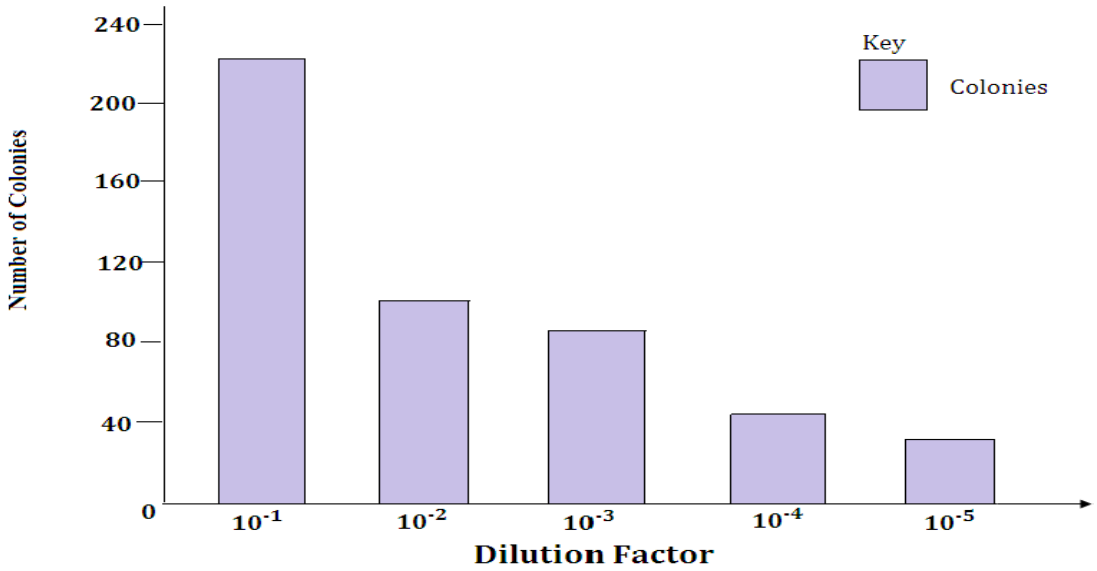

Fig 6: Total coliform counts obtained from Kunun Aya samples in sampling site B (cfu/ml)

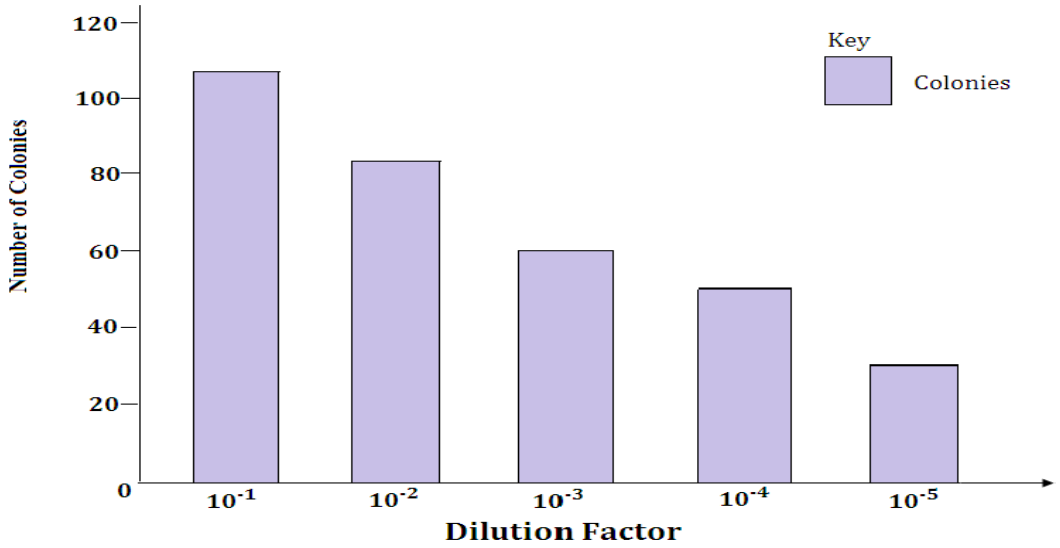

Fig 7: Total coliform counts obtained from Kunun Aya samples in sampling site C (cfu/ml)

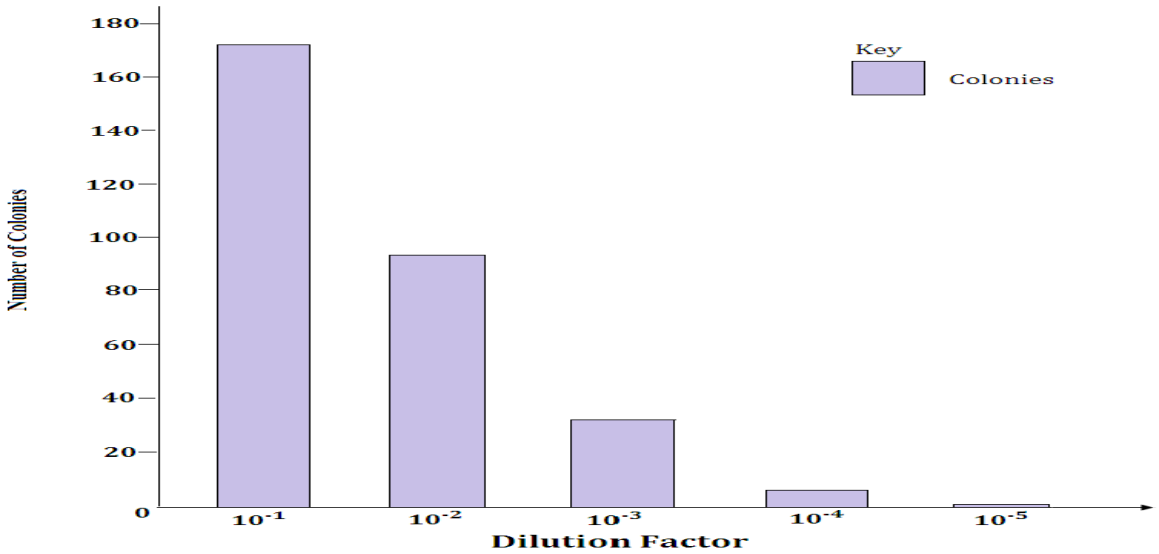

Fig 8: Total coliform counts obtained from Kunun Aya samples in sampling site D (cfu/ml)

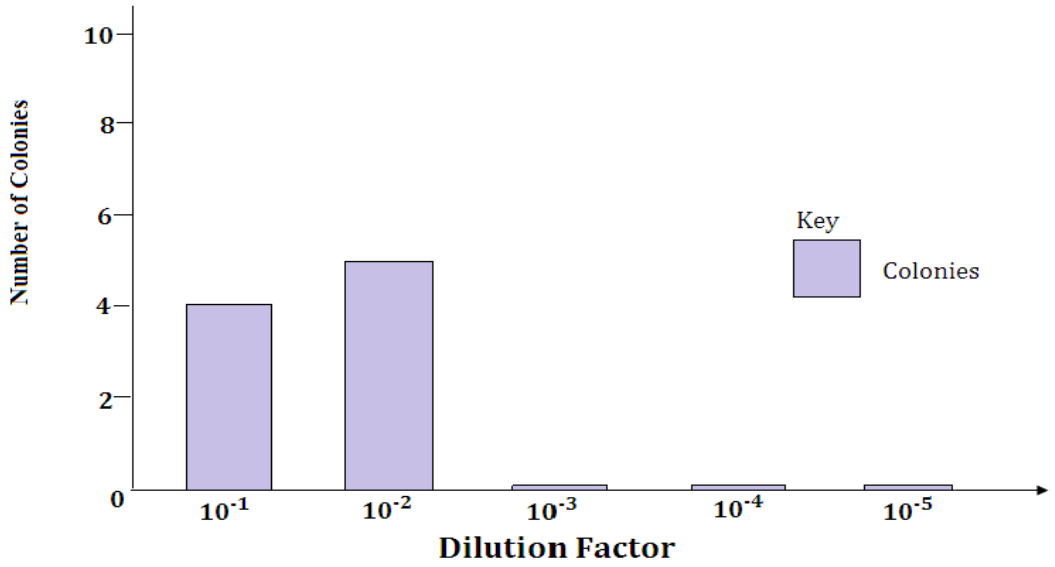

Fig 9: Salmonella-Shigella counts obtained from kunun aya samples in sampling site A (cfu/ml)

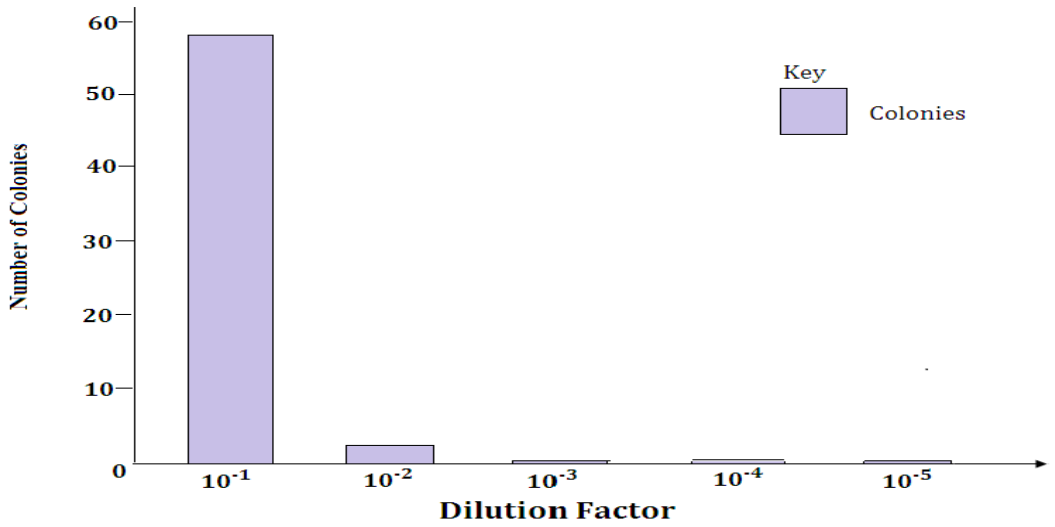

Fig 10: Salmonella-Shigella counts obtained from kunun aya samples in sampling site B (cfu/ml)

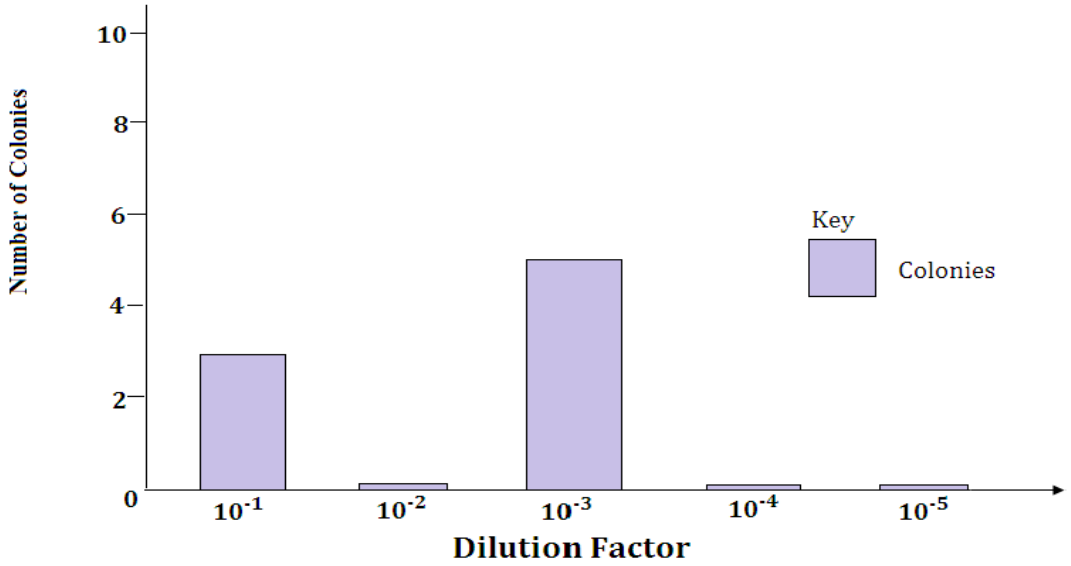

Fig 11: Salmonella-Shigella counts obtained from kunun aya samples in sampling site C (cfu/ml)

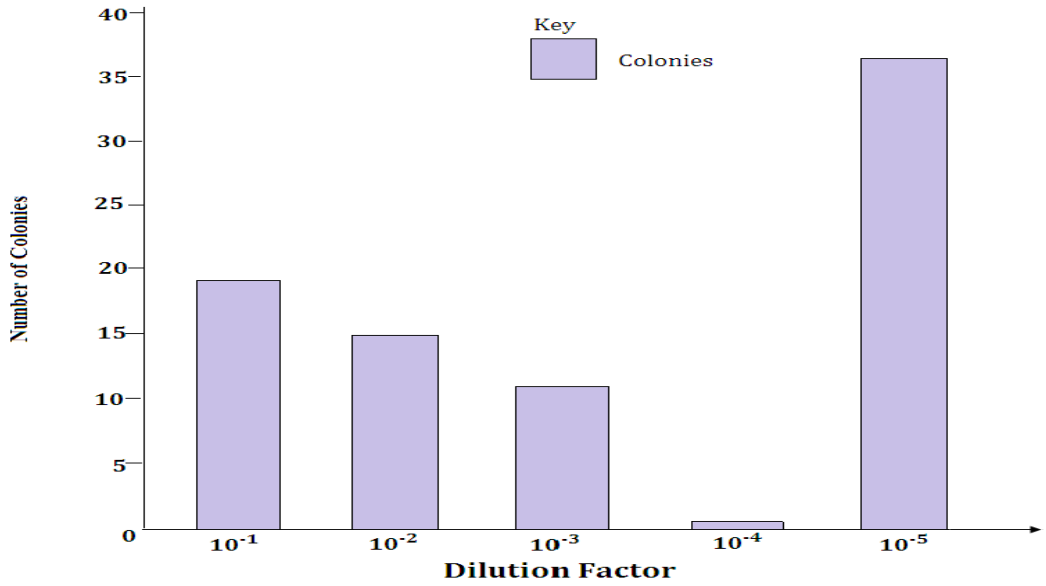

Fig 12: Salmonella-Shigella counts obtained from kunun aya samples in sampling site D (cfu/ml)

Conclusion

This study suggests that Kunun aya drinks sold at Umaru Musa Yar'adua University Katsina Campus contained higher bacterial population. Some producers get involved in the market with little or no emphasis on quality control and higher temperature experienced within northern region may encourage the rate of microbial growth. The unmonitored manner in which kunun aya drink is produced and sold to public raised alarm on the possibility of its hygienic production.

Recommendations

Based on the findings of the study, the following recommendations can be made:

i. Fresh tiger nut should be used in producing the locally made Kunun aya drink.
ii. Water used in processing the drink should be properly and thoroughly treated.
iii. Personnel involved in processing the drink should be educated on good personal hygiene.
iv. Kunun aya drink should not be exposed to higher temperature.
v. More research should be carried out on the extent at which microbes act on kunun aya.

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