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Research Article

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ABSTRACT

In this study, the effects of corn steep liquor addition to cassava tubers during retting were monitored. Peeled and washed Cassava tubers were cut to 4cm weighed and then soaked in different sample buckets containing 100.0%, 80:20%, 60:40%, 20: 80% and 0:100% water to corn steep liquor ratio. The Temperature, PH value and degree of softness was monitored. The highest temperature recorded was 30°C at a pH of 3.75. It was observed that corn steep liquor increases the period of fermentation from 4 to 8days. When the corn steep liquor was neutralized with NaOH solution to PH 4.69 from 3.98, period of fermentation was reduced to 5days showing that the high acidity of the raw corn steep liquor was detrimental to cassava softening process.

Keywords: Corn steep Liquor, Cassava Tubers, Retting, Fermentation.

INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is a perennial woody shrub which has an edible root and grows in the tropics and the sub tropics of the world (Burrell, 2003). It is also called yaca and madiola. It has the ability to grow on marginal lands where cereal and other crops do not grow well; it can tolerate drought and can even grow well in low nutrient soils (Peters, 2007). Moreso, because cassava roots can be stored in the ground for up to 36months, harvest may be delayed until market processing or other condition are favourable. Cassava is a tropical root crop that serves as food security and income generation crop for many millions of people in the developing World (Scott et al., 2002). It is the basis of many products, including food in Africa and Latin America. Cassava is mostly used for human consumption, while in Asia and parts of Latin America, it is also used commercially for the production of animal feeds and starch based products (FAO, 1991). Cassava is normally processed before consumption as a means of detoxification, preservation and modification (Oyewole, 1991). Ayenor (1995) found that retting of cassava tubers is associated with fermentation and softening of the tubers. Fermentation is an important processing method for the crop. The fermentation processes can be classified into solid state (without soaking, eg garri) and submerged (involving soaking in water, eg fufu). During fermentation of fufu, lactic acid bacteria, yeast and other bacteria contribute significantly to starch breakdown, acidification, detoxification and flavor development (Oyewole, 1991). Bourdoux et al. (cited by padmaja, 1995) found that soaking cassava roots in water for one day decreased the cyanide from 108.2 ppm to 59.5 ppm, while soaking for five days reduced to 2.9 ppm. Akinrele (1964) reported that changes in temperature and PH during fermentation affect the flavor of the fermented product. Corn steep Liquor is a major by-product of corn starch processing. It is an inexpensive source of Nitrogen, Vitamins, amino acids and other nutrients (Alkhatar et al., 1997; Atkinson and Mavutuna, 1983; Miller et al., 1986). Its main uses are as feed supplement for ruminants and poultry. Corn steep liquor has been used effectively as a cheap source of Nitrogen and other nutrients in most fermentation (Amartey and Jeffries, 1994; Rousseau and Lawford, 1997; Vick Roy, 1985). It was reported that corn steep liquor when added to Cassava tuber retting, increases the fermentation period as well as the acidity of cassava tuber retting (William, 2005).

This paper reviews the effect of Corn steep liquor addition to cassava tuber retting as well as its stabilization with Caustic Alkali to the desired PH value.

MATERIAL AND METHODS

Corn Steep Liquor Production

Yellow dry corn grains were obtained from the market for the production of pap. The corn grains were soaked in a bucket with water for about 72 hours. The corn grains were separated from the soaked water, washed with clean water and then grind. The grinded was sifted using sieve with the aid of water. The residue was of no importance in this study and this was thrown away. The filtrate was allowed to settle down for some times. The liquid found on the surface after the filtrate had settled was the corn steep liquor.

Fermentation

Freshly harvested cassava tubers were obtained from Choba market, Port Harcourt, Rivers state. The tubers were washed and peeled using a kitchen knife to remove the skin and cortex. The peeled and washed cassava tuber was cut to almost equal size, weighed and then soaked in seven different sample bucket that was labeled sample **A** to sample **G**. sample **A** contained 100 % of water, sample **B** contained 20: 80% corn steep liquor and water respectively; sample **C** contained 40:60 % corn steep liquor and water respectively; sample **D** contained 50: 50% corn steep liquor and water respectively. Sample **E** contained 60: 40% corn steep liquor and water respectively; sample **F** contained 80:20% corn steep liquor and Sample **G** contained 100% corn steep liquor. More so, a Sample bucket **H** was used and it contained only 100% of corn steep liquor without cassava. Sample **H** was used as control. These Sample buckets were covered and the top perforated. Thermometer held with rubber cock was placed vertically in one of the perforated holes on the sample buckets, which was being monitored closely. Temperature reading was taken for interval of two hours, five times daily. A 60ml syringe and needle was used to collect 45ml concentration from each sample bucket twice daily. The 45ml concentration collected was tested for their Ph value and temperature for acidic range using Ph 211 microprocessor-based Ph/mv/ $^{\circ}\text{C}$ meter. The Ph electrode and temperature probe were washed with distilled water after each reading to remove all trace of concentration of previous sample. Furthermore, after about 48hours, a stainless steel poke was inserted into one of the other perforated holes and a finger was used to press it gently downwards. If the spoke goes easily into the soaked cassava in the set up, it would be concluded that fermentation had occurred.

RESULT

Figure 1.0 described the variation of Temperature for a period of 3hours for samples A, B and C during retting of Cassava tubers, while Figure 2.0 showed the variation of Temperature for a period of 96 hours for samples D, E and F during retting of Cassava tubers. Figure 3.0 showed the variation of Temperature for a period of 3hours for samples G and H during retting of Cassava tubers. Figure 4.0 Showed the Variation of Ph values for Sample A for a 96 hours period during retting of cassava tubers, while Figure 5.0 described the Variation of Ph values for Sample B, C, D, E, F and G for a 96 hours period during retting of cassava tubers. Figure 7.0 and Figure 8.0 showed the variation of Ph values for a period of 96 hours for Sample A, B, C, D and E for stabilized solution and for Sample F, G and H for stabilized solution respectively. Table 1.0 gave the result of the weight of each Sample, while Table 2.0 showed the concentration of solutions in each sample.

Figure 1.0: Variation of Temperatures for a period of 96hrs for samples A, B, C during retting of Cassava tubers.

Figure 2.0: Variation of Temperatures for a period of 96hrs for sample D, E, and F during retting of Cassava tubers.

Figure 3.0: Variation of Temperatures for a period of 96hrs for sample G, H during retting of Cassava tubers.

Figure 4.0: Variations of Ph values for a period of 96hours for sample A during retting of cassava tubers (interval 6hrs).

Figure 5.0: Variations of Ph values for a period of 96hours for sample B, C, D, E, F, and G during retting of cassava tubers (interval 6hrs).

Figure 6.0: Variations of Ph values for a period of 96hours for sample H, during retting of cassava tubers (interval 6hrs).

Figure 7.0: Variations of Ph values for a period of 96hrs for sample A, B, C, D and E for stabilized solution (intervals of 6hrs).

Figure 8.0: Variations of Ph value for a period of 96hrs for sample F, G and H for stabilized solution.

Table 1: weight of sample buckets

Sample	Weight
A	103.05
B	103.05
C	105.00
D	103.00
E	102.00
F	103.40
G	103.00

Weight of Cassava = 500g (for unstabilized solution)

Table 2: Concentration of solution in samples (for unstabilized)

sample	Water concentration	Corn steep liquor(ml)
A	800	-
B	640	160
C	840	320
D	400	400
E	480	320
F	160	640
G	-	800
H	-	800

DISCUSSION

It was observed that sample A which was 100 % water, fermented on the 72 hours with a temperature and pH of 29 °C and 4.64 as shown in Figure 1.0 and Figure 4.0 respectively.

The other sample (B-G) did not ferment during this period of 96 hours. These may be due to its high acid content as shown in Figure 5.0 and 6.0.

The sample (B-G) was observed to ferment about 8 days, further investigation shows that stabilizing corn steep liquor to have a pH that is to water of pH 4.69 using NaOH, made the samples to ferment within 5 days as shown in Figure 7.0 and 8.0.

CONCLUSION

From the experimental result, it was observed that water is still a better fermenting medium and with corn steep liquor the period of fermentation was prolonged from 3 days to 8 days.

Stabilized corn steep liquor was found to ferment for a period of 5 days. This may be due to the reduction of acidity level. The graph of temperature against time was observed to be fluctuated.

RECOMMENDATION

Further work on temperature control is recommended to determine the optimal fermentation temperature.

It can be observed from the experiment that where the concentration of corn steep liquor was stabilized with NaOH, it gives a better result. Therefore it is recommended that more experiment should be carried out on the stabilization of corn steep liquor using different bases, to see if it is possible to achieve a reduction of the period of cassava fermentation.

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