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The Effects of Different Processing Techniques on the Organoleptic Quality of Soymilk Processing and Storage.

Oloye DA*

Department of Food Science and Technology, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria.

Research Article

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*For Correspondence

Department of Food Science and Technology, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria.

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ABSTRACT

Soymilk was processed from soymilk (Glycine Max) seed using that different processing techniques: Hot extraction method , cold extraction method and soaking before hot extraction method. The soymilk samples were subjected to sensory evaluation using 9 point hedonic scale and proximate analysis. Results obtained showed that sample A was significantly different ($P < 0.05$) between sample B had a more acceptable colour ($P < 0.05$) than samples A and C this was no significant difference between sample A and C in terms of colour. The general acceptability of the sample showed that all the samples were acceptable.

INTRODUCTION

Soybeans belongs to the family leguminous, subfamily papiliondase and the genus Glycine Max.[1] , other normendatures which have been used include phaseolus Max, Soja Max Piper and Soja hispide moech.It is not known when this remarkable legume, soybean was first cultivated in China .Soybean contain about 46% protein and 18% fat, characteristics which have influenced it's history, the ancient Chinese evolved methods of making from it's preparations with high protein content for example, curd and shoyu, shoyu is a dark brown liquid made by fermentation of a combination of soybeans and cereals [2] .

Soybean milk has been prepared for hundreds of years in the orient by a standard method of soaking beans in water for several hours, followed in order by grinding with filtration and cooking for about 30mins [3] . Although this conventional process method is relatively simple the techniques and conditions have not been thoroughly investigated for producing a soymilk with a blend or desirable aroma.

The soymilk off flavour problem mainly associated with volatile compound. Preliminary experiment [4] utilizing gas chromatography instrumentation demonstrated that the volatiles responsible for off flavour were derived only from soymilk which is prepared from whole fat soybeans. It was postulated that soymilk could be produced with a minimum of flavour development by developing techniques and conditions involving a high temperature – hydration grindings [5] indicated that the thermal inactivation of lipoxygenase was pH. [6] reported that off flavour development was suppressed in legumes at pH 3.85 and below. [7] extracted soymilk at pH 2 and found there was no lipoxygenase activity even when the product was neutralized to pH 6.4. [8] described a method of preparing soymilk resulted in a colloidal stable, bland product of very good acceptability.

With this method no filtration or dehaulling is used, so protein recovery is essentially 100% and the beans are hydrated and blanched to eliminate the off flavour producing enzymes and growth inhibitors. However industrial equipment such as a homogenizer is required.

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Soymilk in the traditional sense is simply an aqueous extract of whole soybean. Soymilk according to the nutritionist a possible substitute for cow or human milk particularly in the feeding of infant who are allegic to animal milk or where cows milk may be found to be two expensive or unavailable. Soybean or vegetable milk or flu-changin chinse is reported to have been developed and used in china before the Christian era [9] by the philosopher who was credited with the first step in the processing of tofu and yuba. Then, the traditional milk is made by soaking the bean in water overnight, wet milling the bean, heating the wet mash to improve flavour and nutritional value and filtration. The milk produce is sold to the public in streets and canteens in china in 1984. In recent years large scale production has evolved along with commercial marketing of soymilk in Hongkong, Taiwan, Thailand, South Korea, Singapore, Malaysia and not the United States [10] . The processing of soybeans into soymilk is aimed at gaining consumer acceptance of the legume by removal of the toxicants that contain and also improving organoleptic qualities of soymilk with special consideration to some adverse effect of these operations in soymilk quality. This work determined the effects of different methods used in the processing of soybeans into soymilk on the quality of the milk produced during processing and storage.

MATERIALS AND METHODS

Collection of Soymilk

Soybean used for this work was purchased from central market in Owo, Ondo State, Nigeria.

Soybean Milk Processing

Three major methods were used for the production of the soymilk for this work.

Hot extraction

The method as development by INTSOY (International soybean program) and modified by [11] . The soybeans were cleaned in order to remove dirt's and also some impurities like other seed stalks etc. The beans were blanched in hot water for 30minutes for the following reason; to soften the seeds and aid in see coat removal to removal, to reduce the beany flavour and eliminates the anti-nutritional factors. The beans were the dehaulled and milled with water using the Kenwood blender, about 3 parts of water was added to the slurry and filtered using a Muslim cloth, the filtrate was allowed to simmer on fire about 10 minutes it was then bottled and allowed to cool.

Cold Extraction

The soybeans were cleaned to remove dirt's and impurities. Water was added to the beans in the ratio of 1.3 (beans to water) and the beans were allowed to soak for 10hrs under refrigeration temperature. This was done in order to prevent fermentation of the beans and growth of microbes. The soybeans were then dehuled and the chaff removed by adding water and decanting. Milling was done using a Kenwood blender. About 3 parts of water was added to the slurry and the mixture was allowed to simmer on fire for 10 minutes. It was then bottled while still hot and allowed to cools.

Soaking Before Hot Extraction

Soybean were cleaned to remove stories iron and other impurities or unwanted particles. The beans were put into a pot of water at a ratio of 1:3 (beans to water) and allowed to soak for 18hrs in a refrigerator. This was to soften the seeds, to present fermentation of the beans and reduce the anti-nutritional compounds. The beans were drained and blanched for 20minutes without decorating. The seed coats were then removal (dehaling) and milling was done by using a Kenwood blender. The slurry was filtered using a Muslim cloth. The filtrate (soymilk) was allowed to simmer on fire for commutes. It is then bottled while hot and cooled.

Chemical analysis

The soymilk samples produced were subjected to analysis such as determination of moisture content , crude protein ,crude fat , ash, total solid by the methods described by [12] .The sensory evaluation was done by trained panelist and subjected to 9 point hedonic scale.

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RESULTS AND DISCUSSION

Effect of Soaking Time on the Organoleptic Qualities of Soymilk

A series of soymilk were prepared from beans soaking in solution of 0.05% sodium bicaboante for different duration of time. This soymilk was then presented to the taste panel for evaluation of the colour and flavour acceptability. The control milk sample was made from three different techniques and subjected to sensory evaluation using 9 point hedonic scale and the results are given below. (Mean sensory scores for flavour and colour of soymilk prepared from bean soaked in 0.05 Na_2HCo_3.)

Table 1: Effect of Soaking time on the flavour and color of soymilk

SAMPLE	SOAKING TIME	MEAN SCORES	
		Flavour	Colour
A	0 hour	$6.43_{+}{}^{+a}$	$6.30_{+}{}^{+a}$
B	18hours	$6.30_{+}{}^{+a}$	6.86^{ab}
C	18hours	$6.33_{+}{}^{+a}$	6.43^{b}

From the table we can see that there is a significant difference in flavour and colour acceptability. Although from the mean, soymilk from unsoaked bean prove to be of a better flavour, then the soaked soybeans, while in colour, the sample B is better than other samples but all the samples were acceptable. (The protein recovery and solid yield of soymilk prepared from soybean soaked in 0.9=05% Na_2HCo_3.)

Table 2: Effect of soaking time in the protein recovery and total solids

SAMPLE	SOAKING TIME	% TOTAL SOLID	% PROTEIN CONTENT
A	0 hour	6.9	2.81
B	18hours	6.4	2.90
C	18hours	6.4	2.85

From the table it can be shown that the solids yield of milk tend to decrease as you soak the soybean for a longer time. The total solids of milk from unsoaked bean from the result is 6.9 but it decreased to 6.4 after soaking for 18hours. As we can see from the sensory evaluation result, milk from unsoaked beans has a better flavour acceptability. Milk from soaked bean is also better acceptable colour than milk from unsoaked bean. Protein recovery from the result was shown to increase with soaking to some extent and latter tend to decrease again, from the table about, the protein content of unsoaked bean is 2.81%, (percent), after protein it increased to 2.91 and after 12hrs it decreased again to 2.90 percent.

Because of the changes in the organoleptic qualities of the soymilk in respect to soaking time a balance has to be establishing to produce milk with good recovery, solids yield and organoleptic qualities. Soaking for 18hrs will give milk with 6.4% total solid, 2.90 protein content and the mean score in the 9 point hedonic scale for flavour and colour acceptability are 7.00 and 6.86 respectively which are well above 5 the acceptable range.

The results demonstrate that soaking soybeans in dilute solution of sodium bicarbonate as a pretreatment for the production of soymilk improves the flavour of reducing the beany flavour when compared with milk prepared by the standard unsoaked procedure.From the result optimum conditions for reducing the beany flavour in soymilk were pre-soaking the blanched soybean in 0.05% Na_2HCo_3 for 3hrs. Under these conditions a reduction of beany flavour was achieved over that in soymilk prepared from unsoaked soybeans.

The results also showed that soaked soybean produce milk with a significantly more acceptable colour when compared to other milk from unsoaked soybeans.

From the experiments there is a little reduction in total solids content of the milk as soaking progress. A fluctuation in protein recovery with time of soaking was also noticed. There is always a less of soluble solids in the water presoak liquor and the extent of this loss increases with time. The present results confirm that a loss of soluble nitrogen occurs into the soak solution and that loss increase in the presence of alkali. Soaking in alkali solution solubilizes most protein molecules and increases protein recovery although protein loss to the soak solution is appreciable [13].

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A series of soymilk was prepared from soybeans blanched in a solution of 0.05 percent sodium bicarbonate for different intervals of time. These milks where then presented to the taste panel for evaluation of the flavour and colour acceptability. The milk sample was made from unblanched soaked soybean. The results are shown below.

(Mean sensory scores for flavour and colour of soymilk prepared from bean blanched in 0.5% Na_2HCo_3)

Table 3: Effect of blanching time on the flavor and color of soymilk.

SAMPLE	BLANCHING TIME	MEAN S CORES	
		Flavour	Colour
A	30mins	7.14[a]	6.25[b]
B	0min	6.55[a]	8.00+[b]
C	25mins	6.57[a]	6.28[b]

From this table, it can be shown that sample A (blanched soymilk) has a better flavour, there is a significant difference in the sample B and C also milk sample B has a better colour acceptability, it has a mean score of 8.00 which has better acceptability than other two samples A and C. All the milk gave acceptable colour but unblanched soybean show a significant difference in colour acceptability from the blanched soybean milk. The unblanched soymilk produce milk with the best colour (mean score 8.00) but a very poor flavour (mean score 6.55)

(The protein recovery and solids yield of soymilk prepared from soybean blanched in 0.0% Na_2HCo_3.)

Table 4: Effect of blanching time on protein recovery and total solids.

SAMPLE	BLANCHING TIME	MEAN S CORES	
		Flavour	Colour
A	30mins	4.0	1.0
B	0min	7.20	3.10
C	25mins	4.50	1.30

From these results we can see that blanching time has a significant effect on protein and solids recovery, it can be seen that total solids and protein content of the milk decrease simultaneously as you increase the blanching time total solids yield decrease from 7.2% at zero blanching time to 4.5% after 25mins heat treatment while the protein recovered in the soymilk decreases drastically 3.1% to 1.3% after 25mins blanching period.From the flavour evaluation we see that soaked unblanched soymilk has a very poor flavour although with a high colour acceptability.This means that the unblanched soymilk was acceptable to the panelists with the better colour acceptability.

Soybean blanched for 30minutes will give milk an acceptable flavour and colour protein and solids recovery are also substantial at the above mentioned blanching time.

Flavour is very important in soymilk so we try to produce milk with acceptable flavour while trying to increase the protein and solids recovery to a reasonable level. These results demonstrate that alkali blanching as a pretreatment for soymilk production improves the flavour by inactivating the lippxidase enzyme responsible for off flavour production in the raw bean [11] .Blanching also help to reduce the beany flavour which is the main constraint I soymilk acceptability. Blanched soybean give milk the acceptable flavour compared to other milk from unblanched soybean. Blanching time is also very important in soybean for about 30mins which produce milk with a good flavour acceptability. From the result there is a reduced protein and solids recovery as you increase the blanching time. Although there is a loss of solids and protein to the blanch water this loss in negligible. Only about 0.5% of the protein [12] . Denafturation of the soybean proteins in the moist heat during blanching thereby soybean sample resulting in poor protein recovery [13] changes in extractability of different protein components as a function of blanching time was reported by [12] .Reduction in solids recovery as function of blanching time is attributed to the loss of soluble solids and low protein recovery or content.

CONCLUSION

From the study, it is shown that the method of processing or preparation affected the quality and deterioration pattern of soymilk during processing and storage. Hence a number of processing techniques have been adopted for soymilk processing in order to extent it's shelf life. It is also shown from the study

that the beany flavour of soymilk was eliminated entirely by longer soaking and cooking periods with the incorporation of sodium bicarbonate which helped to eliminate the beany lavour. The result of the sensory evaluation showed that the soymilk sample containing additive received general received general acceptability because of the improvement of the Organoeptic properties. Then sterilized soymilk packed in bottles and held under refrigerated storage had a longer shelf. Life then sterilized soymilk packed in tetrapa ck containers and held also under the refrigerated storage. When the soymilk samples were held at ambient temperature, the samples in bottles kept longer than the one in tetrapack. This shows that sterilized bottles are more preferable than the one in tetrapack for the storage of soymilk both at refrigeration temperature and at ambient temperature. This was also shown from the study that rate of spoilage of soymilk was affected mostly by the condition of storage rather than the method of processing. Refrigeration storage increased the shelf-life of soymilk tremendously.

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