

Pina Soy: A New Drink with Desirable Organoleptic Characteristics

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Abstract: This study was carried out to formulate a drink "Pina soy" by blending different proportions of soybean milk and pineapple juice with the aim of firstly suppressing the "beany flavor" associated with soymilk. The blends were prepared using different proportions of pineapple juice and soya milk in the ratio 20/80, 40/60, 50/50, 60/40, 80/20 in addition to two controls which were 100% pineapple and 100% soy. The different blends were formulated, homogenized, packaged and assessed for organoleptic (sensory) properties. Results showed that in terms of taste, 100% pineapple with a mean value of 4.50 and 80/20% pineapple/soy with a mean value of 4.45 were the most preferred while the least preferred was the 100% soy with mean value of 2.25. In terms of aroma and thickness the most preferred samples were 100% pineapple with mean scores of 4.15 and 4.50 and 80/20% pineapple/soy with mean score of 4.00 and 4.25, respectively. Mean scores obtained for colour showed that the same blends were the most preferred sample while the least preferred sample was 20/80% pineapple/soy with mean score of 3.45. On the overall acceptability, "Pina soy" drink prepared from 80% pineapple juice blended in soy milk was the most acceptable blend (4.35) while the 20/80% pineapple/soy was the least accepted (2.50). Further acceptability studies using older people as panelists is recommended.

Keywords: Juice, Pineapple, Processing, Sensory evaluation, Soybeans

I. Introduction

The primary role of any diet is to provide sufficient nutrients to meet the body requirements of an individual. Research has shifted to the identification of biologically active components in food which improve the physical and mental wellbeing of an individual and reduces the risk of diseases as well. Many traditional food products including fruits, vegetables, soy, whole grain and milk have been shown to have potential health benefits and consumers acknowledge that food play an indispensable role in health recovery and maintenance (Mollet and Rowland, 2002). Most of the world's nutrition related diseases including birth defects, mental and physical retardation, weakened immune systems, blindness and at times death are caused by the consumption of diets lacking in vitamins and minerals (micronutrients). Fruits are full of these essential vitamins and minerals hence should be consumed regularly. Fruits consumption is beneficial to health and contributes to the prevention of degenerative processes, particularly in lowering the incidence and mortality rate of cancer and cardiovascular diseases (Rapisarada *et al.*, 1999).

Pineapple (*Ananas comosus*) has long been one of the most popular of the non-citrus tropical and subtropical fruits, largely because of its attractive flavor and refreshing sugar-acid balance (Bartolome, *et al.*, 1995). Pineapple juice is largely consumed around the world, mostly in the form of single strength, reconstituted or concentrated and in the blend composition to obtain new flavors in beverages and other products (De Carvalho *et al.*, 2008). Pineapples are very rich in fibre which is effective for curing constipation as well as ease bowel movement; it is low in cholesterol and fat. Vitamin C which is a natural antioxidant present in pineapple juice and helps to boost the immune system; prevent gum disease thus keeping the teeth healthy. Manganese present in pineapple juice is an effective mineral for the growth of healthy bones and tissues. Bromelian which is also present in pineapple juice has significant anti inflammatory effect, aids in menstrual disorder and sore throat relief (Onuekwe, 2012)

Soybean (*Glycine max*) belongs to the family of *Leguminosae*. It is about the most utilized legume as well as the most well researched and health-promoting food material in the world today (William and Akiko, 2000, Akubor *et al.* 2003). Soymilk is a fine, off-white or creamy emulsion, which resembles cow milk in both appearance and consistency. Soymilk has low cholesterol and lactose levels, ability to reduce bone loss and menopausal symptoms, prevention and reduction of heart disease and certain cancers (Mbajiuaka *et al.*, 2014). The increase in the rate of soymilk consumption has encouraged low-scale production of the milk under household conditions with little or no regard to quality control measures. Soymilk has poor consumer acceptability, principally because of the "beany flavor" and flatulence inducing oligosaccharides such as starchyose and

raffinose (Buono *et al*, 1990; Osundahunsi *et al*, 2007). Approaches towards removal of the “beany flavor” include heat inactivation of the lipoxygenase enzyme in whole dry bean during grinding process, starting with defatted material. Alternatively, this can be done by masking the bitterness and “off flavor” with sweetening and flavorings. Presently, some fruit juice blended soy beverages are available in the market (Rostango *et al*, 2007). Some studies have also shown that pineapple flavors are effective in suppressing the beany flavor, thus resulting in more acceptable products (Hazen, 2007). Besides flavoring the milk, pineapple is an important source of essential nutrients like minerals and vitamins, especially vitamin C. A possible blend of soymilk and pineapple juice would yield a composite drink which is rich in nutrient and can suppress the “beany” flavor of soymilk. It can also serve as a “quick fixer” drink for malnourished children and adults who are convalescing. The main objective of this study was to develop a consumer acceptable composite vegetable milk drink using blends of pineapple juice and soymilk. The specific objectives were to (i) process soy milk and pineapple into juice, (ii) formulate different levels of the soy milk and pineapple blend, (iii) conduct a consumer sensory evaluation of the product, and (iv) determine the levels of inclusion at which the product will be most acceptable to the consumers.

II. Materials And Methods

Site of Experiment

The experiment was carried out in the Faculty of Agriculture Laboratory, University of Benin, Benin City, Edo state, Nigeria.

Production of pineapple juice

Freshly harvested, wholesome pineapples were purchased from a reputable pineapple vendor at Ogbemudia Street, Evobomore quarters, Benin City, Edo State, Nigeria, The pineapples were washed, peeled and diced into irregular shapes with a knife for easy blending. The blended pineapple was sieved with a cheesed cloth and the juice obtained pasteurized at 72°C for 15 min before packaging. The flow chart for production of the pineapple juice is shown in Fig. 1.

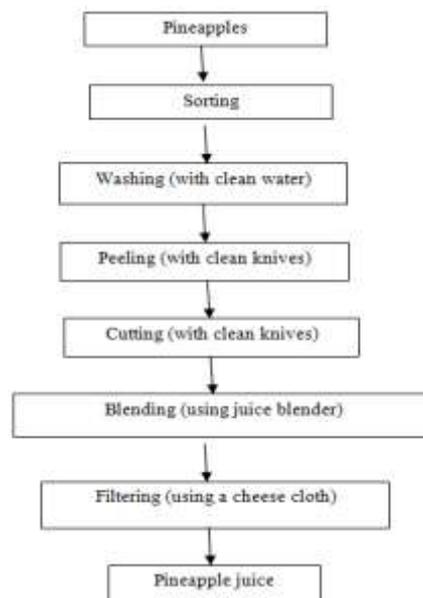


Fig 1: Unit operation for the production of pineapple juice

Source: Akinosun (2010)

Production of soymilk

Soymilk for this study was prepared as described by Igene and Ebabhamiegbekho (2009). Clean soybeans were also purchased from new Benin market and then processed into soymilk. The processing of the soy beans into milk was carried out in stages. The first stage involved soaking the already sorted beans in about 1% sodium hydrogen carbonate (NaHCO_3) solution for 16 h in order to soften the soybean seeds. The soaked soybeans was boiled for about 20 min. Immediately after boiling, the water was drained off and the beans dehulled manually, washed and blended with water at 30°C to form slurry. The slurry was diluted with about 5 litres of water which was boiled to obtain homogenous slurry and thereafter filtered to have the soymilk. The soymilk was then pasteurized at 70°C for 10 min with stirred continuously to prevent the product from burning. Thereafter the

milk was filled hot into already sterilized bottles, cooled and then refrigerated. The flowchart for production of soymilk is presented in Figure 2.



Fig 2: Unit operation for the processing of soy milk

Source: Igene and Ebabhamiegbbeho, (2009)

Formulation of pineapple soy blend “Pina soy”

‘Pina soy’ was formulated by blending different proportions of pineapple juice and soymilk as follows; two controls. These were; (i) 100% soy (control), (ii) 100% pineapple (control) (iii) 50 / 50% pineapple / soy, (iv) 60 / 40% pineapple / soy, (v) 40 / 60% pineapple / soy, (v) 80 / 20% pineapple / soy, and (vi) 20 / 80% pineapple / soy. No additive was added.

Organoleptic (Sensory) Evaluation

The samples were coded (using 111, 222, 333, 444, 555, 666, 777) and presented to a taste panel of 20 judges to access the sensory attributes in terms of taste, color, aroma, thickness/ mouth feel and overall acceptance, using a 5-point Hedonic scale having 5 (like extremely) as the highest score and 1 (dislike extremely) as the lowest score. Water was presented to the judges rinse their mouth properly in between samples testing.

Statistical Analysis

The data obtained were analyzed using SPSS (Version 16.0) statistical software package and the significant treatment means were separated by Duncan Multiple Range test (Alika, 2006).

III. Results And Discussion

The results obtained from the study showed that 4.5 kg of soy beans that was used gave a yield of 6.2 kg of soy milk while 6.7 kg of pineapple yielded 5.4 kg of pineapple juice. In the sensory evaluation of the product “Pina soy”, the taste scores showed that 100% pineapple and 80/20% pineapple/soy were not significantly different ($p>0.05$), but were significantly higher ($p<0.05$) than scores for other samples. It was also observed that taste score for the 100% soy control was significantly lower than that of the 40/60% pineapple/soy blend. There was no significant difference ($p>0.05$) between 50/50% pineapple/soy (3.20) and 60/40% pineapple/soy (3.70) (Table 1). The high values recorded for 100% pineapple and 80/20% pineapple/soy may be attributed to the higher percentage of pineapple which added to the sweetness and were most acceptable probably because the taste panel consisted mainly of young persons (students) who would prefer high sugar products rather than low sugar products. The results may have been different if the samples were administered among adults. Similar results have been observed in a study carried out by Kale *et al.* (2012) where soymilk and orange juice were blended in different proportions into a drink in a bid to suppress the “beany flavor” of soymilk. The different blends were served to a group of panelist and it was observed that the drink with 70% orange was most accepted in terms of taste. There may be need to carry out further acceptability studies including panelists from different age brackets in order to further validate the assertions reported in this study.

In terms of aroma, 100% pineapple (4.15) 80/20% pineapple/soy (4.00), 50/50% pineapple/soy (3.45) and 60/40% pineapple/soy (3.60) were not significantly different ($p>0.05$) from each other but significantly

higher ($p < 0.05$) than the other samples. The most preferred in terms of aroma was the 100% pineapple with mean score of 4.15, while “Pina soy” with 20% pineapple was least accepted with mean score of 2.95 (Table 1). Again, the low acceptability of this product could also be attributed to the low percentage of pineapple in the formulation which would have impacted a good aroma that will be appealing to the consumer and also the “beany flavor” of the soy milk could not be suppressed due to the high percentage of soy in that formulation. Soybeans confers what is generally termed “beany flavor” which has been shown in earlier studies (Buono *et al.*, 1990; Osundahunsi *et al.*, 2007) to be a major inhibition to the consumption has earlier reported that this is the major inhibition to the consumption of soy products. The nutritional and health benefits of soybeans cannot however be ruled out (Messina, 1999, 2010; Zhou, 2004) and so further studies are required to explore the lowering of this flavor and at the same time, retaining high nutritional quality and acceptability among consumers.

Regarding thickness scores for the blends, there was no significant difference ($p > 0.05$) among 100% soy, 40/60% pineapple/soy, 50/50% pineapple/soy and 20/80% pineapple/soy, while 100% pineapple with mean score of 4.05, 60/40% pineapple/soy with mean score of 3.70 and 80/20% pineapple/soy with mean score of 4.25 were also not significantly different ($p > 0.05$) from one another. The most preferred “Pina soy” drink in terms of thickness was the 80/20% pineapple/soy, while the least preferred samples were the 100% soy and 20/80% pineapple/soy having same mean score of 3.00.

The highest score obtained for color was observed in 100% pineapple with a mean score of 4.45 and was therefore the most preferred while 50/50% pineapple/soy had the lowest mean score of 3.30 and was the least preferred. There was also no significant difference ($p > 0.05$) among 100% soy, 100% pineapple, 60/40% pineapple/soy and 80/20% pineapple/soy having mean scores of 3.75, 4.45, 3.90 and 4.35 respectively. The high preference may also be as result of higher percentage of pineapple in those blends and the panelists who consisted mainly of students may be naturally attracted to the sweet aroma and bright color of the pineapple. Older people may have preferred “Pina soy” drink with higher percentage of soy because at their age they prefer drinks with lesser amount of sugar. Earlier reports have shown that color is an important factor in terms of how food is displayed and sold, and thus it is an indices used in quality control. Color is also added to foods to stimulate the appetite (Dias *et al.*, 2012; Boles and Pegg, 2005) as well as stimulating physical and physiological reactions (Crepaldi, 2006).

In terms of overall acceptability, the 80/20% pineapple/ soy blend was the most acceptable with a mean score of 4.35 which was not significantly different ($P > 0.05$) from the 100% pineapple control which had a mean acceptability score of 4.40. On the other hand, the 20/80% pineapple/soy blend was the least acceptable sample by panelists with an average score of 2.50. This score was not significantly different from that of the 100% soy control used in this study (2.65). (Table 1, Fig 4). This result showed that the sensory properties of “Pina soy” decreased with increase amount of soy milk present in the blends, thus suggesting an inverse relationship between these two parameters which is similar to the findings of Rostango *et al.*, (2007). The results from this study were also consistent with those obtained from the research work on orange soy beverage formulated by Kale *et al.* (2012). These researchers also showed that in terms of taste, aroma, color, mouth feel and overall acceptability, the panelist preferred the blend with 80% orange juice, while the blend with 10% orange juice was least accepted. Similar research in a work by Villegas (2009) also showed that the panelist preferred soymilk with pineapple flavours to plain soy milk. The low acceptability of “Pina soy” with high percentage of soymilk substitution may also be attributed to the fact that the samples were served in their natural state (that is without any form of flavor). In all these, there is an indication that the panelists were still not accustomed to soymilk, probably because of its “beany flavor”. Although the presence of soymilk in combination with pineapple juice may have increased the nutritional quality of the “Pina soy” drink, the taste, flavor, aroma and color of soymilk were still not acceptable to the consumers of the product. We thus hypothesize that the resultant blends still had some undesirable sensory qualities that made them less acceptable to the consumers of the product. Although results from this study showed that fruits could be used in masking the “beany flavor” of soybeans thus promoting acceptability of soymilk, further studies on the mechanisms involved are thus recommended to substantiate this claim. More detailed studies to improve the shelf life and marketability of the accepted blend is also necessary so as to further explore this novel blend’s applications (Baruwa, 2013).

Table 1: Organoleptic (sensory) mean scores of pineapple soy blend drink “Pina soy”

Pineapple soy blend	Taste	Aroma	Thickness	Color	Overall acceptability
100% soy	2.25 ^d	3.00 ^c	3.00 ^c	3.75 ^{bc}	2.65 ^a
100% pineapple	4.50 ^a	4.15 ^a	4.05 ^{ab}	4.45 ^a	4.40 ^d
80% pineapple + 20% soy	4.45 ^a	4.00 ^a	4.25 ^a	4.35 ^a	4.35 ^{cd}
60% pineapple + 40% soy	3.70 ^b	3.60 ^b	3.70 ^{bc}	3.90 ^b	3.75 ^{bc}
50% pineapple + 50% soy	3.20 ^{bc}	3.45 ^{bc}	3.45 ^{bc}	3.30 ^c	3.25 ^b
40% pineapple + 60% soy	2.80 ^{cd}	3.20 ^c	3.25 ^c	3.50 ^{bc}	3.00 ^{ab}
20% pineapple + 80% soy	2.45 ^d	2.95 ^c	3.00 ^c	3.45 ^c	2.50 ^a

Note: means within same column and superscripted with different alphabets are different significantly ($p < 0.05$)

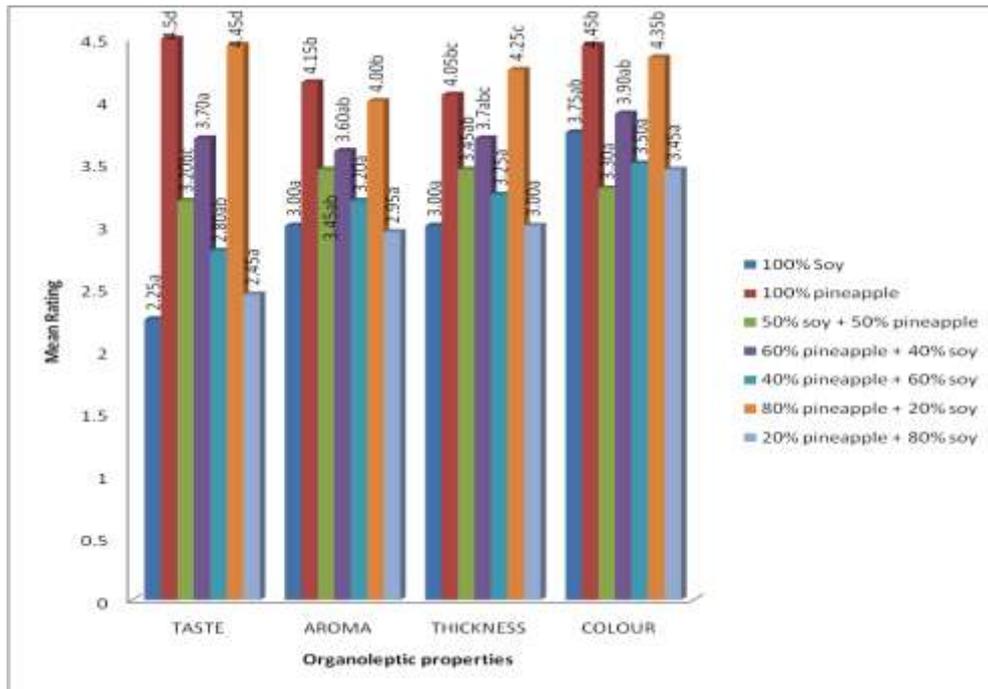


Fig 3: The mean scores for the different combination of Pineapple soy blend drink (Pina soy) Note: mean scores with the same alphabets across bar are not significantly different ($p > 0.05$)

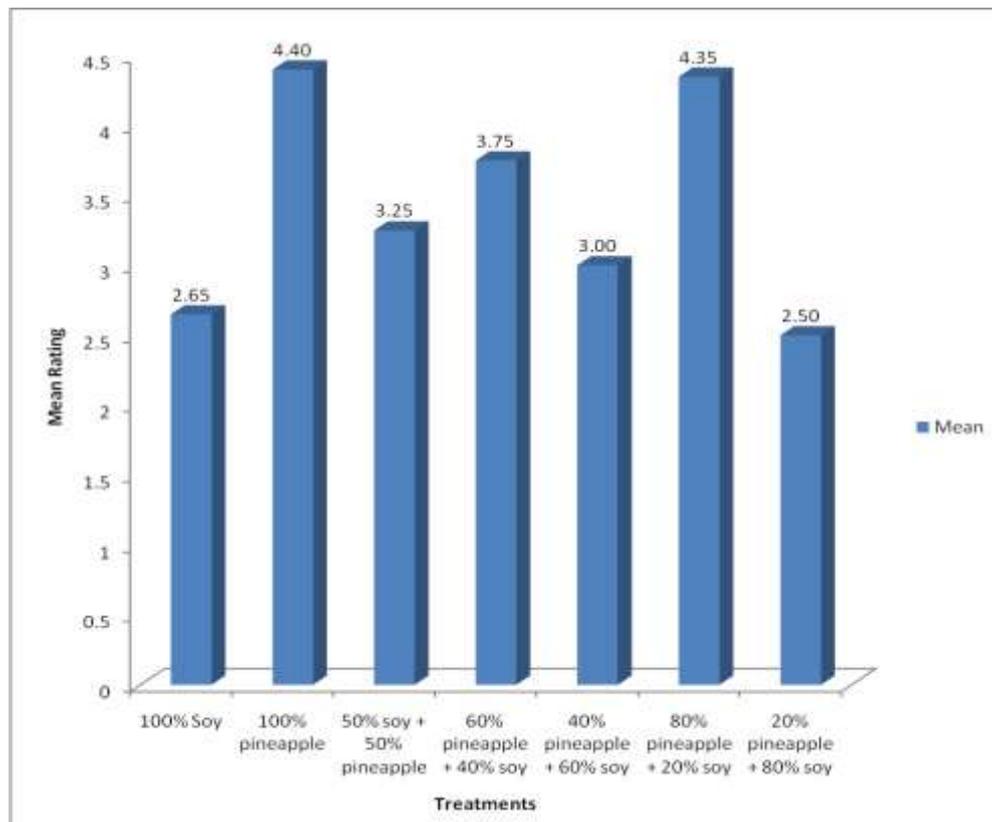


Fig 4: The mean scores for the general acceptability of the pineapple soy blend drink “Pina soy”

IV. Conclusion And Recommendation

This study has shown that 80/20% pineapple/soy blend was the most acceptable for “Pina soy” drink, followed by 60/40% pineapple/soy blend. Pineapple may be used in masking undesirable properties in foods and fruit

juices. Further research should be carried out to determine the acceptability of “Pina soy” with the panelists comprising of older people as the result from this study were obtained from panelist made up of young people.

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